YASKAWA

Machine Controller MP920

Motion Module

USER'S MANUAL

YASKAWA

MANUAL NO. SIEZ-C887-2.5C

Using this Manual

Please read this manual to ensure correct usage of the MP920 system. Keep this manual in a safe place for future reference.

■ Overview

This manual describes the Motion Modules designed for MP920 Machine Controller.

The following Motion Modules can be used with MP920 Machine Controller.

- SVA-01A 4-axis Servo Module
- SVA-02A 2-axis Servo Module
- SVB-01 MECHATROLINK Interface Servo Module
- PO-01 Pulse Output Module

This manual describes the following items required to use these Motion Modules.

- Motion Module setup
- Installation and connection methods
- Parameters
- Troubleshooting

Read this manual carefully to ensure that motion control is correctly performed using the MP920 Machine Controller. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

■ Intended Audience

This manual is intended for the following users.

- Those responsible for estimating the MP920 system
- Those responsible for deciding whether to apply the MP920 system
- Those responsible for designing the MP920 system so that it can be mounted in the control and operating panels
- Those responsible for making, inspecting, testing, adjusting, and maintaining the control and operating panels in which the MP920 is mounted

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MP920 = MP920 Machine Controller
- PC: Programmable Logic Controller
- MPE720: The Programming Device Software or a Programming Device (i.e., a personal computer) running the Programming Device Software
- PLC = Programmable Logic Controller
- "—" in "MOV [axis1]—..." represents numeric data for axis 1.

■ Visual Aids

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

IMPORTANT	Indicates important information that should be memorized.
INFO	Indicates supplemental information.
◀ EXAMPLE ▶	Indicates application examples.
TERMS	Describes technical terms that are difficult to understand, or in the text without an explanation being given.

■ 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 example:

- $\overline{\text{S-ON}}$ = /S-ON
- $\overline{\text{P-CON}}$ = /P-CON

■ Related Manuals

Refer to the following related manuals as required.

Thoroughly check the specifications, restrictions, and other conditions of the product before attempting to use it.

Manual Name	Manual Number	Contents
Machine Controller MP920 User's Manual: Design and Maintenance	SIEZ-C887-2.1	Describes the design and maintenance for the MP920 Machine Controller.
Machine Controller MP920 Communications Module User's Manual	SIEZ-C887-2.6	Describes the functions, specifications, and usage of the MP920 Communications Modules (215IF, 217IF, and 218IF).
Machine Controller MP900/MP2000 Series Ladder Logic Programming User's Manual	SIEZ-C887-1.2	Describes the instructions used in MP900/MP2000 Series ladder logic programming.
Machine Controller MP900/MP2000 Series Motion Programming User's Manual	SIEZ-C887-1.3	Describes the motion programming language used for MP900/MP2000 Series Machine Controllers.
Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device	SIEPC88070005	Describes how to install and operate the MP900/MP2000 Series programming system MPE720.

Safety Information

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

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

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

In some situations, the precautions indicated could have serious consequences if not heeded.

PROHIBITED Indicates prohibited actions that must not be performed. For example, this symbol would be used as follows to indicate that fire is prohibited: .

MANDATORY Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory: .

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

ISO	JIS
	

The ISO symbol is used in this manual.

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

Safety Precautions

This section describes precautions to ensure the correct application of the product. Before installing, operating, maintaining, or inspecting the product, always read this manual and all other documents provided to ensure correct work procedures and application. Before using the equipment, familiarize yourself with equipment details, safety information, and all other precautions.

■ Handling

⚠ CAUTION

- Do not subject the product to halogen gases, such as fluorine, chlovine, bromine, and iodine, at any time even during transportation or installation.

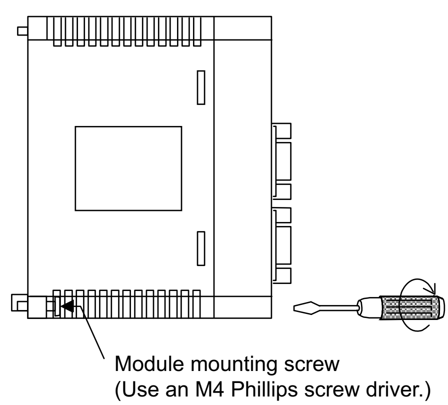
  Failure to observe this caution may cause damage or failure of the product.

■ Installation

⚠ CAUTION

- Firmly tighten the Module mounting screws and terminal block mounting screws to prevent them from loosening during operation.

  Loose screws may result in a malfunction of the MP920.



- Always turn OFF the power supply to the Module before installing it.
- Insert the connectors of the cables that are to be connected to the MP920 Modules and secure them well.

  Incorrect insertion of the connectors may result in a malfunction of the MP920.

■ Wiring

⚠ CAUTION

- Always connect a power supply that meets the given specifications.

  Connecting an inappropriate power supply may cause fires.

- Wiring must be performed by qualified personnel.

  Incorrect wiring may cause fires, product failure, or electrical shocks.

- Do not accidentally leave foreign matter such as wire chips on the Mounting Base or in the Module when wiring.

  This may cause fires, failures, and malfunctions.

MANDATORY

- Always ground the FG terminal to a ground resistance 100Ω or less.

  Failure to ground the MP920 may result in electrical shocks or malfunctioning.

Select, separate, and lay external cables correctly.

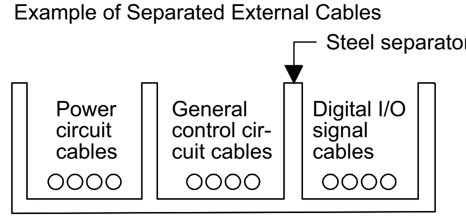
- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP920 Module to external devices.

  - Mechanical strength
  - Noise interference
  - Wiring distance
  - Signal voltage, etc.

- Separate the I/O signal lines from the power lines both inside and outside the control panel to reduce the influence of noise from the power lines.

  If the I/O signal lines and power lines are not separated properly, malfunctioning may result.

Example of Separated External Cables



■ Application

⚠ WARNING

- Do not touch any Module terminals when the system power is ON.

  There is a risk of electrical shock.

⚠ CAUTION

- Do not attempt to modify the MP920 programs, force outputs, switch between RUN and STOP, or perform other similar operations while the MP920 is operating without knowing the direct and indirect consequences of the operation.

  Incorrect programming or operation may damage the equipment or cause an accident.

■ Maintenance

⚠ WARNING

- Make sure that the polarity of the Module's built-in battery is correct. The battery must be installed correctly and must not be charged, disassembled, heated, thrown into fire, or short-circuited.

  Improper handling may cause the battery to explode or ignite.

PROHIBITED

- Do not attempt to disassemble or modify the MP920 Modules in any way.

  Doing so can cause fires, product failure, or malfunctions.

- The customer must not replace any built-in fuses.

  If the customer replaces a built-in fuse, the MP920 Module may malfunction or break down. The built-in fuse must always be replaced by Yaskawa service staff.

■ General

Always note the following to ensure safe use.
• MP920 was not designed or manufactured for use in devices or systems directly related to human life. Users who intend to use the product described in this manual for special purposes such as devices or systems relating to transportation, medical, space aviation, atomic power control, or underwater use must contact Yaskawa Electric Corporation beforehand. • MP920 has been manufactured under strict quality control guidelines. However, if this product is to be installed in any location in which a failure of MP920 involves a life and death situation or in a facility where failure may cause a serious accident, safety devices MUST be installed to minimize the likelihood of any accident. • Drawings in this manual show typical product examples that may differ somewhat from the product delivered. • This manual may change without prior notice due to product improvements and specification changes or for easier use. We will update the manual number of the manual and issue revisions when changes are made. The revision number of the revised manual appears on the back of the manual. • Contact your nearest Yaskawa sales representative or the dealer from whom you purchased the product and quote the manual number on the front page of the manual if you need to replace a manual that was lost or destroyed. • Contact your nearest Yaskawa sales representative or the dealer from whom you purchased the product to order new nameplates whenever a nameplate becomes worn or damaged. • Products modified by the customer are not covered by the Yaskawa warranty, nor does Yaskawa assume any liability for injury or damage that may result from such modifications.

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Revision History

1

Overview of Motion Modules

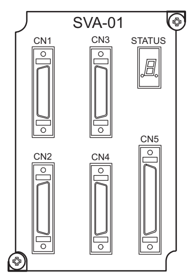
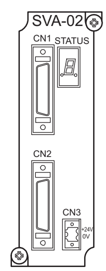
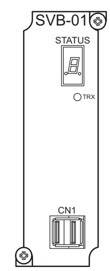
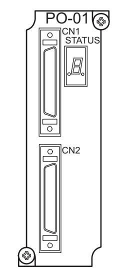
This chapter provides an overview of the Motion Modules and describes their features.

1.1 Module Overview and Features

This section provides an overview of the Motion Modules and describes their features.

1.1.1 Motion Modules

The following table lists the Motion Modules that can be used with the MP920.

Description	SVA-01A	SVA-02A	SVB-01	PO-01
Model Number	JEPMC-MC200A	JEPMC-MC220A	JEPMC-MC210	JEPMC-PL210
Appearance				
Interface	Analog		MECHATROLINK	Pulse
Number of Controlled Axes per Module	4	2	14	4
Maximum Number of Modules	15	16	16	16
Total Number of Modules	16 max.			
Pulse Counting Methods	A/B, Up/Down, sign, ×1/2/4		×4	–
Control Functions	• Speed reference output • Synchronized phase control • Position control	• Speed reference output • Synchronized phase control • Position control • Torque reference output	• Position control only Position loop is performed by Servo Drivers. The SVB-01 Module outputs position reference values.	• Position control only Open loop control The PO-01 Module outputs reference pulses.
Motion Functions	• Positioning • Linear interpolation • Circular interpolation • Helical interpolation • External positioning		• Positioning • Linear interpolation • Circular interpolation • Helical interpolation • External positioning	• Positioning • Linear interpolation • Circular interpolation • Helical interpolation

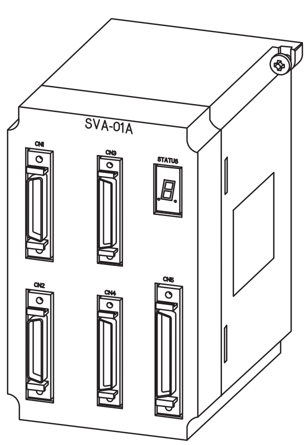
(cont'd)

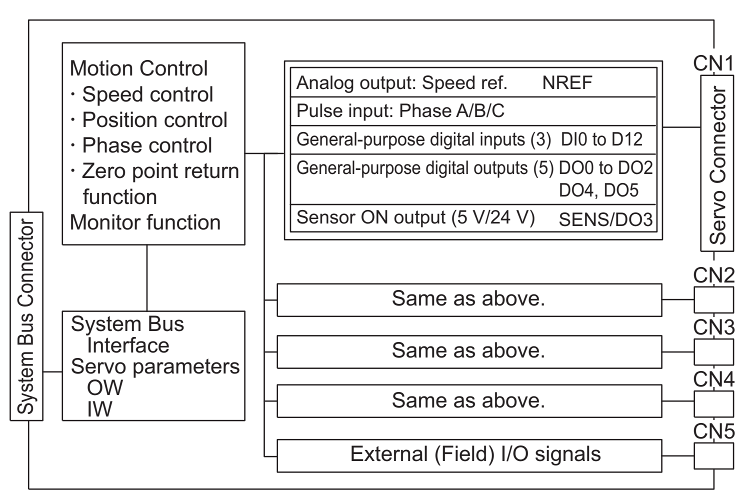
Description	SVA-01A	SVA-02A	SVB-01	PO-01
Model Number	JEPMC-MC200A	JEPMC-MC220A	JEPMC-MC210	JEPMC-PL210
Applicable Servo Drivers and Inverters	• Servo Drivers SGDA-□□□S SGDB-□□□ SGDM-□□ SGDS-□□ • Inverters		• Servo Drivers SGD-□□□N SGDB-□□AN SGDH-□□□E+JUSP-NS100 • Inverters (216IF Card required) VS-616G5 VS-676H5 VS-676H5T	Pulse Motor Drivers
Features	Analog control		High-speed network control • Transmission speed: 4 Mbps • Communications cycle: 2 ms • Transmission distance: 50 m max. Multi-axis control: 14 axes max. per Module	Low-cost and simple control

1.1.2 SVA-01A Module

■ Overview of the SVA-01A Module

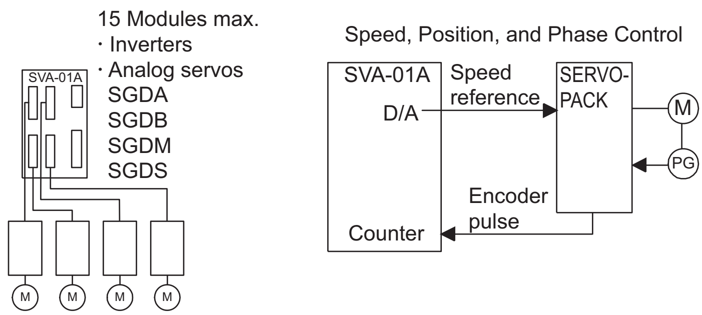
The SVA-01A Module is a Motion Control Module with analog outputs. One SVA-01A Module can control servos for up to four axes. Four connectors (CN1 to CN4) are provided for connections to SERVOPACKs. Each connector is equipped with a speed reference analog output, phase-A/B/C pulse inputs (5 V differential), a pulse latch digital input, and general-purpose digital I/O signals. The CN5 connector is equipped with positive and negative overtravel signals, deceleration limit inputs, zero point latch inputs, external positioning latch inputs, brake control outputs, and other external I/O signals for four axes.





■ Features of the SVA-01A Module

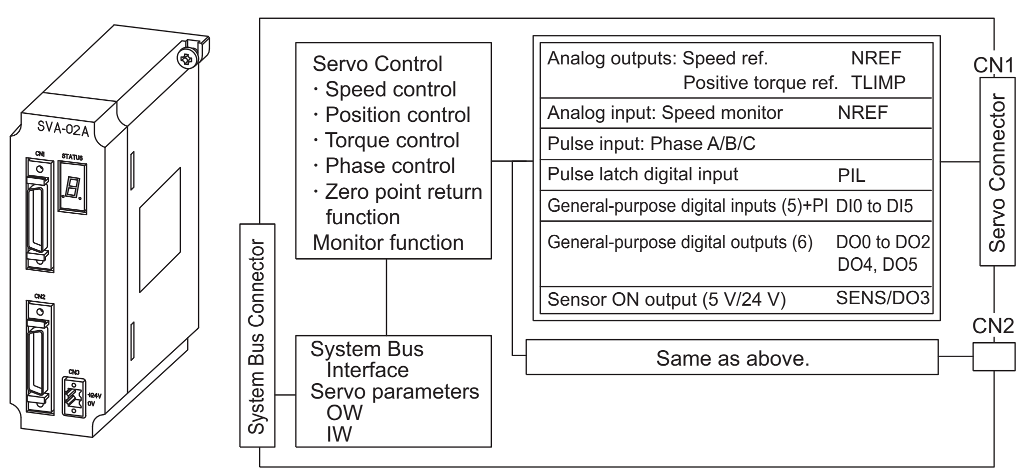
- Analog-output 4-axis Servo Module
- Independent position control, speed reference output, torque reference output, and phase control are possible for each axis.
- Up to 60 axes (up to 15 Modules) can be controlled.
- Interpolations and complex processing operations can be easily programmed in motion programs.



1.1.3 SVA-02A Module

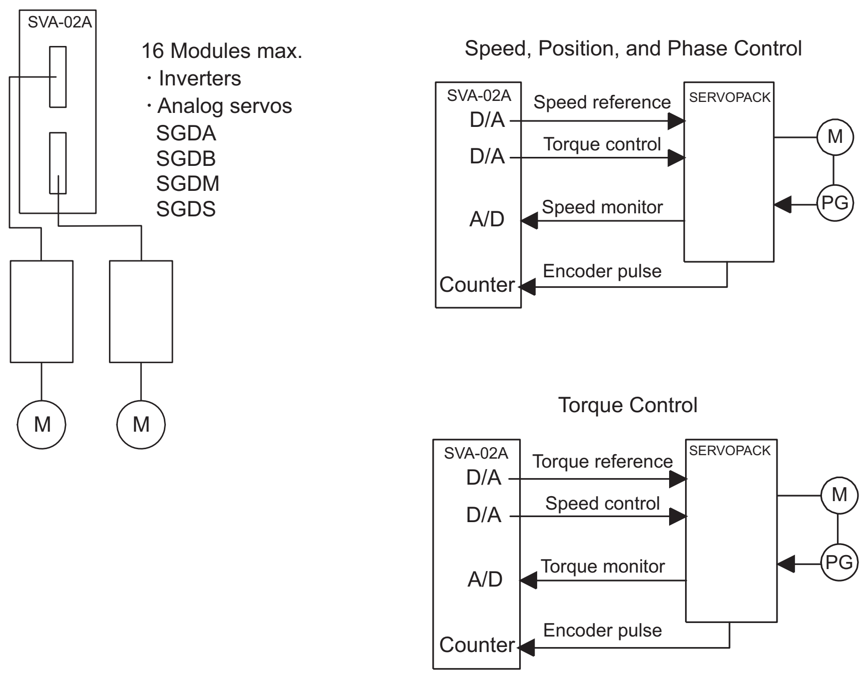
■ Overview of the SVA-02A Module

The SVA-02A Module is a Motion Control Module with analog outputs. One SVA-02A Module can control servos for up to two axes. Two connectors (CN1 and CN2) are provided for connections to SERVOPACKs and external I/O devices. Each connector is equipped with a speed reference analog output, a torque reference output, a torque monitoring analog output, phase A/B/C pulse inputs (5 V differential), a pulse latch digital input, and general-purpose digital I/O signals.



■ Features of the SVA-02A Module

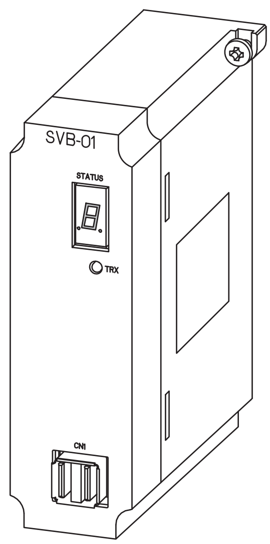
- Analog-output 2-axis Servo Module
- Independent position control, speed reference output, torque reference output, and phase control are possible for each axis.
- Up to 32 axes (up to 16 Modules) can be controlled.
- Interpolations and complex processing operations can be easily programmed in motion programs.

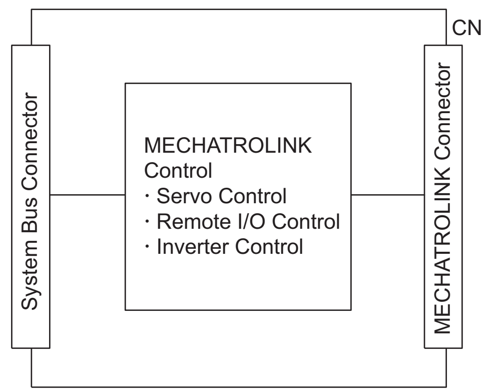


1.1.4 SVB-01 Module

■ Overview of the SVB-01 Module

The SVB-01 Module has a single MECHATROLINK connector and can control up to 14 Module Devices with MECHATROLINK interfaces.

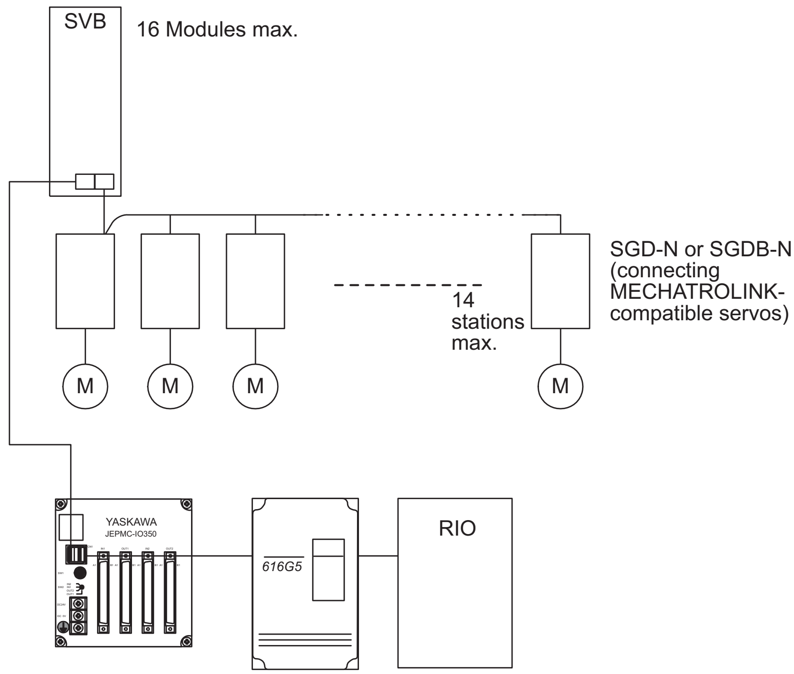




The SVB-01 Module can be connected to I/O Modules (such as the JEPMC-IO350) or Inverters (such as the VS-616G5 or VS-675H5) to transmit control signals and messages.

■ Features of the SVB-01 Module

- By using the MECHATROLINK high-speed field network interface, up to 14 axes can be controlled with less wiring. A total of 224 axes can be controlled using a maximum of 16 Modules.
- Using the position control functions, motion programs can perform positioning, zero point returns, and interpolations.

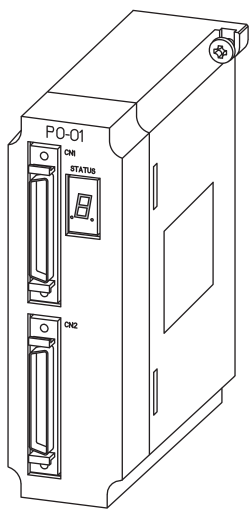


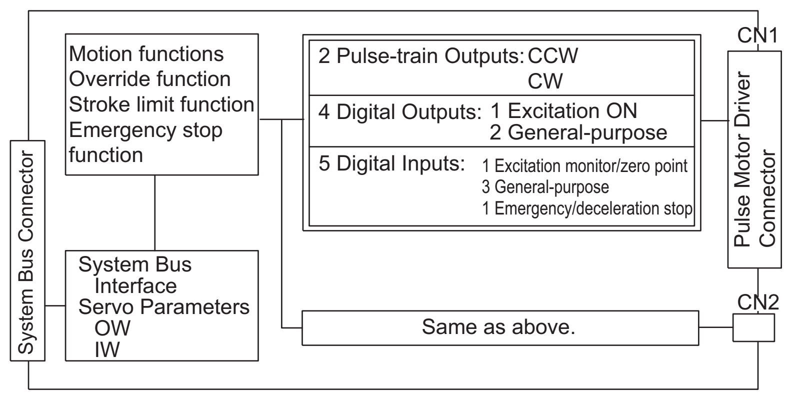
1.1.5 PO-01 Module

■ Overview of the PO-01 Module

The PO-01 Module is a Motion Control Module with pulse-train outputs. One PO-01 Module can be connected to pulse motor drivers for up to 4 axes.

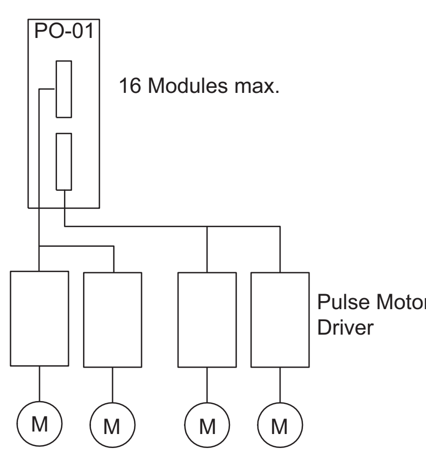
Two connectors (CN1 and CN2) are provided for connections to pulse motor drivers. Each connector is equipped with a 5-V differential pulse-train output as well as 4 digital outputs (DO) and 5 digital inputs (DI) for various pulse driver control applications.

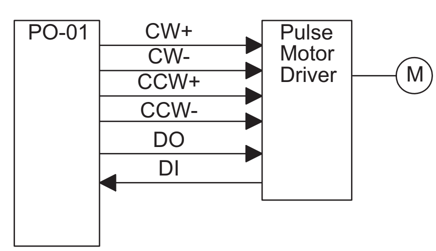




■ Features of the PO-01 Module

- The PO-01 Module can be connected to up to four axes.
- A total of 64 axes can be controlled using a maximum of 16 Modules.
- This Module provides positioning, zero point returns, interpolations, and other functions, all of which can be specified in motion programs.

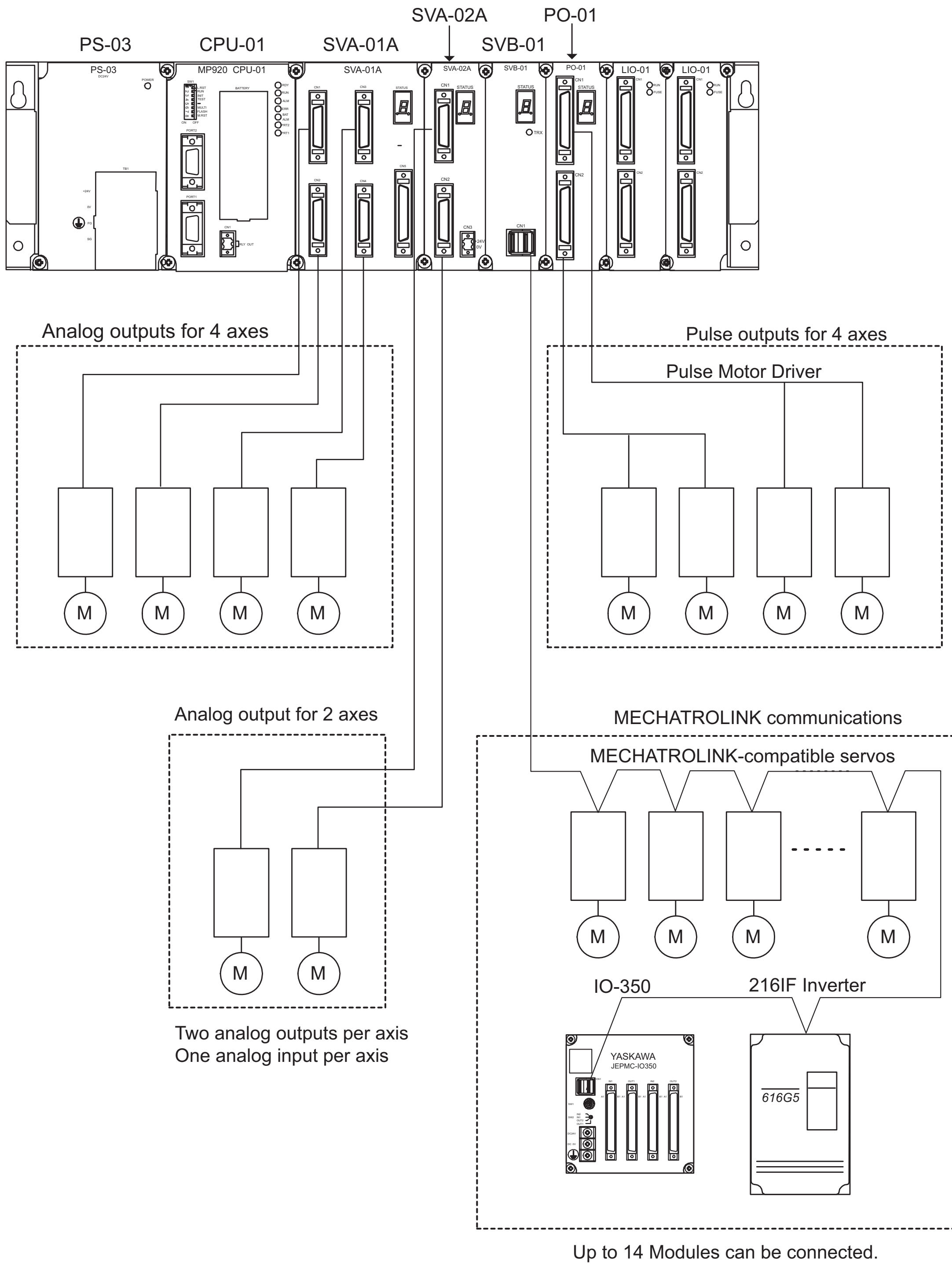




1.2 System Configuration

1.2.1 System Configuration Examples

The MP920 Motion Modules are available with analog outputs, pulse outputs, and field network interfaces. Modules can be freely selected to configure the system best suited to the application.



1.3 Specifications

This section gives an overview of the specifications and functions of the MP920 Modules.

1.3.1 General Specifications

■ General Specifications of the MP920 Modules

Table 1.1 lists the general specifications of the MP920 Modules.

Table 1.1 General Specifications of the MP920 Modules

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0 to 55°C
	Storage Temperature	-20 to 85°C
	Ambient Operating Humidity	30% to 95% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B 3501)
	Corrosive Gas	There must be no combustible or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Electrical Operating Conditions	Noise Resistance	Conforming to JIS B 3502: 1,500 V (p-p) in either normal or common modes with a pulse width of 100 ns/11µs and a rise time of 1 ns (tested with impulse noise simulator)
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B 3502: 10 to 57 Hz with single-amplitude of 0.075 mm 57 to 150 Hz with fixed acceleration of 9.8 m/s^2 (1G) 10 sweeps each in X, Y, and Z directions (sweep time: 1 octave/min)
	Shock Resistance	Conforming to JIS B 3502: Peak acceleration of 147 m/s^2 (15G) twice for 11 ms each in the X, Y, and Z directions
Installation Requirements	Ground	Ground to 100Ω max.
	Cooling Method	Natural cooling

1.3.2 Function Lists

Table 1.2 lists the motion control function specifications for the MP920.

Table 1.2 MP920 Motion Control Function Specifications

Item			Specification			
Description			SVA-01A	SVA-02A	SVB-01	PO-01
Model Number			JEPMC-MC200A	JEPMC-MC220A	JEPMC-MC210	JEPMC-PL210
Interface			Analog	Analog	MECHATROLINK	Pulse
Number of Controlled Axes per Module			4	2	14	4
Maximum Number of Modules			15	16	16	16
Control Specifi-cations	PTP Control		Linear, rotary, infinite-length, and independent axes			
	Interpolation		Up to 16 linear axes, 2 circular axes, and 3 helical axes			
	Speed Reference Output		Yes	Yes	No	No
	Torque Reference Output		No	Yes	No	No
	Phase Control		Yes	Yes	No	No
	Position Control	Positioning	Yes	Yes	Yes	Yes
		External Positioning	Yes	Yes	Yes	No
		Zero Point Return	Yes	Yes	Yes	Yes
		Interpolation	Yes	Yes	Yes	Yes
		Interpolation with Position Detection	Yes	Yes	Yes	No
		Fixed-speed Feed	Yes	Yes	Yes	Yes
		Fixed-length Feed	Yes	Yes	Yes	Yes
Reference Unit			mm, inch, deg, pulse			
Reference Unit Minimum Setting			1, 0.1, 0.01, 0.001, 0.0001, 0.00001			
Maximum Programmable Value			-2147483648 to +2147483647 (signed 32-bit value)			
Speed Reference Unit			mm/min, inch/min, deg/min, pulses/min			
Acceleration/Deceleration Type			Linear, asymmetric, S-curve, exponential			
Override Function			Positioning: 0.01% to 327.67% by axis Interpolation: 0.01% to 327.67% by group			
Coordinate System			Rectangular coordinates			
Zero Point Return	DEC1 + Phase-C		Yes	Yes	Yes	No
	DEC2 + Phase-C		Yes	Yes	No	No
	DEC1 + LMT + C		Yes	Yes	No	No
	Phase-C		Yes	Yes	Yes	No
	DEC1 + ZERO		Yes	No	Yes	Yes
	DEC2 + ZERO		Yes	No	No	Yes
	DEC1 + LMT + ZERO		Yes	No	No	Yes
	ZERO		Yes	No	Yes	No
Pro-grams	Language		Special motion language, ladder logic program			
	Number of Tasks		Up to eight programs can be executed in parallel.			
	Number of Programs		Up to 256			
	Program Capacity		80 Kbytes			

Table 1.2 MP920 Motion Control Function Specifications (cont'd)

Item	Specification			
Description	SVA-01A	SVA-02A	SVB-01	PO-01
Applicable SERVOPACKs and Inverters	SERVOPACKs • SGDA-□□□S • SGDB-□□□ • SGDM-□□ • SGDS-□□ Inverters	SERVOPACKs • SGDA-□□□S • SGDB-□□□ • SGDM-□□ • SGDS-□□ Inverters	SERVOPACKs • SGD-□□□N • SGDB-□□AN • SGDH-□□□E+JUSP-NS100 Inverters (216IF board required) • VS-616G5 • VS-676H5 • VS-676H5T	Pulse Motor Drivers
Encoder	Incremental or absolute	Incremental or absolute	Incremental or absolute	No

Note: Yes: Can be controlled, No: Cannot be controlled.

2

Motion Control

2

This chapter gives an overview of motion control and describes the motion commands.

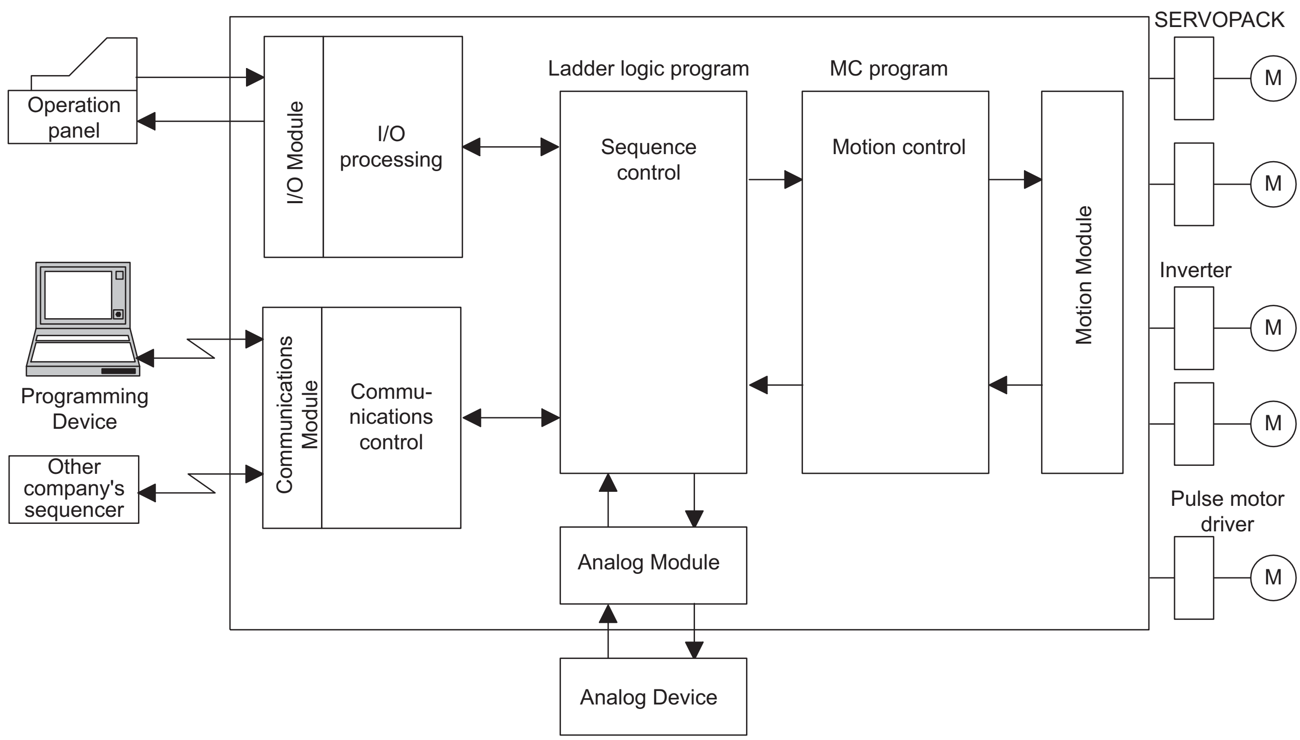
2.1 Overview of Motion Control

This section describes the methods used for motion control and gives some examples of their use.

2.1.1 Motion Control for the MP920

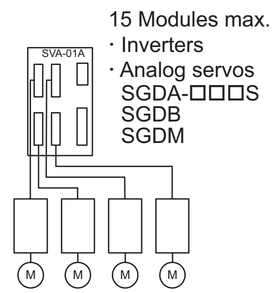
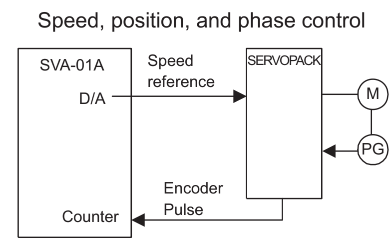
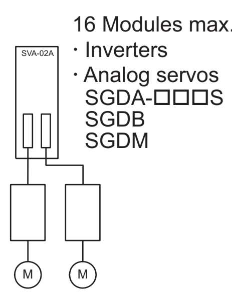
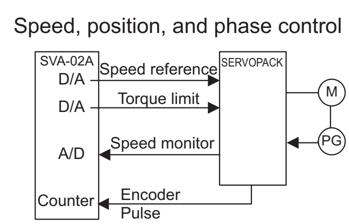
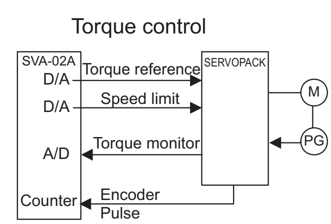
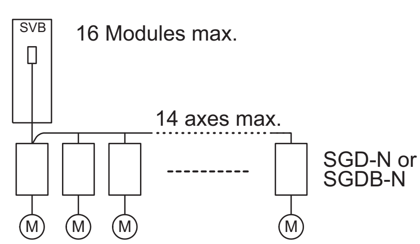
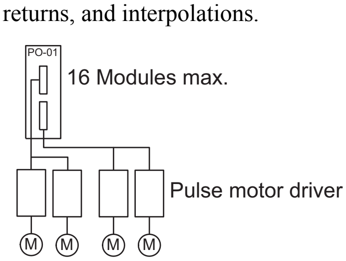
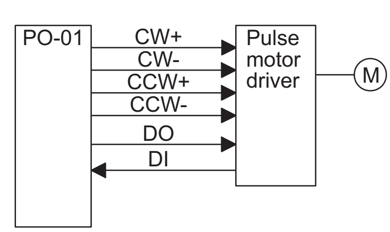
The MP920 Machine Controller provides fully integrated sequence control and motion control.

The following diagram shows a conceptual diagram of the MP920 system.



A wide range of Motion Modules is provided for the MP920, and these can be selected according to the purpose.

The following table shows the types of Motion Module and their features.

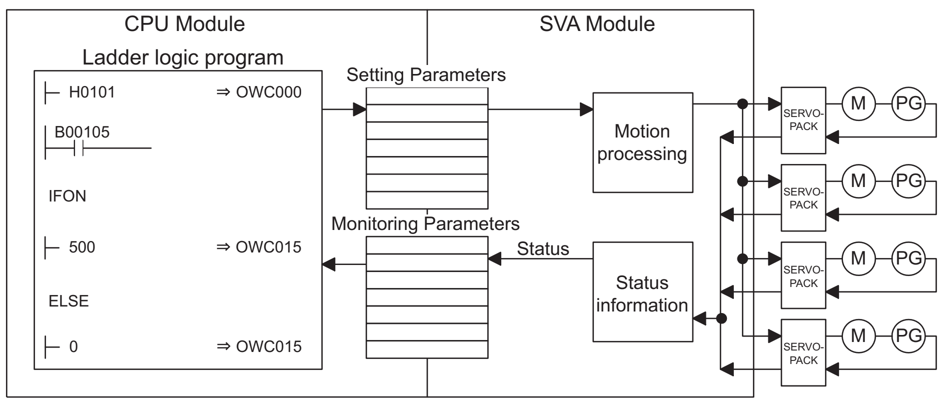
Name	Features
SVA-01A	• Analog-output 4-axis Servo Module • Independent position control, speed control, and phase control are possible for each axis. • Up to 60 axes (up to 15 Modules) can be controlled. • Interpolations and complex processing operations can be easily programmed in motion programs.  
SVA-02A	• Analog-output 2-axis Servo Module • Independent position control, speed control, torque, and phase control are possible for each axis. • Up to 32 axes (up to 16 Modules) can be controlled. • Interpolations and complex processing operations can be easily programmed in motion programs.   
SVB-01	• By using the high-speed field network (MECHATROLINK) interface, up to 14 axes can be controlled with less wiring. (Using a maximum of 16 Modules, 224 axes can be controlled.) • Using the position control functions, motion programs can perform positioning, zero point returns, and interpolations. 
PO-01	• Pulse output type 4-axis Pulse Output Module • Up to 64 axes (up to 16 Modules) can be controlled. • Using the position control functions, motion programs can perform positioning, zero point returns, and interpolations.  

2.1.2 Motion Control Methods

By using Motion Modules, motions for a wide variety of applications can be controlled. There are two programming methods for controlling motions: Ladder logic programs and motion programs. An overview of each programming method is given below.

■ Ladder Logic Programming

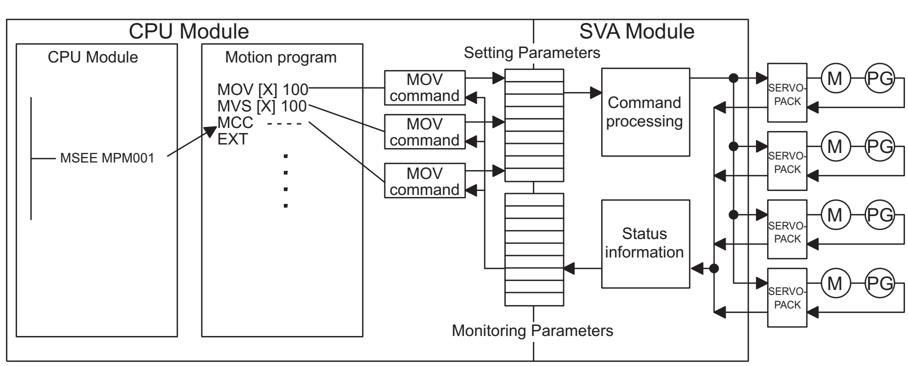
Ladder logic programs are designed mainly for sequence control. The motion setting parameters and motion monitoring parameters used as interfaces with the Motion Modules are directly written to and read by the ladder logic programs to perform motion control.



Special operations can be programmed and combined as user functions. For details, refer to *Chapter4 Parameters* and the section describing the parameters of each Motion Module.

■ Motion Programming

The motion programs that have been created using a special motion language perform motion control. Up to 256 programs can be created, and these can also be executed in parallel.



The use of the special motion language enables complex operations to be easily programmed. The system performs command end checks and other processing. The special motion commands shown in the following table are provided as standard in the MP9□□ Series.

Com- mands	Axis move commands: 8 types MOV, MVS, MCW, MCC, ZRN, SKP, MVT, EXM Basic control commands: 6 types ABS, INC, POS, PLN, MVM, PLD Speed and acceleration/deceleration commands: 7 types ACC, DCC, SCC, VEL, IAC, IDC, IFP, FMX High-level control commands: 4 types PFN, INP, SNG, UFC Control commands: 10 types MSEE, TIM, IOW, END, RET, EOX, IF ELSE IEND, WHILE WEND, PFORK JOINTO PJOINT, SFORK JOINTO SJOINT Math and sequence control commands: 32 types =. +. -, *, /, MOD, |, ^, &, !, ( ), S{ }, R { }, SIN, COS, TAN, ASN, ACS, ATN, SQRT, BIN, BCD, = =, < >, >, <, >=, <=, SFR, SFL, BLK, CLR

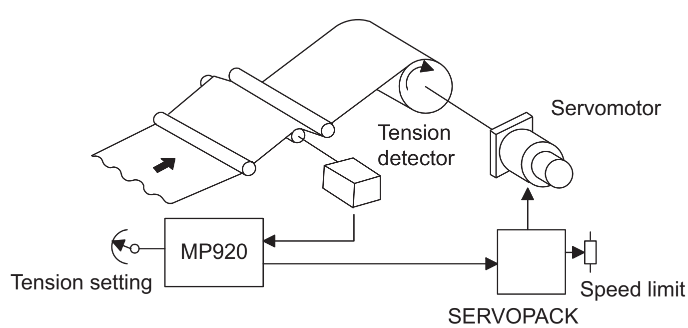
2

2.1.3 Examples of Motion Control Applications

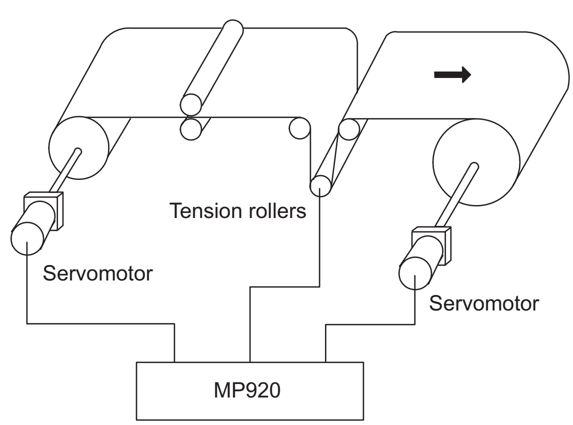
The following illustrations show examples of the use of each control mode for Motion Modules.

■ Speed Reference Output Control and Torque Reference Output Control

Winder A

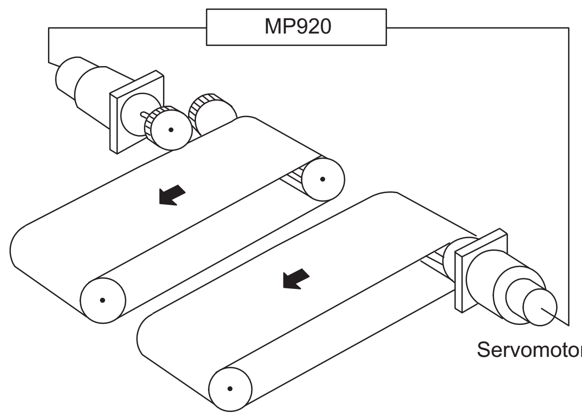


Winder B



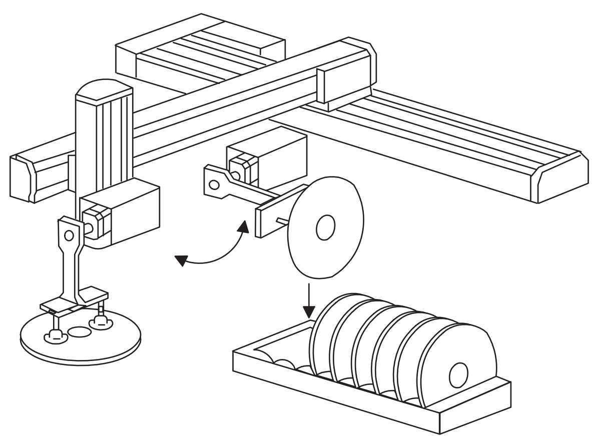
■ Phase Control

Conveyor Synchronization

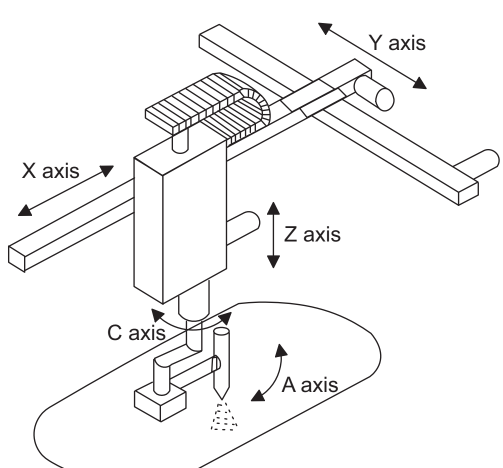


■ Position Control

Conveyor



Coater



2.2 Control Modes

This section describes the motion control modes that can be used by the MP920.

2.2.1 Overview of Control Modes

Five control modes are available for MP920 Motion Modules. These modes can be switched in real time, according to the purpose.

The following table shows the control mode that can be used by MP920 Motion Modules, and gives an overview and some examples of their uses.

2

Control Mode	Overview	Typical Applications	Module			
			SVA-01A	SVA-02A	SVB-01	PO-01
Speed Reference Output Mode	Rotates the motor at the specified speed.	Conveyors or main axes	Yes	Yes	No	No
Torque Reference Output Mode	Outputs the specified torque.	Injection molding machines or presses	No	Yes	No	No
Position Control Mode*	Specifies the target position and speed. Executes a position loop, identifies the difference to the target position from the encoder, converts the difference to the speed reference, and performs position control.	Conveyors or XY tables	Yes	Yes	Yes	Yes
Phase Control Mode	While executing speed control using a standard speed reference, generates the target position from the speed reference, and performs phase control.	Electronic cams or electronic shafts	Yes	Yes	No	No
Zero Return Mode*	Performs zero point positioning when an incremental encoder is used.	–	Yes	Yes	No	No

* There are two methods for returning to the zero point:

- Using ZERO POINT RETURN command for position control
- Using Zero Return Mode

Note: Yes: Available, No: Not available

2.2.2 Speed Reference Output Mode

■ Overview

This mode is used to rotate the motor at the desired speed.

A speed reference is output to the servo drive according to the specified speed reference, linear acceleration/deceleration time constant, and filter time constant.

The acceleration/deceleration time can be set as desired.

S-curve acceleration/deceleration can be easily performed by the user program (one command).

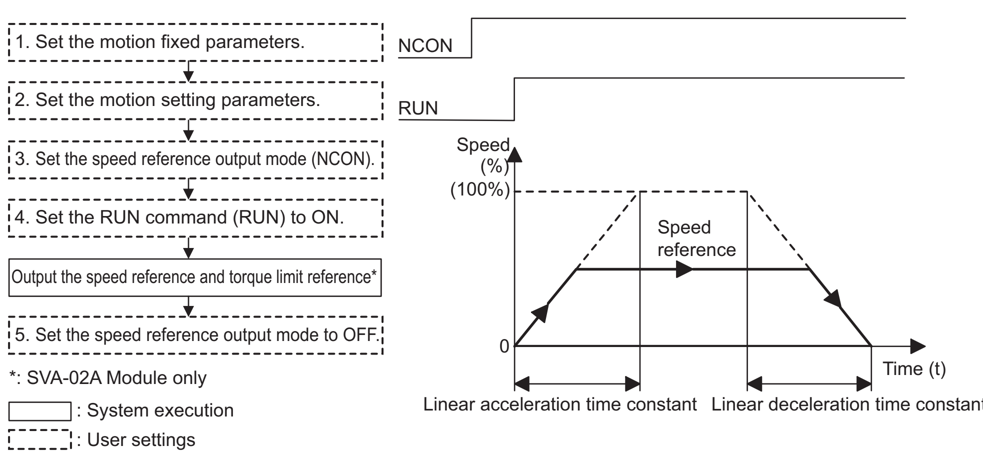
The speed reference output mode can also be used for a general-purpose D/A converter. In this case, set the linear acceleration/deceleration time constant and the filter time constant to "0."

IMPORTANT

The speed reference output mode is available only with the SVA-01A and SVA-02A Modules. It cannot be used with the SVB-01 and PO-01 Modules.

■ Details

Use the following procedure to perform operation in the speed reference output mode.



1. Set the motion fixed parameters according to the user's machine.

Table 2.1 Examples of Fixed Parameters

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated motor speed	3000 min^{-1}
8	Number of Feedback Pulses per Motor Rotation	4 to 65532	Number of pulses before multiplication	2048
9	D/A Output Voltage at 100% Speed	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	6.000 V
	Number of Feedback Pulses per Motor Rotation (For high-resolution) *1	4 to 2147483647	1 = 1 pulse/rev	2048 pulses/rev
10	D/A Output Voltage at 100% Torque Limit*2	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	3.000 V

* 1. Valid only with an SVB-01 Module.
* 2. Valid only with an SVA-02A Module.

2. Set the motion parameters to be used in the speed reference output mode.
   The following three methods can be used to set the motion setting parameters.
   - Using the MPE720 Setting Parameter Window
   - Using a ladder logic program
   - Using a motion program

Table 2.2 Examples of Setting Parameters

Name	Register No.	Setting Range	Meaning	Setting Example
Positive Torque Limit Setting (TLIMP)*	OW☐☐02	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	-100.00 (-100.00%)
Positive Speed Limiter Setting (NLIMP)	OW☐☐04	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Negative Speed Limiter Setting (NLIMN)	OW☐☐05	0 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Linear Acceleration Time Constant (NACC)	OW☐☐0C	0 to 32767	Linear acceleration time constant (ms) at speed pattern generation	1000 (1 second)
Linear Deceleration Time Constant (NDEC)	OW☐☐0D	0 to 32767	Linear deceleration time constant (ms) at speed pattern generation	1000 (1 second)
Filter Time Constant Setting (NNUM)	OW☐☐14	0 to 255	For simple S-curve acceleration	0
Speed Reference Setting (NREF)	OW☐☐15	-327.68 to 327.67	Speed reference value 0.01 = 0.01% 1 = 1%	50.00 (50.00%)

* Valid only with an SVA-02A Module.

In the examples, SERVOPACK is used as axis 1 of Module No. 1. When the Module number and the axis number are different, see *4.1.2 Modules and Motion Parameter Registers*, and change the register numbers.

3. Select the Speed Reference Output Mode (NCON) (bit 0 of OW☐☐00).

4. To start operation, set the Servo ON (RUN) to ON (bit 0 of OW☐☐01).
   The speed reference will be output for the axis according to the specified motion parameters.
   With an SVA-02A Module (2-axis), the speed reference is output with an NREF signal from channel 1 (or channel 2), and the torque limit reference is output with an AO-OUT signal.
   Even while the speed reference output mode is being selected, the motion parameter settings can be changed.
5. To stop operation, set the RUN command (RUN) and the speed reference output mode (NCON) to OFF.

■ User Program Examples

Example of RUN Operation

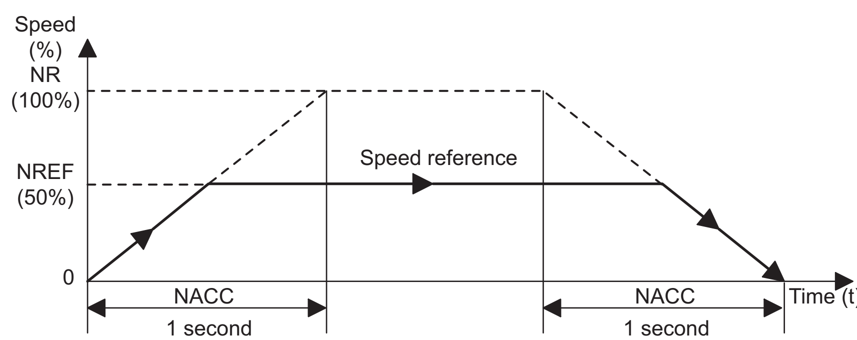
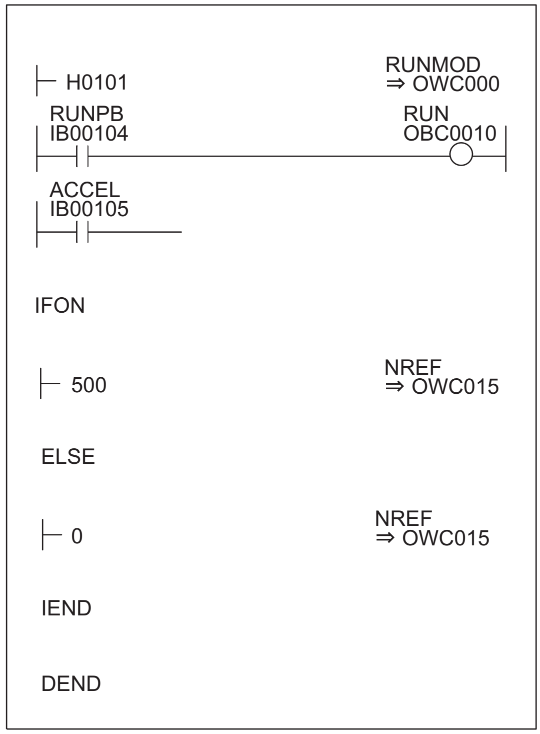


Fig. 2.1 Speed Pattern

Ladder Logic Program Example



Set the speed reference output mode to ON.

Driver RUN command (RUN)

When IB00104 turns ON, the speed reference output mode starts.

When the acceleration command (IB00105) turns ON, a speed reference of 50% is output for the acceleration time constant (ACC).
When IB00105 turns OFF, the deceleration time constant (DEC) causes deceleration stop (a speed reference of 0% is output).

Fig. 2.2 RUN Commands (DWG H01)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2

2.2.3 Torque Reference Output Mode

■ Overview

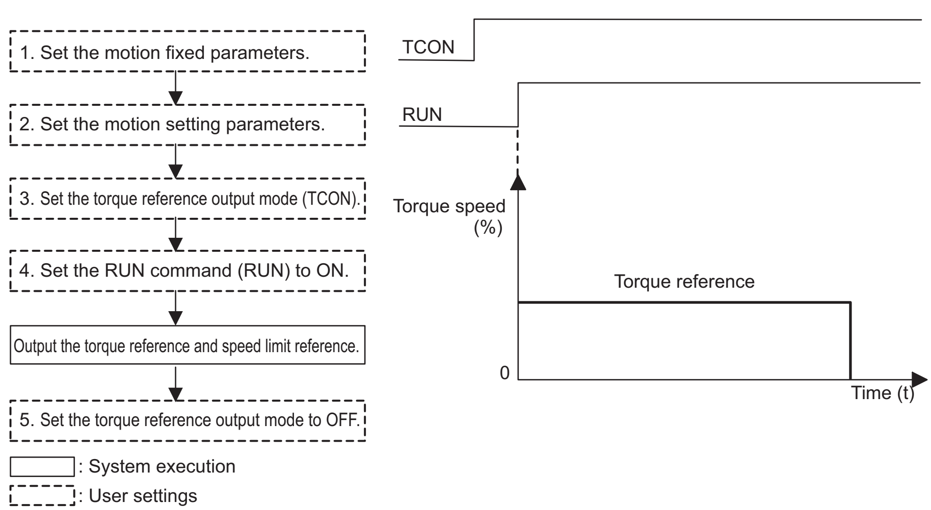
This mode is used to generate a constant torque, regardless of the speed.
Select this mode to keep the metal mold of a plastic molding machine, such as an injection molding machine, at a constant pressure.
When the torque reference output mode is selected, the specified torque reference and speed limit reference are output by the servo drive.
This mode can be used only with an SVA-02A Module.

IMPORTANT

The torque reference output mode is available only with the SVA-02A Module. It cannot be used with the SVA-01A, SVB-01, and PO-01 Modules.

■ Details

Use the following procedure to perform operations in the torque reference output mode.



1. Set the motion fixed parameters according to the user's machine.
   Table 2.3 shows the related parameters when the torque reference output mode is used.

Table 2.3 Examples of Fixed Parameters

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated motor speed	3000 min^{-1}
8	Number of Feedback Pulses per Motor Rotation	4 to 65532	Number of pulses before multiplication	2048
9	D/A Output Voltage at 100% Speed	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	6.000 V
	Number of Feedback Pulses per Motor Rotation (For high-resolution) *1	4 to 2147483647	1 = 1 pulse/rev	2048 pulses/rev
10	D/A Output Voltage at 100% Torque Limit*2	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	3.000 V

* 1. Valid only with an SVB-01 Module.
* 2. Valid only with an SVA-02A Module.

2. Set the motion parameters to be used in the torque reference output mode.

Table 2.4 Examples of Setting Parameters

Name	Register No.	Meaning	Setting Example
Torque Reference Setting (TREF)	OW□□1B	Sets the torque reference value at 0.01%.	50.00 (50.00%)
Speed Limit Setting (NLIM)	OW□□1C	Sets the speed limit value at 0.01%.	50.00 (50%)

3. Select the Torque Reference Output Mode (TCON) (bit 1 of OW□□00).
4. To start operation, set the RUN Servo ON (RUN) to ON (bit 0 of OW□□01).
   The torque reference and the speed limit reference will be output for the axis according to the specified motion parameters.
   Even while the torque reference output mode is being selected, the motion parameter settings can be changed.
5. To stop operation, set the RUN command (RUN) and the torque reference output mode (TCON) to OFF.

■ User Program Example

Example of RUN Operation

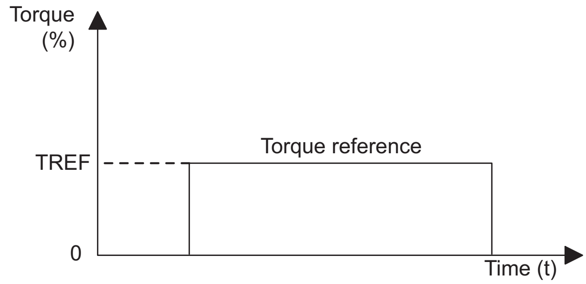
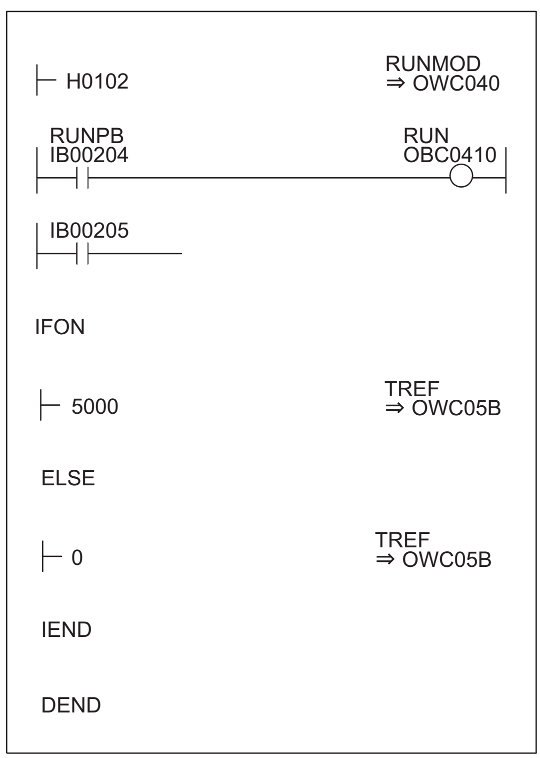


Fig. 2.3 Torque Pattern

Ladder Logic Program Example



Set the torque reference output mode to ON.

Driver RUN command (RUN)

When IB00204 turns ON, the torque reference output mode starts.

When IB00205 turns ON, 50% is output as the torque reference.
When IB00205 turns OFF, 0% is output as the torque reference.

Fig. 2.4 RUN Commands (DWG H02)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.2.4 Phase Control Mode

■ Overview

This mode is used to rotate the motor according to the specified speed reference, and at the same time to strictly control the number of rotations.

Phase control uses multiple axes, ensuring that no deviation occurs in the angle of rotation (phase) for the motors and enabling endless rotation for printing and other machines being controlled.

Electronic shafts and electronic cams can thus be used in the servomotors of complex machine configurations. Phase alignment and synchronous operation, as well as ratio operation and cam variable speed operation have all been replaced by software.

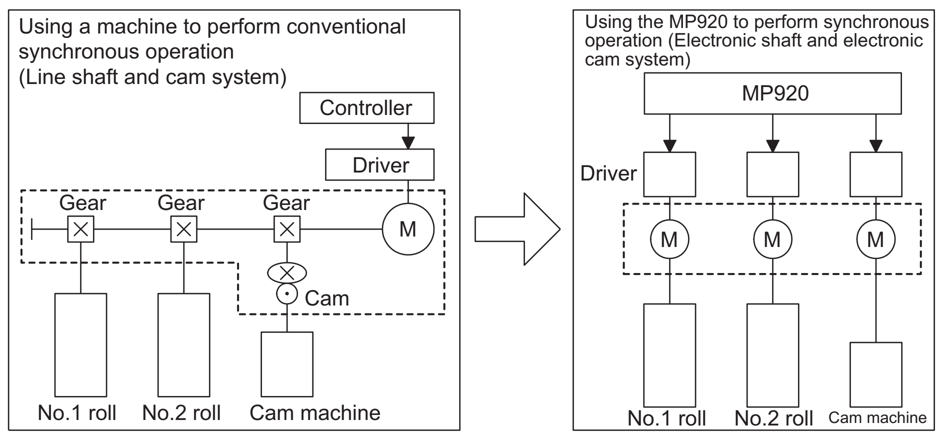


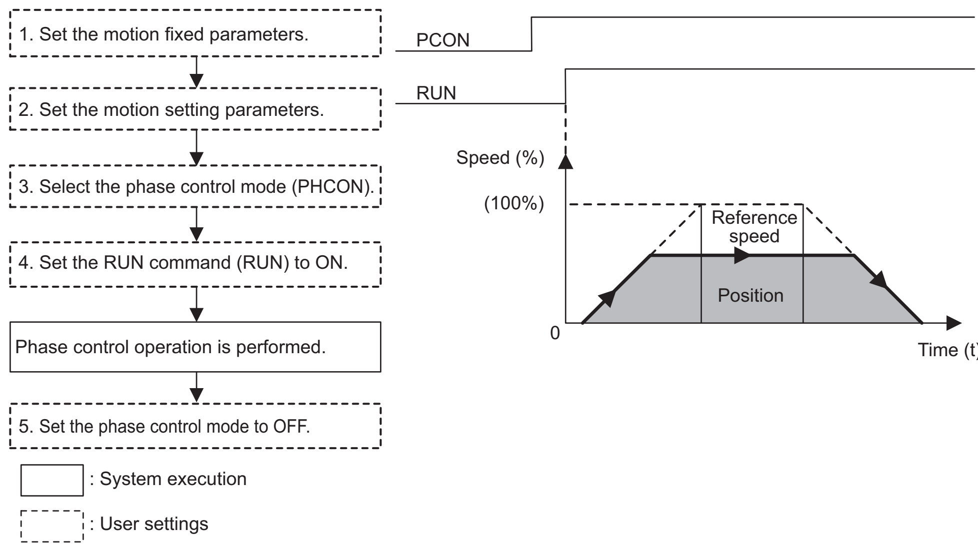
Fig. 2.5 Electronic Cam and Electronic Shaft Illustration

IMPORTANT

The phase control mode is available only with the SVA-01A and SVA-02A Modules. It cannot be used with the SVB-01 and PO-01 Modules.

■ Details

Use the following procedure to perform phase control operation.



1. Set the motion fixed parameters according to the user's machine.

Table 2.5 Examples of Fixed Parameters

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated motor speed	3000 min^{-1}
8	Number of Feedback Pulses per Motor Rotation	4 to 65532	Number of pulses before multiplication	2048
9	D/A Output Voltage at 100% Speed	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	6.000 V
	Number of Feedback Pulses per Motor Rotation (For high-resolution) *1	4 to 2147483647	1 = 1 pulse/rev	2048 pulses/rev
10	D/A Output Voltage at 100% Torque Limit*2	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	3.000 V

* 1. Valid only with an SVB-01 Module.
* 2. Valid only with an SVA-02A Module.

2. Set the motion parameters to be used in the phase control mode. Use the user program to control the reference speed so that no shock occurs.

   The following three methods can be used to set the motion setting parameters.

   - Using the MPE720 Setting Parameter Window
   - Using a ladder logic program
   - Using a motion program

   Table 2.6 shows the related parameters when the phase control mode is used.

Table 2.6 Examples of Setting Parameters

Name	Register No.	Setting Range	Meaning	Electronic Shaft Setting Example	Electronic Cam Setting Example
Positive Torque Limit Setting (TLIMP)*	OW□□02	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	-100.00 (-100.00%)	-100.00 (-100.00%)
Positive Speed Limiter Setting (NLIMP)	OW□□04	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)	130.00 (130.00%)
Negative Speed Limiter Setting (NLIMN)	OW□□05	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)	130.00 (130.00%)
Error Count Alarm Detection Setting (EOV)	OW□□0F	0 to 65535	1 = 1 pulse	65535	65535
Speed Reference Setting (NREF)	OW□□15	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	50.00 (50.00%)	Set by the ladder logic program.
Phase Bias Setting (PHBIAS)	OL□□16	-2^{31} to 2^{31}-1	1 = 1 pulse	Set by the ladder logic program.	Set by the ladder logic program.
Speed Compensation Setting (NCOM)	OW□□18	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	0.00	0.00
Proportional Gain Setting (PGAIN)	OW□□19	0.0 to 3276.7	0.1 = 0.1 /s 1 = 1 /s	1.5 (1.5)	250.0 (250.0)
Integral Time Setting (TI)	OW□□1A	0 to 32767	1 = 1 ms	300 (300 ms)	0 (0 ms)

* Valid only with an SVA-02A Module.

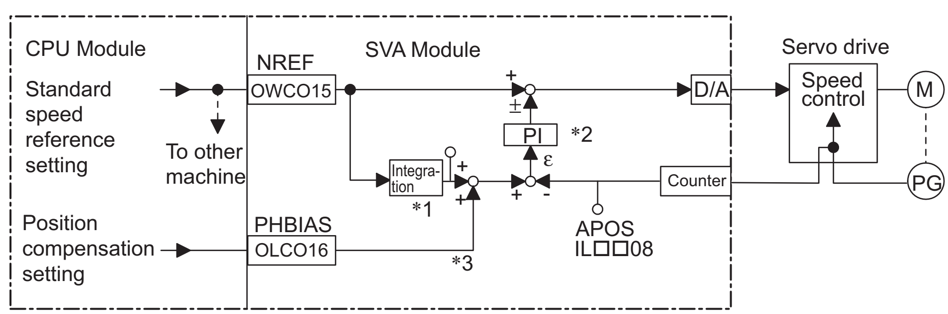
3. Select the Phase Control Mode (PHCON) (bit 3 of OW☐☐00).
   At this time, also set Phase Reference Disable (PHREFOFF: bit 7 of OW☐☐00). Normally, this bit is set to OFF for electronic shaft applications, and it is set to ON for electronic cam applications.
4. To start operation, set the RUN Servo ON (RUN) to ON (bit 0 of OW☐☐01).
   Phase control will be performed for the axis according to the specified motion parameters. Even while phase control is being performed, the motion parameter settings can be changed.
5. To stop operation, set the RUN command (RUN) and the phase control mode (PHCON) to OFF.

■ User Program Example 1: Electronic Shaft

Example of RUN Operation

Phase control can be called “speed control with position compensation” or “position control with 100% speed feed forward.” “Position” means the motor angle of rotation, and is therefore called “phase control.” An electronic shaft can be configured using this phase control.

Fig. 2.6 shows a block diagram of a phase control loop.



*1 Integrates the reference speed reference, and calculates the corresponding position (pulse).

*2 Generates the speed reference from the target position (CPOS) and current position (APOS) error ε. This is the position (phase) compensation.

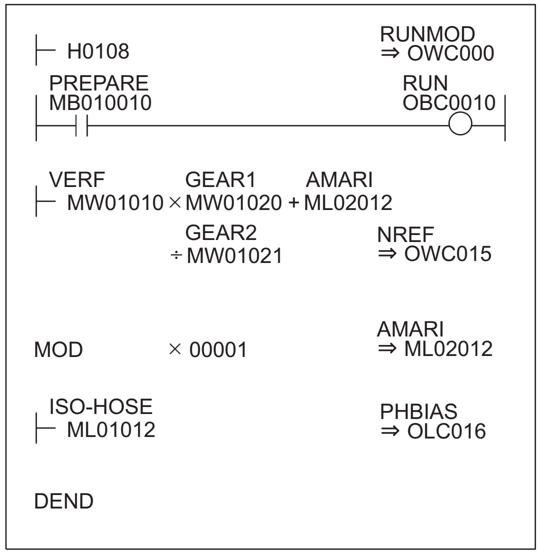
*3 To move the phase, the distance to be moved (the angle of rotation of the motor axis converted to the number of pulses) can be added as the phase compensation setting.

Fig. 2.6 Block Diagram of Phase Control Loop

The rotational phase of the motor can be managed (controlled) using the above method.

This control loop is processed in the SVA-02A Module. Therefore, the user can easily control the electronic shaft simply by selecting the phase control mode on the CPU Module and providing the required parameters for the SVA Module.

Ladder Logic Program Example



Set the phase control mode to ON.
Set Phase Reference Generation Operation Disable to OFF.
Driver RUN command (RUN)
When MB01010 turns ON, phase control starts.
Set the reference speed reference (NREF).
The speed reference is stored in advance in MW01010. The gear ratios are stored in advance in MW01020 and NW01021. If gears are not required, "1" is stored in advance.

To move the phase, set the phase compensation (OLC016). The distance to be moved (the angle of rotation of the motor axis converted to the number of pulses) is stored in advance in ML01012.

Fig. 2.7 RUN Commands (DWG H04)

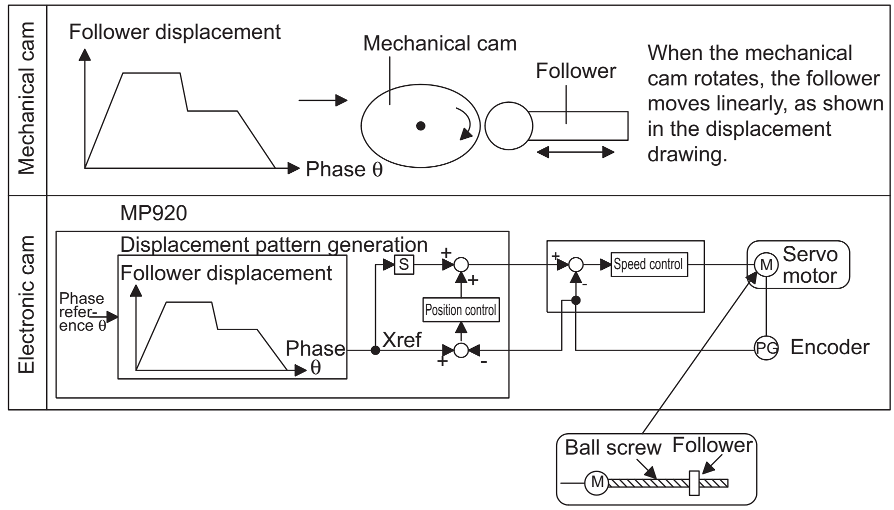
The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

■ User Program Example 2: Electronic Cam

Example of RUN Operation

Cams are one of the conventional methods for changing a rotational movement to a linear movement, and they are used to obtain the desired operation curve (displacement drawing) during a cycle.

- A mechanical cam forms a cam with a shape corresponding to this displacement drawing. Placing a follower on the circumference and rotating the cam enables the desired linear operation to be obtained.
- An electronic cam holds the actual displacement drawing data in the controller as a position pattern, and performs regular position control for the so-called continuous path (CP) by changing the phase.



An electronic cam control loop can be configured using phase control. With normal phase control, the position reference is generated by integrating the reference speed reference into the SVA Module (see *Fig. 2.8*).

An electronic cam control loop cuts the integral circuit of the reference speed reference, and provides the position reference from the phase compensation settings (see *Fig. 2.9*).

The following illustration shows a block diagram of a phase control loop.

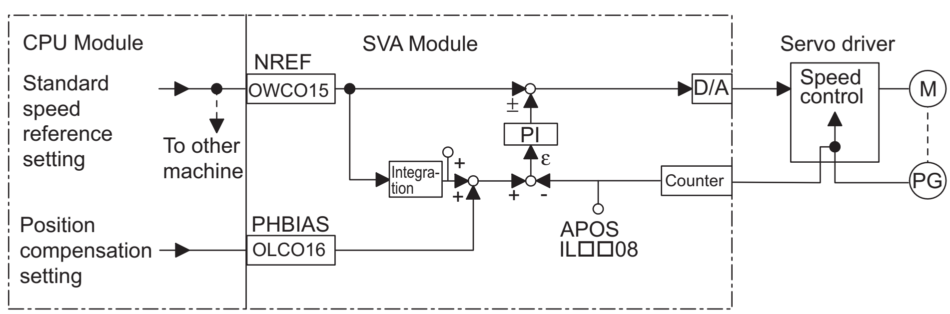


Fig. 2.8 Block Diagram of Phase Control Loop

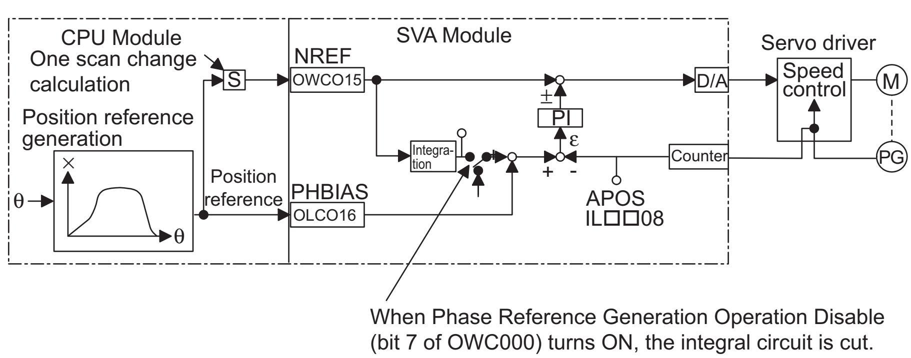
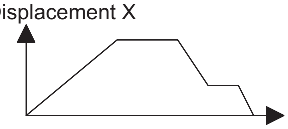


Fig. 2.9 Block Diagram of Electronic Cam Control Loop

The electronic cam control loop is processed in the SVA Module. Therefore, the user can easily control the electronic cam simply by selecting the phase control mode on the CPU Module and providing the required parameters for the SVA Module.

Ladder Logic Program Example

Ladder program	Comment
├ H0188 ⇒ OWC000 (RUNMOD)	Set the phase control mode to ON. Set Phase Reference Generation Operation Disable to ON.
├ MW00040 (K1) × SW00004 (TsH) ÷ MW00041 (K2) ⇒ ML03010 (KS)	Calculate the speed scalling constant (ks). High-speed scan setting: SW0004 $\frac{NR \times FBppr \times n}{60 \times 10^4}$ → Numerator* MW00040, Denominator* MW00041 NR = Rated speed FBppr = Number of feedback pulses n = Number of pulse multipliers (1, 2 or 4) * Reduce the fraction to the lowest terms so that it can be stored as one word.
├ 10000 ⇒ MW03012 (FFGAIN)	Feed forward gain [10000/100%]
PREPARE MB010010 ─┤├─ RUN OBC0010 ─○─	Drive RUN command (RUN) When MB01010 turns ON, phase control starts.
PHASE REFERENCE ├ ML03030	
FGN DISPLACEMENT PATTERN MA03050 DISPLACEMENT X ⇒ ML03020	The phase reference displacement [pulse] is read from the FGN function.



The FGN pattern is set in advance.

Ladder program	Comment
DISPLACEMENT X ├ ML03020 PREVIOUS VALUE -ML03024 CHANGE ⇒ ML03022	Changes [pulses] per scan
├ 00000	
RUN command MB010020 ─┤├─	When RUN command MB010020 turns ON, the machine operates at the reference speed NREF. When MB010020 turns OFF, the reference speed NREF remains at "0."
CHANGE [├ML03022] × FFGAIN MW03012 KS ÷ ML03010 NREF ⇒ OWC015	Standard speed reference setting [0.01%]
Position BIAS [├ML03022] + DISPLACEMENT X [+MW03020] PHBIAS [⇒ OLC016]	Phase compensation setting [pulse]
DISPLACEMENT X ├ ML03020 PREVIOUS VALUE ⇒ML03024	Phase reference previous displacement value [pulse]
DEND	

Fig. 2.10 RUN Command (DWG H04)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.2.5 Zero Point Return Mode

■ Overview

The zero point return operation returns the machine to the machine-specific zero point.

When an incremental encoder is used, the system zero point position data is destroyed if the power supply is disconnected. Therefore, after turning ON the power, the system zero point must be repositioned. As a general rule, a pulse generator (PG) with a zero point pulse and a limit switch showing the zero point area are used to determine the zero point.

There are two zero point return methods. One method uses motion commands, and the other method uses the zero point return mode. Care is required because zero point return operations are different with these two methods.

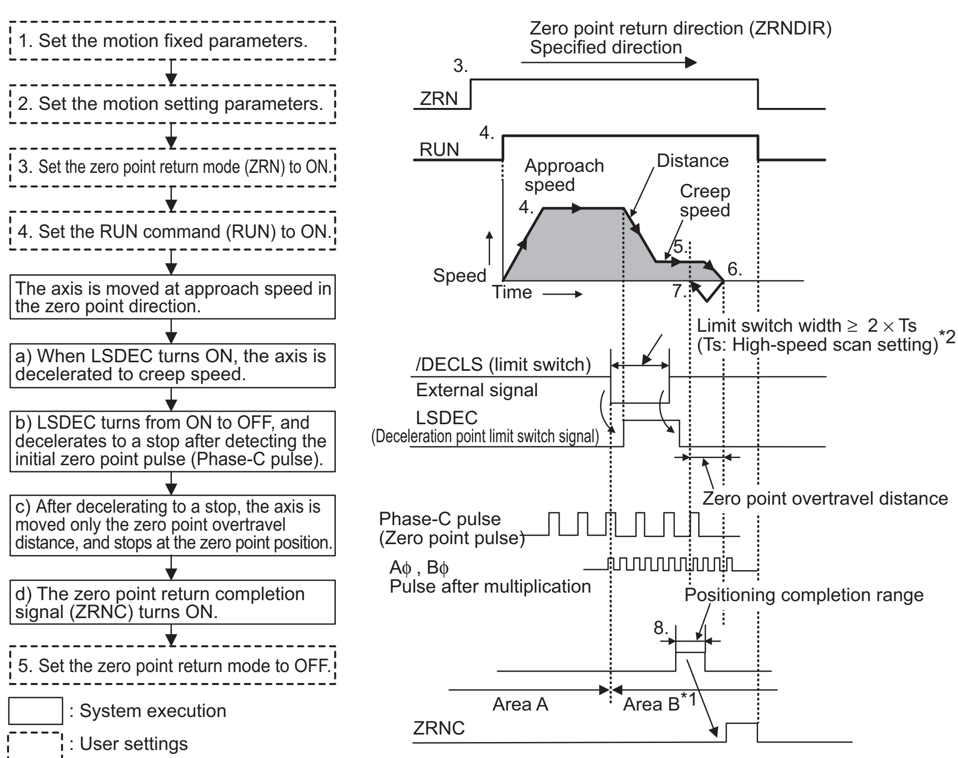
Using the zero point return mode is explained below.

Note: To use motion commands, see *2.4.4 Zero Point Return (ZRET)*.

When an absolute encoder is used, position reference "0" will be the position control when zero point return is selected.

■ Details

Use the following procedure to perform operation in the zero return mode.



* 1. If the machine is in Area B after the power is turned ON, a return cannot be performed correctly. Be sure to move the machine back to Area A before performing a return.

* 2. The limit switch (/DECLS) width must be at least twice that of the high-speed scan setting.

2

1. Set the motion fixed parameters according to the user's machine.

Table 2.7 Examples of Fixed Parameters

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated motor speed	3000 min^{-1}
8	Number of Feedback Pulses per Motor Rotation	4 to 65532	Number of pulses before multiplication	2048
9	D/A Output Voltage at 100% Speed	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	6.000 V
	Feedback Pulses per Motor Rotation (For high-resolution) *1	4 to 2147483647	1 = 1 pulse/rev	2048 pulses/rev
10	D/A Output Voltage at 100% Torque Limit *2	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	3.000 V

* 1. Valid only with an SVB-01A Module.
* 2. Valid only with an SVA-02A Module.

2. Set the motion parameters.
   The following three methods can be used to set the motion setting parameters.
   - Using the MPE720 Setting Parameter Window
   - Using a ladder logic program
   - Using a motion program

Table 2.8 Examples of Setting Parameters

Name	Register No.	Setting Range	Meaning	Setting Example
Positive Torque Limit Setting (TLIMP)*	OW☐☐02	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	-100.00 (-100.00%)
Positive Speed Limiter Setting (NLIMP)	OW☐☐04	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Negative Speed Limiter Setting (NLIMN)	OW☐☐05	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Zero Point Offset (ABSOFF)	OW☐☐06	-2^{31} to $2^{31}-1$	1 = 1 reference unit With pulse: 1 = 1 pulse	100 pulses
Approach Speed Setting (NAPR)	OW☐☐0A	0 to 32767	Value (%) for rated speed: 1 = 0.01%	2000 (20.00%)
Creep Speed Setting (NCLP)	OW☐☐0B	0 to 32767	Value (%) for rated speed: 1 = 0.01%	1000 (10.00%)
Linear Acceleration Time Constant (NACC)	OW☐☐0C	0 to 32767	Linear acceleration time constant (ms) at speed pattern generation	1000 (1 second)
Linear Deceleration Time Constant (NDEC)	OW☐☐0D	0 to 32767	Linear deceleration time constant (ms) at speed pattern generation	1000 (1 second)
Positioning Completed Range Setting (PEXT)	OW☐☐0E	0 to 65535	1 = 1 reference unit With pulse: 1 = 1 pulse	10 pulses
Error Count Alarm Detection Setting (EOV)	OW☐☐0F	0 to 65535	1 = 1 reference unit With pulse: 1 = 1 pulse	65535 pulses

Table 2.8 Examples of Setting Parameters (cont'd)

Name	Register No.	Setting Range	Meaning	Setting Example
Position Loop Gain Setting (KP)	OW□□10	0.0 to 3276.7	0.1 = 0.1 /s 1 = 1 /s	30.0 (30.0 /s)
Filter Time Constant (NNUM)	OW□□14	0 to 255	For simple S-curved acceleration	0

* Valid only with an SVA-02A Module.

In the example, the SERVOPACK is used as axis 1 of Module No. 1. When the Module number and the axis number are different, see *4.1.2 Modules and Motion Parameter Registers*, and change the register number.

3. Set the Zero Point Return Mode (ZRN) to ON (bit 4 of OW□□00).
4. To start operation, set the RUN Servo ON (RUN) to ON (bit 0 of OW□□01).
   The axis will be moved in the direction specified by the Zero Point Return Direction Selection ZRNDIR (bit 9 of OW□□00).
   a) When the Zero Point Return Deceleration Point Limit Switch LSDEC (bit 15 of OW□□01) turns ON, the axis is decelerated to creep speed.

IMPORTANT

A user program must be created to connect the Limit Switch Signal DECLS (the DI signal included in the LIO-01 Module) to the Zero Point Return Deceleration Point Limit Switch LSDEC (bit 15 of OW□□01).

   b) When LSDEC turns from ON to OFF, the point detected by the initial zero point pulse (Phase-C pulse) is the zero point position. The axis is decelerated to a stop after detecting the initial zero point pulse.
   c) After decelerating to a stop, the axis is moved only the zero point overtravel distance at creep speed in the zero point position direction and stops at the zero point position. A zero point position offset value can also be set. (If Machine Coordinate System Zero Point Position Offset OL□□06 is set in advance to 100, the position data will be 100.)
   d) The zero point return operation is completed when the axis enters the positioning completed range. When the zero point return operation is completed, the Zero Point Return Completed Signal ZRNC (bit 15 of IW□□00) turns ON.
5. After checking that the zero point return completion signal (ZRNC) is turned ON, set the RUN command (RUN) and the zero return mode (ZRN) to OFF.

■ User Program Example

Example of RUN Operation

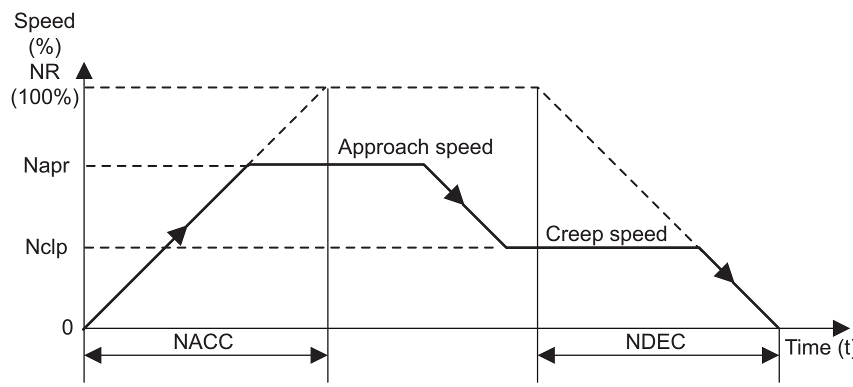


Fig. 2.11 Zero Point Return Pattern

Operating Conditions

Input a limit switch signal width at least twice that of the high-speed scan setting.

Ladder Logic Program Example

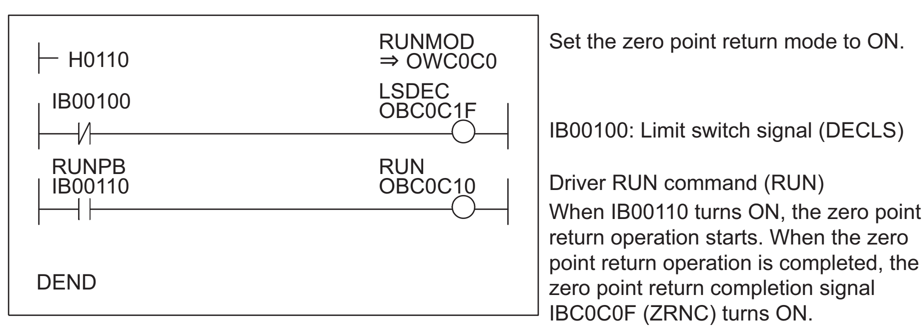


Fig. 2.12 RUN Commands (DWG H01)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.3 Position Control

This section describes the prerequisites for position control, and position control without using motion commands.

2.3.1 Prerequisites for Position Control

With position control, the axis is moved to the target position, stops there, and holds that position (servo clamp).

An incremental encoder or a Yaskawa absolute encoder is used as the position detector. When a Yaskawa absolute encoder is used, the absolute position is stored, even when the power for the machine (positioning device) is disconnected. Therefore, when the power is turned ON again, the zero point return operation is not required.

There are two position control methods. One method uses motion commands (OW☐☐20), and the other method does not use motion commands.

Whether or not motion commands (OW☐☐20) are to be used is set in the motion parameters shown in the following table.

Motion Parameter	Motion Command (OW☐☐20) Not Used	Motion Command (OW☐☐20) Used
Motion fixed parameter No. 14 Bit 7 of Additional Function Selections (Motion Command Code Selection)	0 (= Not used)	1 (= Used)
Motion setting parameter Bit 8 of RUN Mode Settings (OW☐☐00) (Motion Command Code Enable/Disable)	0 (= Disabled)	1 (= Enabled)

Note: When bit 7 (motion command code selection) of motion fixed parameter No. 14 (Additional Function Selections) is not selected for use and bit 8 (motion command code enable/disable) of RUN Mode Settings (OW☐☐00) motion setting parameter is set to “1” (= enabled), the axis is controlled without motion commands (OW☐☐20).

IMPORTANT

The position control mode is available with all Motion Modules. However, it can be used for the SVB-01 and PO-01 Modules only when motion command code is enabled.

The following table shows position control mode availability for each Motion Module.

Motion Module	Position Control Mode	
	Motion Command Code Enabled	Motion Command Code Disabled
SVA-01A	Available	Available
SVA-02A	Available	Available
SVB-01	Available	Not available
PO-01	Available	Not available

IMPORTANT

When using a motion program, always set Position Reference Type (bit 14 of OW□□01) to 1 (incremental addition mode).
The default is 1 (incremental addition mode).

Table 2.9 shows the differences when motion commands (OW□□20) are used, and when no motion commands are used.

Table 2.9 Differences When Motion Commands are Used/Not Used

Item	Motion Commands (OW□□20) Not Used	Motion Commands (OW□□20) Used
Reference Unit	Pulse	Pulse, mm, inch, or deg can be selected.
Electronic Gear Function	Not possible	Possible
Finite length position control	Possible	Possible
Infinite length position control that rotates the axis in one direction only, without resetting after one rotation	Possible	Possible
Infinite length position control that resets the axis after one rotation	Not possible	Possible
Position reference	Absolute position mode	Absolute position mode or incremental addition mode can be selected.
Position buffer	Not possible	Possible
Position monitor	Pulse unit	Reference unit
Speed reference	Percentage (%) reference	The percentage (%) reference or the reference unit can be selected.

The meaning of the terms used in the above table and their method of application are described below.

■ Reference Unit

The reference units input to the Module are set with the following motion fixed parameter settings.

Pulses, millimeters, degrees, or inches can be used as the reference unit. The reference unit is specified in bits 0 to 3 of motion fixed parameter No. 17 (Motion Controller Function Selection Flags).

The minimum reference unit that can be specified in the Module is determined by the above unit settings and the setting of motion fixed parameter No. 18 (Number of Digits Below Decimal Point).

When motion commands (OW□□20) are not used, the unit will be the pulse.

Table 2.10 Minimum Reference Unit (1 Reference Unit)

Number of Digits Below Decimal Point	Motion Fixed Parameter No. 17 Bits 0 to 3 of Motion Controller Function Selection Flags			
	Pulse (= 0)	mm (= 1)	deg (= 2)	inch (= 3)
0	1 pulse	1 mm	1 deg	1 inch
1	1 pulse	0.1 mm	0.1 deg	0.1 inch
2	1 pulse	0.01 mm	0.01 deg	0.01 inch
3	1 pulse	0.001 mm	0.001 deg	0.001 inch
4	1 pulse	0.0001 mm	0.0001 deg	0.0001 inch
5	1 pulse	0.00001 mm	0.00001 deg	0.00001 inch

Note: The number of digits below the decimal point is specified in motion fixed parameter No. 18 (Number of Digits Below Decimal Point).

■ Electronic Gear

In contrast to the reference unit input to the Module, the mechanical travel unit is called the "output unit."

The electronic gear converts position or speed units from reference units (millimeters, degrees, or inches) to output units (millimeters, degrees, or inches).

When the axis at the motor has rotated m times and the mechanical configuration allows the axis at the load to rotate n times, this electronic gear function can be used to make the reference unit equal to the output unit.

The electronic gear function is set in the motion setting parameters shown in *Table 2.11*.

Table 2.11 Electronic Gear Parameters

Motion Fixed Parameter	Name and Meaning
No. 17 Bit 4 of Motion Controller Function Selection Flags	Electronic gear selection (0: Disabled, 1: Enabled) • Disabled when the unit selected is the pulse. Set Disabled = (0).
No. 19	Travel distance per machine rotation • This parameter setting is invalid when Disabled = (0) is set for the electronic gear selection.
No. 21	Motor side gear ratio • This parameter setting is invalid when Disabled = (0) is set for the electronic gear selection.
No. 22	Machine side gear ratio • This parameter setting is invalid when Disabled = (0) is set for the electronic gear selection.

When the unit selected is the pulse and motion commands (OW☐☐20) are not used, the electronic gear function is disabled.

Table 2.12 shows the meanings of the above parameters and gives some setting examples.

Table 2.12 Electronic Gear Parameters and Constant Table

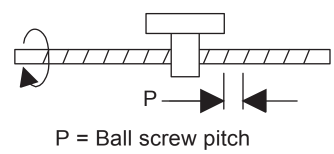
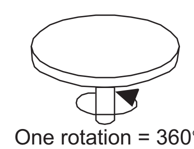
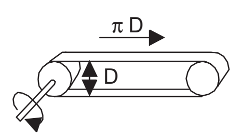
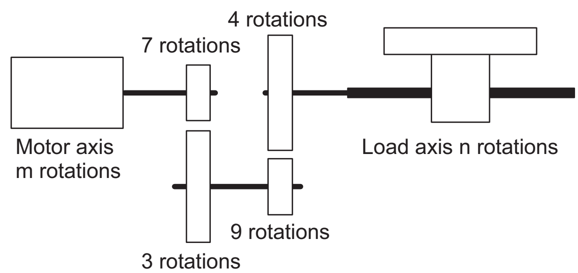
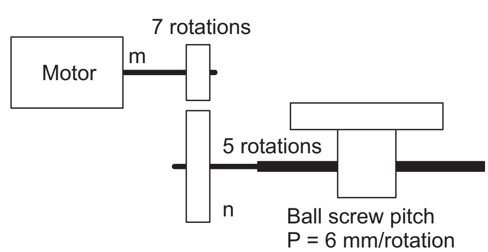
<table>
<tr><th>Servo Fixed Parameter No.</th><th>Name</th><th colspan="3">Description</th><th>Initial Value</th></tr>
<tr><td rowspan="6">No.19</td><td rowspan="6">Travel Distance Per Machine Rotation</td><td colspan="3">• This parameter shows the load travel distance for each rotation of the load axis. Sets the load travel distance value divided by the minimum reference unit.
$$\text{No.19} = \frac{\text{Load travel distance per load axis rotation}}{\text{Minimum reference unit}}$$
• Some examples of the load travel distance are shown below.</td><td rowspan="6">10000</td></tr>
<tr><td>Travel Distance Per Machine Rotation</td><td colspan="2">Load Configuration Examples</td></tr>
<tr><td>P [mm]</td><td>Ball screw</td><td></td></tr>
<tr><td>360 [°]</td><td>Round table</td><td></td></tr>
<tr><td>πD [mm]</td><td>Belt</td><td></td></tr>
<tr><td colspan="3">• No.19 setting range: 1 to 2^{31}-1[1 = 1 reference unit]
Setting Examples
• Load travel distance per load axis rotation = 12 mm
• Minimum reference unit = 0.001 mm [reference unit: mm, digit number after decimal point: 3]
$$\text{No.19} = \frac{12\ \text{mm}}{0.001\ \text{mm}} = 12000$$</td></tr>
</table>

Table 2.12 Electronic Gear Parameters and Constant Table (cont'd)

<table>
<tr><th>Servo Fixed Parameter No.</th><th>Name</th><th>Description</th><th>Initial Value</th></tr>
<tr><td>No.21</td><td>Servomotor Gear Ratio</td><td rowspan="2">• These parameters are used to set the gear ratio between the motor and the load. When the motor axis has rotated m times and the mechanical configuration allows the load axis to rotate n times, set the following values: No.21 = m rotations
No.22 = n rotations
• Setting range: 1 to 65,535 [rotations]
Setting Examples


Gear ratio = $\frac{n}{m} = \frac{3}{7} \times \frac{4}{9} = \frac{4}{21}$
Therefore, set the following values: No. 21 = 21
No. 22 = 4</td><td>1</td></tr>
<tr><td>No.22</td><td>Machine Gear Ratio</td><td>1</td></tr>
</table>

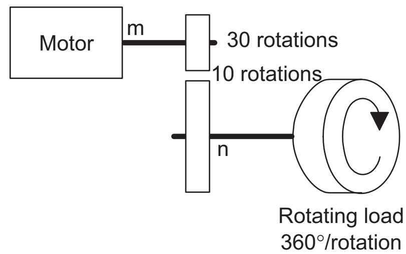
Electronic Gear Parameter Setting Example (A): With Ball Screw



In the above machine system, if the requirement is reference unit = output unit = 0.001 mm, the setting of each parameter will be as follows:

- No.19 = $\frac{6\ \text{mm}}{0.001\ \text{mm}}$ = **6000**
- Gear ratio = $\frac{n}{m} = \frac{5}{7}$
- No.21 = **7**
- No.22 = **5**

Electronic Gear Parameter Setting Example (B): Rotating Load



In the above machine system, if the requirement is reference unit = output unit = 0.1°, the setting of each parameter will be as follows:

- No.19 = $\frac{360^\circ}{0.1^\circ}$ = **3600**
- Gear ratio = $\frac{n}{m} = \frac{10}{30} = \frac{1}{3}$
- No.21 = **3**
- No.22 = **1**

■ Axis Selection

There are two types of position control: Finite length position control, where return and other operations are performed only within a specified range, i.e., within a prescribed positioning interval, and infinite length position control, which is used for rotation in one direction only.

There are two infinite length position control methods. One method involves resetting the conveyor belt or other device to “0” after one rotation; the other method involves rotating the conveyor belt in one direction only, without resetting after one rotation.

Axis selection involves selecting which of these types of position control is to be used. The axis selection is set in bit 5 of motion fixed parameter No. 17 (Motion Controller Function Selection Flags).

When motion commands (OW□□20) are not used, axis selection is disabled. (Set as a finite length axis (= 0).)

Table 2.13 Axis Selections

Types of Position Control	Axis Selection
Finite length position control	Finite length axis (= 0)
Infinite length position control that rotates the axis in one direction only, without resetting after one rotation	Finite length axis (= 0)
Infinite length position control that resets the axis after one rotation*	Infinite length axis (= 1)

* The reset position is set in motion fixed parameter No. 23 (Infinite Length Axis Reset Position).

■ Position Reference

There are two methods of setting the position reference: Direct designation, which directly sets the position reference in OL□□12, and indirect designation, which specifies the number of the position buffer from which the position reference is stored in OL□□12.

There are two direct designation methods: The absolute position reference mode, in which the absolute position is set in OL□□12, and the incremental addition mode, in which the present travel distance is added to the previous position reference value (previous value of OL□□12).

Table 2.14 shows the parameters relating to the position reference.

Table 2.14 Position Reference Parameters

Parameter Type	Parameter No. (Register No.)	Name	Description	Initial Value
Motion Setting Parameters	Bit 12 of OW□□01	Position Reference Value Selection	Sets the position reference designation method. • 0: Direct designation Directly sets the position data in OL□□12. Specifies in bit 14 of OW□□01 whether the position data is to be set in the absolute position mode or the incremental addition mode. • 1: Indirect designation Sets the number of the position buffer in OL□□12. The absolute position must first be stored in the specified position buffer.	0
	Bit 14 of OW□□01	Position Reference Type	Specifies the type of position data. • 0: Absolute position mode Sets the absolute position in OL□□12. • 1: Incremental addition mode Adds the present travel distance value to the previous value of OL□□12 and sets the result in OL□□12.*1	1
	OL□□12	Position Reference Setting	Sets the position data.*2	0

* 1. This parameter is invalid when the position reference value selection is the position buffer (indirect designation).

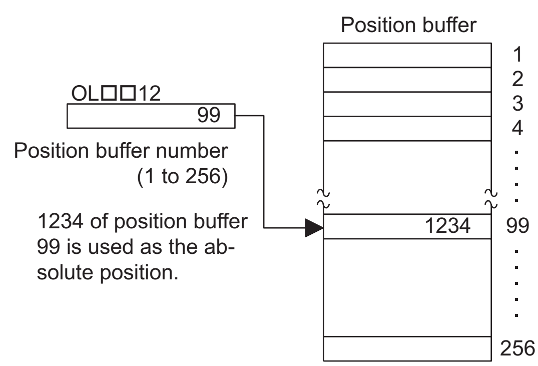
* 2. The setting data differs according to the setting of the Position Reference Value Selection (bit 12 of OW□□01) and the Position Reference Type (bit 14 of OW□□01).

IMPORTANT

When indirect designation is used to specify the position buffer number, the positions stored in the position buffer are treated as absolute positions.

When a motion command (OW□□20) is not used, the position reference value set in OL□□12 is treated as an absolute position.

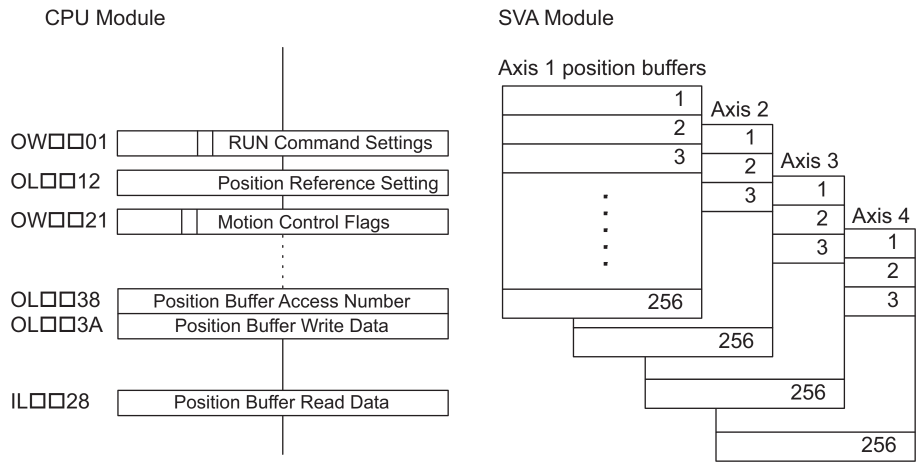
Table 2.15 Position Reference Value Selection

Position Reference Value Selection (Bit 12 of OW□□01)	Position Reference Type (Bit 14 of OW□□01)	Position Reference (OL□□12)
0 (Direct designation)	0 (Absolute position mode)	Sets the absolute position. (Moves to the setting position.) Example: OL□□12 ← 10000 OL□□12 ← 20000
	1 (Incremental addition mode)	Sets the present travel distance value (increment) added to the previous value of OL□□12. OL□□12 ← Previous OL□□12 + Incremental travel distance Example: When the previous OL□□12 = 1,000 and the present travel distance is 500, then: OL□□12 ← 1000 + 500 = 1500
1 (Indirect designation)	0 (Absolute position mode)	Sets the position buffer number.  The absolute position must be stored in advance in the position buffer with the specified number.

With the position reference for an infinite length axis, the present travel distance (incremental travel distance) is added to the previous position reference (OL□□12), and the position reference (OL□□12) is reset. The position reference (OL□□12) must not be set in the range of 0 to (infinite length axis reset position – 1).

■ Position Buffers

The position buffers are a collection of position data stored in the SVA Module, and a maximum of 256 points can be stored for each axis. They are used for the position data when POSITIONING and other motion commands are executed. Continuous operation is enabled by storing the position data in advance, and by using a simple program that only specifies the points.

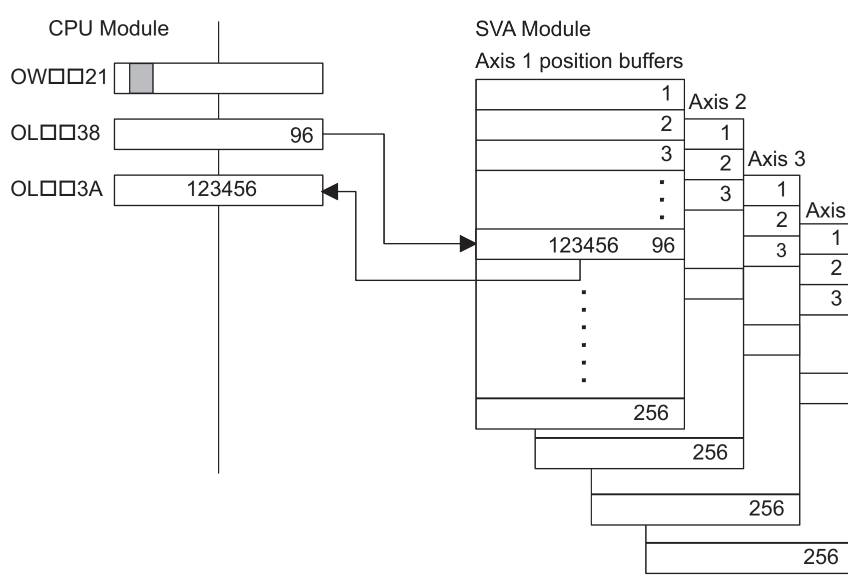


INFO With the SVA-02A Module (2-axis Servo Module), there are position buffers for only 2 axes.

Using the Position Buffers

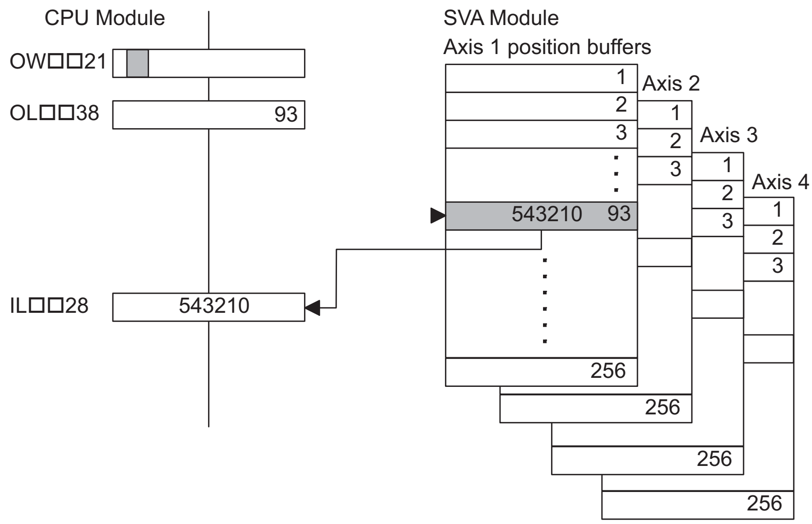
By first storing in the position buffers the position information for a machine whose operating pattern has been determined in advance, continuous positioning of up to 256 points is enabled simply by refreshing the buffer pointer at the completion of a single-block operation.

Writing to Position Buffers



1. Set the Position Buffer Access Number (OL□□38). Any number between 1 and 256 can be set.
2. Set the Position Buffer Write Data (OL□□3A).
3. Set Position Buffer Write (OB□□21E) in the Motion Command Control Flags to ON.

Reading Position Buffers



1. Set the Position Buffer Access Number (OL□□38). Any number between 1 and 256 can be set.
2. Set Position Buffer Read (OB□□21F) in the Motion Command Control Flags to ON.
3. After two scans, the position data specified in Position Buffer Read Data (IL□□28) will be stored.

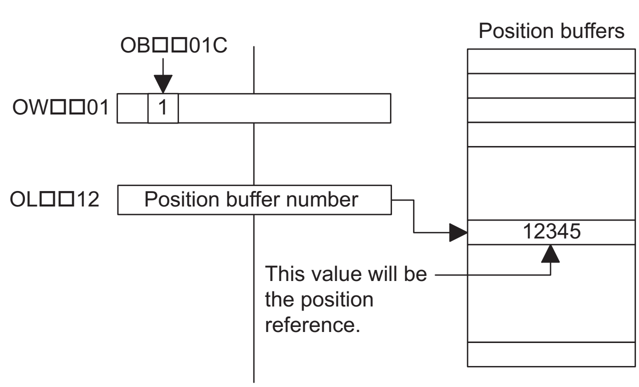
INFO

1. Position buffers can be used only when motion commands are used in the position control mode.
2. The position data specified in the position buffers are absolute position references.

IMPORTANT

The data in the position buffers is deleted by turning OFF the power and resetting the CPU Module Master. Be sure to set the data when the power is turned ON, or before using the position buffers.

Using the Position Buffers as Position References



1. Set bit 12 of the RUN Command Settings (OW□□01) to ON.
2. Set a position buffer number 1 to 256 in place of the position reference in the Position Reference Setting (OL□□12).

In this way, the data for the position buffer number specified in OL□□12 functions as the position reference.

■ Position Monitoring

Table 2.16 shows the parameters used to monitor positioning.

Table 2.16 Position Monitoring Parameters

Motion Monitoring Parameter No. (Register No.)	Name	Description
IL□□02	Calculated Position in the Machine Coordinate System*1 (CPOS)	The calculated position of the machine coordinate system managed by the SVA Module is reported. Normally, the position data reported in this parameter will be the target position for each scan.*2
IL□□08	Machine Coordinate System Feedback Position (APOS)	The feedback position of the machine coordinate system is reported.*3
IL□□18	Machine Coordinate System Reference Position (MPOS)	The position output externally by the SVA Module and the reference position of the machine coordinate system are reported. In machine lock status, this data is not refreshed. (With the machine lock status, the data is not output externally.) When the machine lock function is not used, this position is the same as that in IL□□02.
IL□□2E	Calculated Reference Coordinate System Position (POS)	This position is significant when the axis selected is an infinite length axis. With an infinite length axis, the target position for each scan corresponding to the position reference in this parameter is reported.*4

* 1. The machine coordinate system is the basic coordinate system that is set according to the zero return mode execution, the Zero Point Return (ZRET) motion command execution, or the Zero Point Setting (ZSET) motion command operation. The SVA Module manages the positions using this machine coordinate system.
* 2. When an infinite length axis is selected, a range of 0 to (infinite length axis reset position – 1) is reported.
With the position reference for an infinite length axis, the present travel distance (incremental travel distance) is added to the previous position reference (OL□□12), and reset as the position reference (OL□□12).
The position reference (OL□□12) must not be set in the range of 0 to (infinite length axis reset position – 1).
* 3. When an infinite length axis is selected, a range of 0 to (infinite length axis reset position – 1) is reported.
* 4. With a finite length axis, this position is the same as that in IL□□02.

■ Speed Reference

There are two methods of setting the speed reference. One method involves using a reference unit for the speed reference setting, such as the rapid traverse speed, approach speed, or creep speed. The other method involves setting the percentage (%) corresponding to the rated speed.

Table 2.17 shows the parameters relating to the speed reference.

Table 2.17 Speed Reference Parameters

Parameter Type	Parameter No. (Register No.)	Name	Description
Motion Fixed Parameters	No.5	Pulse Counting Mode Selection	Sets the pulse count mode and multiplier. 0: Sign mode, ×1 1: Sign mode, ×2 2: Up/Down mode, ×1 3: Up/Down mode, ×2 4: A/B mode, ×1 5: A/B mode, ×2 6: A/B mode, ×4
	No.7	Rated Motor Speed Setting	Sets the number of rotations when the motor is rotated at the rated speed (100% speed).
	No.8	Number of Feedback Pulses Per Rotation	Sets the number of pulses (the value before multiplication) per motor rotation.
Motion Setting Parameters	Bit 13 of OW□□01	Speed Reference Value Selection	Specifies the setting unit for the rapid traverse speed, approach speed, and creep speed, and specifies the register number for the rapid traverse speed. 0: Specifies the speed using a reference unit, and sets the Rapid Traverse Speed in OL□□22. 1: Specifies the speed using the percentage (%) corresponding to the rated speed, and sets the Rapid Traverse Speed in OW□□15.
	OW□□0A	Approach Speed Setting	Sets the zero point return (ZRET) approach speed. The unit varies according to the Speed Reference Selection (bit 13 of OW□□01).
	OW□□0B	Creep Speed Setting	Sets the zero point return (ZRET) creep speed. The unit varies according to the Speed Reference Selection (bit 13 of OW□□01).
	OW□□15	Speed Reference Setting	This setting is valid when the Speed Reference Selection (bit 13 of OW□□01) is “1.” Sets the percentage (1 = 0.01%) corresponding to the rated speed as the rapid traverse speed.
	OL□□22	Rapid Traverse Speed	This speed is valid when the Speed Reference Selection (bit 13 of OW□□01) is “0.” Set the rapid traverse speed using the reference unit.
	OW□□2C	Override	Changes the actual rapid traverse speed.

When Motion Commands Are Not Used

When motion commands are not used, the Speed Reference Selection Flags are disabled, and the speed-related parameters have the meanings shown in the following table.

Parameter No.	Name	Description
Bit 3 of OW☐☐01	Speed Reference Value Selection	Invalid
OW☐☐0A	Approach Speed Setting	Specified as a percentage (%) of the rated speed.
OW☐☐0B	Creep Speed Setting	Specified as a percentage (%) of the rated speed.
OW☐☐15	Speed Reference Setting	The rapid traverse speed is specified as a percentage (%) of the rated speed.
OL☐☐22	Rapid Traverse Speed	Invalid
OW☐☐2C	Override	Invalid

When Motion Commands Are Used

When motion commands are used, the meanings of the speed-related parameters differ according to the Speed Reference Selection (bit 13 of OW☐☐01).

Bit 13 of OW☐☐01	Parameter No.	Name	Description
0	OW☐☐0A	Approach Speed Setting	Specified using the reference unit.
	OW☐☐0B	Creep Speed Setting	Specified using the reference unit.
	OW☐☐15	Speed Reference Setting	Invalid
	OL☐☐22	Rapid Traverse Speed	Specified using the reference unit.
	OW☐☐2C	Override	Valid
1	OW☐☐0A	Approach Speed Setting	Specified as a percentage (%) of the rated speed.
	OW☐☐0B	Creep Speed Setting	Specified as a percentage (%) of the rated speed.
	OW☐☐15	Speed Reference Setting	The rapid traverse speed is specified as a percentage (%) of the rated speed.
	OL☐☐22	Rapid Traverse Speed	Invalid
	OW☐☐2C	Override	Valid

Table 2.18 shows some examples of the parameter settings.

Table 2.18 Parameter Setting Examples

Parameter Type	Parameter No. (Register No.)	Name	Description	Initial Value
Motion Fixed Parameters	No.5	Pulse Counting Mode Selection	No. 5 = A/B mode, × 4 No. 7 = 3,000 min^{-1} No. 8 = 2,048 p/r Therefore, Rated speed = 3,000 min^{-1} = 3,000 ×2,048 ×4*2 = 2,575,000 ppm Various parameter setting examples are given below.	A/B mode (×4)
	No.7	Rated Motor Speed Setting		3000
	No.8	Number of Feedback Pulses Per Rotation		2048
Motion Setting Parameters	Bit 13 of OW☐☐01	Speed Reference Value Selection		0
	OW☐☐0A	Approach Speed Setting		0
	OW☐☐0B	Creep Speed Setting		0
	OW☐☐15	Speed Reference Setting		0
	OL☐☐22	Rapid Traverse Speed		0
	OW☐☐2C	Override*1		100%

* 1. Select Enabled (= 1) in bit 9 (override selection) of motion fixed parameter No. 17.
* 2. “4” is the pulse multiplier.

Parameter Setting Examples

1. Speed Reference Value Selection Set to “0”

a) Pulses Selected as the Unit

When you wish to perform operations with the fixed parameters set for a rapid traverse speed of 1,500 min^{-1}, an approach speed of 300 min^{-1}, and a creep speed of 150 min^{-1}, use the following settings.

- OW☐☐0A = 30 (min^{-1}) × 2,048 × 4 (ppr) ÷ 1,000 = 2,457 (= 2,457,000 ppm)
- OW☐☐0B = 150 (min^{-1}) × 2,048 × 4 (ppr) ÷ 1,000 = 1,228 (= 1,228,000 ppm)
- OW☐☐15 = —— (Invalid)
- OL☐☐22 = 1,500 (min^{-1}) × 2,048 × 4 (ppr) ÷ 1,000 = 12,288 (= 12,288,000 ppm)
- OW☐☐2C = 10,000 (100%)

b) Millimeters Selected as the Unit

When you wish to perform operations with the fixed parameters set for a rapid traverse speed of 900 mm/min, an approach speed of 180 mm/min, and a creep speed of 90 mm/min in a machine configuration that moves the axis 10 mm in one rotation, use the following settings.

- OW☐☐0A = 180
- OW☐☐0B = 90
- OW☐☐15 = —— (Invalid)
- OL☐☐22 = 900

- OW□□2C = 10,000 (100%)

2. Speed Reference Value Selection Set to "1"

a) When you wish perform operations with the fixed parameters set for a rapid traverse speed of 1,500 min^{-1}, an approach speed of 300 min^{-1}, and a creep speed of 150 min^{-1}, use the following settings.

- OW□□0A = $\frac{300\ (min^{-1})}{3{,}000\ (min^{-1})} \times 10{,}000 = 1{,}000\ (10.00\%)$
- OW□□0B = $\frac{150\ (min^{-1})}{3{,}000\ (min^{-1})} \times 10{,}000 = 500\ (5.00\%)$
- OW□□15 = $\frac{1{,}500\ (min^{-1})}{3{,}000\ (min^{-1})} \times 10{,}000 = 5{,}000\ (50.00\%)$
- OW□□22 = —— (Invalid)
- OW□□0A = 10,000 (100%)

b) When you wish to leave the above speed reference settings unchanged, but halve the operating speed, use the following setting.

- OW□□2C = 5,000 (50.00%)

2

2.3.2 Position Control Without Using Motion Commands

■ Overview

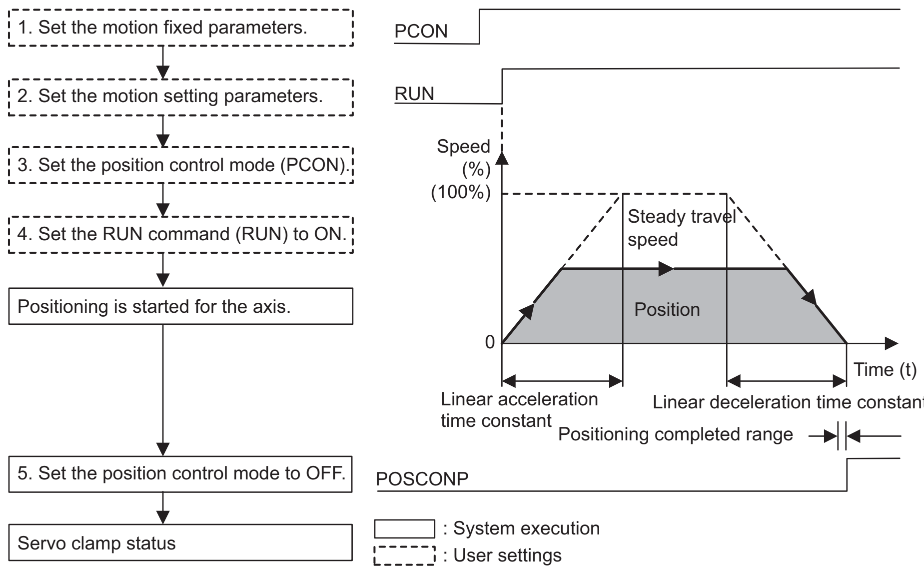
Position control performs speed acceleration/deceleration according to the related parameters, and positions the axis to the target position of the position reference setting parameter (OL□□12).

IMPORTANT

Position control without using motion commands is not valid for the SVB-01 and PO-01 Modules. For these Modules, always enable motion commands.

■ Details

Use the following procedure to perform position control operations without using motion commands.



1. Set the motion fixed parameters according to the user's machine.

Table 2.19 Examples of Fixed Parameters

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated motor speed	3000 min^{-1}
8	Number of Feedback Pulses per Rotation	4 to 65532	Number of pulses before multiplication	2048
9	D/A Output Voltage at 100% Speed	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	6.000 V
	Number of Feedback Pulses per Motor Rotation (For high-resolution) *1	4 to 2147483647	1 = 1 pulse/rev	2048 pulses/ rev
10	D/A Output Voltage at 100% Torque Limit*2	0.001 to 10.000	0.001 = 0.001 V 1 = 1 V	3.000 V

* 1. Valid only with an SVB-01 Module.
* 2. Valid only with an SVA-02A Module.

2. Set the motion parameters to be used in position control mode.
   The following three methods can be used to set the motion setting parameters.
   - Using the MPE720 Setting Parameter Window
   - Using a ladder logic program
   - Using a motion program

Table 2.20 Examples of Setting Parameters

Name	Register No.	Setting Range	Meaning	Setting Example
Positive Torque Limit Setting (TLIMP)*	OW□□02	-327.68 to 327.67	0.01 = 0.01% 1 = 1%	-100.00 (-100.00%)
Positive Speed Limiter Setting (NLIMP)	OW□□04	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Negative Speed Limiter Setting (NLIMN)	OW□□05	0.00 to 327.67	0.01 = 0.01% 1 = 1%	130.00 (130.00%)
Machine Coordinate System Zero Point Offset Setting (ABSOFF)	OL□□06	-2^{31} to $2^{31}-1$	1 = 1 reference unit With pulse: 1 = 1 pulse	100 pulses
Linear Acceleration Time Constant (NACC)	OW□□0C	0 to 32767	Linear acceleration time constant (ms) at speed pattern generation	1000 (1 second)
Linear Deceleration Time Constant (NDEC)	OW□□0D	0 to 32767	Linear deceleration time constant (ms) at speed pattern generation	1000 (1 second)
Positioning Completed Range Setting (PEXT)	OW□□0E	0 to 65535	1 = 1 reference unit With pulse: 1 = 1 pulse	10 pulses
Error Count Alarm Detection Setting (EOV)	OW□□0F	0 to 32767	1 = 1 reference unit With pulse: 1 = 1 pulse	65535 pulses
Position Loop Gain Setting (KP)	OW□□10	0.0 to 3276.7	0.1 = 0.1 /s 1 = 1 /s	30.0 (30.0 /s)
Filter Time Constant (NNUM)	OW□□14	0 to 255	For simple S-curved acceleration	0
Feed Forward Gain Setting (Kf)	OW□□11	0 to 200	1 = 1%	0
Position Reference Setting (XREF)	OL□□12	-2^{31} to $2^{31}-1$	1 = 1 reference unit With pulse: 1 = 1 pulse	10000 pulses
Speed Reference Setting (NREF)	OW□□15	-327.68 to 327.67	Speed reference value 0.01 = 0.01% 1 = 1%	50.00 (50.00%)

* Valid only with an SVA-02A Module.

3. Select the Position Control Mode (PCON) (bit 2 of OW□□00).
4. To start operation, set the RUN Servo ON (RUN) to ON (bit 0 of OW□□01).

   The axis is positioned according to the specified motion parameters.

   Even during positioning, the motion parameter settings can be changed.
5. To stop position control, set the RUN command (RUN) and the position control mode (PCON) to OFF.

   The POSCOMP Positioning Completed Signal (bit 13 of IW□□00) turns ON when the axis enters the positioning completed range. Control continues even when the axis enters the positioning completed range (the axis enters servo clamp status).

■ User Program Example

Example of RUN Operation

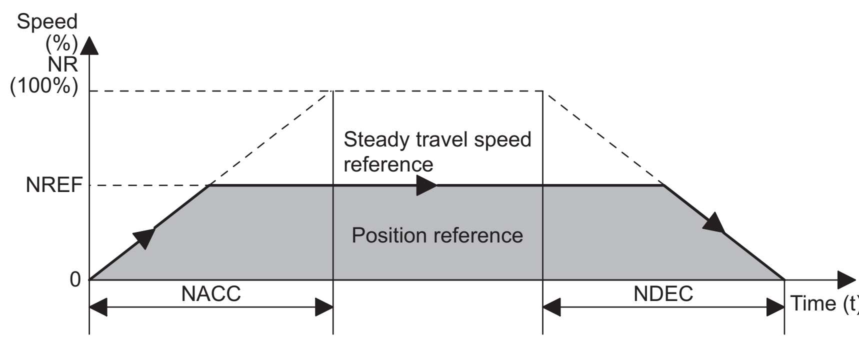


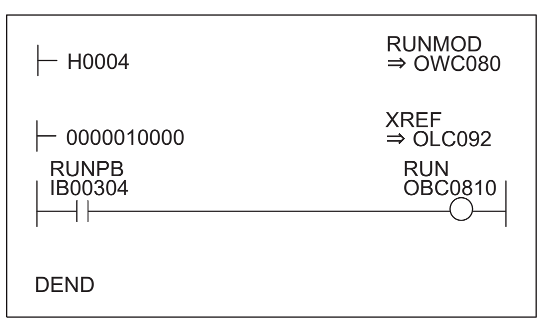
Fig. 2.13 Position Pattern

Operating Conditions

In the pattern shown in the above illustration, the axis is stopped at an absolute position of 10000 (pulses).

- Position reference: XREF = 10000 (pulses)

Ladder Logic Program Example



Set the position control mode to ON.

Position reference pulse (XREF)
(Absolute position: 10000)
Driver RUN command (RUN)

When IB00304 turns ON, position control starts, and the axis is moved to absolute position 10000. When absolute position 10000 is reached, the IBC080D positioning completed signal turns ON.

Fig. 2.14 RUN Commands (DWG H03)

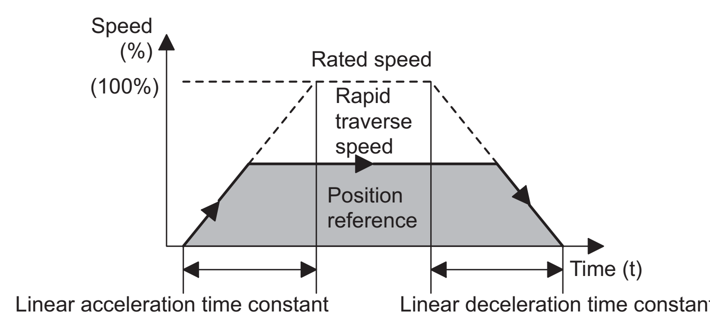
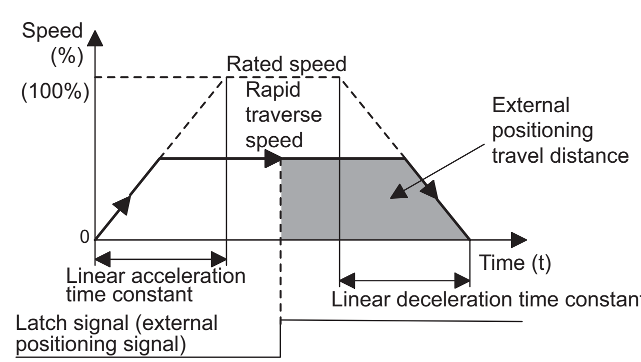
The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

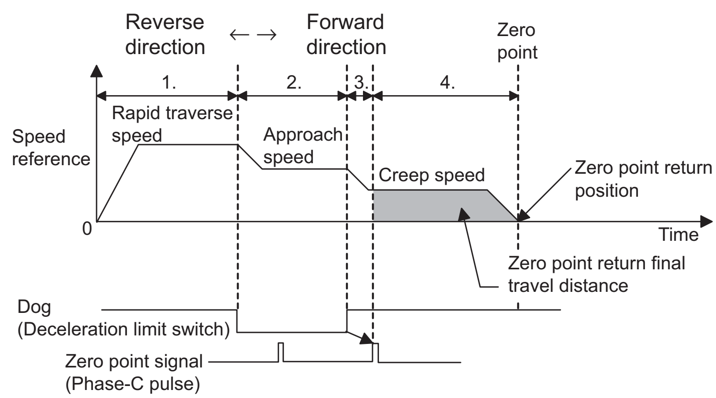
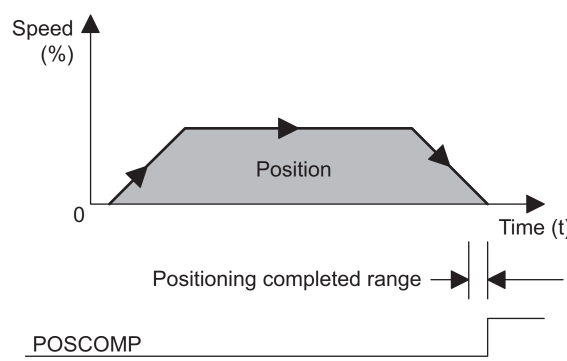
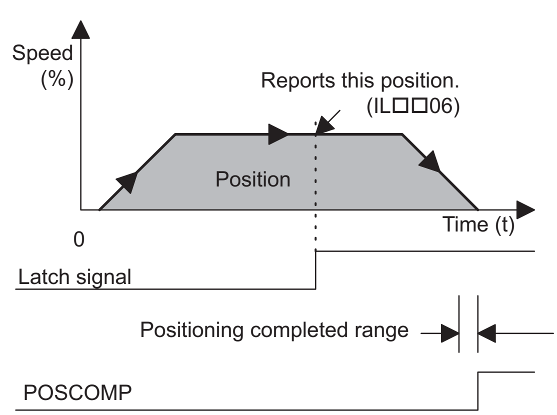
2.4 Position Control Using Motion Commands

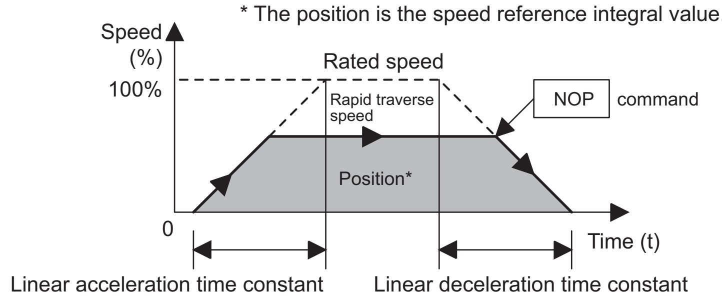
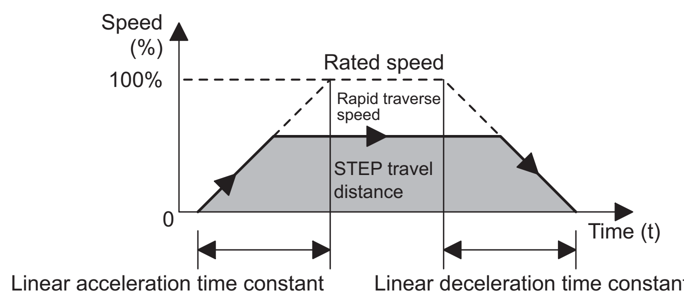
This section describes position control using motion commands.

2.4.1 Overview of Motion Commands

The following table lists the motion commands and gives an overview of each.

Command	Name	Description
1	Positioning (POSING)	Positions the axis at the specified position using the specified acceleration/ deceleration time constant and speed. 
2	External Positioning (EX_POSING)	Latches a counter when a latch signal (external positioning signal) is input during positioning (POSING), and positions the axis at a position where it has traveled the external positioning travel distance from that position. 

Command	Name	Description
3	Zero Point Return (ZRET)	Returns the system to the machine coordinate system zero point. Eight zero return modes are provided. 
4	Interpolation (INTERPOLATE)	Performs interpolation feeding using the position data distributed from the CPU Module. 
5	Not used.	This command is used by the system. Do not use it in a user program.
6	Interpolation with Position Detection (LATCH)	Latches a counter when a latch signal is input during an interpolation feed operation, and reports the changed latch position to the reference unit system. 

Command	Name	Description
7	Fixed Speed Feed (FEED)	Performs rapid traverse in the infinite length direction at the specified speed and acceleration time. 
8	Fixed Length Feed (STEP)	Performs STEP travel positioning using the specified direction, speed, and acceleration time constant. 
9	Zero Point Setting (ZSET)	Determines the machine coordinate zero point, and validates the stroke limit check.

2.4.2 Positioning (POSING)

■ Overview

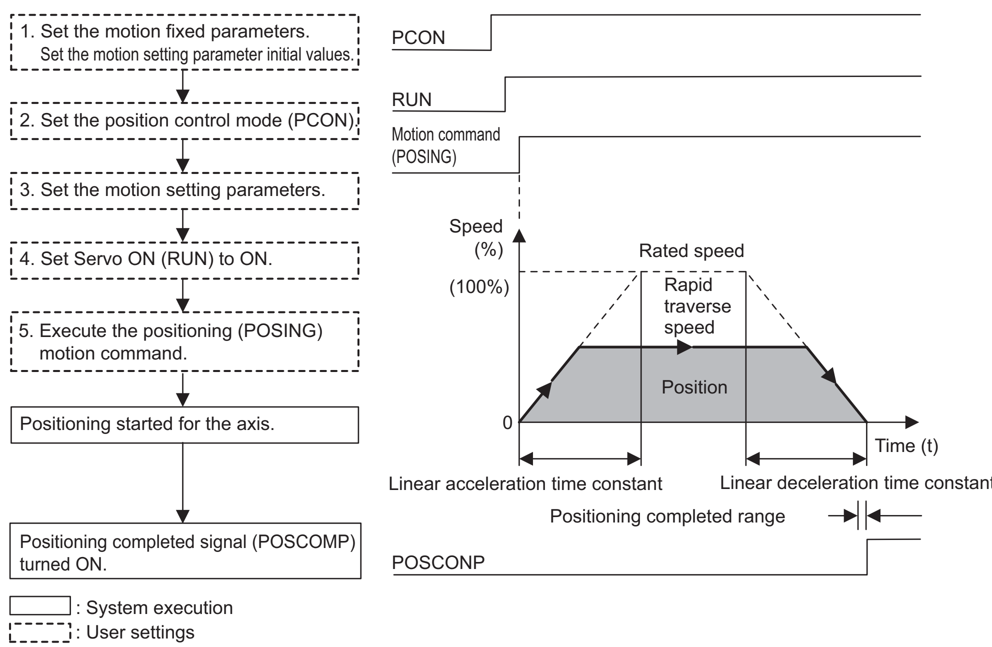
Positions the axis at the position reference position using the specified acceleration/deceleration time constant and the specified rapid traverse speed.

The rapid traverse speed and the position reference value can be changed during operations.

When the change in the position reference value is less than the deceleration distance or the reverse direction is used, the system first decelerates to a stop and then is repositioned according to the position reference value.

■ Details

Use the following procedure to perform positioning operations.



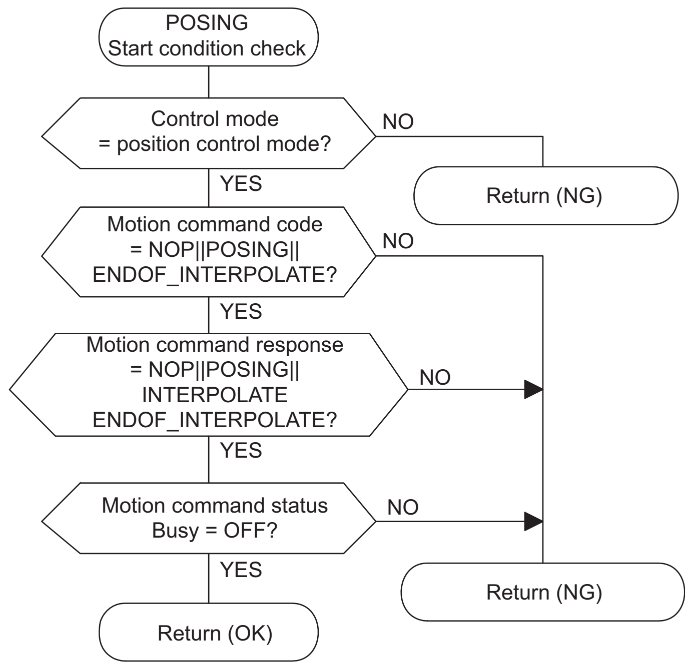
1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user's machine.

   When performing position control using motion commands, be sure to set the following parameters:

   - Set "Use (= 1)" in bit 7 (motion command code selection) of motion fixed parameter No. 14 (Additional Function Selections).
   - Set "1 (= Enabled)" in bit 8 (motion command code enable/disable) in the RUN Mode Settings (OW☐☐00) motion setting parameter.

2. Set the Position Control Mode (PCON) (bit 2 of OW☐☐00).
3. Set the motion setting parameters to be used in positioning (POSING).

4. Set RUN Servo ON (RUN) to ON (bit 0 of OW☐☐01).
   For the PO-01 Module, set Excitation ON (RUN) to ON.
5. Set positioning (POSING = 1) in the motion command code (OW☐☐20).



The specified motion parameters perform positioning for the axis. Even during positioning, the motion parameter settings can be changed.

The positioning command operations are as follows:

a) Operation Start

Servo ON (bit 0 of OW☐☐01).

Set the positioning (POSING = 1) to motion command code (OW☐☐20).

b) Feed Hold

Set Hold (bit 0 of OW☐☐21) to ON.

At feed hold completion, HOLDL (bit 1 of IW☐☐15) turns ON.

c) Feed Hold Release

Set Hold (bit 1 of OW☐☐21) to OFF. Positioning resumes.

d) Abort

Set Abort (bit 1 of OW☐☐21) to ON, or set NOP (= 0) in the motion command code.

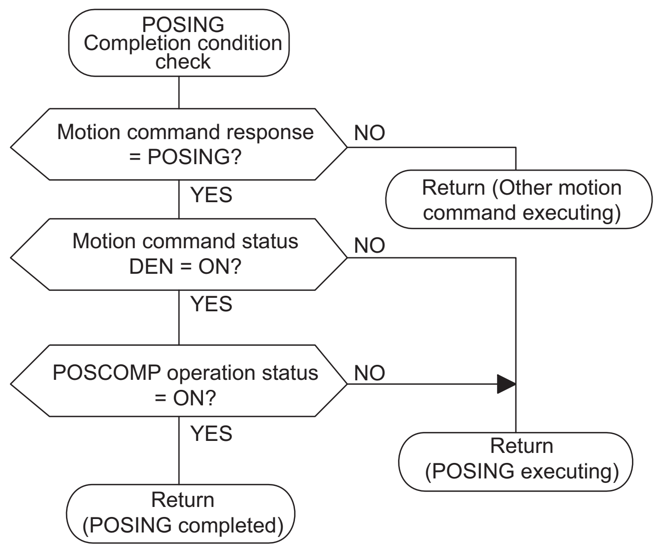
Busy (bit 0 of IW☐☐15) turns ON during abort processing, and turns OFF at completion of the abort.

Note: When the abort has been completed and released (ABORT turns OFF), the following occurs:

- When the Position Reference Type (bit 14 of OW☐☐01) is the absolute position mode (= 0), positioning resumes in the direction of the Position Reference Setting (OL☐☐12).

- When the Position Reference Type (bit 14 of OW☐☐01) is the incremental addition mode (= 1), operations remain stopped until the Position Reference Setting (OL☐☐12) is reset.

6. When the axis enters the Positioning Completed Range (OW☐☐0E) after Distribution Completed (bit 2 of IW☐☐15 is ON), the POSCOMP Positioning Completed Signal (bit 13 of IW☐☐00) turns ON.



■ User Program Example: Positioning

Example of RUN Operation

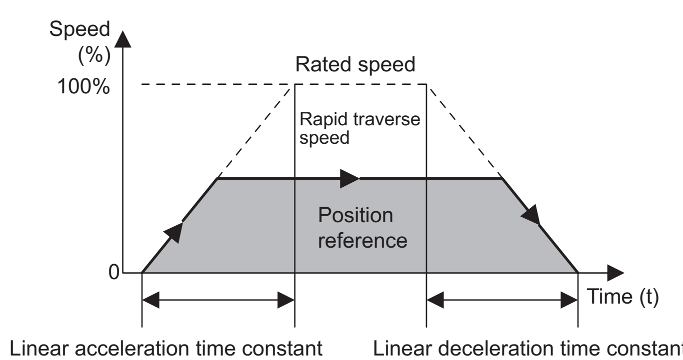
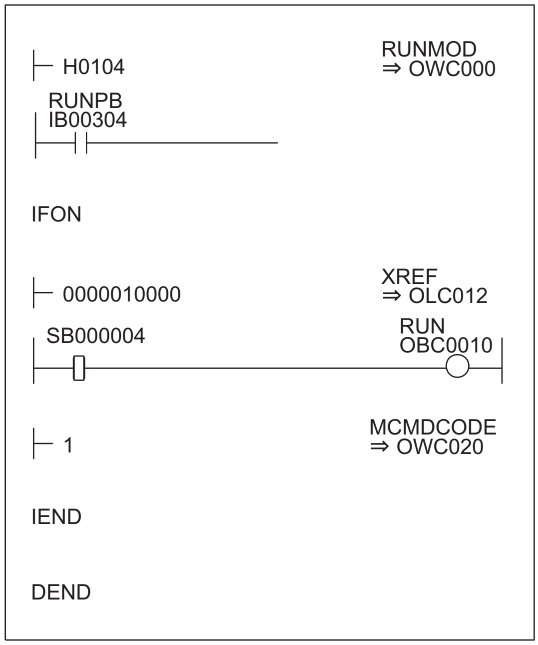


Fig. 2.15 Positioning Pattern

Ladder Logic Program Example



Set the position control mode to ON.

Position reference pulse (XREF)
(Absolute position: 10000)

Driver operation command (RUN)

Execute positioning (POSING) as the motion command.

When IB00304 turns ON, position control starts, and the axis moves to absolute position 10000. When absolute position 10000 is reached, the IBC000D positioning completed signal turns ON.

Fig. 2.16 Positioning Programming Example (DWG H03)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.4.3 External Positioning (EX_POSING)

■ Overview

In the same way as the positioning (POSING) command, the external positioning (EX_POSING) command positions the axis at the position reference position using the specified acceleration/deceleration time constant and the specified rapid traverse speed.

If a latch signal (external positioning signal) is input while at the feed speed, external positioning uses the latch signal to latch the current position, and positions the axis at a position where it has traveled the external positioning travel distance set as a parameter from that position.

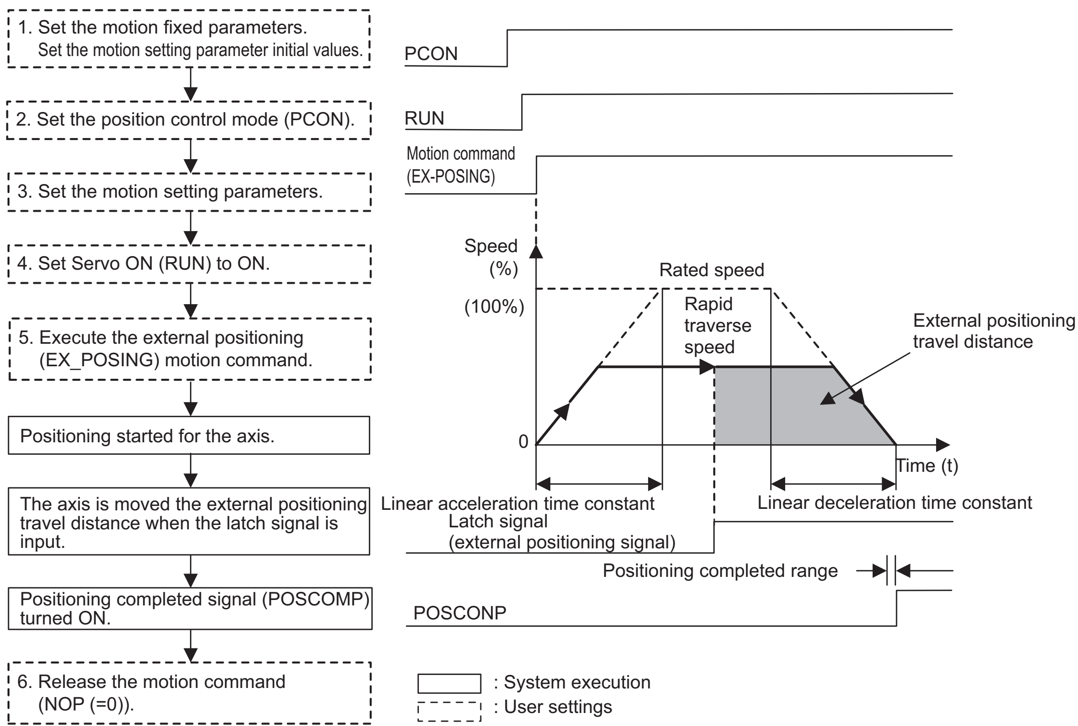
When the specified external positioning travel distance is less than the deceleration distance, the system first decelerates to a stop and then is repositioned according to the position reference value.

The external positioning travel distance can be changed before the latch signal (external positioning signal) is input.

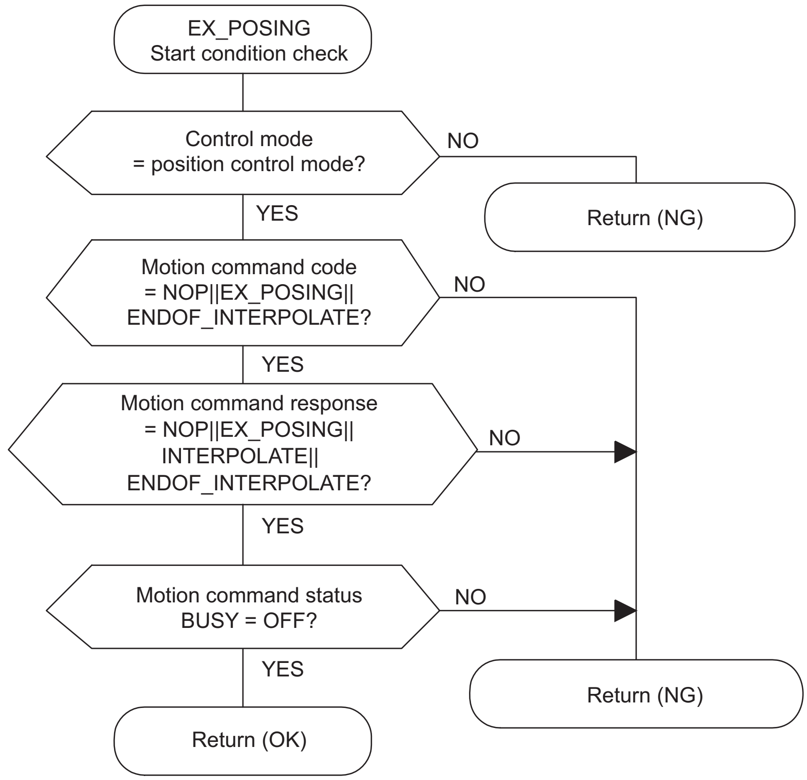
A specific discrete input (DI input) is used for the latch signal (external positioning signal).

■ Details

Use the following procedure to perform external positioning operations.



1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user's machine.
2. Set the Position Control Mode (PCON) (bit 2 of OW□□00).
3. Set the motion setting parameters to be used in the Position Control Mode.
4. Set Servo ON (RUN) to ON (bit 0 of OW□□01).
   For the PO-01 Module, set Excitation ON (RUN) to ON.
5. Set external positioning (EX_POSING = 2) in the motion command code (OW□□20).
   The external positioning command will be executed.



The specified motion parameters are used to position the axis.
Even during positioning, the motion parameter setting values can be changed.

The external positioning command operations are as follows:

a) Operation Start

Set Servo ON (bit 0 of OW□□01) to ON. For the PO-01 Module, set Excitation ON (RUN) to ON.

Set the external positioning (EX_POSING) to motion command code (OW□□20).

b) Feed Hold

Set Hold (bit 0 of OW□□21) to ON.

At feed hold completion, HOLDL (bit 1 of IW□□15) turns ON.

c) Feed Hold Release

Set Hold (bit 1 of OW□□21) to OFF. Positioning resumes.

d) Abort

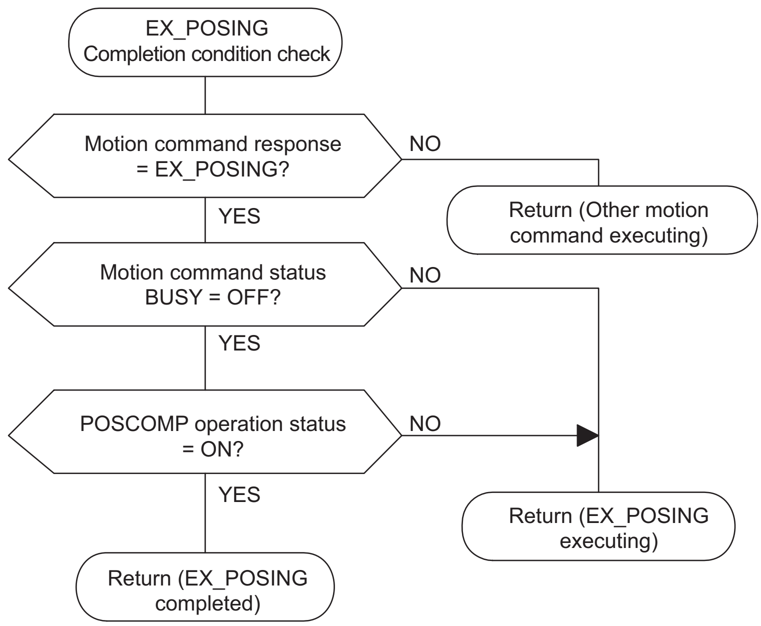
Set Abort (bit 1 of OW□□21) to ON, or set NOP (= 0) in the motion command code.

Busy (bit 0 of IW□□15) turns ON during abort processing, and turns OFF at abort completion.

INFO

At abort completion, operations remain stopped even if the abort is released (ABORT turns OFF) and regardless of whether the Position Reference Type (bit 14 of OW□□01) is the absolute position mode (= 0) or the incremental addition mode (= 1).

When the axis enters the Positioning Completed Range (OW□□0E) after Distribution Completed (bit 2 of IW□□15 is ON), the POSCOMP Positioning Completed Signal (bit 13 of IW□□00) turns ON.



6. Once external positioning has been completed, release the external positioning motion command.

INFO

External positioning is detected at startup. Therefore, when external positioning has been executed, the motion command must be set to NOP for at least one scan, and external positioning must be reset in a motion command.

■ User Program Example: External Positioning

Example of RUN Operation

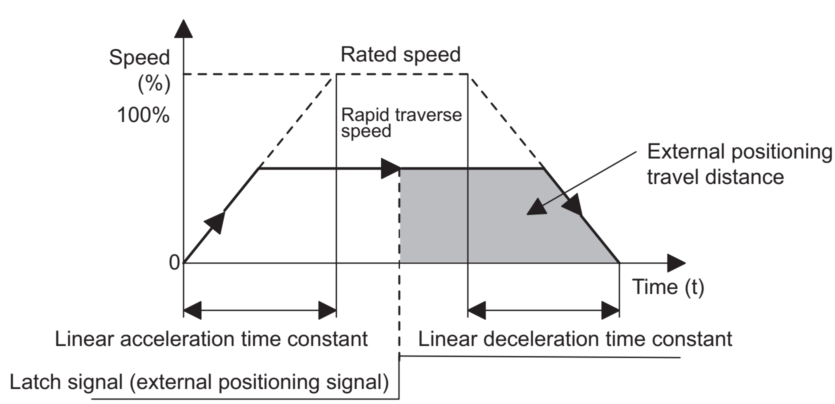
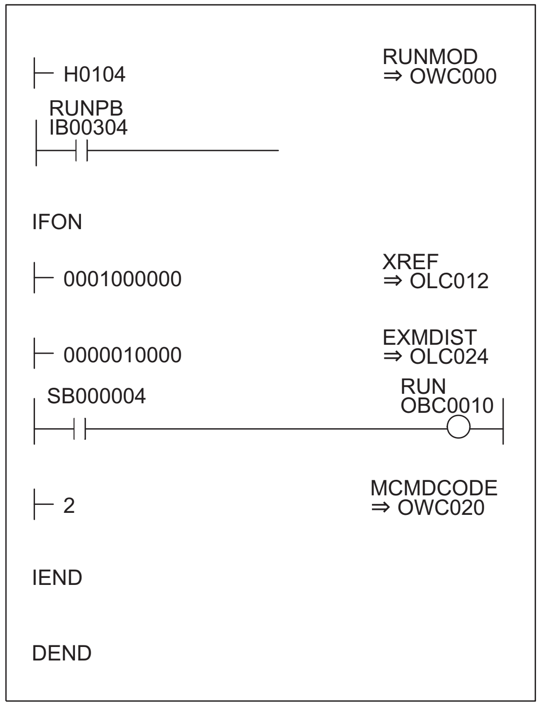


Fig. 2.17 Example of an External Positioning Pattern

Ladder Logic Program Example



Set the position control mode to ON.

Position reference pulse (XREF)
(Absolute position: 10000)

External positioning travel distance
(EXMDIST)

Driver operation command (RUN)

Execute external positioning (EX_POSING)
as the motion command.

When IB00304 turns ON, position control starts, and the axis moves to absolute position 1000000. When a latch signal (external positioning signal) is input while the feed operation is executing, the axis travels only the external positioning travel distance (10,000 pulses). When travel is completed, the IBC000D positioning completed signal turns ON. If a latch signal has not been input, the IBC00D positioning completed signal turns ON when absolute position 10000 is reached.

Fig. 2.18 External Positioning Programming Example (DWG H03)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.4.4 Zero Point Return (ZRET)

■ Overview

The zero point return operation is used to return to the machine coordinate system zero point.

The machine coordinate system zero point position data is destroyed when the power is turned OFF. Therefore, after turning ON the power, the machine coordinate system zero point must be repositioned. In general, a zero point pulse (Phase-C pulse) and a limit switch showing the zero point area are used to determine the zero point.

There are two zero point return methods. One method uses motion commands, and the other method uses the zero return mode. Care is required because zero point return operations are different with these two methods.

The method of using motion commands is described below.

■ Zero Point Return Method

The following methods are available with the zero point return (ZRET) motion command.

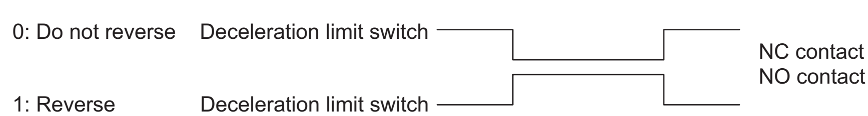
Zero Point Return Method	Fixed Parameter 31 Setting	SVA-01A	SVA-02A	SVB-01	PO-01
DEC1 + Phase-C pulse	0	Yes	Yes	Yes	No
DEC2 + Phase-C pulse	6	Yes	Yes	No	No
DEC1 + LMT + Phase-C pulse	7	Yes	Yes	No	No
Phase-C pulse	3	Yes	Yes	Yes	No
DEC1 + ZERO signal	2	Yes	No	Yes	Yes
DEC2 + ZERO signal	4	Yes	No	No	Yes
DEC1 + LMT + ZERO signal	5	Yes	No	No	Yes
ZERO signal	1	Yes	No	Yes	No

Note: Yes: Available, No: Not available

INFO

1. With a limit switch (deceleration limit switch) and a zero point return limit signal, a user program must be created to connect the LIO-01 or other external DI signal to the next motion setting parameters.
   - Limit Switch Signal*: OB□□01F
   - Reverse Limit Signal for Zero Point Return: OB□□21C
   - Forward Limit Signal for Zero Point Return: OB□□21D

   * DI5 (DI signal) can also be used with a 4-axis SVA-01A Module. Whether a DI signal or OB□□01F is used as the limit switch signal is set in the bit 2 in motion fixed parameter No. 14 (Additional Function Selections).
2. A limit switch (deceleration limit switch) signal's polarity can be reversed using the setting of bit 10 (Deceleration Limit Switch Inversion Selection) in motion fixed parameter No. 17 (Motion Controller Function Selection Flags (SVFUNCSEL)). The default is 0 (do not reverse).



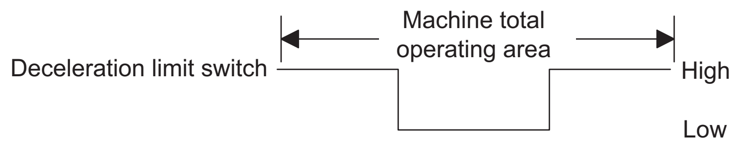
3. Refer to *2.2.5 Zero Point Return Mode* for details.
4. The zero point return method is set by specifying a number (0 to 7) in fixed parameter No. 31 (Zero Point Return Method).

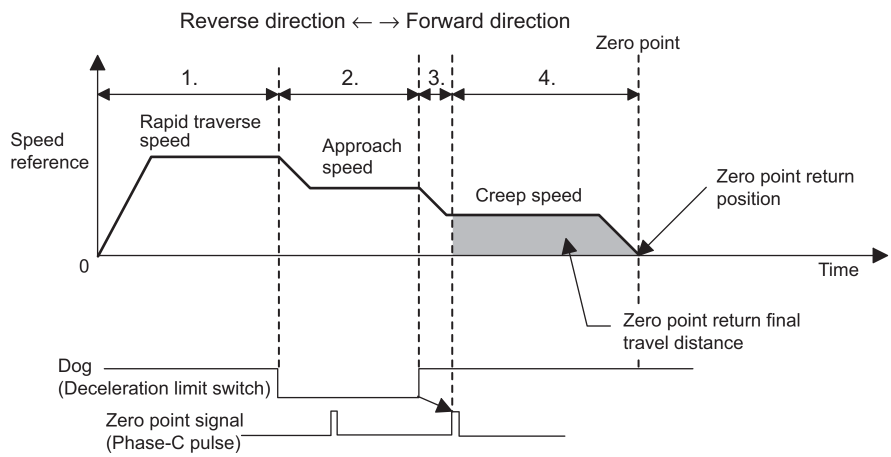
Details on each method are given next.

■ DEC1 + Phase-C Pulse

This method is used to perform zero point return using a limit switch (deceleration limit switch) and a zero point signal (Phase-C pulse) by rapid traverse using linear acceleration/deceleration (with a dog width).

The limit switch is used with a mechanical configuration such as the one shown in the following illustration.





1. The axis travels at rapid traverse speed in the direction specified in the motion setting parameter (OB□□009).
2. The axis decelerates to approach speed at the falling edge of the dog (deceleration limit switch) signal.
3. The axis decelerates to creep speed at the rising edge of the dog (deceleration limit switch) signal.
4. When the dog goes high, the axis stops after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal (Phase-C pulse), and that position will be the machine coordinate system zero point.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Available	Available	Not available

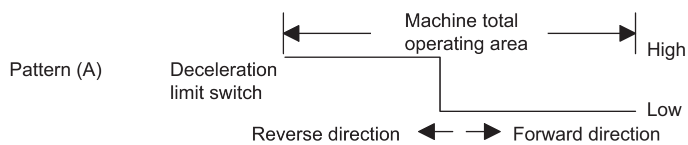
IMPORTANT

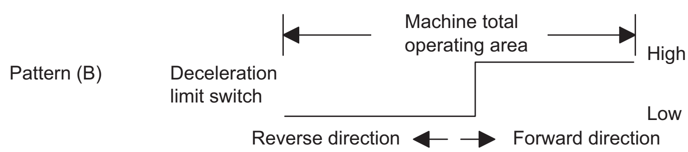
Automatic return is not performed with this zero point return method. Where zero point return to a position is not possible, use a manual operation to return to the zero point.

■ DEC2 + Phase-C Pulse

This method is used to perform zero point return using a limit switch (deceleration limit switch) and a zero point signal (Phase-C pulse) by rapid traverse using linear acceleration/ deceleration (without a dog width).

The limit switch is used with a mechanical configuration such as the one shown in the following illustration.



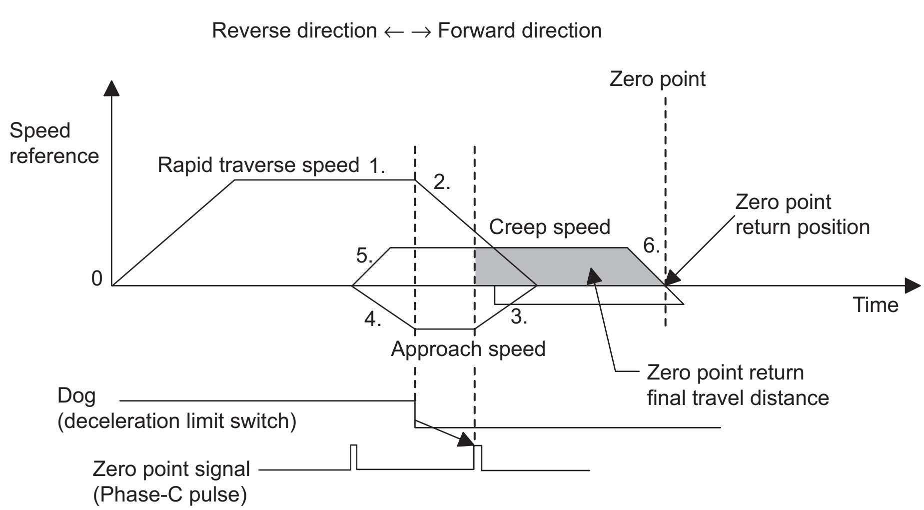


SVA-01A	SVA-02A	SVB-01	PO-01
Available	Available	Not available	Not available

INFO

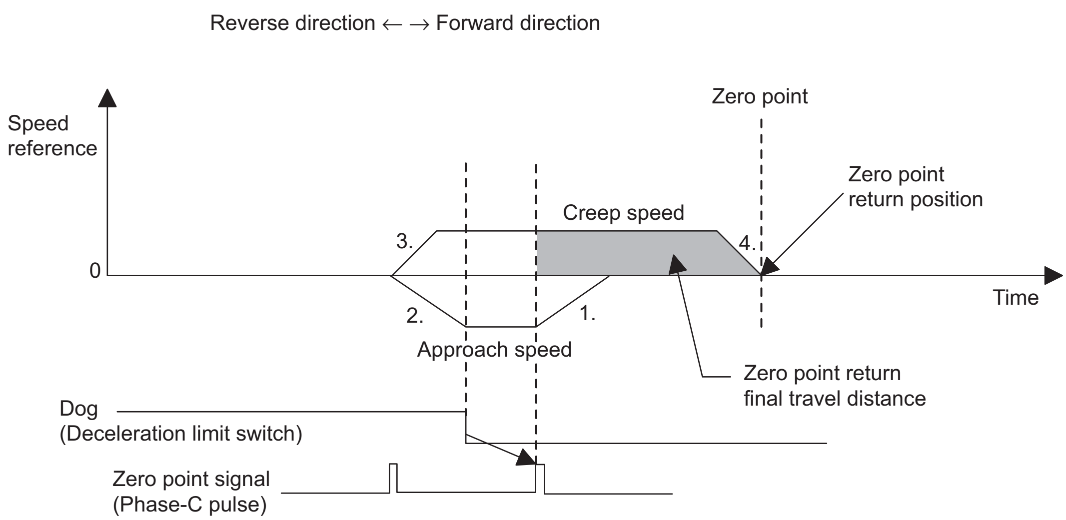
1. With this method, the axis recognizes the machine position by the deceleration limit switch ON/ OFF status, and automatically performs a return operation. Be sure to perform zero point return under the same conditions.
2. With pattern (B), set the deceleration limit switch inversion selection (bit 10) of motion fixed parameter No. 17 to ON.

Zero Point Return Operation Started with the Dog (Deceleration Limit Switch) Signal in the High Area



1. The axis travels at rapid traverse speed in the forward direction.
2. The axis decelerates at the falling edge of the dog (deceleration limit switch) signal.
3. The axis travels at approach speed in the reverse direction.
4. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
5. The axis travels at creep speed in the forward direction.
6. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal, and that position will be the machine coordinate system zero point.

Zero Point Return Operation Started with the Dog (Deceleration Limit Switch) Signal in the Low Area

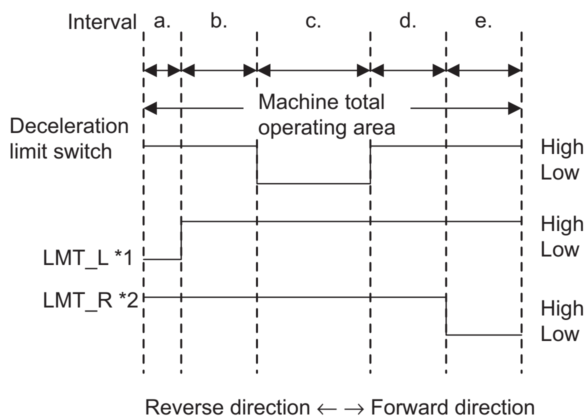


1. The axis travels at approach speed in the reverse direction.
2. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
3. The axis travels at creep speed in the forward direction.
4. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal, and that position will be the machine coordinate system zero point.

■ DEC1 + LMT + Phase-C Pulse

This method is used to perform zero point return using a limit switch (deceleration limit switch), a zero point return limit signal, and a zero point signal (Phase-C pulse) by rapid traverse using linear acceleration/deceleration (with a dog width).

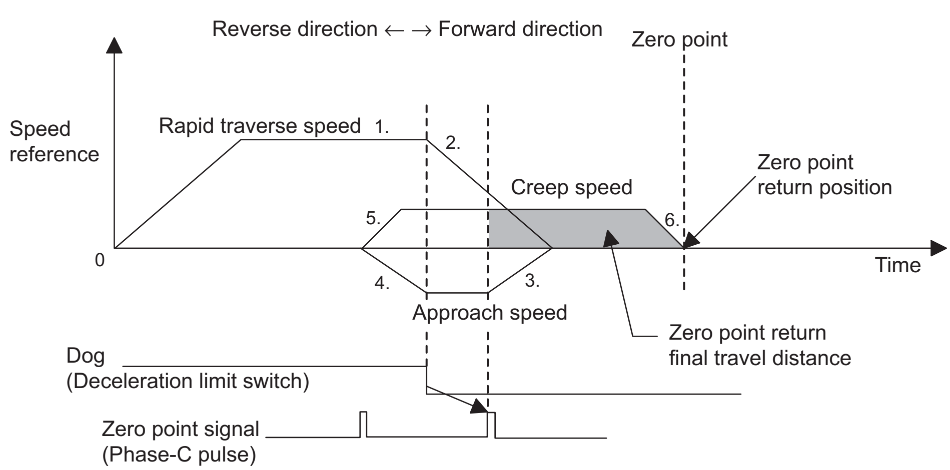
The limit switch (deceleration limit switch) and the zero point return limit signal are used with a mechanical configuration such as the one shown in the following illustration.



* 1. Zero point return reverse limit signal (OB□□21C)
* 2. Zero point return forward limit signal (OB□□21D)

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Available	Not available	Not available

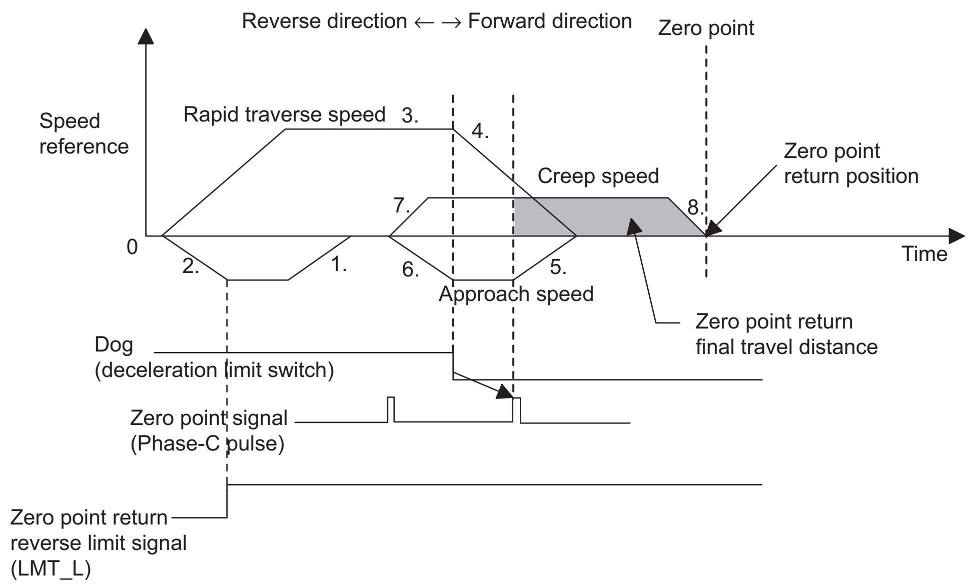
Zero Point Return Operation Started and Interval (a) Used



1. The axis travels at rapid traverse speed in the forward direction.
2. The axis decelerates at the falling edge of the dog (deceleration limit switch) signal.
3. The axis travels at approach speed in the reverse direction.
4. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
5. The axis travels at creep speed in the forward direction.
6. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops

after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal, and that position will be the machine coordinate system zero point.

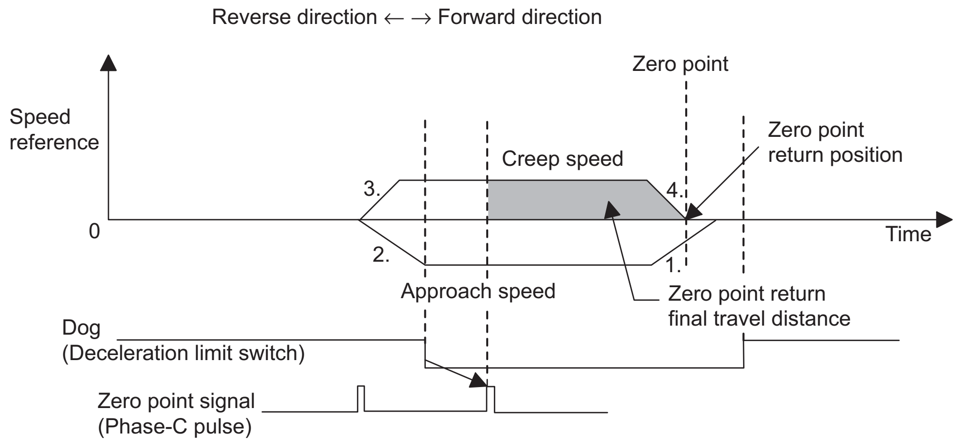
Zero Point Return Operation Started and Interval (b) Used



1. The axis travels at approach speed in the reverse direction.
2. The axis decelerates at the falling edge of the zero point return reverse limit signal (LMT_L).
3. The axis travels at rapid traverse speed in the forward direction.
4. The axis decelerates at the falling edge of the dog (deceleration limit switch) signal.
5. The axis travels at approach speed in the reverse direction.
6. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
7. The axis travels at creep speed in the forward direction.
8. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal, and that position will be the machine coordinate system zero point.

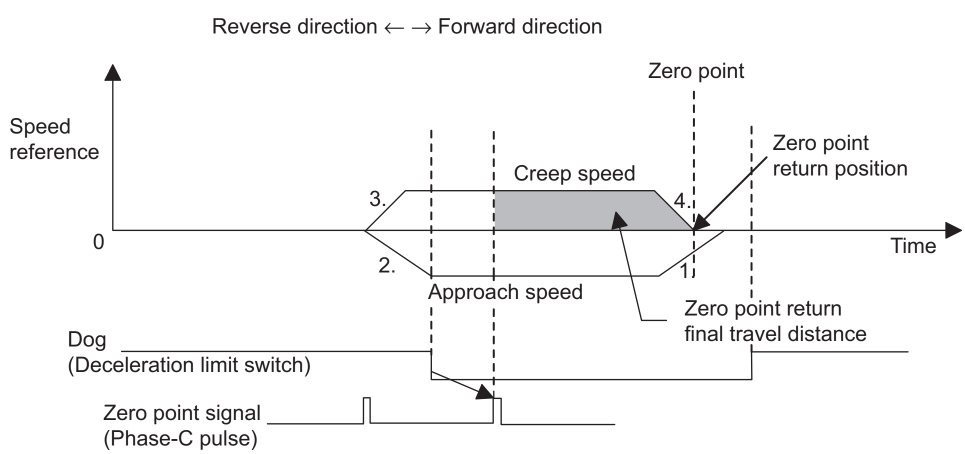
2

Zero Point Return Operation Started and Interval (c) Used



1. The axis travels at approach speed in the reverse direction.
2. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
3. The axis travels at creep speed in the forward direction.
4. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops after traveling only the zero point return final travel distance (OL□□2A) from the initial zero point signal, and that position will be the machine coordinate system zero point.

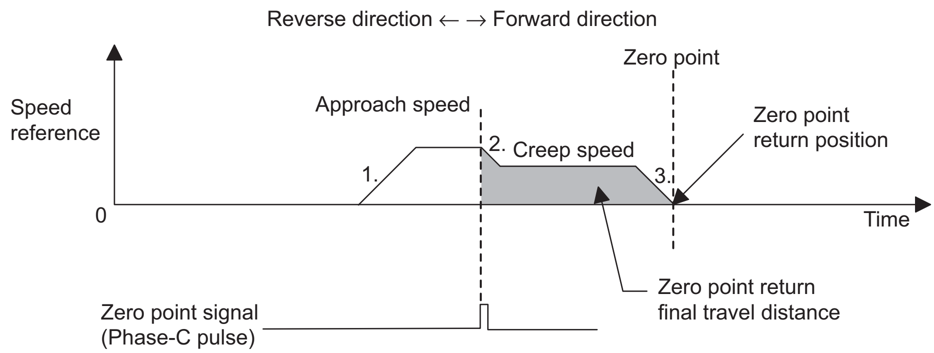
Zero Point Return Operation Started and Intervals (d) & (e) Used



1. The axis travels at approach speed in the reverse direction.
2. The axis decelerates at the rising edge of the dog (deceleration limit switch) signal.
3. The axis travels at creep speed in the forward direction.
4. After the falling edge of the dog (deceleration limit switch) is detected, the axis stops after traveling only the zero point return final travel distance from the initial zero point signal, and that position will be the machine coordinate system zero point.

■ Phase-C Pulse

This method is used to perform zero point return using only a zero point signal (Phase-C pulse) by rapid traverse using linear acceleration/deceleration.



1. The axis travels at approach speed in the direction specified in the motion setting servo parameter (OB□□009).
2. The axis decelerates to creep speed after detecting the initial zero point signal.
3. The axis stops after traveling only the zero point return final travel distance from the initial zero point signal, and that position will be the machine coordinate system zero point.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Available	Available	Not available

■ DEC1 + ZERO Signal

Zero point return is performed using a ZERO signal (DI signal) in place of the Phase-C pulse used in the *DEC1 + Phase-C Pulse* described above.

For details, see *DEC1 + Phase-C Pulse*.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Not available	Available	Available

■ DEC2 + ZERO Signal Method

Zero point return is performed using a ZERO signal (DI signal) in place of the Phase-C pulse used in the *DEC2 + Phase-C Pulse* discussed above.

For details, see *DEC2 + Phase-C Pulse*.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Not available	Not available	Available

■ DEC1 + LMT + ZERO Signal Method

Zero point return is performed using a ZERO signal (DI signal) in place of the Phase-C pulse used in the *DEC1 + LMT + Phase-C Pulse* discussed above.

For details, see *DEC1 + LMT + Phase-C Pulse*.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Not available	Not available	Available

■ ZERO Signal Method

Zero point return is performed using a ZERO signal (DI signal) in place of the Phase-C pulse used in the *Phase-C Pulse* discussed above.

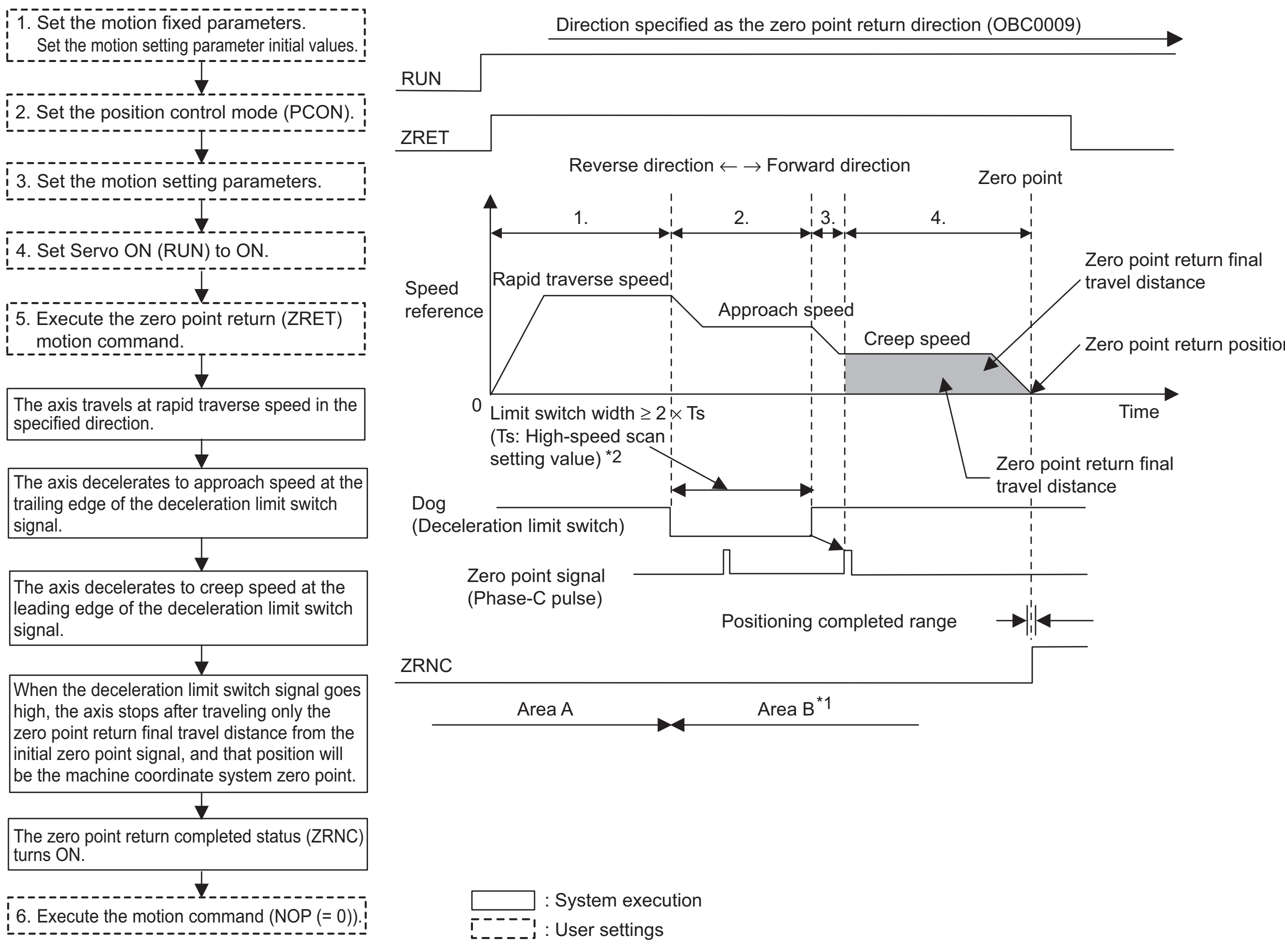
For details, see *Phase-C Pulse*.

SVA-01A	SVA-02A	SVB-01	PO-01
Available	Not available	Available	Not available

■ Example of the Zero Point Return Operations

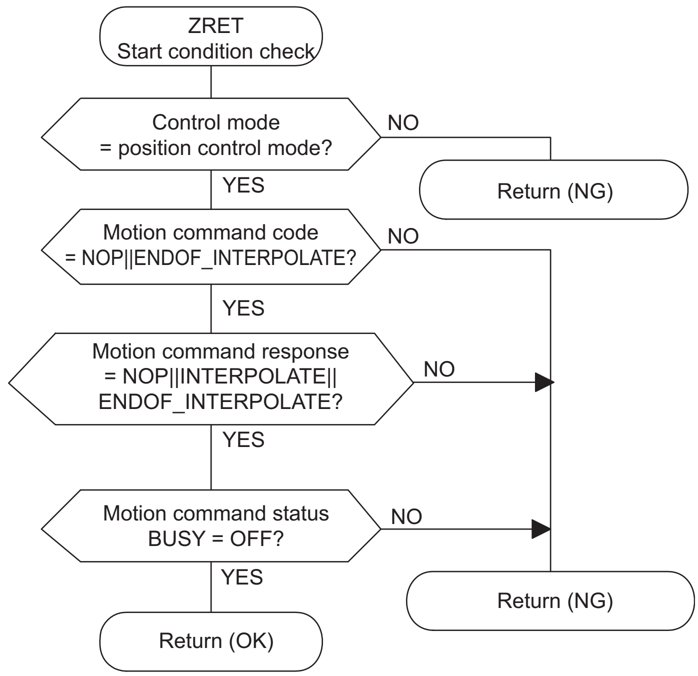
Use the following procedure to perform zero point return operations.

The following illustration shows an example of the DEC1 + Phase-C pulse method.



1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user's machine.
2. Set the Position Control Mode (PCON) (bit 2 of OW□□00).
3. Set the motion setting parameter to be used with zero point return (ZRET).
4. Set RUN Servo ON (RUN) to ON (bit 0 of OW□□01).
   For the PO-01 Module, set Excitation ON (RUN) to ON.
5. Set zero point return (ZRET = 3) in the motion command code (OW□□20).

6. Zero point return (ZRET) will be executed.



The axis travels at rapid traverse speed in the direction specified by the zero point return direction selection (OBC0009).

The motion parameter setting values cannot be changed during a zero point return operation.

The zero point return command operations are as follows:

a) Operation Start

Set RUN Servo ON (bit 0 of OW☐☐01) to ON. For the PO-01 Module, set Excitation ON (RUN) to ON.

Set the zero point return (ZRET) to motion command code (OW☐☐20).

b) Feed Hold

Not possible.

c) Abort

Set Abort (bit 1 of OW☐☐21) to ON, or set NOP (= 0) in the motion command code.

Busy (bit 0 of IW☐☐15) turns ON during abort processing, and turns OFF at abort completion.

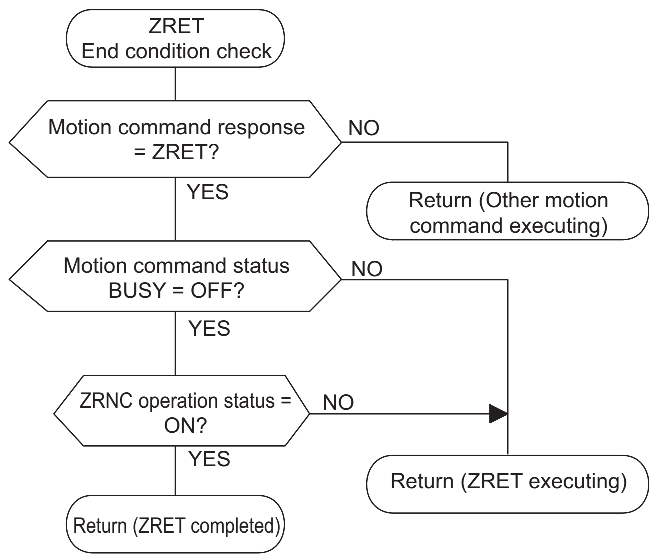
Note: Even when the abort is completed and the abort is released (ABORT turns OFF), operations remain stopped.

7. The axis decelerates to approach speed at the falling edge of the dog (deceleration limit switch) signal.
8. The axis decelerates to creep speed at the rising edge of the dog (deceleration limit switch) signal.
9. When the dog goes high, the axis stops after traveling only the zero point return final travel distance (OL☐☐2A) from the initial zero point signal (Phase-C pulse), and that

position will be the machine coordinate system zero point.

A zero point position offset value can also be set. (If Zero Point Offset OL□□06 is set in advance to 100, the position data will be 100.)

10. The zero point return operation is completed when the axis enters the Positioning Completed Range (OW□□0E) after Distribution Completed (bit 2 of IW□□15 is ON). When the zero point return operation is completed, the ZRNC Zero Point Return Completed (bit 6 of IW□□15) turns ON.



11. After checking that the ZRNC Zero Point Completed (bit 6 of IW□□15) is ON, set NOP (= 0) in the motion command code (OW□□20).

IMPORTANT

1. If the machine is in Area B after the power is turned ON, the return cannot be performed correctly. Be sure to move the machine back to Area A before performing a return.
2. The deceleration limit switch width must be at least twice that of the high-speed scan setting value. The criteria for the deceleration limit switch width (L) can be calculated using the formula shown below.
   - Ts (s) = High-speed scan set value (ms)/1000
   - F (m/s) = k× {NR × n × FBppr}/60

     F: 100% speed (m/s)

     k: Weight of 1 pulse (m/pulse)

     NR: Rated rotation speed (min^{-1})

     FBppr: Feedback pulse resolution (p/r)

     n: Pulse magnification (1, 2, or 4)
   - t (s) = Linear acceleration/deceleration time (s)
   - α (m/s^2) = f/t

     If α = acceleration/deceleration time constant (m/s^2), the following equation applies.

     $L = 1/2 \cdot \alpha\,(2 \times Ts)^2 = 2\,\alpha\,Ts^2$
3. When a short distance is set for the zero point return final travel distance, the axis returns to the zero point after the zero point has been passed once.

■ User Program Example: Zero Point Return

Example of RUN Operation

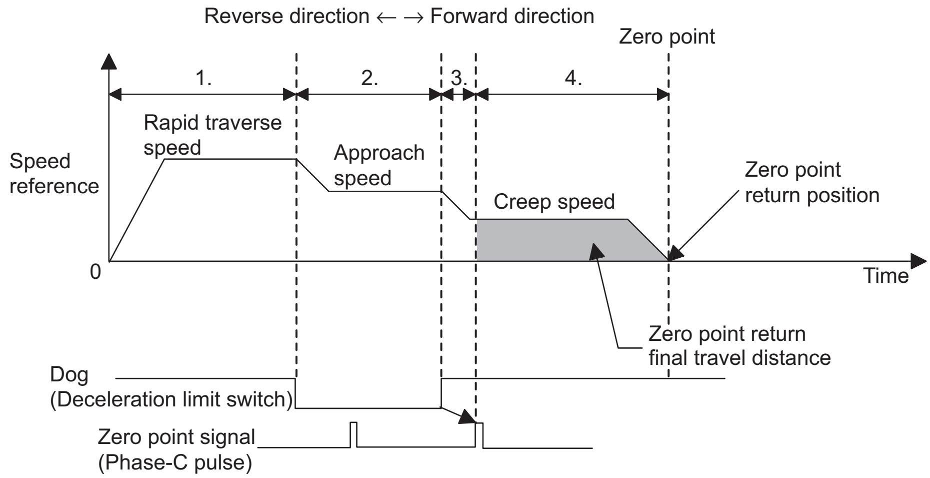


Fig. 2.19 Example of a Zero Point Pattern (DEC1 + Phase-C Pulse Signal Method)

Ladder Logic Program Example

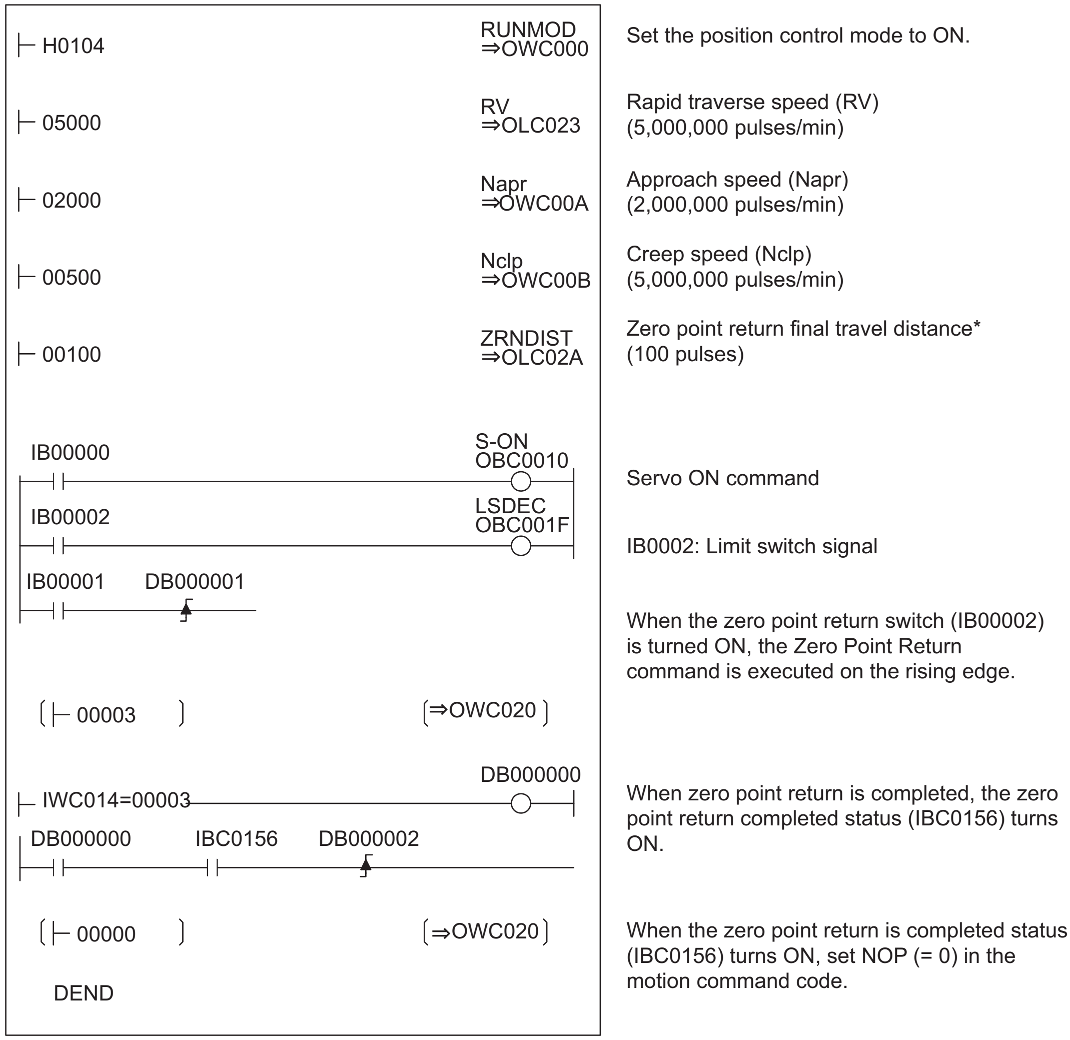


Fig. 2.20 Zero Point Return Programming Example (DWG H03)

* For the SVB-01 Module, set the zero point return final distance to the value of the SERVOPACK parameter.

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

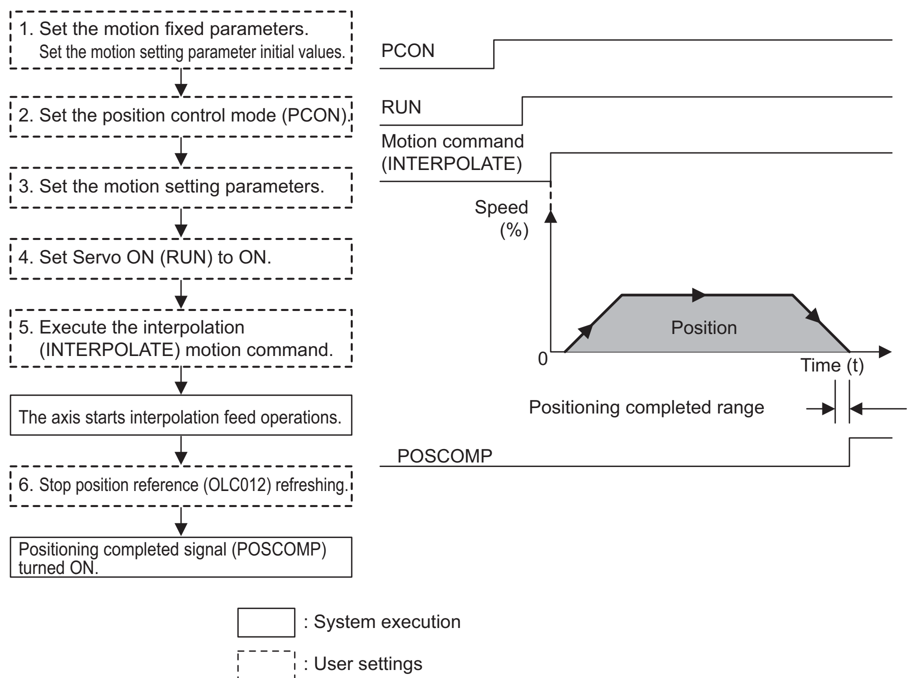
2.4.5 Interpolation (INTERPOLATE, END_OF_INTERPOLATE)

■ Overview

This command performs interpolation feeding using the position data distributed from the CPU Module.

■ Details

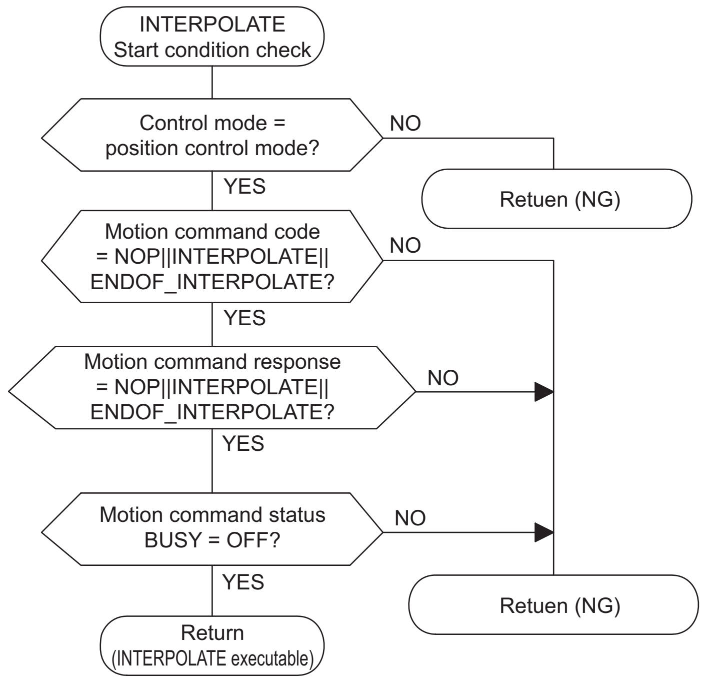
Use the following procedure to perform interpolation feed operations.



1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user's machine.
2. Set the Position Control Mode (PCON) (bit 2 of OW☐☐00).
3. Set the Position Reference Setting (OL☐☐12).

   If required, set any motion setting parameters to use with interpolation (INTERPOLATE), such as the Filter Time Constant Setting (OW☐☐14).
4. Set RUN Servo ON (RUN) to ON (bit 0 of OW☐☐01).
   For the PO-01 Module, set Excitation (RUN) to ON.

5. Set interpolation (INTERPOLATE = 4) in the motion command code (OW□□20).



When interpolation (INTERPOLATE) is set as the motion command, the axis performs positioning to the position specified in the position reference (OL□□12).

6. Stop refreshing the position reference (OL□□12).
7. Change the motion command to 0.

When the axis enters the Positioning Completed Range (OW□□0E) after Distribution Completed (bit 2 of IW□□15 is ON), the POSCOMP Positioning Completed Signal (bit 13 of IW□□00) turns ON.

INFO

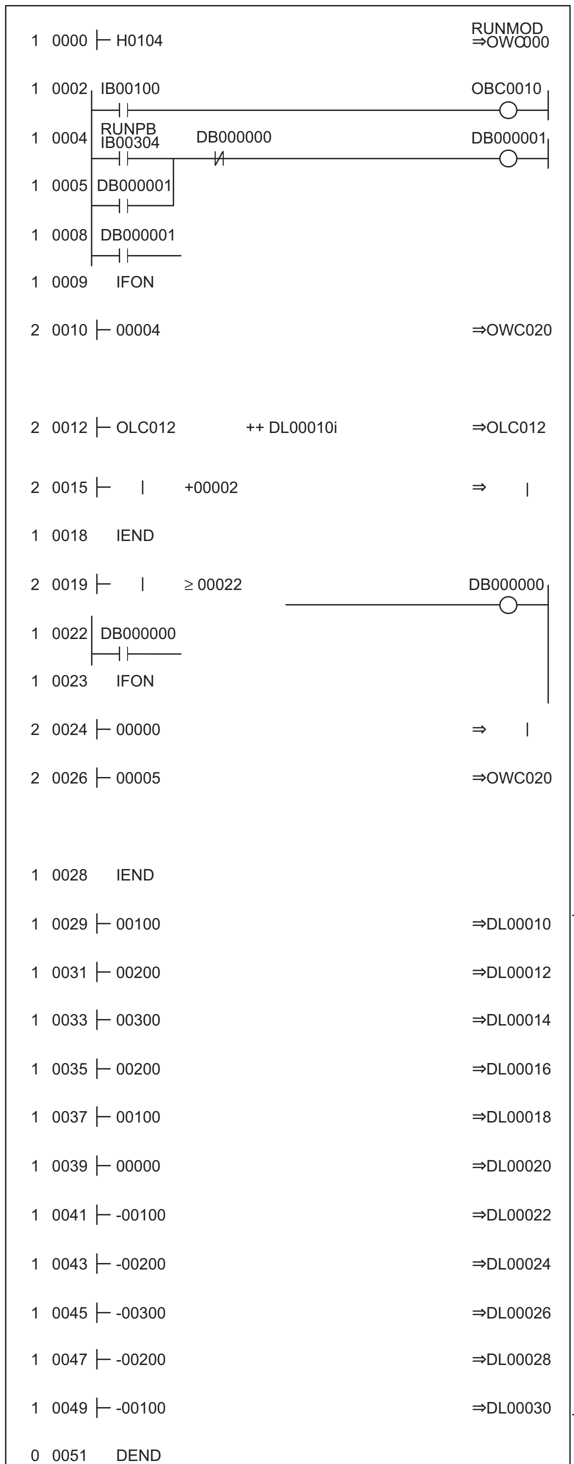
When END_OF_INTERPOLATE is set in the motion command, the motion command will be automatically changed to 0 by the system by the next scanning.

IMPORTANT

The interpolation commands do not have a parameter that sets the speed reference. The position reference will be changed each scan by the interpolation speed.

■ User Programming Example: Interpolation

Ladder Logic Program Example



Set the position control mode to ON.

Send RUN command to driver.

Execute INTERPOLATE command.

Set the position reference.

Check for completion of specified reference distribution.

Execute END_OF_INTERPOLATE command.

Increment data for position reference each scan.

Fig. 2.21 Programming Example for INTERPOLATE and END_OF_INTERPOLATE

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.4.6 Interpolation with Position Detection (LATCH)

■ Overview

In the same way as for an interpolation feeding, the latch signal is used to latch the current position counter while the interpolation feed is being executed, and reports the changed latch position converted to the reference unit system.

A specific discrete input (DI input) is used for the latch signal.

■ Details

For details on interpolation operations, see *2.4.5 Interpolation (INTERPOLATE, END_OF_INTERPOLATE)*.

2

IMPORTANT

When latching is performed again after current position counter latching has been executed once by the latch signal, first set the motion command to NOP for 1 scan or more, and then execute the LATCH command.

2.4.7 Fixed Speed Feed (FEED)

■ Overview

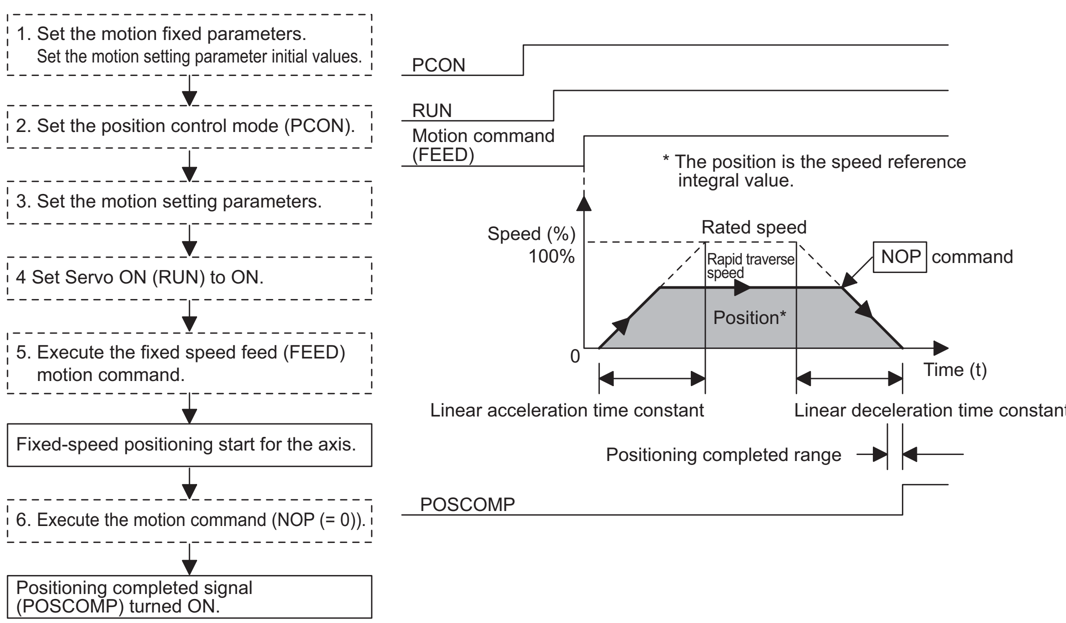
This command performs rapid traverse in the infinite length direction using the specified acceleration/deceleration time constant and the specified rapid traverse speed.

The rapid traverse speed can be changed during operations.

The axis decelerates to a stop when NOP (= 0) is set in the motion command code (OW☐☐20).

■ Details

Use the following procedure to perform fixed speed feed operations.



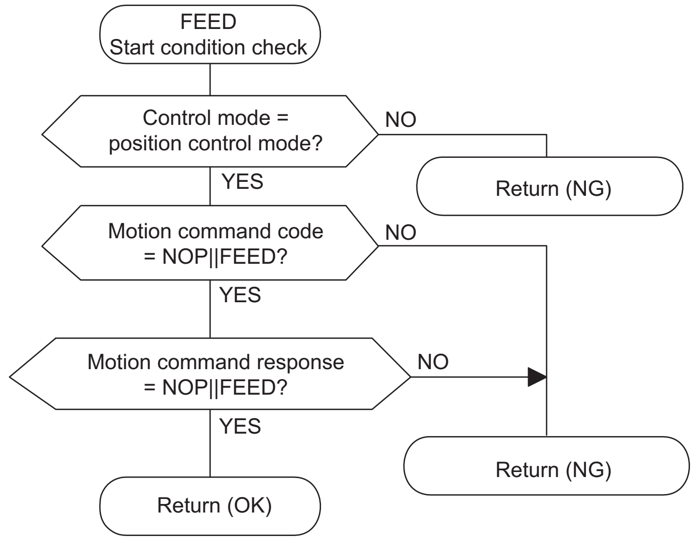
☐ : System execution

⬚ : User settings

1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user's machine.
2. Set the Position Control Mode (PCON) (bit 2 of OW☐☐00).
3. Set the Rapid Traverse Speed (OL☐☐22 or OW☐☐15).

   Set the motion setting parameter to be used with fixed speed feed (FEED).
4. Set RUN Servo ON (RUN) to ON (bit 0 of OW☐☐01).
   For the PO-01 Module, set Excitation ON (RUN) to ON.
5. Set fixed speed feed (FEED = 7) in the motion command code (OW☐☐20).

   Fixed speed feed will be started.

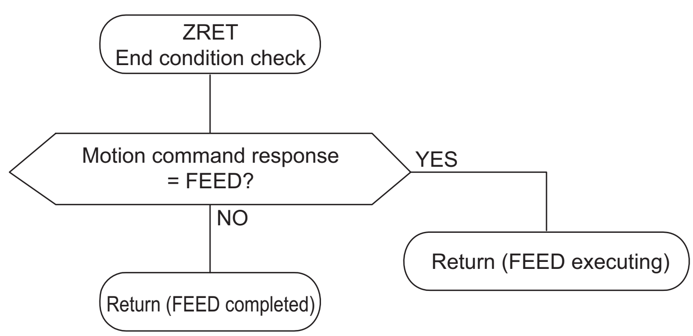


The axis performs fixed speed feed using the specified motion parameter.

Fixed speed feed cannot be temporarily stopped.

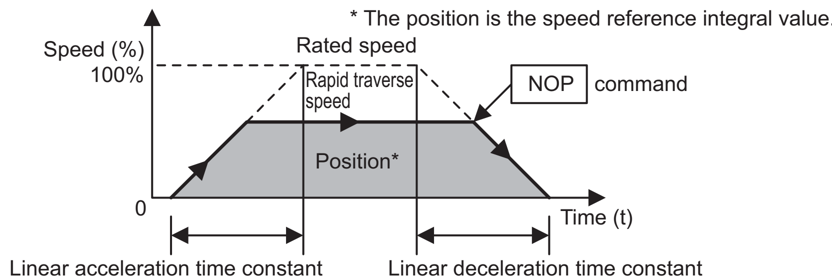
6. To stop (abort) fixed speed feed, set NOP (= 0) in the motion command code (OW☐☐20).

   When the axis enters the Positioning Completed Range (OW☐☐0E) after Distribution Completed (bit 2 of IW☐☐15 is ON), the POSCOMP Positioning Completed Signal (bit 13 of IW☐☐00) turns ON.



■ User Program Example: Fixed Speed Feed

Example of RUN Operation



Ladder Logic Program Example

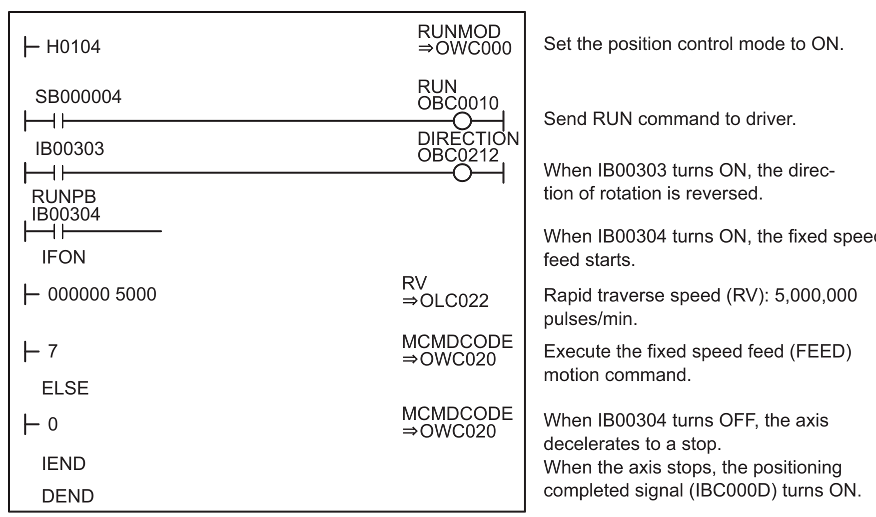


Fig. 2.22 Fixed Speed Feed Programming Example (DWG H03)

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.4.8 Fixed Length Feed (STEP)

■ Overview

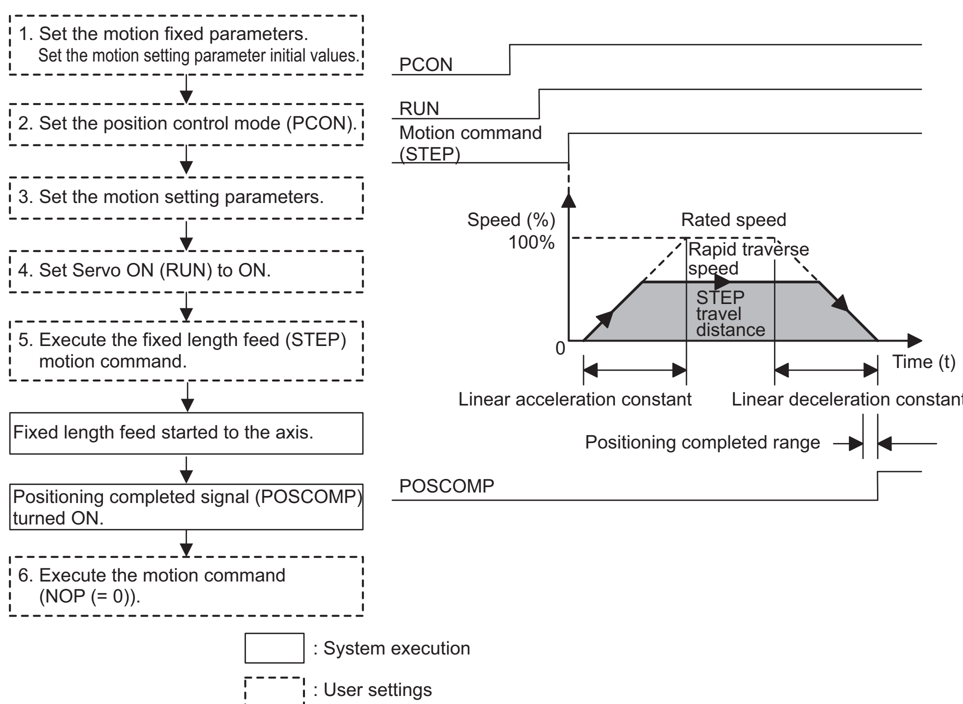
This command positions the axis at rapid traverse speed in the specified direction for only the specified travel distance (STEP travel distance) using the specified acceleration/deceleration time constant.

The rapid traverse speed can be changed during operations.

When you change the travel distance during operations, the changed value will be incorporated when the next fixed length feed (STEP) is executed.

■ Details

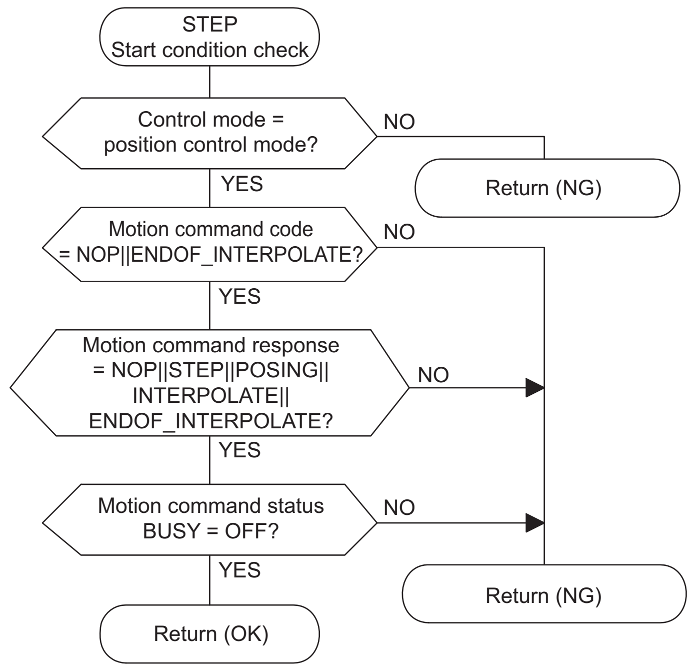
Use the following procedure to perform fixed length feed operations.



1. Set the initial values for the motion fixed parameters and the motion setting parameters according to the user’s machine.
2. Set the Position Control Mode (PCON) (bit 2 of OW□□00).
3. Set the Step travel distance (OL□□28) and the Rapid Traverse Speed (OL□□22 or OW□□15).

   Set the motion setting parameters to be used with fixed length feed (STEP).
4. Set RUN Servo ON (RUN) to ON (bit 0 of OW□□01).
   For the PO-01 Module, set Excitation ON (RUN) to ON.
5. Set fixed length feed (STEP = 8) to the motion command code (OW□□20).

   Fixed length feed (STEP) will be started.



The axis performs positioning using the specified motion parameter. Even during fixed length feed operations, the motion parameter settings can be changed.

The fixed length feed command operations are as follows:

a) Operation Start

Set RUN Servo ON (bit 0 of OW□□01) to ON.
For the PO-01 Module, set Excitation ON (RUN) to ON.

Set fixed length feed (STEP) in the motion command code (OW□□20).

b) Feed Hold

Set Hold (bit 0 of OW□□21) to ON.

At feed hold completion, HOLDL (bit 1 of IW□□15) turns ON.

c) Feed Hold Release

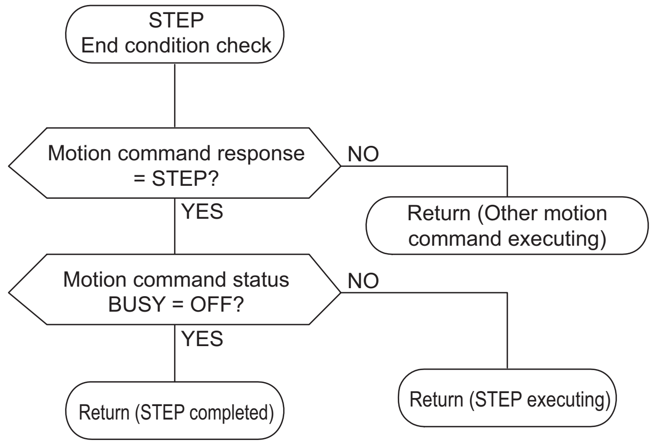
Set Hold (bit 1 of OW□□21) to OFF. Positioning resumes.

d) Abort

Set Abort (bit 1 of OW□□21) to ON, or set NOP (= 0) in the motion command code.

Note: Even when the abort is completed and the abort is released (ABORT turns OFF), operations remain stopped.

When the axis enters the Positioning Completed Range (OW□□0E) after Distribution Completed (bit 2 of IW□□15 is ON), the POSCOMP Positioning Completed Signal (bit 13 of IW□□00) turns ON.



6. Once positioning has been completed, clear the fixed length feed motion command.

   Note: Fixed length feed is detected at the leading edge. Therefore, when fixed length feed has been executed, the motion command must be set to NOP for 1 scan or more, and fixed length feed must be reset as the motion command.

■ User Program Example: Fixed Length Feed

Example of RUN Operation

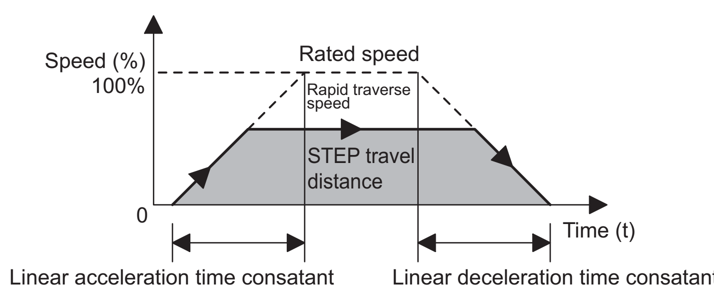
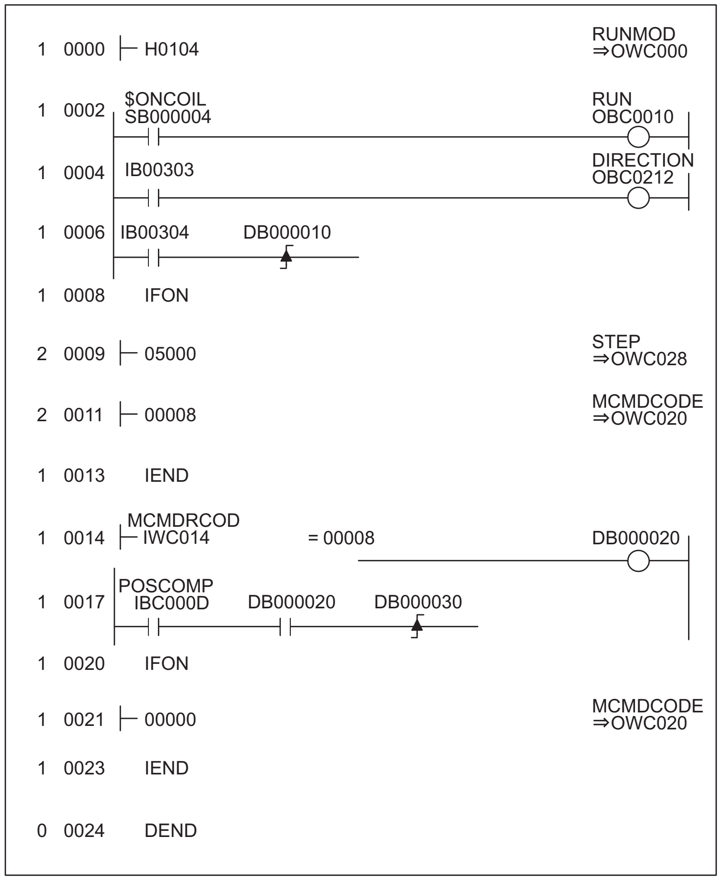


Fig. 2.23 Example of a Fixed Length Feed Pattern

Ladder Logic Program Example



Set the position control mode to ON.

Send RUN command to driver.

When IB00303 turns ON, the direction of rotation is reversed.

STEP travel distance: 2,000 pulses.

When IB00304 turns ON, STEP feeding is begun and the axis is moved by STEP travel distance.

When travel is completed, the positioning completed signal (IBC00D) is turned ON.

When travel is completed, clear the command (i.e., set to the NOP command) to prepare for next operation.

The example in the above illustration has been greatly simplified. In actual operation, each register can be controlled from the user program.

2.4.9 Zero Point Setting (ZSET)

⚠ WARNING

- The zero return setting (ZSET) command is used to set the machine coordinate system zero point. Therefore, if the ZSET setting position is incorrect, the movement for subsequent operations will differ from the actual position. Before executing operations, be sure to check that the correct machine coordinate system zero point has been set.

  Failure to carry out this check may result in damage to equipment, serious personal injury, or even death.

2

■ Overview

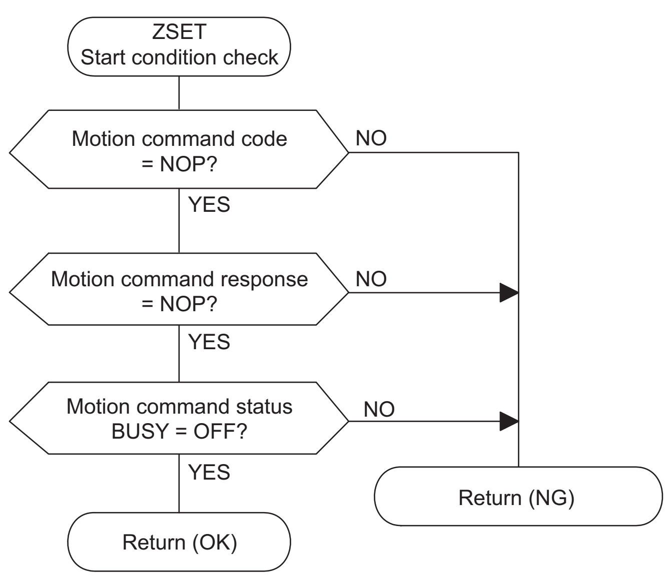
When the zero point setting is executed, the current position will be the machine coordinate system zero point. Therefore, the zero point can be set without performing a zero point return operation.

When a stored stroke limit is used, be sure to execute a zero point return operation or a zero point setting.

■ Details

Use the following procedure to set the zero point.

1. Move the machine to the zero point using fixed speed feed, fixed length feed, or manual operation.
2. Set the Position Control Mode (PCON) (bit 2 of OW☐☐00).



Note: Set "Use (= 1)" in bit 7 (motion command code selection) of motion fixed parameter No. 14 (Additional Function Selections). Set "1 (= Enabled)" in bit 8 (motion command code enable/disable) of the RUN Mode Settings (OW☐☐00) motion setting parameter.

3. Set the zero point setting (ZSET = 9) in the motion command code (OW□□20).

Note: Servo ON (bit 0 of OW□□01) may be either ON or OFF. The zero point setting (ZSET) command cannot be executed when the axis is traveling if motion fixed parameter No. 3 (Encoder Selection) is set to “absolute encoder” (= 1) and bit 5 (axis selection) of motion fixed parameter No. 17 (Motion Controller Function Selection Flags) is set to “infinite length axis” (= 1).

When the zero point setting has been completed, Zero Point Setting Completed (bit 3 of IW□□15) and the Zero Point Return Completed (bit 6 of IW□□15) turn ON.

3

Motion Module Allocations and Setup

3

This chapter describes how to set Motion Module configuration definitions and individual Module definitions.

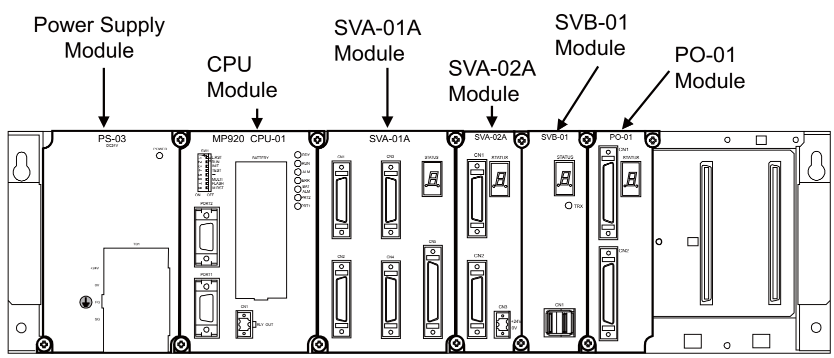
3.1 Allocations and Configuration Definitions

This section describes the MP920 Motion Module allocation method and the configuration definition procedure.

3.1.1 Motion Module Allocation Method

■ Module Allocations

Make allocations for the MP920 Modules on the Mounting Base as shown below, then define the system configuration.



Module Configuration Example

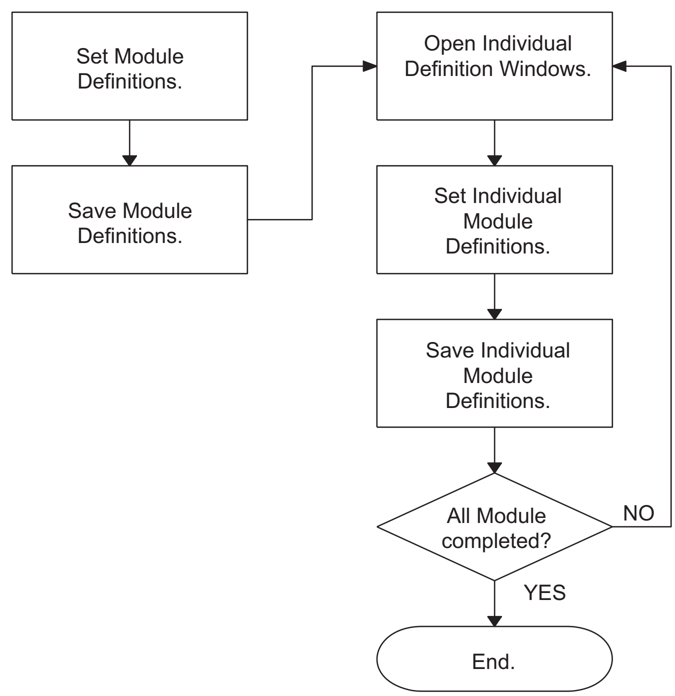
PS	Slot 0	1	2	3	4	5	6	7	8

(Long Rack)

The following configuration definition procedure applies when these Modules are allocated using the MB-01 Long Rack.

■ Defining the Module Configuration

After using the Module Definition Window to define the Modules to be mounted in each slot and the parameters, the individual Module definitions must be set. Module Definitions are normally set in the following order:



The contents of the individual Module are shown in the following table.

Module	Slots Used	Contents of Individual Module Definitions
SVA-01A	2	Motion parameters (SVA-01A)
SVA-02A	1	Motion parameters (SVA-02A)
PO-01	1	Motion parameters (PO-01)
SVB-01	1	MECHATROLINK definitions motion parameters (SVB-01)

IMPORTANT

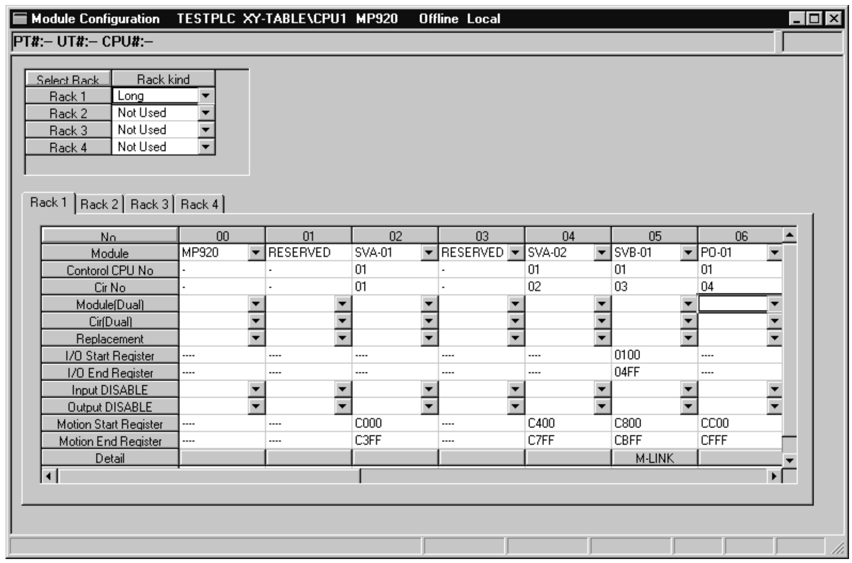
The SVB-01 Module's MECHATROLINK settings must be made before the motion parameters.

Refer to *Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual* (SIEPC88070005) for details on Module configuration definitions.

3

3.1.2 Setting Module Definitions

Set the Module types, control CPU numbers, circuit numbers, and other items for the Module to be mounted in each slot.



Module

Click the ▼ button on the right side of the desired Module column. A list of MP920 Modules will be displayed. Select the Module to be mounted in the slot.

The following data will be set automatically when the Module is set.

Control CPU No.	1
Cir No (Circuit Number)	1
Motion Start Register	C000
Motion End Register	C3FF

Control CPU No.

For Motion Modules, always set to 1.

Cir No (Circuit Number)

For Motion Modules, circuit numbers are treated as Module numbers. When using multiple Motion Modules, assign consecutive circuit numbers (such as 1, 2, 3) to the Motion Modules. When the Module type is set, 1 will be automatically set as the circuit number. Be sure to assign a different circuit number to each Module.

Module	Circuit Number
SVA-01A	1
SVA-02A	2
SVB-01	3
PO-01	4

Motion Start Register

This row displays the motion parameter register’s leading offset address, which is allocated according to the circuit number setting for the Module. The Motion Start Register cannot be set.

I/O Start Register

The leading I/O register number must be set only for the SVB-01 Module.

For the SVB-01 Module, always set register numbers that are different from those of other I/O Modules.

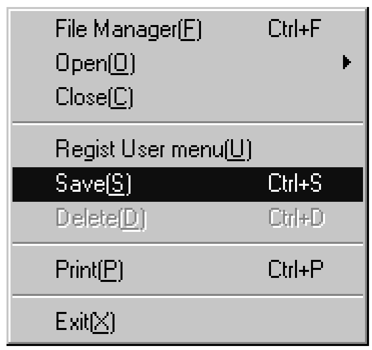
The following data is set in the Module definitions.

Slot No.	Module	Control CPU No.	Circuit Number (Cir No)	I/O Register Number		Motion Register Number	
				Leading	End	Leading	End
2	SVA-01A	1	1	–	–	C000	C3FF
4	SVA-02A	1	2	–	–	C400	C7FF
5	SVB-01	1	3	0100	04FF	C800	CBFF
6	PO-01	1	4	–	–	CC00	CFFF

3.1.3 Saving Module Definitions

Save the module configuration data after making the required Module definition settings. In Online Mode, the data will be saved to both the Machine Controller and the hard disk on the computer. In Offline Mode, the data will be saved to the hard disk on the computer.

1. Select ***File (F)*** and then ***Save (S)*** on the menu.



2. Verify the message in the message box and click the **Yes** button.

IMPORTANT

After changing the Module definitions (or loading them), always reset the MP920 by turning the power OFF, and then back ON.

3.2 Individual Module Definitions

This section describes MECHATROLINK definitions and motion parameter settings as individual Module definitions.

3.2.1 MECHATROLINK Definitions

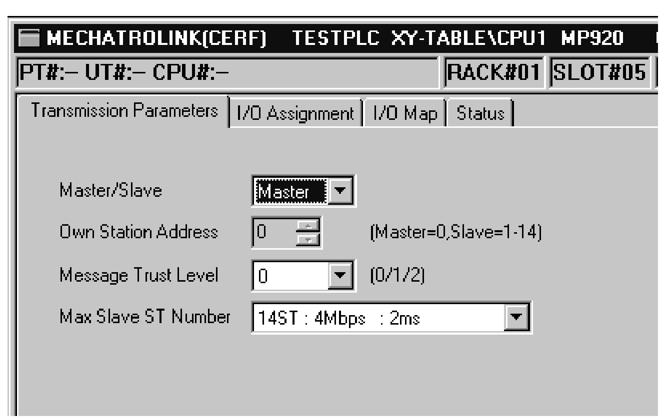
The SVB-01 Module requires MECHATROLINK definitions to be made before motion parameters are set. Double-click detailed item ***M-LINK*** to open the MECHATROLINK Window.

INFO

When the MECHATROLINK Definitions Window is opened and the MECHATROLINK definitions are being set for the first time, a confirmation message box will be displayed indicating that a new file will be created. Click the **OK** button to proceed to the next operation.

Transmission Parameters

The Transmission Parameters Tab is used to set the parameters required to use the MECHATROLINK communications system. Do not change the default values.



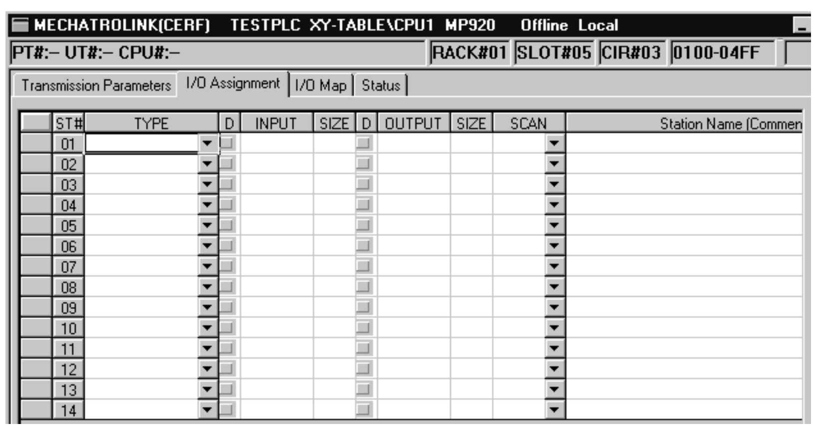
INFO

When the MECHATROLINK Definition Window is initially opened, clicking the ***I/O Assignment*** Tag will cause a save confirmation message box to be displayed even if no changes have been made. Click the **Yes** button. The window for the selected tag will be displayed to allow the user to proceed to the next operation.

■ I/O Assignments

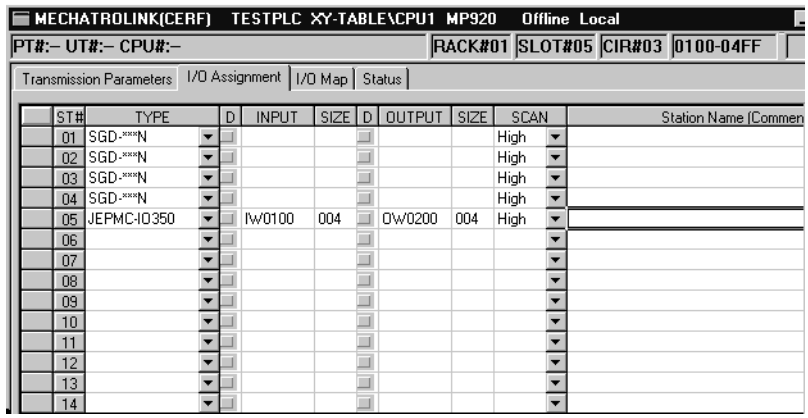
Setting Assignments

Select the I/O Assignment Tag, and set the I/O devices to be connected to MECHATROLINK and transmission definition data.



Assignment Example

In the following example, SGD-***N is assigned to stations 01 to 04, and JEPMC-IO300 is assigned to station 05.

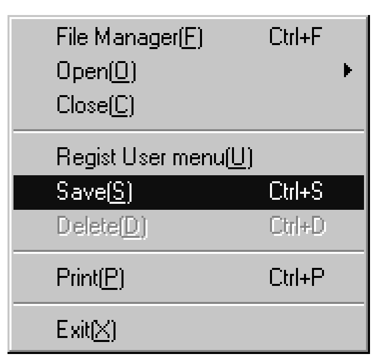


INFO When assigning the JEPMC-IO300, be sure to set the input address, output address, and scan.

■ Saving MECHATROLINK Definitions

The MECHATROLINK definitions can be saved with the following procedure.

1. Select ***File (F)*** and then ***Save (S)*** on the menu.



2. Click the **Yes** button to save the settings.

3.2.2 Setting Motion Parameters

Motion parameters must be specified separately for each Motion Module to control each Module according to the machine conditions.

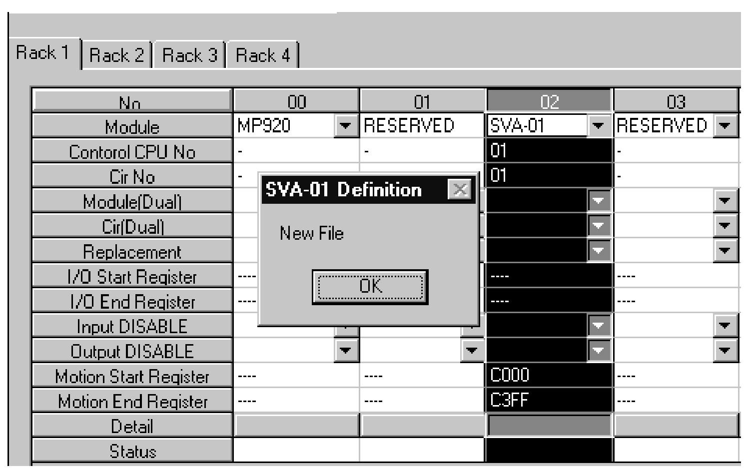
For details on motion parameters, refer to *Chapter 4 Parameters*, *5.4 SVA-01A and SVA-02A Parameters*, *6.2 SVB-01 Parameters*, and *7.3 PO-01 Parameters*.

Motion Parameter Setting Procedure

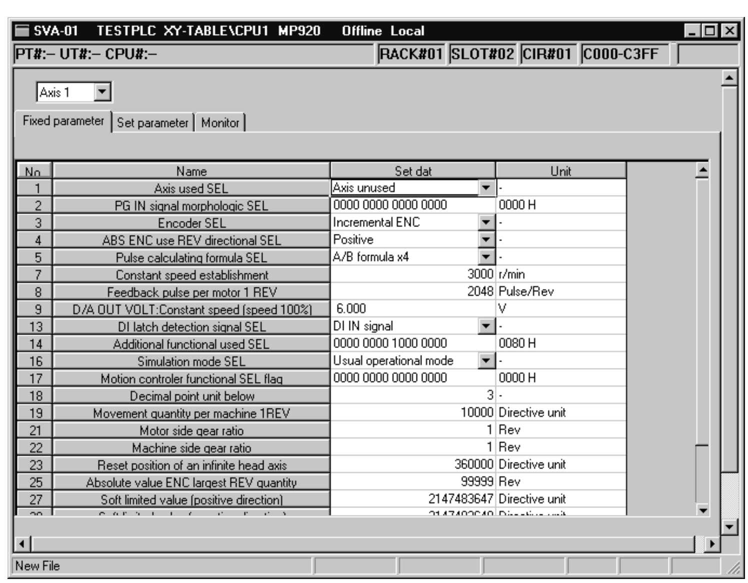
Follow the motion parameter setting procedure below.

1. Double-click the Module cell in the slot number column.

   When the Motion Parameter Window is opened for the first time, a new file confirmation message box will be displayed. Click the **OK** button. The Motion Parameter Window will be displayed to allow the user to proceed to the next operation.



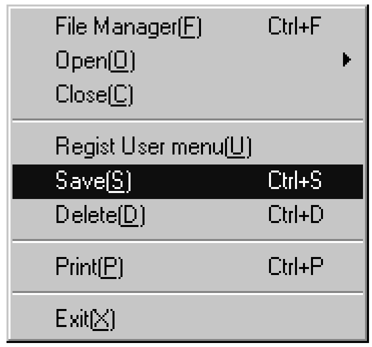
2. The Fixed Parameter Tag Page will be displayed. Set the required parameters according to the machine specifications.



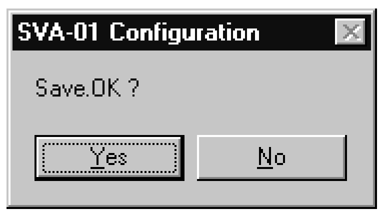
■ Saving Motion Parameter

Use the following procedure to save motion parameters.

1. Select ***File (F)*** and then ***Save (S)*** in the Motion Parameter Window.



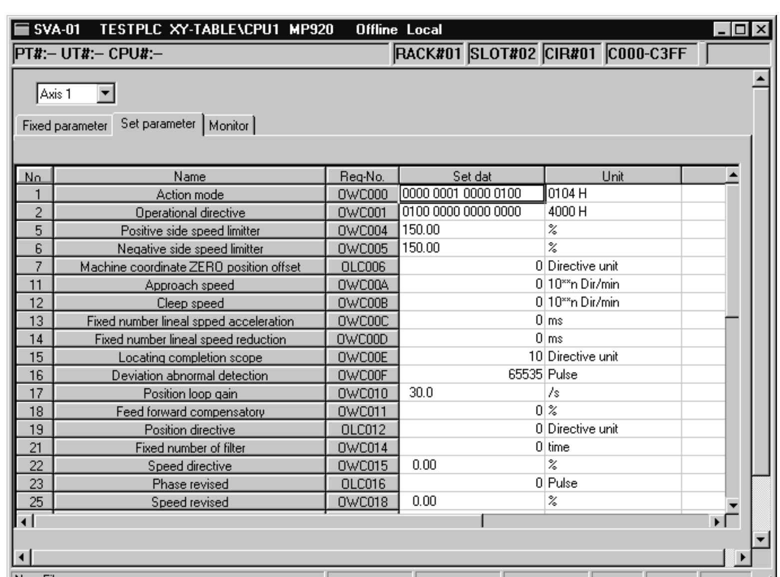
2. Click the **Yes** button in the following message box.



■ Setting Setting Parameters

Use the following procedure to set the setting parameters.

1. Click the Set Parameter Tag to display the Set Parameter Tag Page.



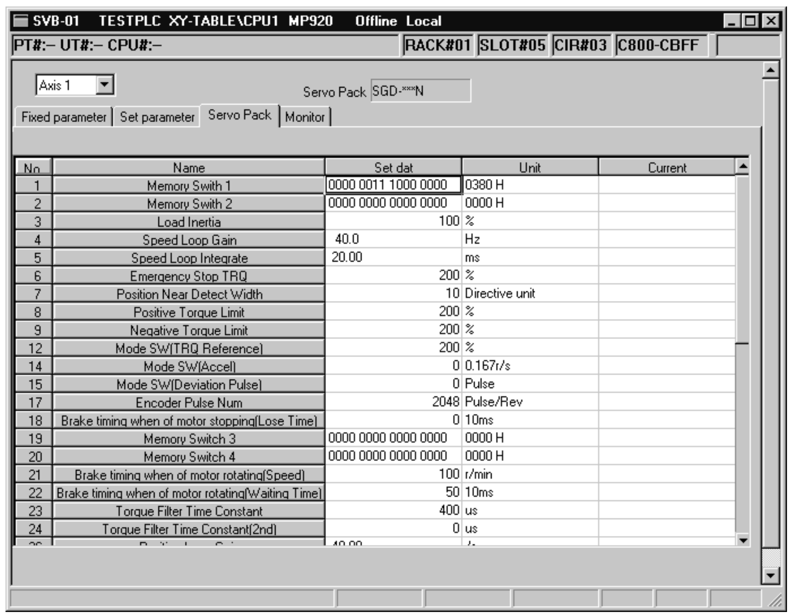
2. Set the setting parameters as necessary. Because these parameters can be changed from ladder logic programs or motion programs, they do not necessarily have to be set here.

■ Monitoring Parameters

The monitoring parameters are the registers referenced by ladder logic programs or motion programs. They cannot be set.

■ Setting SERVOPACK Parameters

For the SVB-01 Module, the MECHATROLINK SERVOPACK parameters must be set.



Set the necessary parameters according to the machine specifications.

These parameters can be saved in the same way as the fixed parameters.

4

Parameters

This chapter describes the procedure for setting the parameters needed to run the MP920.

4.1 Overview of Parameters

This section outlines the parameters critical to Module motion functions. The user must read this section to gain a basic understanding of these parameters.

4.1.1 Parameter Classifications

■ Overview

Parameters are specific constants needed for Module motion functions. Set these parameters to values appropriate for machine specifications as well as for applicable Servodrive (Servomotor + SERVOPACK) performance.

Use a MPE720 Programming Device to create and edit parameters.

■ Parameter List

Parameters are classified into the following four types.

Classification	Register No.	Description
Motion Fixed Parameters	No registers	These parameters set machine, Servomotor, encoder, and other mechanical conditions. They are not normally changed once they are set, and they cannot be changed while the system is running.
Motion Setting Parameters	OW□□00 to OW□□3F	These parameters are used to provide commands to the servo control section. They can be set from a motion program or ladder logic program while the system is running.
Motion Monitoring Parameters	IW□□00 to IW□□3F	These parameters are servo monitor data reported by the servo control section. They can serve as reference for motion programs or ladder logic programs.
Motion Servo Parameters	Cn-0001 to Cn-003F	These parameters are the SERVOPACK parameters that are set on the Motion Parameter Setting Window. Note: The servo parameters are required only for the SVB-01 Module.

■ Editing Parameters

The following table describes the procedures used to create, edit, or change parameters.

Setting Method	Procedure	Applicable Parameters
Personal Computer Programmer	Parameters are edited in the Definitions Folder from the Setting Window.	Fixed Parameters Setting Parameters Servo Parameters
Motion Programs	Motion programs can be used to set setting parameters (output registers OW□□00 to OW□□3F) with assignment statements.	Setting Parameters
Ladder Logic Programs	Parameters can be set directly from ladder logic programs.	Setting Parameters

4.1.2 Modules and Motion Parameter Registers

The motion parameter register numbers (I register numbers and O register numbers) will vary with the motion number and the individual axis (axis 1 to 16).

The following equation is used to determine motion parameter register numbers.

- Motion register number (IW□□□□ and OW□□□□) = Motion number offset + axis offset.

The following are Module number offsets listed by Module number.

Module No.	Offset Value	Module No.	Offset Value
1	C000	9	E000
2	C400	10	E400
3	C800	11	E800
4	CC00	12	EC00
5	D000	13	F000
6	D400	14	F400
7	D800	15	F800
8	DC00	16	FC00

The following equations gives the axis offsets according to the axis number.

$$\text{Axis offset} = (\text{axis number}-1) \times 40\text{H (64 words)}$$

4

The following table summarizes the above information.

Table 4.1 Motion Parameter Register Numbers

Module	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	• •	Axis 14
1	C000 to C03F	C040 to C07F	C080 to C0BF	C0C0 to C0FF	C100 to C13F	• •	C340 to C37F
2	C400 to C43F	C440 to C47F	C480 to C4BF	C4C0 to C4FF	C500 to C53F	• •	C740 to C77F
3	C800 to C83F	C840 to C87F	C880 to C8BF	C8C0 to C8FF	C900 to C93F	• •	CB40 to CB7F
4	CC00 to CC3F	CC40 to CC7F	CC80 to CCBF	CCC0 to CCFF	CD00 to CD3F	• •	CF40 to CF7F
5	D000 to D03F	D040 to D07F	D080 to D0BF	D0C0 to D0FF	D100 to D13F	• •	D340 to D37F
6	D400 to D43F	D440 to D47F	D480 to D4BF	D4C0 to D4FF	D500 to D53F	• •	D740 to D77F
7	D800 to D83F	D840 to D87F	D880 to D8BF	D8C0 to D8FF	D900 to D93F	• •	DB40 to DB7F
8	DC00 to DC3F	DC40 to DC7F	DC80 to DCBF	DCC0 to DCFF	DD00 to DD3F	• •	DF40 to DF7F
9	E000 to E03F	E040 to E07F	E080 to E0BF	E0C0 to E0FF	E100 to E13F	• •	E340 to E37F
10	E400 to E43F	E440 to E47F	E480 to E4BF	E4C0 to E4FF	E500 to E53F	• •	E740 to E77F
11	E800 to E83F	E840 to E87F	E880 to E8BF	E8C0 to E8FF	E900 to E93F	• •	EB40 to EB7F
12	EC00 to EC3F	EC40 to EC7F	EC80 to ECBF	ECC0 to ECFF	ED00 to ED3F	• •	EF40 to EF7F
13	F000 to F03F	F040 to F07F	F080 to F0BF	F0C0 to F0FF	F100 to F13F	• •	F340 to F37F
14	F400 to F43F	F440 to F47F	F480 to F4BF	F4C0 to F4FF	F500 to F53F	• •	F740 to F77F
15	F800 to F83F	F840 to F87F	F880 to F8BF	F8C0 to F8FF	F900 to F93F	• •	FB40 to FB7F
16	FC00 to FC3F	FC40 to FC7F	FC80 to FCBF	FCC0 to FCFF	FD00 to FD3F	• •	FF40 to FF7F

The number of controlled axes per Module differs according to the Module.

Module	Number of Controlled Axes per Module	Maximum Number of Modules
SVA-01A	4	15
SVA-02A	2	16
SVB-01	14	16
PO-01	4	16

IMPORTANT

1. Register numbers will not be consecutive across registers for different Module numbers, but will be consecutive among axes for the same Module number. Therefore, special attention must be paid when using superscripts (I, J) in user programs.
   Example:
   I = 0 to 255 can be read using ├IW(OW) C000i.
   IW(OW) C000 reads the registers for Module number 1, that is in the range from IW(OW) C000 to IW(OW) C0FF. It will not read correctly beyond I > 256.
2. For the SVB-01 Module, axis numbers will not be consecutive (1 to 8, 9 to 14) even for the same Module numbers.

4.2 Parameter List by Module

This section describes the meaning and availability of each parameter according to the model of Motion Module.

4.2.1 Motion Fixed Parameters

Motion fixed parameters are set only once unless there is a configurational, specification, or other machine-related change. They are set from the Fixed Parameter Setting Window on the MPE720.

IMPORTANT

Motion fixed parameters cannot be changed if bit 0 of the RUN command (OW□□01) is ON. Position and other data will be initialized every time a motion fixed parameter is changed.

Table 4.2 Motion Fixed Parameters

No.	Name	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
1	Axis Selection (USESEL)	0 or 1 (Default = 0)	0: Not used selection 1: Use selection		√	√	√	√
2	PG Input Signal Form Selections (PGSEL)	Bits 0 to 7: Not used.	–		–	–	–	–
		Bit 8: ABPISEL	Pulse-A/B Input Signal Polarity Selection	0: Positive logic 1: Negative logic	√	√	–	–
		Bit 9: CPISEL	Pulse-C Input Signal Polarity Selection	0: Positive logic 1: Negative logic	√	√	–	–
		Bits 10 to 15: Not used.	–		–	–	–	–
3	Encoder Selection (ENCSEL)	0 to 2 (Default = 0)	0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as an incremental encoder		√	√	√	–
4	Rotation Direction Selection with an Absolute Encoder (DIRINV)	0 or 1 (Default = 0)	0: Forward direction selection 1: Reverse direction selection		√	√	–	–
5	Pulse Counting Mode Selection (PULMODE)	0 to 6 (Default = 6)	0: Sign, ×1		√	√	–	–
			1: Sign, ×2		√	√	–	–
			2: Up/Down, ×1		√	√	–	–
			3: Up/Down, ×2		√	√	–	–
			4: A/B mode, ×1		√	√	√	–
			5: A/B mode, ×2		√	√	√	–
			6: A/B mode, ×4		√	√	√	–
6	Not used.	–	–		–	–	–	–

Table 4.2 Motion Fixed Parameters (cont'd)

No.	Name	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
7	Rated Motor Speed Setting (NR)	1 to 32000 (Default = 3000)	1 = 1 min^{-1}		√	√	√	√
8	Number of Feedback Pulses Per Rotation (FBppr)	Multiple of 4 between 4 and 65532 (Default = 2048)	1 = 1 pulse/rev	Set the value prior to multiplying.	√	√	√	–
9	D/A Output Voltage at 100% Speed (V1)	0.001 to 10.000 (Default = 6 V = 6.000)	1 = 1 V		√	√	–	–
	Number of Feedback Pulses Per Rotation (For high-resolution)	(Default = 2048)	1 = 1 pulse/rev	Set the value prior to multiplying.	–	–	√	–
10	D/A Output Voltage at 100% Torque Limit (V2)	0.001 to 10.000 (Default = 3 V = 3.000)	1 = 1 V	Valid only for the SVA (2 axes) Module.	–	√	–	–
11	Input Voltage at 100% Speed Monitoring (A/D) (MV1)	0.001 to 10.000 (Default = 6 V = 6.000)	1 = 1 V	Valid only for the SVA (2 axes) Module.	–	√	–	–
12	Not used.	–	–		–	–	–	–
13	DI Latch Signal Selection (DIINTSEL)	0 or 1 (Default = 0)	0: DI input signal 1: Pulse-C input signal		√	√	–	–
14	Additional Function Selections (AFUNCSEL)	Bits 0 to 1: Not used.	–		–	–	–	–
		Bit 2: LIMITSEL	Limit Switch Signal Selection	0: Use OB□□01F. 1: Use the DI signal.	√	–	–	√
		Bit 3: LMT_LSEL	Reverse Limit Signal Selection for Zero Point Return	0: Use OB□□21C. 1: Use the DI signal.	–	–	–	√
		Bit 4: LMT_RSEL	Forward Limit Signal Selection for Zero Point Return	0: Use OB□□21D. 1: Use the DI signal.	–	–	–	√
		Bit 5: EMGSEL	Emergency Stop (DI) Signal Selection	0: Emergency stop (hard) 1: Deceleration stop (soft)	–	–	–	√
		Bit 6: ABSRDSEL	Absolute Position Read at Startup	0: Execute. 1: Do not execute.	√	√	–	–
		Bit 7: MCMDSEL	Motion Command Code Selection	0: Not used. 1: Use.	√	√	–	√
		Bit 9	Σ-II Series SERVOPACK Selection	0: OFF 1: ON	√	√	–	–
		Bits 12 to 15	Error Count Alarm Detection Setting Coefficient	Setting range: 0 to 4	√	√	–	–

Table 4.2 Motion Fixed Parameters (cont'd)

No.	Name	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
14	Additional Function Selections (AFUNCSEL) (cont'd)	Bit 9	Selection for Feedback Pulses per Motor Rotation for High-resolution	0: Disabled 1: Enabled	–	–	√	–
15	Not used.	–	–		–	–	–	–
16	Simulation Mode Selection	0 to 2 (Default = 0)	0: Normal operation mode		√	√	√	–
			1: Simulation mode		√	√	√	–
			2: Factory Adjustment Mode		√	√	–	–
17	Motion Controller Function Selection Flags (SVFUNCSEL)	Bits 0 to 3: 0 to 7 CMD_UNIT	Reference Unit Selection	0: pulse (Electronic gear disabled)	√	√	√	√
				1: mm	√	√	√	√
				2: deg	√	√	√	√
				3: inch	√	√	√	√
		Bit 4: USE_GEAR	Electronic Gear Selection	0: Disabled 1: Enabled	√	√	√	√
		Bit 5: PMOD_SEL	Axis Selection	0: Finite length axis 1: Infinite length axis	√	√	√	√
		Bit 6: USE_BKRSH	Backlash Compensation Enabled Selection	0: Disabled 1: Enabled	√	√	–	–
		Bit 7: USE_SLIMP	Positive Software Limit Selection	0: Disabled 1: Enabled	√	√	√	√
		Bit 8: USE_SLIMN	Negative Software Limit Selection	0: Disabled 1: Enabled	√	√	√	√
		Bit 9: USE_OV	Override Selection	0: Disabled 1: Enabled	√	√	√	√
		Bit 10: INV_DEC	Deceleration Limit Switch Inversion Selection	0: Do not reverse. 1: Reverse.	√	√	–	√
		Bit 11: Not used.	–		–	–	–	–
		Bit 12	Servo Driver Transparent Command Mode	0: Normal 1: Transparent command mode	–	–	√	–
		Bit 13: OVT1_SEL	Positive Overtravel Selection	0: Disabled 1: Enabled	√	√	–	–
		Bit 14: OVT2_SEL	Negative Overtravel Selection	0: Disabled 1: Enabled	√	√	–	–
		Bit 15: SEGBUF	Interpolation Segment Distribution Processing Selection	0: Disabled 1: Enabled	–	–	√	–

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Table 4.2 Motion Fixed Parameters (cont’d)

No.	Name	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
18	Number of Digits Below Decimal Point (DECNUM)	0 to 5 (Default = 3)	Sets the number of digits right of the decimal point in commands. (Example) With 3 digits right of the decimal point mm: 1 reference unit = 0.001 mm deg: 1 reference unit = 0.001 deg inch: 1 reference unit = 0.001 inch	Minimum reference unit is determined by this parameter as well as by the Reference Unit Selection (see fixed servo parameter no. 17.).	√	√	√	√
19	Travel Distance Per Machine Rotation (PITCH)	1 to 2^{31}-1 (Default = 10000)	1 = 1 reference unit		√	√	√	√
21	Servomotor Gear Ratio (GEAR_ MOTOR)	1 to 65535 (Default = 1)	1 = 1 rotation		√	√	√	√
22	Machine Gear Ratio (GEAR_ MACHINE)	1 to 65535 (Default = 1)	1 = 1 rotation		√	√	√	√
23	Infinite Length Axis Reset Position (POSMAX)	1 to 2^{31}-1 (Default = 360000)	1 = 1 reference unit		√	√	√	√
25	Maximum Number of Absolute Encoder Turns (MAXTURN)	1 to 2^{31}-1 (Default = 99999)	1 = 1 rotation		√	√	√	–
27	Positive Software Limit (SLIMP)	-2^{31} to 2^{31}-1 (Default = 2^{31}-1)	1 = 1 reference unit		√	√	√	√
29	Negative Software Limit (SLIMN)	-2^{31} to 2^{31}-1 (Default = -2^{31})	1 = 1 reference unit		√	√	√	√
31	Zero Point Return Method (ZRETSEL)	0 to 7 (Default = 0)	0: DEC1 + Phase-C pulse		√	√	√	–
			1: ZERO		√	–	√	–
			2: DEC1 + ZERO		√		√	√
			3: Phase-C pulse		√	√	√	–
			4: DEC2 + ZERO		√	–	–	√
			5: DEC1 + LMT + ZERO		√	–	–	√
			6: DEC2 + Phase-C pulse		√	√	–	–
			7: DEC1 + LMT + Phase-C pulse		√	√	–	–
32	Backlash Compensation (BKLSH)	0 to 32767 (Default = 0)	1 = 1 reference unit		√	√	–	–

Table 4.2 Motion Fixed Parameters (cont'd)

No.	Name	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
33	Number of Feed-back Pulses Per Rotation (For simulation)	1 to 2^{31}-1 (Default = 200)	1 = 1 pulse	Number of pulses per stepping motor rotation	–	–	–	√
35	Bias Speed (BIASSPD)	0 to 32767 (Default = 0)	1 = 10^n reference units/min (n: Number of digits right of the decimal point) Pulse units: 1 = 1000 pulses/min mm units: 1 = 1 mm/min deg units: 1 = 1 deg/min inch units: 1 = 1 inch/min		–	–	–	√
36	Bias Speed for the Exponential Accel-eration/Decelera-tion Filter (EXPBIAS)	0 to 32767 (Default = 0)	1 = 10^n reference units/min (n: Number of digits right of the decimal point) Pulse units: 1 = 1000 pulses/min mm units: 1 = 1 mm/min deg units: 1 = 1 deg/min inch units: 1 = 1 inch/min		√	√	–	√
37	Pulse Output Signal Format Selection (AFUNCSEL)	Bits 0 to 7	Not used.	–	–	–	–	–
		Bit 8: ABPOSEL	Pulse Output Signal Polarity Selection	0: Positive logic 1: Negative logic	–	–	–	√
		Bits 9 to 11	Not used.		–	–	–	–
		Bits 12 to 15: POUTMODE	Pulse Output Mode Selection	0: CW/CCW mode 1: Sign (CCW) + Pulse (CW) mode	–	–	–	√
38	Maximum Pulse Output Frequency (MAXHZ)	1 to 50 (Default = 10)	1 = 10 kHz Set 1, 2, 4, 8, 10, 20, 25, 40, or 50. Always set the same value for all four axes (including unused axes).		–	–	–	√
39 to 48	Not used.	–	–		–	–	–	–

Note: √: Available, –: Not available

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4.2.2 Motion Setting Parameters

Motion setting parameters serve as instructions to Motion Modules. They are located at the top of high-speed scans and are sent together to Motion Modules. Motion can be controlled simply by setting parameters in these registers.

Table 4.3 Motion Setting Parameters

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
1	RUN Mode Settings (RUNMODE)	OW□□00	Bit 0: NCON	Speed Reference Output Mode	0: OFF, 1:ON	√	√	–	–
			Bit 1: TCON	Torque Reference Output Mode	0: OFF, 1:ON	–	√	–	–
			Bit 2: PCON	Position Control Mode	0: OFF, 1:ON	√	√	√	√
			Bit 3: PHCON	Phase Control Mode	0: OFF, 1:ON	√	√	–	–
			Bit 4: ZRN	Zero Point Return Mode	0: OFF, 1:ON	√	√	–	–
			Bit 5: PHTEST	Phase Control Test Signal	0: OFF, 1:ON	√	√	–	–
			Bit 6: ACR	Alarm Clear	0: OFF, 1:ON	√	√	√	√
			Bit 7: PHREFOFF	Phase Reference Disable	0: OFF, 1:ON	√	√	–	–
			Bit 8: MCDSEL	Motion Command Mode Selection	0: OFF, 1:ON	√	√	√	√
			Bit 9: ZRNDIR	Zero Point Return Direction Selection	0: OFF, 1:ON	√	√	√	√
			Bit 10: ABSRD	Absolute Position Read Request	0: OFF, 1:ON	√	√	–	–
			Bit 11	Feed Forward Gain at Switching Control Mode	0: OFF, 1:ON	√	√	–	–
			Bit 12	Not used.		–	–	–	–
			Bit 13: DIINTREQ	DI Latch Request	0: OFF, 1:ON	√	√	–	–
			Bit 14	Not used.		–	–	–	–
			Bit 15: IRESET	Phase Control Integration Reset	0: OFF, 1:ON	√	√	–	–
2	RUN Command Settings (SVRUNCMD)	OW□□01	Bit 0: RUN	Servo ON (DO0)	0: OFF, 1: ON	√	√	√	
				Excitation ON (DO0)	0: OFF, 1: ON	–	–	–	√
			Bit 1: DO1	DO1	0: OFF, 1: ON	√	√	–	√
			Bit 2: DO2	DO2	0: OFF, 1: ON	√	√	–	√
			Bit 3: DO3	DO3	0: OFF, 1: ON	√	√	–	√
			Bit 4: DO4	ROC	0: OFF, 1: ON	√	–	–	–
				DO4	0: OFF, 1: ON	–	√	–	–
			Bit 5	Not used.		–	–	–	–
			Bits 6 to 10	Not used.		–	–	–	–

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
2	RUN Command Settings (SVRUNCMD) (cont'd)	OW□□01	Bit 11: EMRST	Emergency Stop and Deceleration Stop Signal Reset		–	–	–	√
			Bit 12: USE_BUF	Position Reference Value Selection 0: OL□□12 1: Position buffer		√	√	√	√
			Bit 13: SPDTYPE	Speed Reference Value Selection 0: OL□□22 valid 1: OW□□15 valid		√	√	√	√
			Bit 14: XREFTYPE	Position Reference Type 0: Absolute position mode 1: Incremental addition mode		√	√	√	√
			Bit 15: LSDEC	Zero Point Return Deceleration Point Limit Signal	0: OFF, 1: ON	√	√	–	√
3	Positive Torque Limit Setting (TLIMP)	OW□□02	-32768 to 32767 (Default = -30000)	1 = 0.01% (-30000 = -300.00%)		–	√	–	–
4	Not used.	OW□□03	–	Set to "0."		–	–	–	–
5	Positive Speed Limiter Setting (NLIMP)	OW□□04	0 to 32767 (Default = 15000)	1 = 0.01% (15000 = 150.00%)		√	√	–	–
6	Negative Speed Limiter Setting (NLIMN)	OW□□05	0 to 32767 (Default = 15000)	1 = 0.01% (15000 = 150.00%)		√	√	–	–
7	Machine Coordinate System Zero Point Offset Setting (ABSOFF)	OL□□06	-2^{31} to $2^{31}-1$ (Default = 0)	1 = 1 reference unit 1 = 1 pulses for pulse unit		√	√	√	√
9	Not used.	OL□□08	–	Set to "0."		–	–	–	–
11	Approach Speed Setting (Napr)	OW□□0A	0 to 32767 (Default = 0)	The unit will vary with the speed reference selection (OB□□01D). When the speed reference value selection = 0. 1 = 10^n reference units/min (n = Number of digits below decimal) Pulse unit: 1 = 1000 pulses/min (PO-01 Module: 1 = 100 pulses/min) mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min inch unit: 1 = 1 inch/min When the speed reference value selection = 1. 1 = 0.01% (1000 = 10.00%)		√	√	–	√
12	Creep Speed Setting (Nclp)	OW□□0B	0 to 32767 (Default = 0)			√	√	–	√
13	Linear Acceleration Time Constant (NACC)	OW□□0C	0 to 32767 (Default = 0)	1 = 1 ms (300 = 0.300 s)		√	√	√	√
14	Linear Deceleration Time Constant (NDEC)	OW□□0D	0 to 32767 (Default = 0)	1 = 1 ms (300 = 0.300 s)		√	√	√	√

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
15	Positioning Completed Range Setting (PEXT)	OW□□0E	0 to 65535 (Absolute value) (Default = 10)	1 = 1 reference unit 1 = 1 pulses for pulse unit		√	√	–	–
16	Error Count Alarm Detection Setting (EOV)	OW□□0F	0 to 65535 (Absolute value) (Default = 65535)	1 = 1 pulse (0 = No error detection)		√	√	–	–
17	Position Loop Gain Setting (kp)	OW□□10	0 to 32767 (Default = 300)	1 = 0.1/s (300 = 30.0)		√	√	√	–
18	Feed Forward Gain Setting (kf)	OW□□11	0 to 200 (Default = 0)	1 = 1% (10 = 10%)		√	√	√	–
19	Position Reference Setting or Position Buffer Number (XREF)	OL□□12	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 reference unit 1 = 1 pulses for pulse unit Position reference value selection When (OB□□01C) = 1 Position buffer no. (1 to 256)		√	√	√	√
21	Filter Time Constant Setting (NNUM)	OW□□14	1. Constant during Position Control Mode and S-curved (moving average) movement with the Speed Reference Output Mode and motion command disabled. 0 to 255 (1 = 1 time) (0 = 1 = No averaging)			√	√	–	–
			2. Constant during S-curved (moving average) movement when bits 4 to 7 at OW□□21 are set to "2." 0 to 255 (1 = 1 time) (0 = 1 = No averaging) SVB Modules: 0 to 65535 (1 = 0.1 ms)			√	√	√	√
			3. Constant during exponential acceleration/deceleration when bits 4 to 7 at OW□□21 are set to "1." 0 to 32767 (1 = 1 ms) SVB Modules: 0 to 65535 (1 = 0.1 ms)			√	√	√	√
22	Speed Reference Setting (NREF)	OW□□15	-32768 to 32767 (Default = 0)	1 = 0.01% (5000 = 50.00%)		√	√	√	√
23	Phase Bias Setting (PHBIAS)	OL□□16	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 pulse		√	√	–	–
25	Speed Compensation Setting (NCOM)	OW□□18	-32768 to 32767 (Default = 0)	1 = 0.01% (100 = 1.00%)		√	√	–	–
26	Proportional Gain Setting (Pv)	OW□□19	0 to 32767 (Default = 300)	1 = 0.1/s (300 = 30.0)		√	√	–	–
27	Integral Time Setting (Ti)	OW□□1A	0 to 32767 (Default = 300)	1 = 1 ms (0 = No integration) (300 = 0.300 s)		√	√	–	–
28	Torque Reference Setting (TREF)	OW□□1B	-32768 to 32767 (Default = 0)	1 = 0.01% (10000 = 100.00%)		–	√	–	–

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
29	Speed Limit Setting (NLIM)	OW□□1C	-32768 to 32767 (Default = 15000)	1 = 0.01% (15000 = 150.00%)		–	√	–	–
30	Speed Loop Gain (kv)	OW□□1D	1 to 20000	Set to "0."		–	–	√	–
31	Pulse Bias Setting (PULBIAS)	OL□□1E	-2^{31} to 2^{31}-1 (Default = 0)	1 = 0.1 Hz		√	√	–	√
33	Motion Command Code (MCMDCODE)	OW□□20	0 to 65535 (Default = 0)	0: NOP	No operation	√	√	√	√
				1: POSING	Positioning	√	√	√	√
				2: EX_POSING	External position	√	√	√	–
				3: ZRET	Zero point return	√	√	√	√
				4: INTERPOLATE	Interpolation	√	√	√	√
				5: ENDOF_ INTERPOLATE	Interpolation end segment	√	√	√	√
				6: LATCH	Interpolation with latch	√	√	√	–
				7: FEED	Feed	√	√	√	√
				8: STEP	Step	√	√	√	√
				9: ZSET	Zero point setting	√	√	√	√
				10: ACC	Change 1-step linear acceleration/ deceleration time constant	–	–	√	–
				11: DCC	Change deceleration time constant	–	–	√*	–
				12: SCC	Change moving average time constant	–	–	√	–
				13: CHG_FILTER	Change filter type	–	–	√	–
				14: KVS	Change speed loop gain (Kv)	–	–	√	–
				15: KPS	Change position loop gain (Kp)	–	–	√	–
				16: KFS	Change feed forward (Kf)	–	–	√	–
				17: CN_RD	Read servo driver Cn constants	–	–	√	–
				18: CN_WR	Change servo driver Cn constants	–	–	√	–
				19: ALM_MON	Monitor current servo driver alarms	–	–	√	–

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
33	Motion Command Code (MCMDCODE) (cont'd)	OW□□20	0 to 65535 (Default = 0)	20: AMHIST_MON	Monitor current servo driver alarm history	–	–	√	–
				21: ALMHIST_CLR	Clear servo driver alarm history	–	–	√	–
				22 to 65535: Not used		–	–	–	–
34	Motion Command Control Flags (MCMDCTRL) (Default = 0, all bits OFF)	OW□□21	Bit 0: HOLD	Command Hold	0: OFF, 1: ON	√	√	√	√
			Bit 1: ABORT	Command Abort	0: OFF, 1: ON	√	√	√	√
			Bit 2: DIRECTION	Direction of Movement For JOG and STEP	0: Forward 1: Reverse	√	√	√	√
			Bit 3: P_PI	Speed Loop P/PI Switch	0: PI, 1: P	–	–	√	–
			Bit 3: REMCUT	No Feed Speed Remainder Compensation	0: OFF, 1: ON	–	–	–	√
			Bit 3: LAGRST	No Primary Lag (Same as primary lag time constant = 0)	0: OFF, 1: ON	√	√	–	–
			Bits 4 to 7: FILTERTYPE	Filter Type Selection 0: No filter. 1: Exponential filter (exponential acceleration/deceleration) 2: Movement averaging filter (simple S-curved acceleration/deceleration)		√	√	√	√
			Bit 8: POS_PPI	Position Loop P/PI Switch 0: P 1: PI		√	√	–	–
			Bit 9: POS_IRST	Position Control Integration Reset	0: OFF, 1: ON	√	√	–	–
			Bit 10: NCOMSEL	Speed Compensation (OW□□18) during Position Control	0: OFF, 1: ON	√	√	–	–
			Bit 11: Not used.	–		–	–	–	–
			Bit 12: LMT_L	Reverse Limit Signal for Zero Point Return	These bits are valid only when bits 3 and 4 of fixed parameter No. 14 (Additional Function Selections) are set to 0 (Use OB□□21□). 0: OFF, 1: ON	√	√	–	√
			Bit 13: LMT_R	Forward Limit Signal for Zero Point Return		√	√	–	√
			Bit 14: BUF_W	Position Buffer Write	0: OFF 1: ON	√	√	√	√
			Bit 15: BUF_R	Position Buffer Read	0: OFF 1: ON	√	√	√	√

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
35	Rapid Traverse Speed (RV)	OL☐☐22	0 to 2^{31} -1 (Default = 3000)	1 = 10^n reference units/min (n = Number of digits below decimal) Pulse unit: 1 = 100 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min inch unit: 1 = 1 inch/min		√	√	√	–
				1 = 10^n reference units/min (n = Number of digits below decimal) Pulse unit: 1 = 100 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min inch unit: 1 = 1 inch/min		–	–	–	√
37	External Positioning Travel Distance (EXMDIST)	OL☐☐24	-2^{31} to 2^{31} -1 (Default = 0)	1 = 1 reference unit	1 = 1 pulses for pulse unit	√	√	√	–
39	Stopping Distance (STOPDIST)	OL☐☐26	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 reference unit	Used for motion control	√	√	√	√
41	Step Travel Distance (STEP)	OL☐☐28	0 to 2^{31}-1 (Default = 0)	1 = 1 reference unit		√	√	√	√
43	Zero Point Return Final Travel Distance (ZRNDIST)	OL☐☐2A	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 reference unit		√	√	–	√
45	Override (OV)	OW☐☐2C	0 to 32767 (Default = 10000)	1 = 0.01% (10000 = 100.00%)		√	√	√	√
46	Position Control Flags (POSCTRL) (Default = 0, all bits OFF)	OW☐☐2D	Bit 0: MLK	Machine Lock Mode Setting 0: OFF 1: ON (Machine Lock Mode setting)		√	√	√	√
			Bit 1: TPRSREQ	Request for Preset Number of POSMAX Turns	0: OFF, 1: ON	√	√	√	√
			Bit 2: ABSLDREQ	ABS System Infinite Length Position Control Data LOAD request	0: OFF, 1: ON	√	√	√	–
			Bit 3: PUNITSEL	Position Monitor 2 (IL☐☐84) Unit Selection 0: Reference unit 1: Pulse unit		√	√	–	–
			Bits 4 to 11	Not used.		–	–	–	–
			Bits 12 to 15: USRMONSEL	Servo Driver User Monitor Information Selection	Setting range: 0 to 4 Refer to the relevant servo driver user's manuals.	–	–	√	–

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
47	Workpiece Coordinate System Offset (OFFSET)	OL□□2E	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 reference unit	1 = 1 pulses for pulse unit	√	√	√	√
49	Preset Number of POSMAX Turns Data (TURNPRS)	OL□□30	-2^{31} to 2^{31}-1 (Default = 0)	1 = 1 rotation		√	√	√	√
51	Second In-position Width (INPWIDTH)	OL□□32	0 to 65535 (Default = 0)	1 = 1 reference unit	1 = 1 pulses for pulse unit	√	√	√	–
52	Zero Point Position Output Width (PSETWIDTH)	OW□□33	0 to 65535 (Default = 10)	1 = 1 reference unit		√	√	√	√
53	Positioning Completed Check Time (PSETTIME)	OW□□34	0 to 65535 (Default = 0)	1 = 1 ms		√	√	√	–
54	Servo Driver Cn Constant No. (Cn_No.)	OW□□35	Specify a SERVOPACK Cn constant number when Motion Command Code (OW□□20) is set to 17 or 18. (Refer to the relevant servo drive user's manuals for details on Cn constants.)			–	–	√	–
	Position Control Integral Time (PTi)		0 to 32767 (Default = 300)	1 = 1 ms		√	√	–	–
55	Cn Constant Change Data (Cn_DAT)	OL□□36	-2^{31} to 2^{31}-1 (Default = 32767)	Specify Cn constant change data when Motion Command Code (OW□□20) is set to 18.		–	–	√	–
	Upper/lower Limit for Position Control Integral (ILIMIT)					√	√	–	–
56	Primary Lag Time Constant (LAGTi)	OW□□37	0 to 32767 (Default = 0)			√	√	–	–
57	Lower-place Two Words of the Encoder Position at Shutdown	OL□□38	-2^{31} to 2^{31}-1 (Default = 0)	ABS System Infinite Length Position Control Data When the Load Request (OB□□2D2) is ON: Lower-place Two Words of the Encoder Position at Shutdown (1 = 1 pulse)		√	√	√	–
	Position Buffer Access Number (eposL)			When the Motion Command Control Flag BUF_W (OB□□21E) = 1 or BUF_R (OB□□21F) = 1: Position Buffer Access Number (1 to 256, 0 = disabled)		–	–	–	√

Table 4.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
59	Upper-place Two Words of the Encoder Position at Shutdown	OL□□3A	-2^{31} to 2^{31}-1 (Default = 0)	ABS System Infinite Length Position Control Data When the Load Request (OB□□2D2) is ON: Upper-place Two Words of the Encoder Position at Shutdown (1 = 1 pulse)		√	√	√	–
	Position Buffer Write Data			When the Motion Command Control Flag BUF_W (OB□□21E) = 1: Position Buffer Write Data		–	–	–	√
61	Lower-place Two Words of the Pulse Position at Shutdown	OL□□3C	-2^{31} to 2^{31}-1 (Default = 0)	ABS System Infinite Length Position Control Data When the Load Request (OB□□2D2) is ON: Lower-place Two Words of the Pulse Position at Shutdown (1 = 1 pulse)		√	√	√	–
63	Upper-place Two Words of the Pulse Position at Shutdown	OL□□3E	-2^{31} to 2^{31}-1 (Default = 0)	ABS System Infinite Length Position Control Data When the Load Request (OB□□2D2) is ON: Upper-place Two Words of the Pulse Position at Shutdown (1 = 1 pulse)		√	√	√	–

* Available for SERVOPACK SGDH+NS100 only.
Note: √: Available, –: Not available

4

4.2.3 Motion Monitoring Parameters

Motion monitoring parameters are parameters reported by Motion Modules. They are located at the top of high-speed scans and are reported together. Use these parameters to control applications and to debug user programs.

Table 4.4 Motion Monitoring Parameters

No.	Name	Register Number	Setting Range (Bit Name)	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
1	RUN Status (RUNSTS)	IW□□00	Bit 0: EOVER	Error Counter Over		√	√	–	–
			Bit 1: PRMERR	Motion Setting Parameter Setting Error		√	√	√	√
			Bit 2: FPRMERR	Motion Fixed Parameter Setting Error		√	√	√	√
			Bit 3: Not used.	–		–	–	–	–
			Bit 4: PGER	Cumulative Number of Rotations Received Error (absolute encoder)		√	√	–	–
			Bit 5: Not used.	–		–	–	–	–
			Bit 6: Not used.	–		–	–	–	–
			Bit 7: SVCRDY	Motion Controller RUN Ready		√	√	√	√
			Bit 8: SVCRUN	Motion Controller RUN		√	√	√	√
			Bit 9: DIRINV	Rotation Direction when Using Absolute Encoder		√	√	–	–
			Bit 10: ABCRDC	Absolute Position Read Completed Signal		√	√	–	–
			Bit 11: DINT	DI Latch Completed Signal		√	√	–	–
			Bit 12: FBPO	Feedback Pulse 0		√	√	–	–
			Bit 13: POSCOMP	Positioning Completed Signal		√	√	√	√
			Bit 14: Not used.	–		–	–	–	–
			Bit 15: ZRNC	Zero Point Return Completed Signal		√	√	–	–
2	Servo Driver Status (SVSTS)	IW□□01	Bits 0 to 15	The meaning of each bit differs depending on the Module model. For details, refer to the monitoring parameters for the relevant Module.		–	–	√	–
	General-purpose DI Monitors					√	√	–	√
3	Machine Coordinate System Calculation Position (CPOS)	IL□□02	-2^{31} to $2^{31}-1$	1 = 1 pulse or 1 = 1 reference unit 1 = 1 pulse for pulse unit Updated when the machine is locked.		√	√	√	√
5	Target Position Difference Monitor (PTGDIF)	IL□□04	-2^{31} to $2^{31}-1$	1 = 1 pulse or 1 = 1 reference unit 1 = 1 pulse for pulse unit		√	√	–	√
7	Machine Coordinate System Latch Position (LPOS)	IL□□06	-2^{31} to $2^{31}-1$	1 = 1 reference unit (1 = 1 pulse for pulse unit)		√	√	√	–

Table 4.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range (Bit Name)	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
9	Machine Coordinate System Feedback Position (APOS)	IL□□08	-2^{31} to $2^{31}-1$	1 = 1 reference unit (1 = 1 pulse for pulse unit) Note: Will not be updated if the machine is locked.		√	√	√	–
11	Position Error (PERR)	IL□□0A	-2^{31} to $2^{31}-1$	1 = 1 pulse		√	√	–	–
13	Speed Reference Output Monitor (SPDREF)	IW□□0C	-32768 to 32767	1 = 0.01%		√	√	–	–
14	Speed Monitor (NFB)	IW□□0D	-32768 to 32767	1 = 0.01%		–	√	–	–
15	Not used.	IW□□0E	–	–		–	–	–	–
16	Out of Range Parameter Number (ERNO)	IW□□0F	1 to 63 101 to 148	Motion setting parameter error number Motion fixed parameter error number + 100		√	√	√	√
17	Cumulative Rotations from Absolute Encoder (ABSREV)	IL□□10	0 to ±99999	1 = 1 rotation		√	√	–	–
19	Initial Incremental Pulses from Absolute Encoder (IPULSE)	IL□□12	-2^{31} to $2^{31}-1$	1 = 1 pulse		√	√	–	–
21	Motion Command Response Code (MCMD-RCODE)	IW□□14	0 to 65535	Motion command that is currently executing. (Refer to OW□□20 for details.)		√	√	√	√
22	Motion Command Status (MCMDSTS)	IW□□15	Bit 0: BUSY	Command Executing Flag		√	√	√	√
			Bit 1: HOLDL	Command Hold Completed		√	√	√	√
			Bit 2: DEN	Distribution Completed		√	√	√	√
			Bit 3: ZSET	Zero Point Setting Completed		√	√	√	√
			Bit 4: EX_LATCH	External Positioning Signal Latched		√	√	√	–
			Bit 5: FAIL	Command Error End		√	√	√	√
			Bit 6: ZRNC	Zero Point Return Completed		√	√	√	√
			Bits 7 to 15	Not used.		–	–	–	–
23	Number of Digits Below Decimal Point Monitor (DECNUMM)	IW□□16	0 to 5	Copies motion fixed parameter Number of Digits Below Decimal Point.		√	√	√	√

Table 4.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range (Bit Name)	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO- 01
24	Position Control Status (POSSTS)	IW□□17	Bit 0: MLKL	Machine Locked		√	√	√	√
			Bit 1: ZERO	Zero Point Position		√	√	√	√
			Bit 2: PSET2	Second In-position Completed		√	√	√	√
			Bit 3: ABSLDE	ABS System Infinite Length Position Control Data Load Completed		√	√	√	–
			Bit 4: TPRSE	Preset no. of POSMAX Turns Completed		√	√	√	√
			Bit 5: GEARM	Copies Motion Fixed Parameter "Electronic Gear Enabled Selection."		√	√	√	√
			Bit 6: MODSELM	Copies motion fixed parameter "Axis Selection."		√	√	√	√
			Bits 7 to 11	Not used.		–	–	–	–
			Bits 12 to 15: USRMONSELR	Servo Driver User Monitor Information Selection Response		–	–	√	–
25	Machine Coordinate System Reference Position (MPOS)	IL□□18	-2^{31} to 2^{31}-1	1 = 1 pulse for pulse unit Will not be updated if the machine is locked.		√	√	√	√
27	Not used.	IL□□1A	–	–		–	–	–	–
29	POSMAX Monitor (PMAXMON)	IL□□1C	1 to 2^{31}-1	1 = 1 reference unit Copies motion fixed parameter "POSMAX."		√	√	√	√
31	Number of POSMAX Turns (PMAXTURN)	IL□□1E	-2^{31} to 2^{31}-1	1 = 1 rotation Raises or lowers the count each time POSMAX is exceeded. (Initializes to 0 at startup.)		√	√	√	√
33	Servo Driver User Monitor Information (USRMON)	IL□□20	-2^{31} to 2^{31}-1	Refer to the relevant servo drive user's manuals.		–	–	√	–
35	Alarms (ALARM)	IL□□22	Bit 0: SVERROR	SERVOPACK Error		–	–	√	–
			Bit 1: OTF	Positive Overtravel		√	√	√	–
			Bit 2: OTR	Negative Overtravel		√	√	√	–
			Bit 3: SOTF	Positive Software Limit		√	√	√	√
			Bit 4: SOTR	Negative Software Limit		√	√	√	√
			Bit 5: SVOFF	Servo OFF		–	–	√	–
				Excitation OFF		–	–	–	√
			Bit 6: TIMEOVER	Positioning Time Over		√	√	√	–
			Bit 7: DISTOVER	Positioning Travel Distance Over		–	–	√	–
				Overspeed		–	–		√
			Bit 8: FILTYOERR	Filter Type Change Error		–	–	√	–
			Bit 9: FILTYMERR	Filter Time Constant Change Error		–	–	√	–
			Bit 10: MODERR	Control Mode Error		√	√	√	√

Table 4.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range (Bit Name)	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
35	Alarms (ALARM) (cont'd)	IL□□22	Bit 11: ZSET_NRDY	Zero Point Not Set		√	√	√	–
			Bit 12: ZSET_MOV	Zero Point Set during Travel		–	–	√	–
			Bit 13: CN_ERR	Servo Driver Cn Constant Setting Error		–	–	√	–
			Bit 14: WDT_ERR	Servo Driver Synchronous Communications Error		–	–	√	–
			Bit 15: COM_ERR	Servo Driver Communications Error		–	–	√	–
			Bit 16: SVTIMOUT	Servo Driver Command Timeout		–	–	√	–
			Bit 17: ABSOVER	ABS Encoder Rotations Exceeded		√	√	√	–
			Bit 18: PGLFLT	Broken PG Wire Error		√	√	–	–
			Bits 19 to 31	Not used.		–	–	–	–
37	Servo Driver Alarm Code (SVALARM)	IW□□24	-32768 to 32767	Error code when an absolute position read error occurs		√	√	–	–
				Current alarm code		–	–	√	–
38	Servo Driver I/O Monitor (ALARM)	IW□□25	Bit 0: P-OT	Forward Limit Switch Input		–	–	√	–
			Bit 1: N-OT	Reverse Limit Switch Input		–	–	√	–
			Bit 2: DEC	Deceleration Dog Switch Input		–	–	√	–
			Bit 3: PA	Encoder Phase-A Signal Input		–	–	√	–
			Bit 4: PB	Encoder Phase-B Signal Input		–	–	√	–
			Bit 5: PC	Encoder Phase-C Signal Input		–	–	√	–
			Bit 6: EXT1	No. 1 External Latch Signal Input		–	–	√	–
			Bit 7: EXT2	No. 2 External Latch Signal Input		–	–	√	–
			Bit 8: EXT3	No. 3 External Latch Signal Input		–	–	√	–
			Bit 9: BRK	Brake Status Output		–	–	√	–
			Bits 10 to 15	Not used.		–	–	–	–
39	Speed Reference Output Monitor (RVMON)	IL□□26	-2^{31} to $2^{31}-1$	This parameter is valid when Speed Reference Value Selection (OB□□01 bit 13) is set to 1. 1 = 1 reference unit/s		–	–	√	–
				This parameter is valid when Speed Reference Value Selection (OB□□01 bit 13) is set to 1. 1 = 1 reference unit/H scan		√	√	–	√
41	Cn Constant Read Data (CNMON)	IL□□28	-2^{31} to $2^{31}-1$	Stores the SERVOPACK Cn constant data specified in OW□□35 when Motion Command Code (OW□□20) is set to 17.		–	–	√	–
	Position Buffer Read Data (CNMON)			Copies position buffer data when Motion Command Control Flag BUF_R (OB□□21 bit 15) is set to 1.		√	√	–	√

Table 4.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range (Bit Name)	Meaning	Remarks	SVA -01A	SVA -02A	SVB -01	PO-01
43	Position Reference Output Monitor (XREFMON)	IL□□2A	-2^{31} to $2^{31}-1$	1 = 1 pulse	Pulse unit absolute position	–	–	√	–
	Number of Output Pluses (XREFMON)					–	–	–	√
45	Integral Output Monitor (YIMON)	IL□□2C	-2^{31} to $2^{31}-1$			√	√	–	–
47	Calculated Reference Coordinate System Position (POS)	IL□□2E	-2^{31} to $2^{31}-1$	1 = 1 reference unit		√	√	√	√
49	Primary Lag Monitor (LAGMON)	IL□□30	-2^{31} to $2^{31}-1$	(PI output value – primary lag output value)		√	√	–	–
51	Position Loop Output Monitor (PIMON)	IL□□32	-2^{31} to $2^{31}-1$	Position loop output value (value prior to adding the calculated feed forward value)		√	√	–	–
53	Position Monitor 2 (APOS2)	IL□□34	-2^{31} to $2^{31}-1$	Position monitor 2 unit selection. This will vary with (OB□□2D3). 1. OB□□2D3 = 0 (With reference unit selected) 1 = 1 reference unit 2. OB□□2D3 = 1 (With pulse unit selected) 1 = 1 pulse		√	√	–	–
55	Not used.	IW□□36	–	–		–	–	–	–
56	Not used.	IW□□37	–	–		–	–	–	–
57	Lower-place Two Words of the Encoder Position at Shutdown	IL□□38	-2^{31} to $2^{31}-1$	1 = 1 pulse (For ABS system unlimited length position control)		√	√	√	–
59	Upper-place Two Words of the Encoder Position at Shutdown	IL□□3A	-2^{31} to $2^{31}-1$	1 = 1 pulse (For ABS system unlimited length position control)		√	√	√	–
61	Lower-place Two Words of the Pulse Position at Shutdown	IL□□3C	-2^{31} to $2^{31}-1$	1 = 1 pulse (For ABS system unlimited length position control)		√	√	√	–
63	Upper-place Two Words of the Pulse Position at Shutdown	IL□□3E	-2^{31} to $2^{31}-1$	1 = 1 pulse (For ABS system unlimited length position control)		√	√	√	–

Note: √: Available, –: Not available

5

SVA Module Specifications and Handling

This chapter describes the specifications and handling of the SVA Modules.

5.1 SVA-01A Module

This section describes the specifications and handling of the SVA-01A Module (4-axis Servo Module).

5.1.1 Hardware Specifications

Table 5.1 shows the SVA-01A Module hardware specifications.

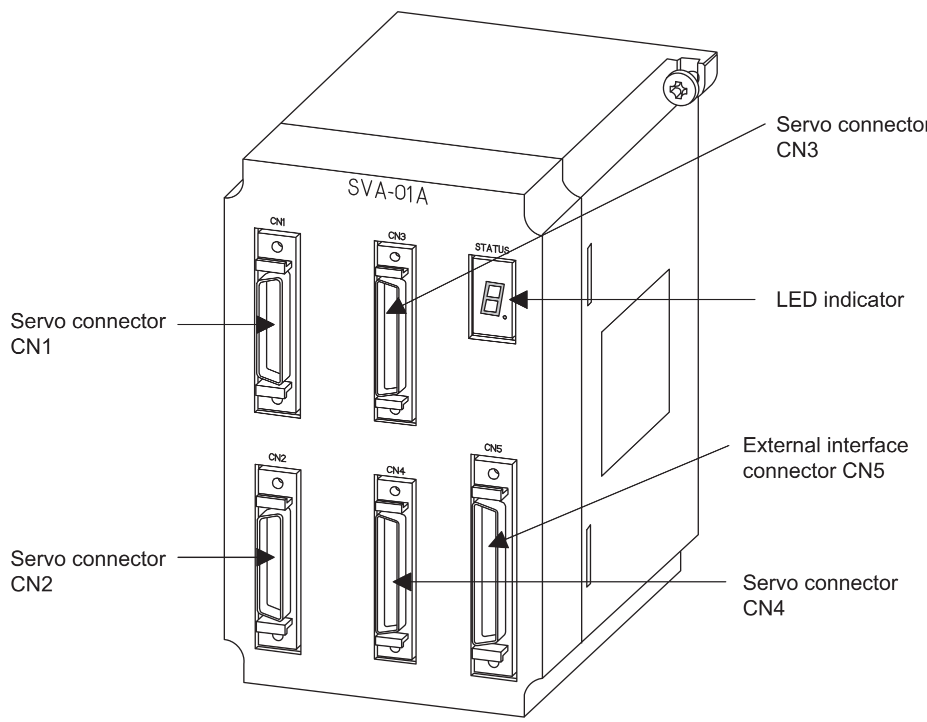
Table 5.1 SVA-01A Module Hardware Specifications

Item	Specifications
Name	4-axis Servo Module
Model Number	JEPMC-MC200A
Description	SVA-01A
Servo Interface	Pulse input circuit: 5 V differential, maximum 1 MHz input (Maximum1.5 MHz input available for the hardware Ver. 3.5 or later.) Pulse input method: A/B/C phase input (selected from 1×, 2×, and 4×), A/B mode, sign mode, Up/Down mode Pulse counter latch: DI (select between zero point and external latch signal)
Analog Outputs	D/A speed references: Sign + 15 bits, 4 points Output range: 0 to ±10 V (Linearity guarantee range: Maximum output of 10 V or more)
Digital Inputs	Servo DI: 3 points × 4 channels 4 mA at 24 VDC, source input SV ALM, SRDY, BRK External DI: 6 points × 4 channels + general-purpose DI 4 mA at 24 VDC, source input Axis unit: OTF, OTR, DEC, ZERO, EXT, RI Common: RIC (ZERO and EXT can be used as counter latch input signals.)
Digital Outputs	Servo DO: 6 points × 4 channels, 24 VDC SV ON, ALM RST, P_CON, SEN, OTR, OTF External DO: 2 points × 4 channels + general-purpose DO 24 VDC ±2% Output current: 100 mA Axis unit: BRK OUT*, RO Common: RCO
Connectors	CN1: Servo connector 1 10236-52A2JL CN2: Servo connector 2 10236-52A2JL CN3: Servo connector 3 10236-52A2JL CN4: Servo connector 4 10236-52A2JL CN5: External interface connector 10250-52A2JL
Indicators	Module status LED indicator 7-segment LED (green)
Dimensions	80 × 130 × 105 mm (W × H × D)

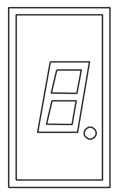
* The SVA-01A Module does not support brake control and does not have the registers for brake control (OW□□□□). The brake control output signals from CN5 merely pass the brake ON input signal for each axis from CN1 to CN4 without altering them. (Refer to *5.3.5 Connection with SGDA-□□□S SERVOPACK*.)
With Yaskawa servo systems, the SERVOPACK controls braking. The brake control output signals are thus passed through the SVA-01A Module and output as the brake control output signals from CN5. When using a servo drive from another company that does not control braking, prepare separate brake control I/O and program brake controls in the ladder diagram.

5.1.2 Handling

The following illustration shows the appearance of the SVA-01A Module.

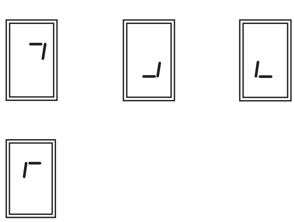


■ LED Indicator



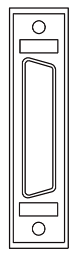
The STATUS indicator is a 7-segment LED indicator that displays the RUN/error status of the SVA-01A Module. The following table shows the indicator display patterns.

Display	Category	Meaning
8.	Hardware reset	The SVA-01A Module is in hardware reset status.
0	Initializing	This display appears one to six seconds after the SVA-01A Module is turned ON or reset.
1 2 3 4 5 6 7 8 9 A b C d E r y	Normal operation	One of servo numbers 1 to 16 will be displayed. The Servo Module is operating normally.

Display	Category	Meaning
 or  followed by error code	Serious fault	A two-digit error code appears following F. Examples: F → 0 → 1: Watchdog time over F → 0 → 2: Synchronization error F → 4 → 1: ROM diagnosis error F → 4 → 2: RAM diagnosis error F → 4 → 3: Shared memory diagnosis error F → 4 → 4: CPU built-in timer error F → 4 → 5: Timer diagnosis error F → 4 → 6: NVRAM read error F → 4 → 7: NVRAM write error F → 4 → 8: General illegal instruction interruption occurrence F → 4 → 9: Slot illegal instruction interruption occurrence F → 5 → 0: CPU address error interruption occurrence F → 5 → 1: DMA address error interruption occurrence F → 5 → 2: User break interruption occurrence F → 5 → 3: Trap instruction interruption occurrence F → 5 → 4: MPD71054 diagnosis error
 Axis 1	Alarm (SVRDY “ON”) Abnormal (SVRDY “OFF”)	Classifies failures into “alarm” or “abnormal” according to the value of “IW☐☐00 + axis offset.” Check for the following errors. • Alarm Deviation error Parameter setting error • Abnormal Fixed parameter setting error Absolute encoder I/F error
 Axis 2		
 Axis 3		
 Axis 4		
	Operation of other CPU stops	Indicates other Modules that do not operate. For example, CPU Module is in STOP status.
	Absolute position reading retry status	Indicates retrying of absolute position reading by turning ON the power and resetting from the start, in the case of setting absolute encoder for fixed parameter encoder.

5

■ Servo Connectors (CN1 to CN4)



The Servo Connectors are used to connect the SVA-01A Module to SERVOPACKs.
Use the following standard cables for these connectors.
- SGDA SERVOPACKs: JEPMC-W6040-□□
- SGDB/SGDM SERVOPACKs: JEPMC-W6050-□□

■ External Interface Connector

The external interface connector is used to connect an SVA-01A Servo Module to external I/O signal terminals.
Use the following standard cables for this connector.
- JEPMC-W6060-□□
  Number of signal points: DI: 6 (points) × 4 (axes) + common DI points
  DO: 2 (points) × 4 (axes) + common DO points

■ Connector Specifications

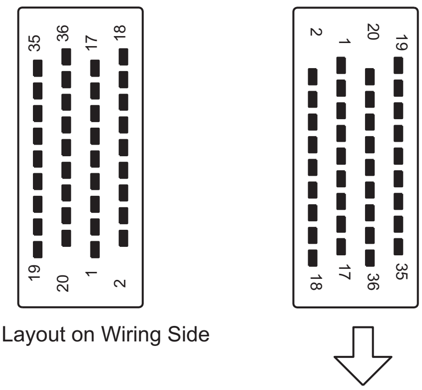
The following table shows the specifications of the connectors shown above

Name	Connector Name	Number of Pins	Connector			Cable
			On Module	On Cable	Manufacturer	
Servo Interface Connector 1 Connector 2 Connector 3 Connector 4	CN1 CN2 CN3 CN4	36	10236-52A2JL	• Connector body: 10136-3000VE • Shell: 10336-52A0-008 (Screw lock) 10336-52F0-008 (One-touch lock)	3M	• For SGDA: JEPMC-W6040-05 JEPMC-W6040-10 JEPMC-W6040-30 • For SGDB or SGDM: JEPMC-W6050-05 JEPMC-W6050-10 JEPMC-W6050-30
External I/O Connector	CN5	50	10250-52A2JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw lock) 10350-52F0-008 (One-touch lock)	3M	JEPMC-W6060-05 JEPMC-W6060-10 JEPMC-W6060-30

■ Connector Pin Layout (CN1 to CN4)

The pin layout of the CN1 to CN4 connectors are shown below.

CN1/CN2 36-pin Connector CN3/CN4 36-pin Connector



Pin Layout on Wiring Side

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	NREF	1	SG	20	SEN (5V)	19	SG
4	PAL	3	PA	22	BAT	21	0BAT
6	PCL (5V)	5	PC (5V)	24	PBL	23	PB
8	–	7	SG	26	–	25	SG
10	0V (24V)	9	–	28	0V (24V)	27	–
12	PCON	11	0V (24V)	30	ALM RST	29	0V (24V)
14	OTF	13	OTR	32	SEN (24V)	31	SV ON
16	+24V	15	–	34	+24V	33	–
18	BRK	17	SV ALM	36	–	35	SRDY

Note: Although the connector orientation differs with each connector CN1 to CN4, the pin layout is the same for all connectors.

The following table shows the names and functions of the pins of the CN1 to CN4 connectors.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	SG	Ground (for analog)	19	SG	Ground (for SEN signal)
2	NREF	Speed reference	20	SEN (5V)	SEN signal, DO-3
3	PA	5-V differential pulse input (+)	21	0BAT	BAT output terminal (-) for absolute specification
4	PAL	5-V differential pulse input (-)	22	BAT	BAT output terminal (+) for absolute specification
5	PC (5V)	5-V differential pulse input (+)	23	PB	5-V differential Pulse-B terminal (+)
6	PCL (5V)	5-V differential pulse input (-)	24	PBL	5-V differential Pulse-B terminal (-)
7	SG	Ground	25	SG	Ground
8	–	–	26	–	–
9	–	–	27	–	–
10	0V (24V)	0 V (24 V)	28	0V (24V)	0 V (24 V)
11	0V (24V)	0 V (24 V)	29	0V (24V)	0 V (24 V)
12	PCON	P operation reference, DO2	30	ALM RST	Alarm reset, DO-1
13	OTR	Overtravel (-)	31	SV ON	Servo ON, DO-0
14	OTF	Overtravel (+)	32	SEN (24V)	SEN output for VS-866
15	–	–	33	–	–
16	+24 V	+24 V power supply	34	+24 V	+24 V power supply
17	SV ALM	Servo alarm input, DI-0	35	SRDY	Servo ready input, DI-1
18	BRK	Brake ON input, DI-2	36	–	–

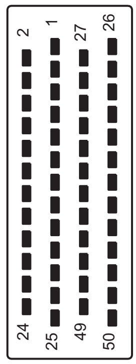
IMPORTANT

Both 5 V and 24 V can be used for the SEN signal. Connect power to either pin 20 or pin 32 according to the application.
The standard cable is connected to 5 V (pin 20).

■ Connector Pin Layout (CN5)

The pin layout of the CN5 connector is shown below.

CN5 50-pin Connector



Pin Layout on Wiring Side

2	–	1	BAT	27	–	26	0BAT
4	OTR IN1	3	+24V1	29	DEC1	28	OTF IN1
6	RI1	5	ZERO1	31	0V1	30	EXT1
8	+24V2	7	BRK OUT1	33	OTF IN2	32	RO1
10	ZERO2	9	OTR IN2	35	EXT2	34	DEC2
12	BRK OUT2	11	RI2	37	RO2	36	0V2
14	OTR IN3	13	+24V3	39	DEC3	38	OTF IN3
16	RI3	15	ZERO3	41	0V3	40	EXT3
18	+24V4	17	BRK OUT3	43	OTF IN4	42	RO3
20	ZERO4	19	OTR IN4	45	EXT4	44	DEC4
22	BRK OUT4	21	RI4	47	RO4	46	0V4
24	+24V	23	RIC	49	+24V	48	ROC
		25	0V (24V)			50	0V (24V)

The following table shows the name and function of the CN5 connector pins.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	BAT	BAT input terminal (+) for absolute specification	22	BRK OUT4	Axis-4 brake control output
2	–	–	23	RIC	Reserved input common, DI-9
3	+24V1	Axis-1 input common	24	+24V	+24 V servo power supply
4	OTR IN1	Axis-1 overtravel (-) input, DI-4	25	0V (24V)	0 V servo power supply
5	ZERO1	Axis-1 zero point latch input, DI-6	26	0BAT	BAT input terminal (-) for absolute specification
6	RI1	Reserved axis-1 input, DI-8	27	–	–
7	BRK OUT1	Axis-1 brake control output	28	OTF IN1	Axis-1 overtravel (+) input, DI-3
8	+24V2	Axis-2 input common	29	DEC1	Axis-1 deceleration limit input, DI-5
9	CTR IN2	Axis-2 overtravel (-) input, DI-4	30	EXT1	Axis-1 external positioning latch input, DI-7
10	ZERO2	Axis-2 zero point latch input, DI-6	31	0V1	Axis-1 output common
11	RI2	Reserved axis-2 input, DI-8	32	RO1	Reserved axis-1 output, DO-3
12	BRK OUT2	Axis-2 brake control output	33	OTF IN2	Axis-2 overtravel (+) input, DI-3
13	+24V3	Axis-3 input common	34	DEC2	Axis-2 deceleration limit input, DI-5
14	OTR IN3	Axis-3 overtravel (-) input, DI-4	35	EXT2	Axis-2 external positioning latch input, DI-7
15	ZERO3	Axis-3 zero point latch input, DI-6	36	0V2	Axis-2 output common
16	RI3	Reserved axis-3 input, DI-8	37	RO2	Reserved axis-2 output, DO-3
17	BRK OUT3	Axis-3 brake control output	38	OTF IN3	Axis-3 overtravel (+) input, DI-3
18	+24V4	Axis-4 input common	39	DEC3	Axis-3 deceleration limit input, DI-4
19	OTR IN4	Axis-4 overtravel (-) input, DI-4	40	EXT3	Axis-3 external positioning latch input, DI-7
20	ZERO4	Axis-4 zero point latch input, DI-6	41	0V3	Axis-3 output common
21	RI4	Reserved axis-4 input, DI-8	42	RO3	Reserved axis-3 output, DO-3

(cont'd)

Pin	Signal Name	Function	Pin	Signal Name	Function
43	OTF IN4	Axis-4 overtravel (+) input, DI-3	47	RO4	Reserved axis-4 output, DO-3
44	DEC4	Axis-4 deceleration limit input, DI-4	48	ROC	Reserved output common, DO-4
45	EXT4	Axis-4 external positioning latch input, DI-7	49	+24V	+24 V servo power supply
46	0V4	Axis-4 output common	50	0V (24V)	0 V servo power supply

■ Standard Cables

The following standard cables are available for use with the 4-axis Servo Module (SVA-01A). Use these cables to connect the SVA-01A Module to SERVOPACKs and other devices, such as overtravel limit switches.

Table 5.2 Standard Cables

Cable	Model	Length
SGDA-☐☐☐S SERVOPACK Connecting Cables	JEPMC-W6040-05	0.5 m
	JEPMC-W6040-10	1.0 m
	JEPMC-W6040-30	3.0 m
SGDB-☐☐, SGDM SERVOPACK Connecting Cables	JEPMC-W6050-05	0.5 m
	JEPMC-W6050-10	1.0 m
	JEPMC-W6050-30	3.0 m
External I/O Cables	JEPMC-W6060-05	0.5 m
	JEPMC-W6060-10	1.0 m
	JEPMC-W6060-30	3.0 m

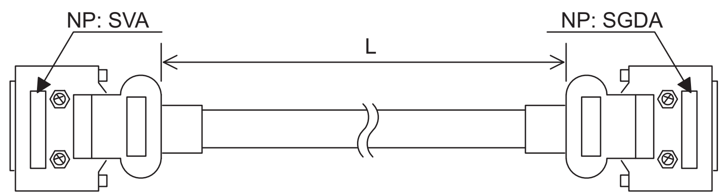
These cables are described below.

■ SGDA-□□□S SERVOPACK Connecting Cables

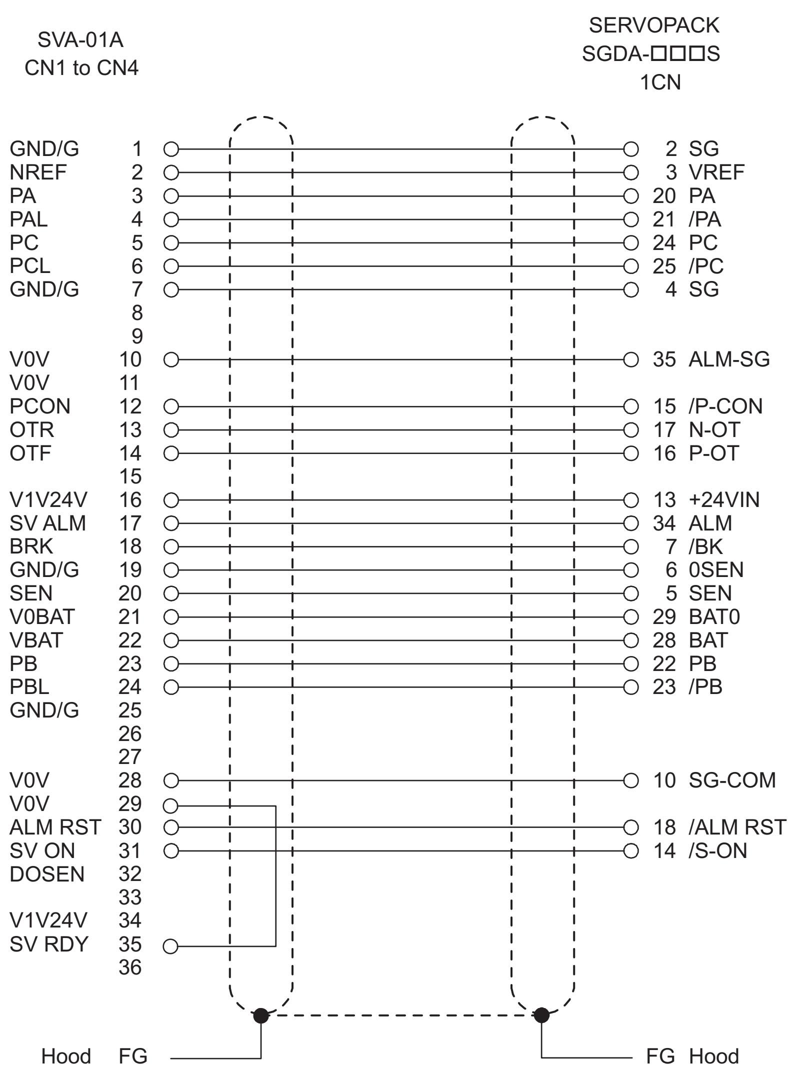
Models

JEPMC-W6040-05: 0.5 m
JEPMC-W6040-10: 1.0 m
JEPMC-W6040-30: 3.0 m

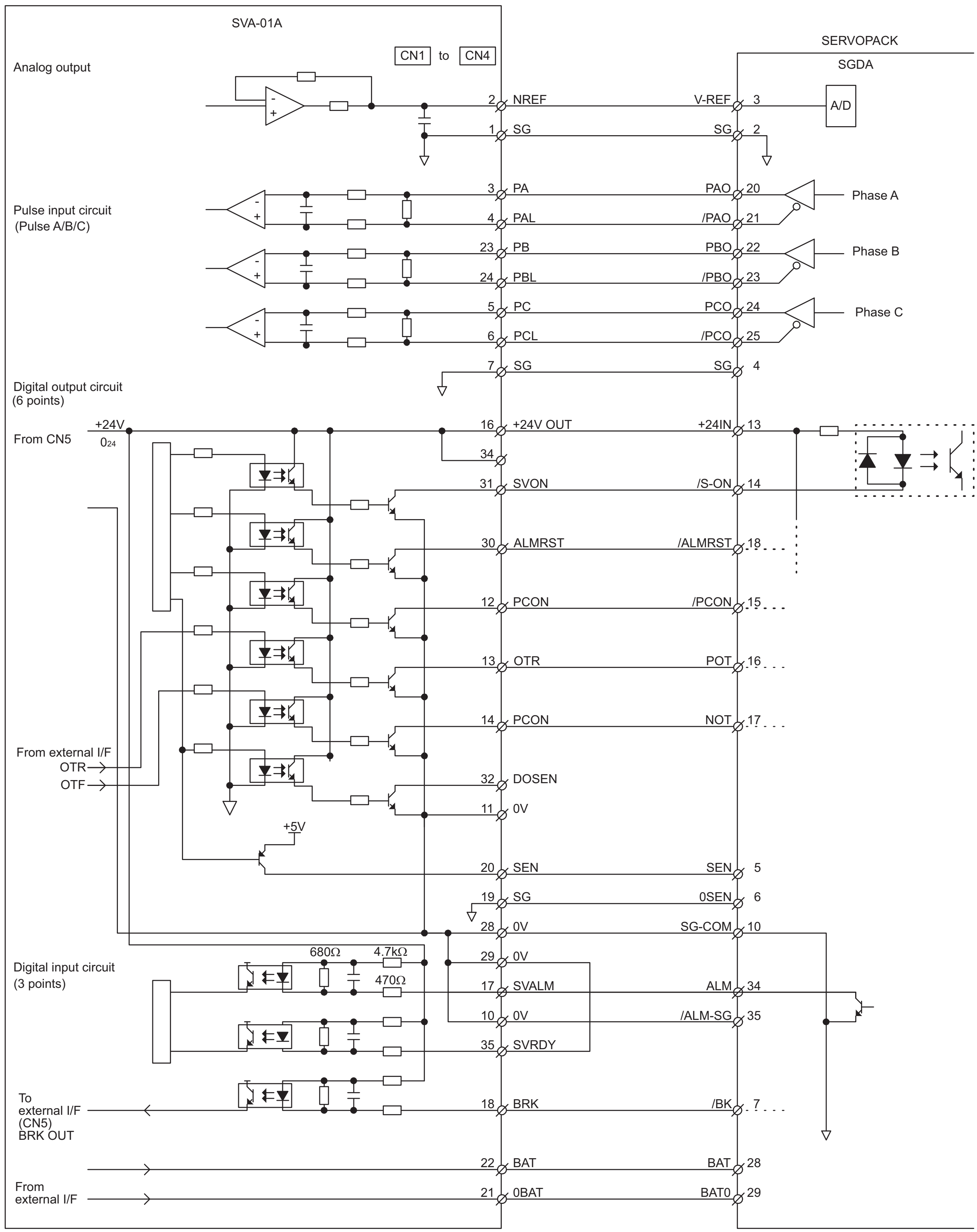
Appearance



Cable Connection Diagram



Example of Connections to SGDA-☐☐☐S SERVOPACK

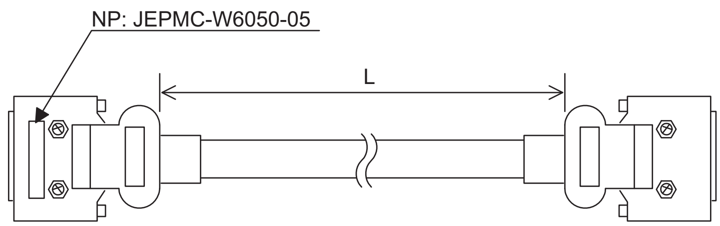


■ SGDB/SGDM/SGDS SERVOPACK Connecting Cables

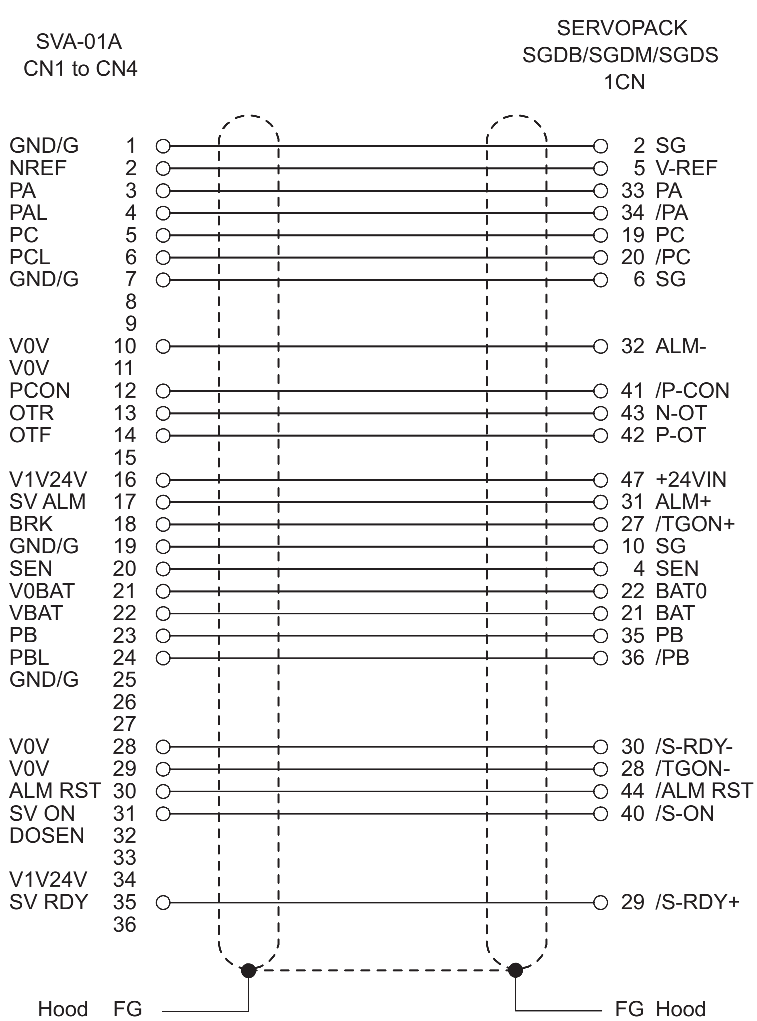
Models

JEPMC-W6050-05: 0.5 m
JEPMC-W6050-10: 1.0 m
JEPMC-W6050-30: 3.0 m

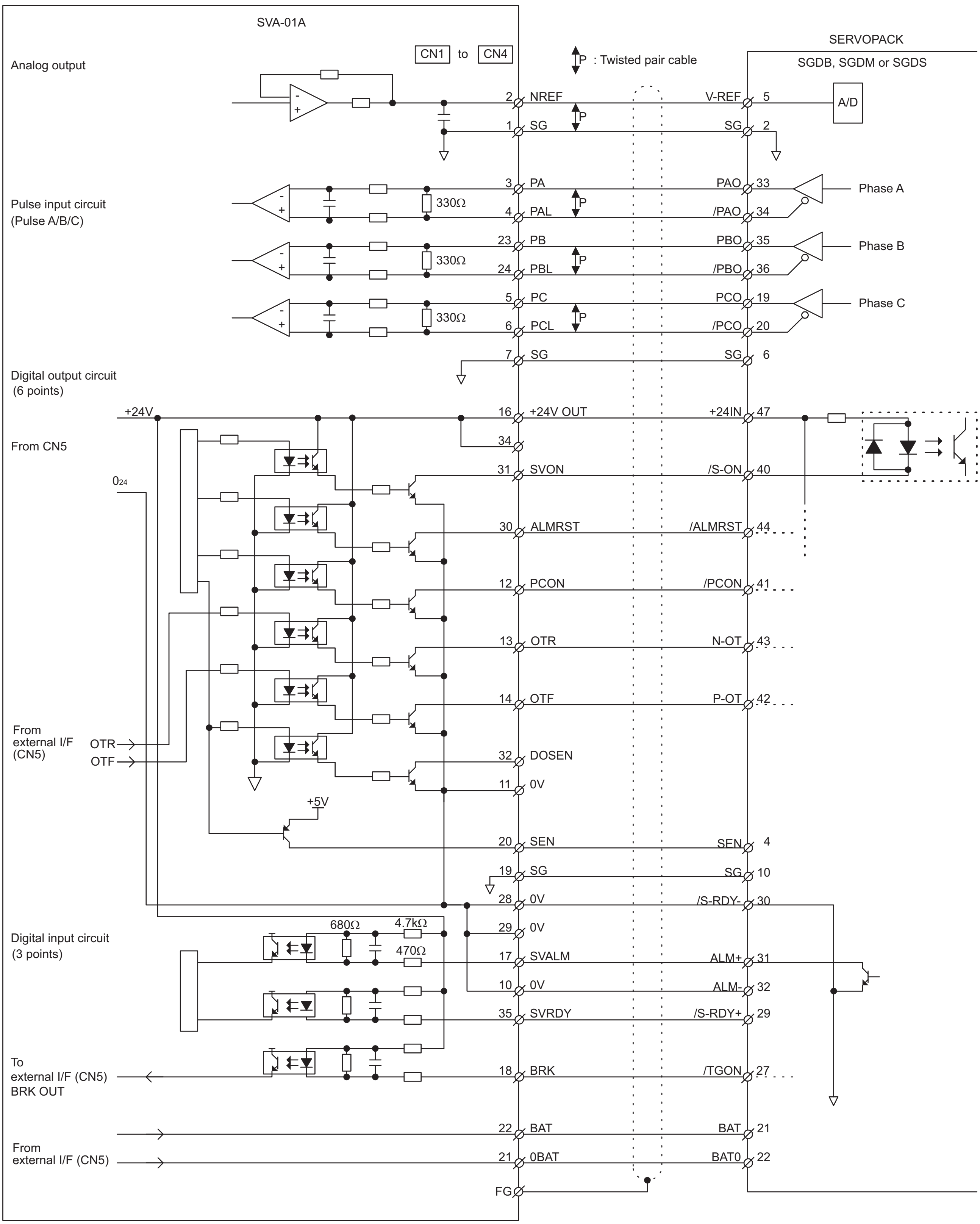
Appearance



Cable Connection Diagram



Example of Connections to SGDB-☐☐/SGDM/SGDS SERVOPACK



Connection Example Using JEPMC-W6050-☐☐ Cables

IMPORTANT

The following SERVOPACK parameters must be set to use brake signals.

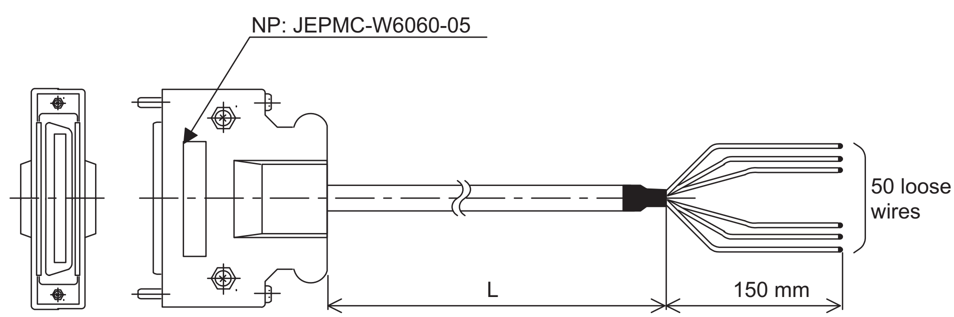
- Specify whether to output BK signals to CN1-27 and CN1-28 on the SERVOPACK.
  Cn-2D (OUTSEL Output Signal Selection) = □4□
  ↑
  Outputs a BK signal to CN1-27 and CN1-28.
- CN-12 (Time Lag from Brake Reference to Servo OFF)
  CN-15 (Brake Output Speed Level during Motor Operation)
  CN-16 (Brake Output Timing during Motor Operation)

■ External I/O Cables

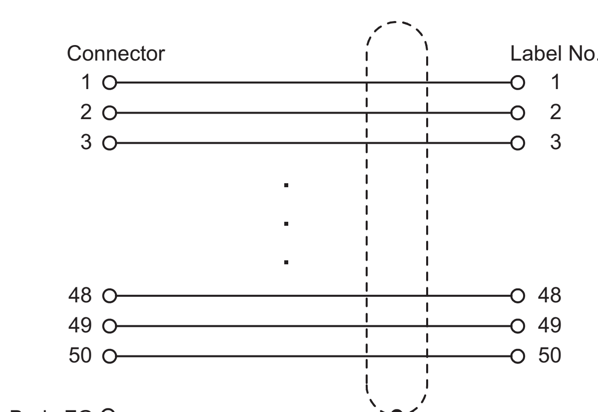
Models

JEPMC-W6060-05: 0.5 m
JEPMC-W6060-10: 1.0 m
JEPMC-W6060-30: 3.0 m

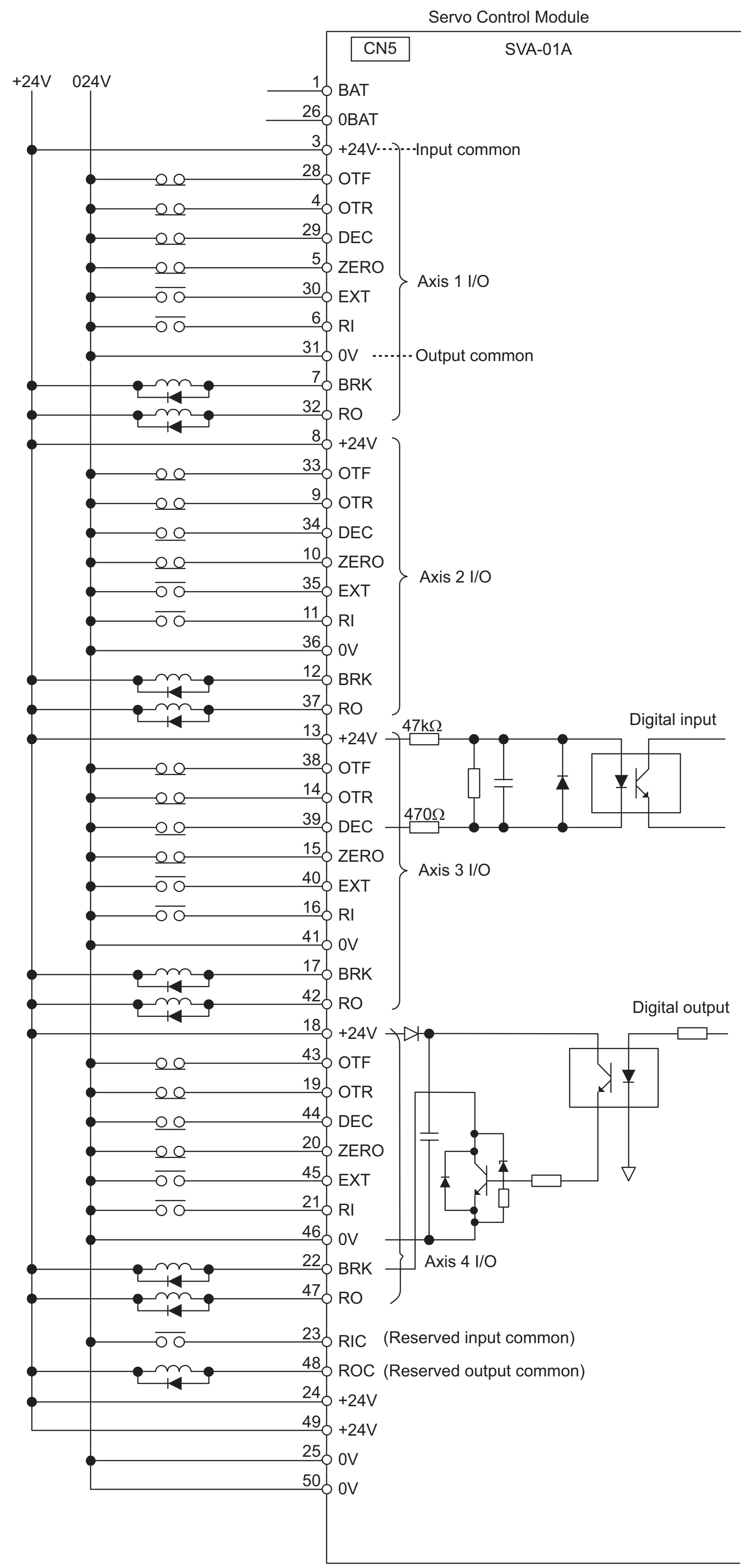
Appearance



Cable Connection Diagram



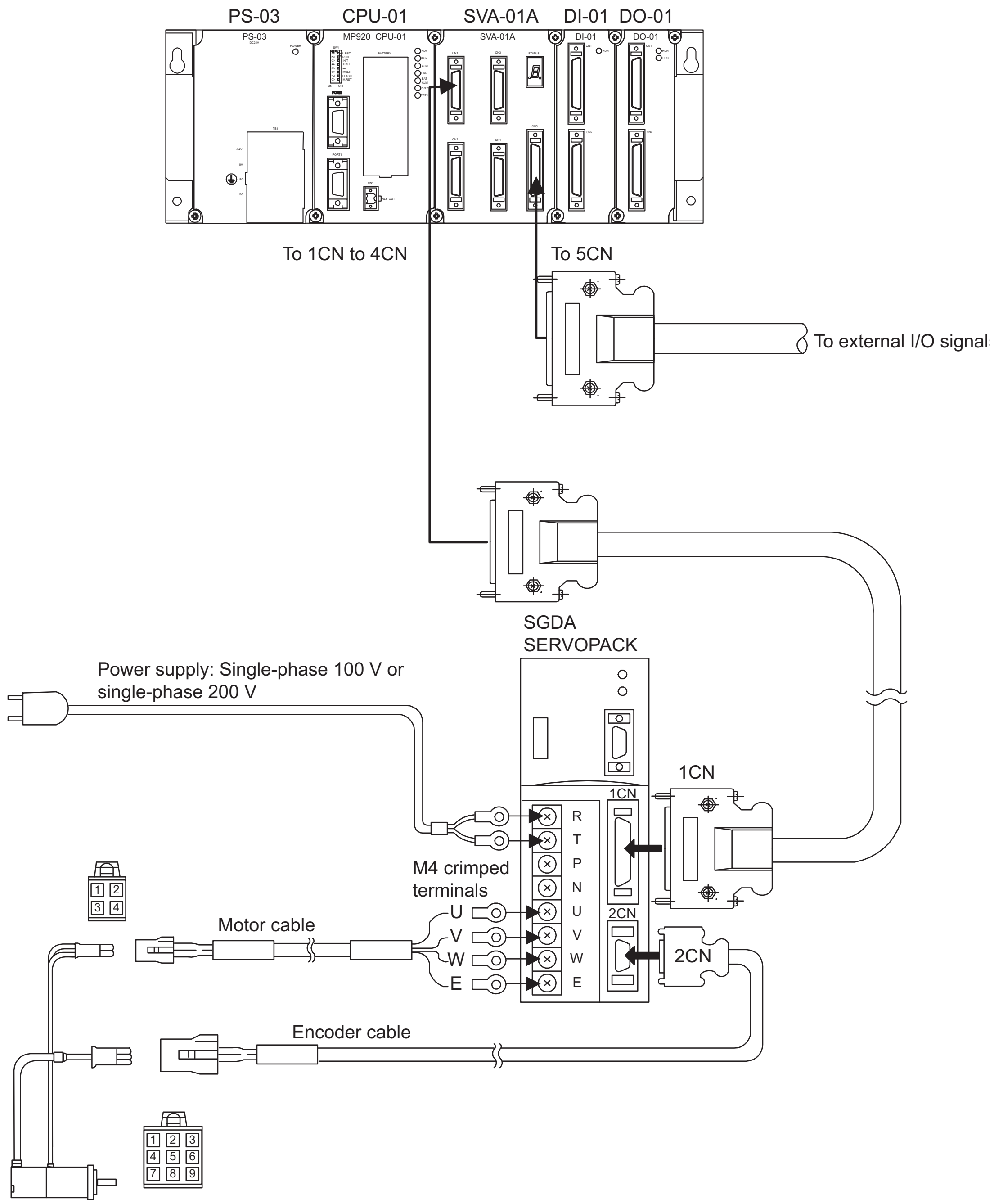
Example of Connections to External Devices



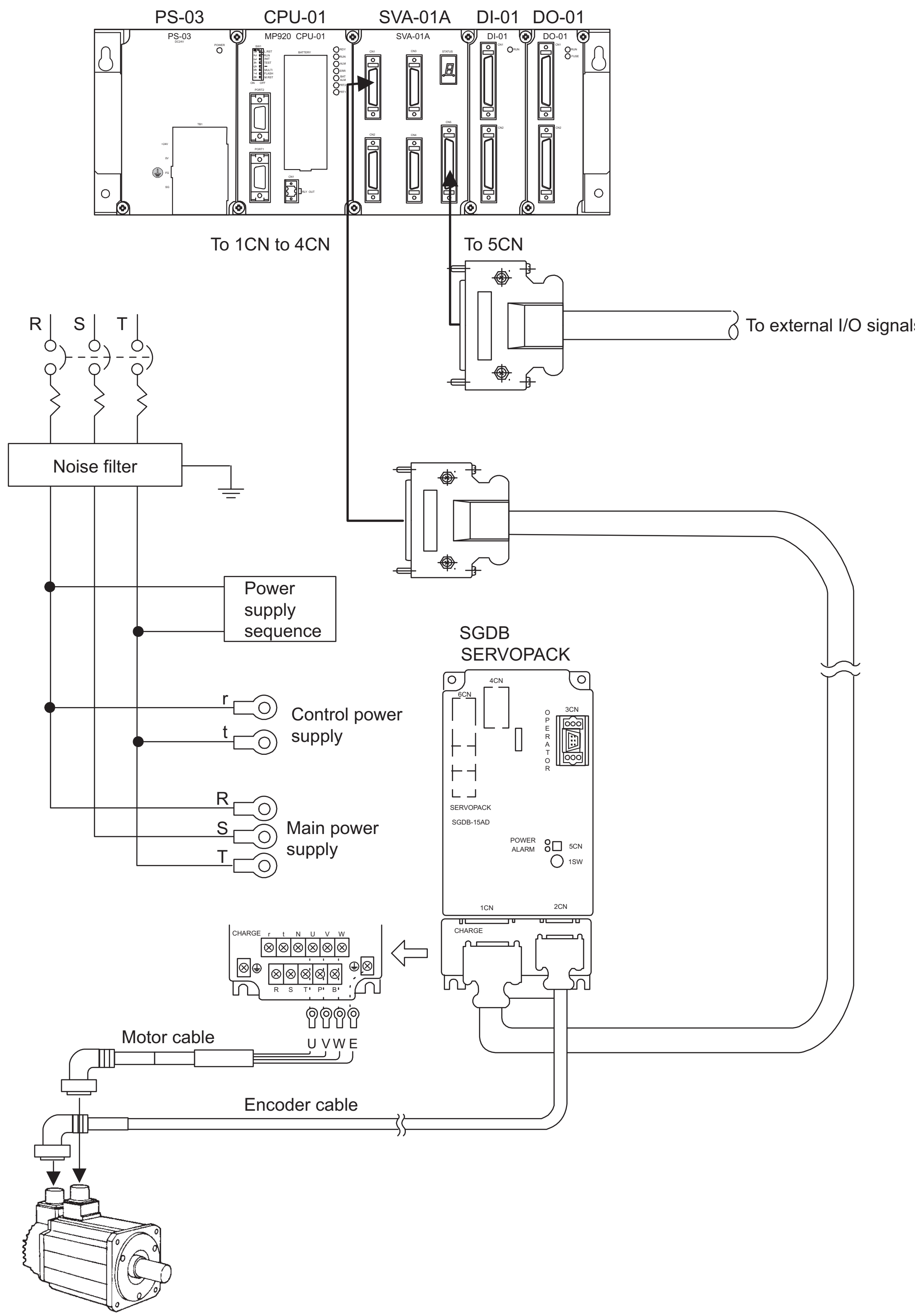
■ Connection of SERVOPACK and Servomotor

Use the special cable and encoder cable to connect the SERVOPACK and Servomotor.

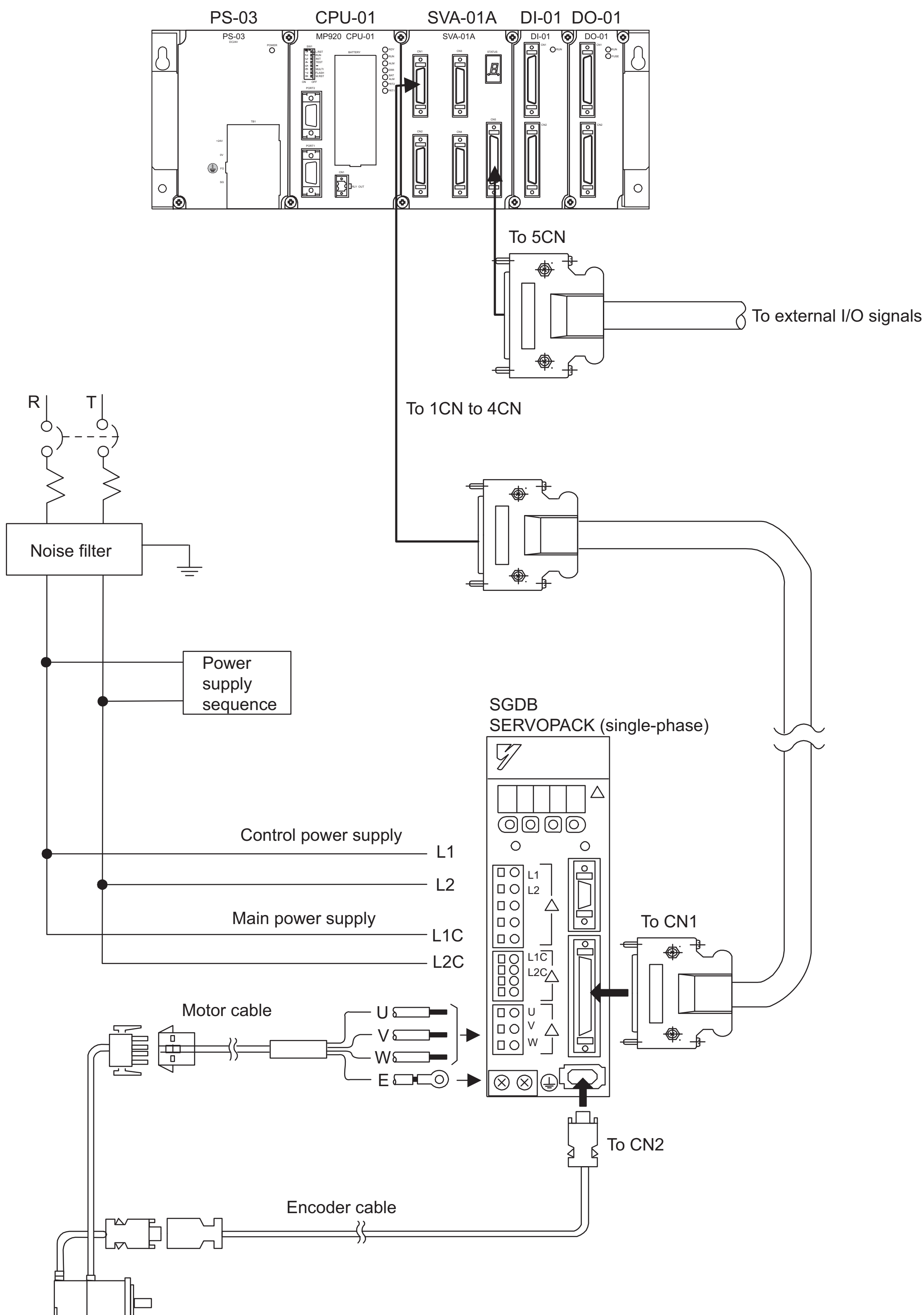
Connection with SGDA SERVOPACK



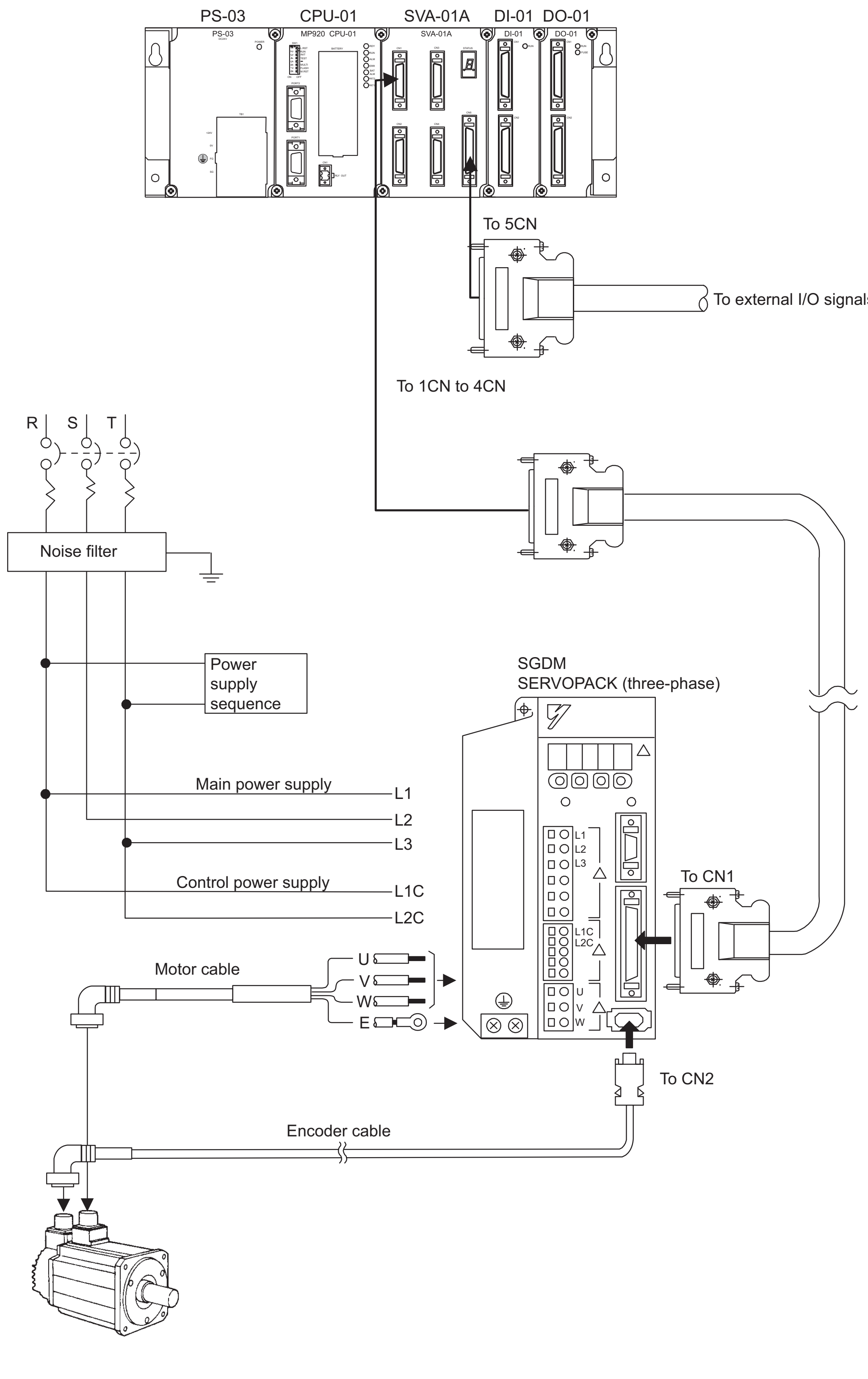
Connection with SGDB SERVOPACK



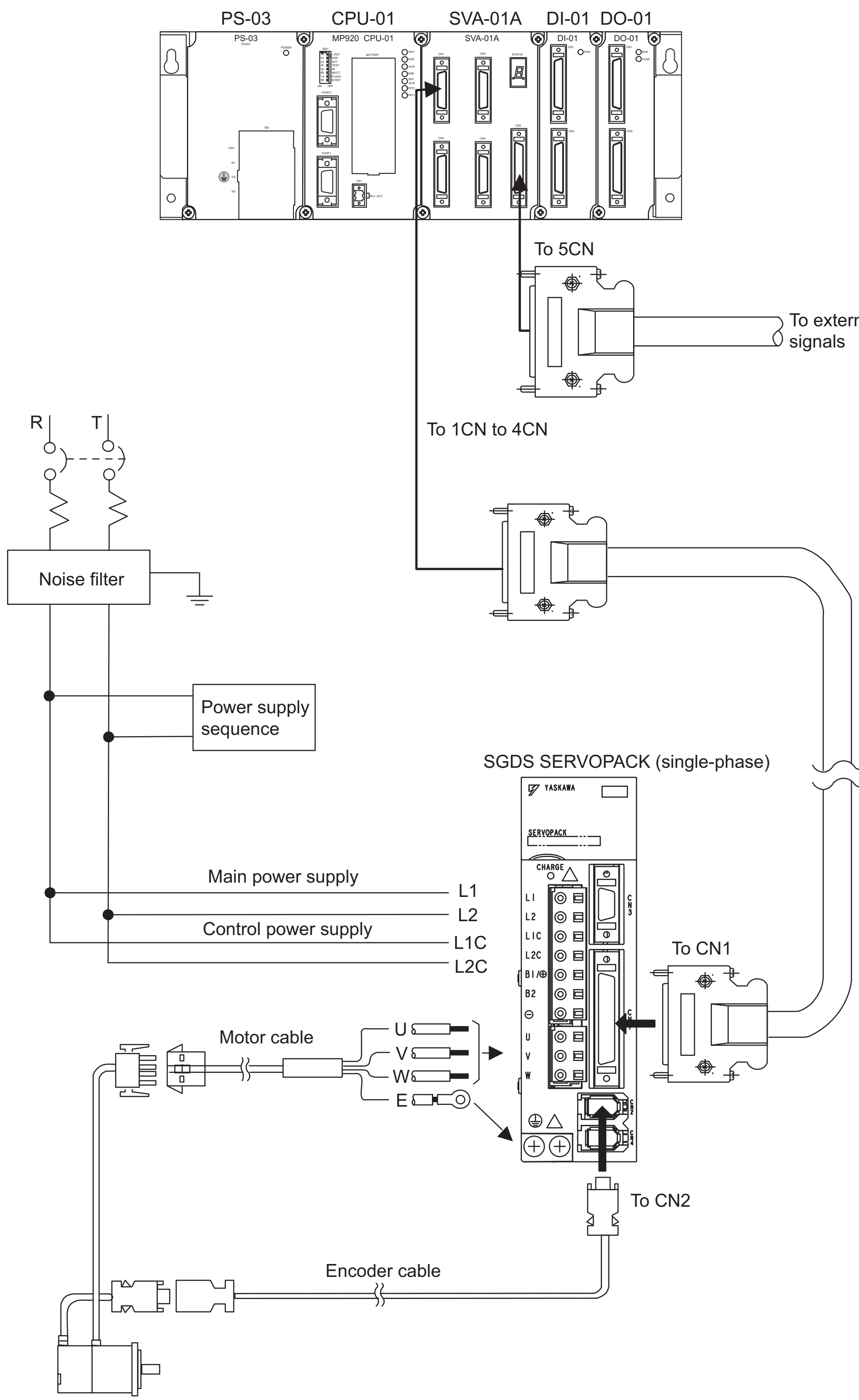
Connection with Single-phase SGDM SERVOPACK



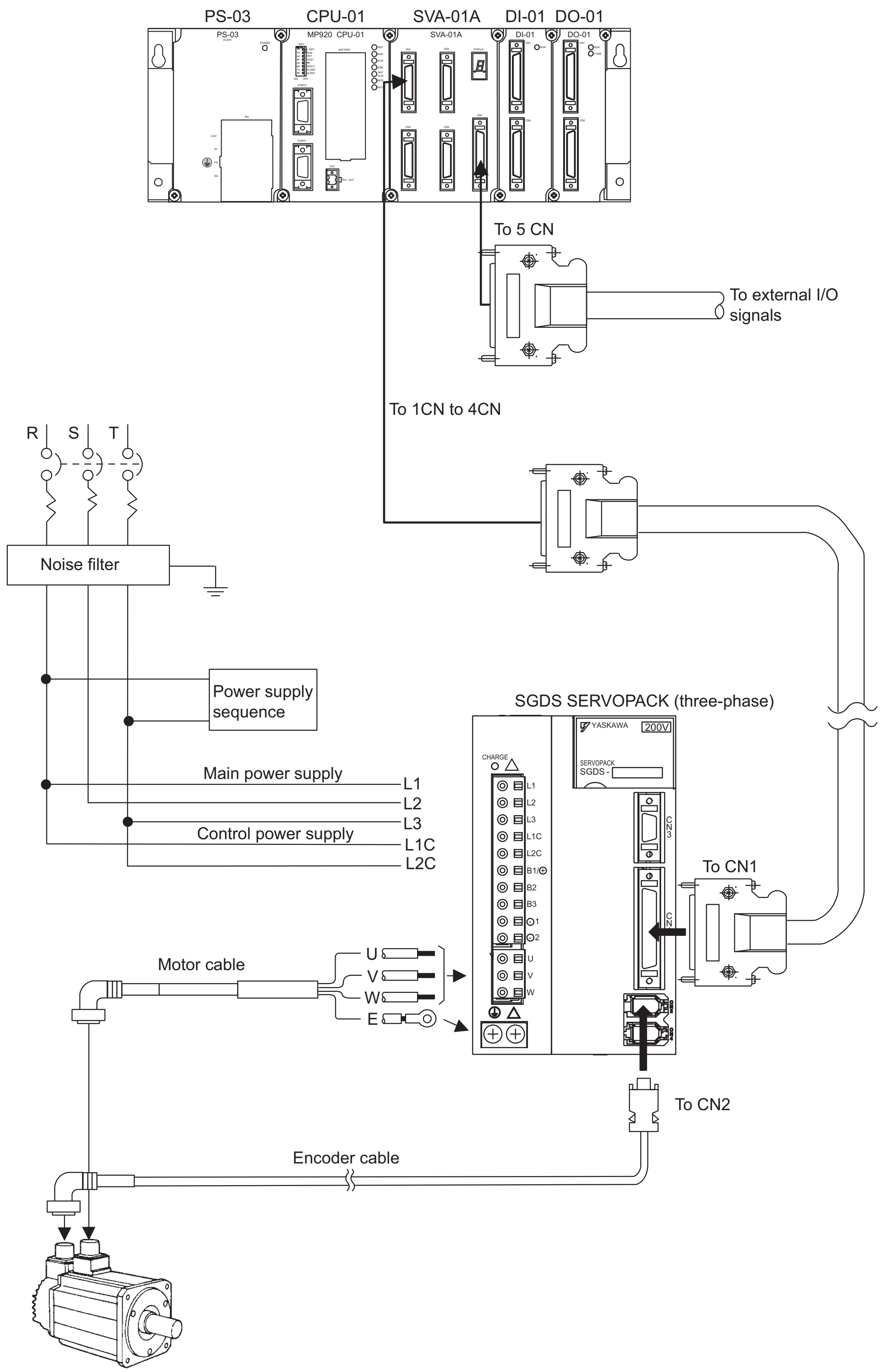
Connection with Three-phase SGDM SERVOPACK



Connection with Single-phase SGDS SERVOPACK



Connection with Three-phase SGDS SERVOPACK



5.2 SVA-02A Module

This section describes the specifications and handling of the SVA-02A (2-axis) Module.

5.2.1 Hardware Specifications

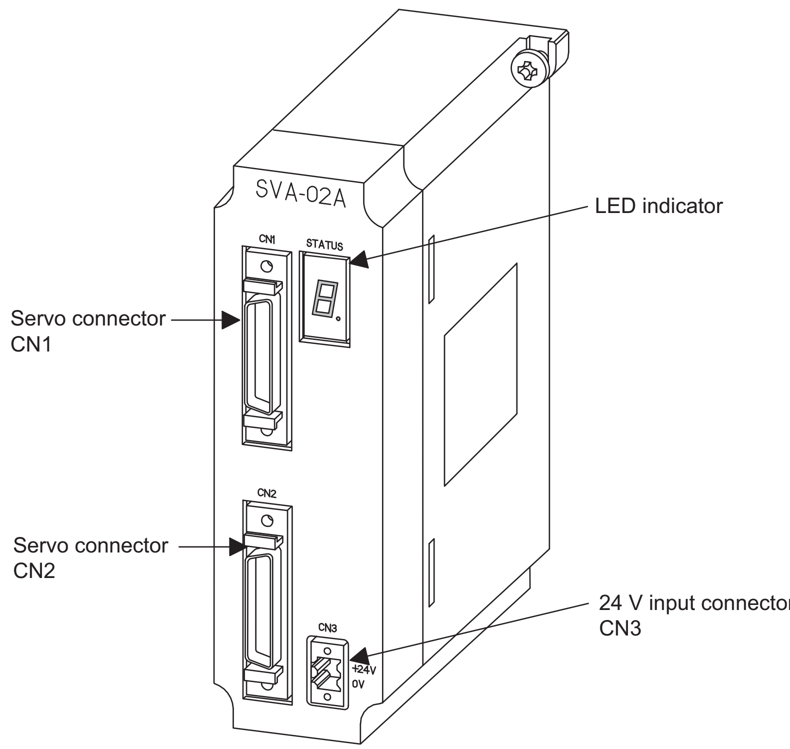
Table 5.3 shows the SVA-02A Module hardware specifications.

Table 5.3 SVA-02A Module Hardware Specifications

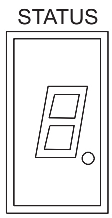
Item	Specifications
Name	Two-axis Servo Module
Model Number	JEPMC-MC220A
Description	SVA-02A
Servo Interface	Pulse input circuit: 5 V differential, maximum 1 MHz input (Maximum 1.5 MHz input for the hardware Ver. B.5 or later.) Pulse input method: A/B/C phase input (selected from 1×, 2×, and 4×), A/B mode, sign mode, up-down mode Pulse counter latch: DI
Analog Outputs	D/A speed references: PWM 16 bits 2 channels Torque references: D/A 12 bits 2 channels
Analog Inputs	16 bits × 2 channels
Digital Inputs	General-purpose DI: 6 points × 2 channels, 4 mA at 24 VDC, source input General-purpose DI (RDY, ALM, BRK, OTF, OTR) PI latch
Digital Outputs	General-purpose DO: 6 points × 2 channels, 24 VDC ±2% Output current: 100 mA SV ON, ALM RST, P_CON, SEN, General 1, General 2 (SEN output is 5 V source and 24 V output.)
Connectors	CN1: Servo connector 1 10236-52A2JL CN2: Servo connector 2 10236-52A2JL CN3: 24 V input BL3.5/2F-AU
Indicators	Module status LED indicator 7-segment LED (green)
Hot Swapping (Removal/Insertion under Power)	Not possible
Dimensions (mm)	40 × 130 × 105 mm (W × H × D)

5.2.2 Handling

The following illustration shows the appearance of the SVA-02A Module.

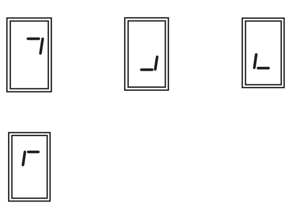


■ LED Indicator

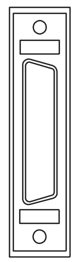


The STATUS indicator is a 7-segment LED indicator that displays the RUN/error status of the SVA-02A Module. The following table shows the indicator display patterns.

Display	Category	Meaning
8.	Hardware reset	The SVA-02A Module is in hardware reset status.
0	Initializing	This display appears one to six seconds after the SVA-02A Module is turned ON or reset.
1 2 3 4 5 6 7 8 9 A b C d E r y	Normal operation	One of servo numbers 1 to 16 will be displayed. The Servo Module is operating normally.

Display	Category	Meaning
 or  followed by error code	Serious fault	A two-digit error code appears following “F.” Examples: F → ☐ → 1 F → 0 → 1: Watchdog time over F → 0 → 2: Synchronization error F → 4 → 1: ROM diagnosis error F → 4 → 2: RAM diagnosis error F → 4 → 3: Shared memory diagnosis error F → 4 → 4: CPU built-in timer error F → 4 → 5: Timer diagnosis error F → 4 → 6: NVRAM read error F → 4 → 7: NVRAM write error F → 4 → 8: General illegal instruction interruption occurrence F → 4 → 9: Slot illegal instruction interruption occurrence F → 5 → 0: CPU address error interruption occurrence F → 5 → 1: DMA address error interruption occurrence F → 5 → 2: User brake interruption occurrence F → 5 → 3: Trap instruction interruption occurrence F → 5 → 4: UPD71054 diagnosis error
 Axis 1	Alarm (SVRDY “ON”) Abnormal (SVRDY “OFF”)	Classifies the failure into “alarm” or “abnormal” according to the “IW☐☐00 + axis offset contents. Verify that the following error occurs. • Alarm Deviation error Parameter setting error • Abnormal Fixed parameter setting error Absolute encoder I/F error
 Axis 2		
	Operation of other CPU stops	Indicates other Modules that do not operate. For example, CPU Module is in STOP status.
	Absolute position reading retry status	Indicates retrying of absolute position reading by turning ON the power and resetting from the start, in the case of setting absolute encoder for fixed parameter encoder.

■ Servo Connectors (CN1 and CN2)j

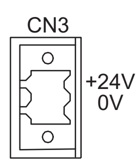


The Servo Connector is used to connect an SVA-02A Servo Module and a SERVOPACK.
Use the following standard cable for this connector.

- SGDA-□□□S SERVOPACKs: JEPMC-W6070-05
- SGDB/SGDM SERVOPACKs: JEPMC-W6080-05

■ 24 V Input Connector (CN3)

Connect the +24 VDC Servo I/O power supply connector to the SVA-02A Module. Use a BL3.5/2F-AU Screw Terminal Block Connector (manufactured by Weidmüller).



Pin No.	Signal Name	Pin Name
2	24 V	+24 VDC Input
1	0 V	0 V

■ Connector Specifications

The following table shows the specifications of the connectors shown above.

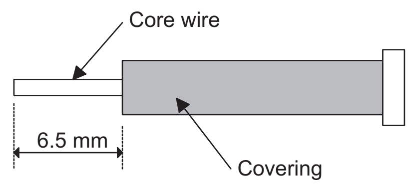
Name	Connector Name	Number of Pins	Connector			Cable
			On Module	On Cable	Manufacturer	
Servo Interface Connector 1 Connector 2	CN1 CN2	36	10236-52A2JL	• Connector body: 10136-3000VE • Shell: 10336-52A0-008 (Screw lock) 10336-52F0-008 (One-touch lock)	3M	JEPMC-W6070-05 (for SGDA) JEPMC-W6080-05 (for SGDB, SGDM)
24 V Input Connector	CN3	2	–	• BL3.5/2F-AU	Weidmüller	The CN3 connector is provided with the SVA-02A Module, but no cable is connected to the connector. The user is expected to connect the cable to the connector.

■ Procedure for Preparing 24 V Input Cable

Use a twisted-pair cable with a wire size of AWG#24 to AWG#20 (0.2 to 0.51 mm^2) to connect the 24-VDC power supply to the 24-V input connector on the SVA-02A Module.

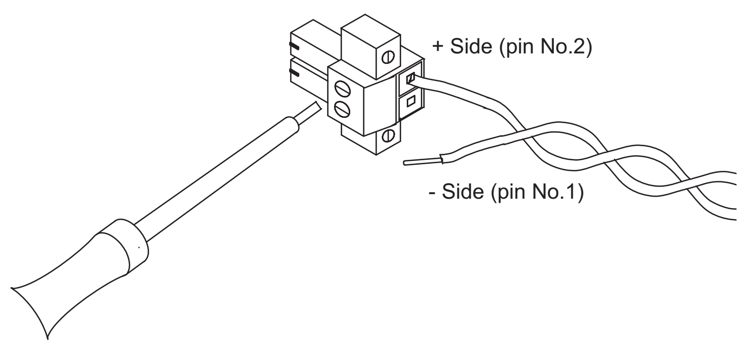
Use the following procedure to prepare cables.

1. Strip the wire of its covering for 6.5 mm from the end.



2. Secure the wire to the plug.

   Insert the core wire deeply into the plug and tighten the screws to a tightening torque of 0.3 to 0.4 N·m.

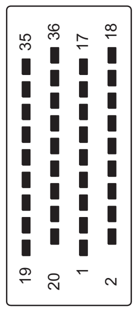


Pin No.	Signal Name	Pin Name
2	24 V	+24 VDC Input
1	0 V	0 V

■ Connector Pin Layout (CN1 and CN2)

The pin layout of the CN1 and CN2 connectors are shown below.

CN1/CN2 36-pin Connector



Pin Layout on Wiring Side

2	NREF	1	SG	20	SEN	19	SG
4	PAL	3	PA	22	–	21	–
6	PCL (5V)	5	PC (5V)	24	PBL	23	PB
8	AI-IN	7	SG	26	AI-GND	25	SG
10	0V (24V)	9	AO-OUT	28	0V (24V)	27	AO-GND
12	PCON (DO-2)	11	0V (24V)	30	ALM RST (DO-1)	29	0V (24V)
14	OTF (DO-3)	13	OTR (DO-4)	32	SEN	31	SV ON (DO-0)
16	+24V	15	OTF (DI-3)	34	+24V	33	OTR (DI-4)
18	BRK(DI-2)	17	SV ALM (DI-0)	36	EXT (DI-5)	35	SRDY (DI-1)

The following table shows the name and function of the pins of the CN1 and CN2 connectors.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	SG	Ground (for analog)	19	SG	Ground (for SEN signal)
2	NREF	Speed reference	20	SEN (5V)	SEN signal
3	PA	5-V differential pulse input (+)	21	Not used.	–
4	PAL	5-V differential pulse input (-)	22	Not used.	–
5	PC (5V)	5-V differential pulse input (+)	23	PB	5-V differential Pulse-B terminal (+)
6	PCL (5V)	5-V differential pulse input (-)	24	PBL	5-V differential Pulse-B terminal (-)
7	SG	Ground	25	SG	Ground
8	AI-IN	Analog input	26	AI-GND	Analog input ground
9	AO-OUT	Analog output	27	AO-GND	Analog output ground
10	0V (24V)	0 V (24 V)	28	0V (24V)	0 V (24 V)
11	0V (24V)	0 V (24 V)	29	0V (24V)	0 V (24 V)
12	PCON	P operation reference, DO2	30	ALM RST	Alarm reset, DO-1
13	OTR	Overtravel (-) DO-4	31	SV ON	Servo ON, DO-0
14	OTF	Overtravel (+) DO-3	32	SEN (24V)	SEN output for VS-866
15	General-purpose DI	General-purpose input (OTF) DI-3	33	General-purpose DI	General-purpose input (OTR) DI-4
16	+24V	+24 V power supply	34	+24V	+24 V power supply
17	SV ALM	Servo alarm input, DI-0	35	SRDY	Servo ready input, DI-1
18	BRK	Brake ON input, DI-2	36	General-purpose DI	General-purpose input DI-5 (External positioning latch)

IMPORTANT

Both 5 V and 24 V can be used for the SEN signal. Connect power to either pin 20 or pin 32 according to the application.
The standard cable is connected to 5 V (pin 20).

■ Standard Cables

The following standard cables are available for use with the 2-axis Servo Module (SVA-02A). Use these cables to connect the SVA-02A Module to SERVOPACKs and other devices, such as overtravel limit switches.

Table 5.4 Standard Cables

Cable	Model	Length
SGDA-□□□S SERVOPACK Connecting Cables	JEPMC-W6070-05	0.5 m
	JEPMC-W6070-10	1.0 m
	JEPMC-W6070-30	3.0 m
SGDB-□□, SGDM SERVOPACK Connecting Cables	JEPMC-W6071-05	0.5 m
	JEPMC-W6071-10	1.0 m
	JEPMC-W6071-30	3.0 m

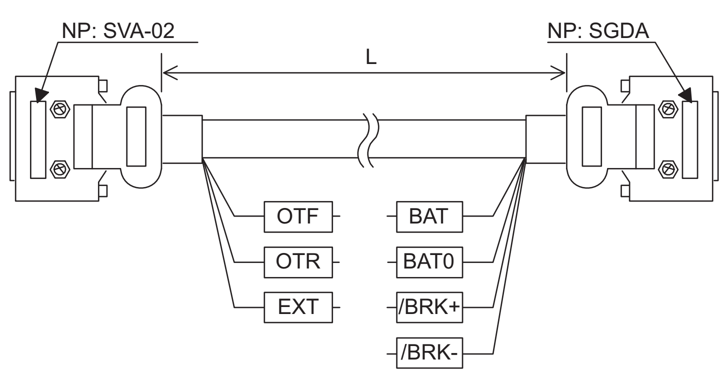
These cables are described below.

■ SGDA-□□□S SERVOPACK Connecting Cables

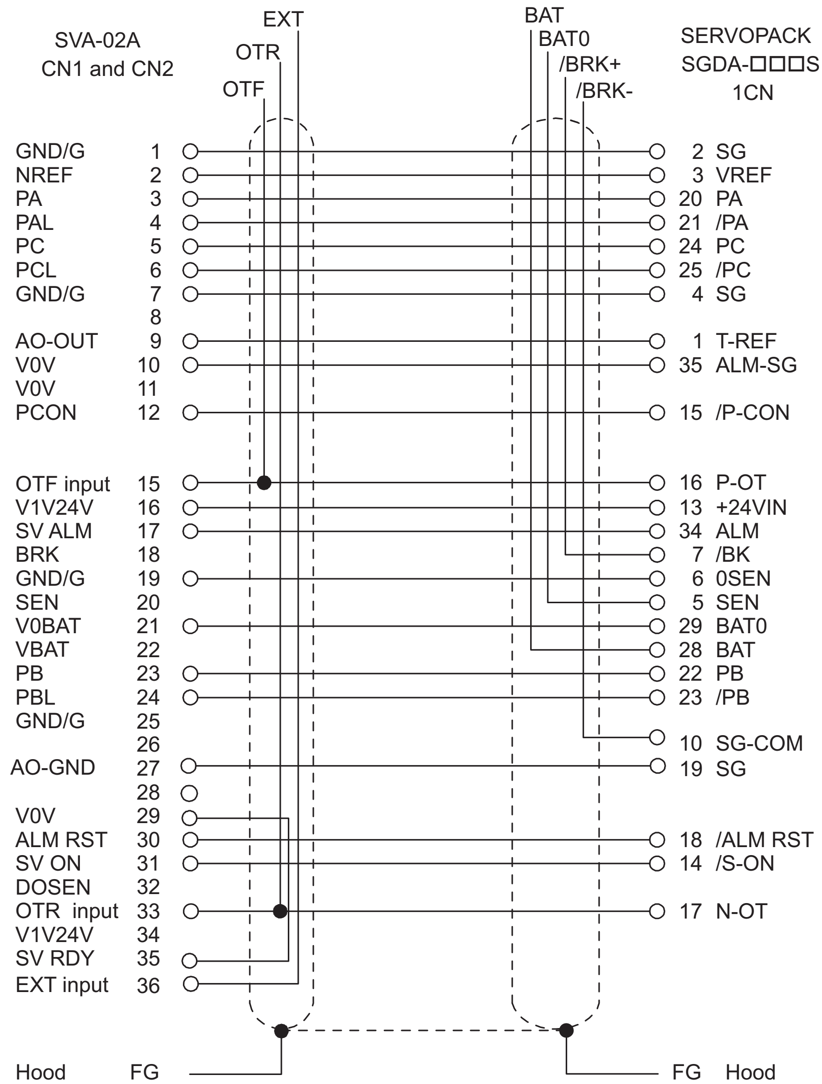
Models

JEPMC-W6070-05: 0.5 m
JEPMC-W6070-10: 1.0 m
JEPMC-W6070-30: 3.0 m

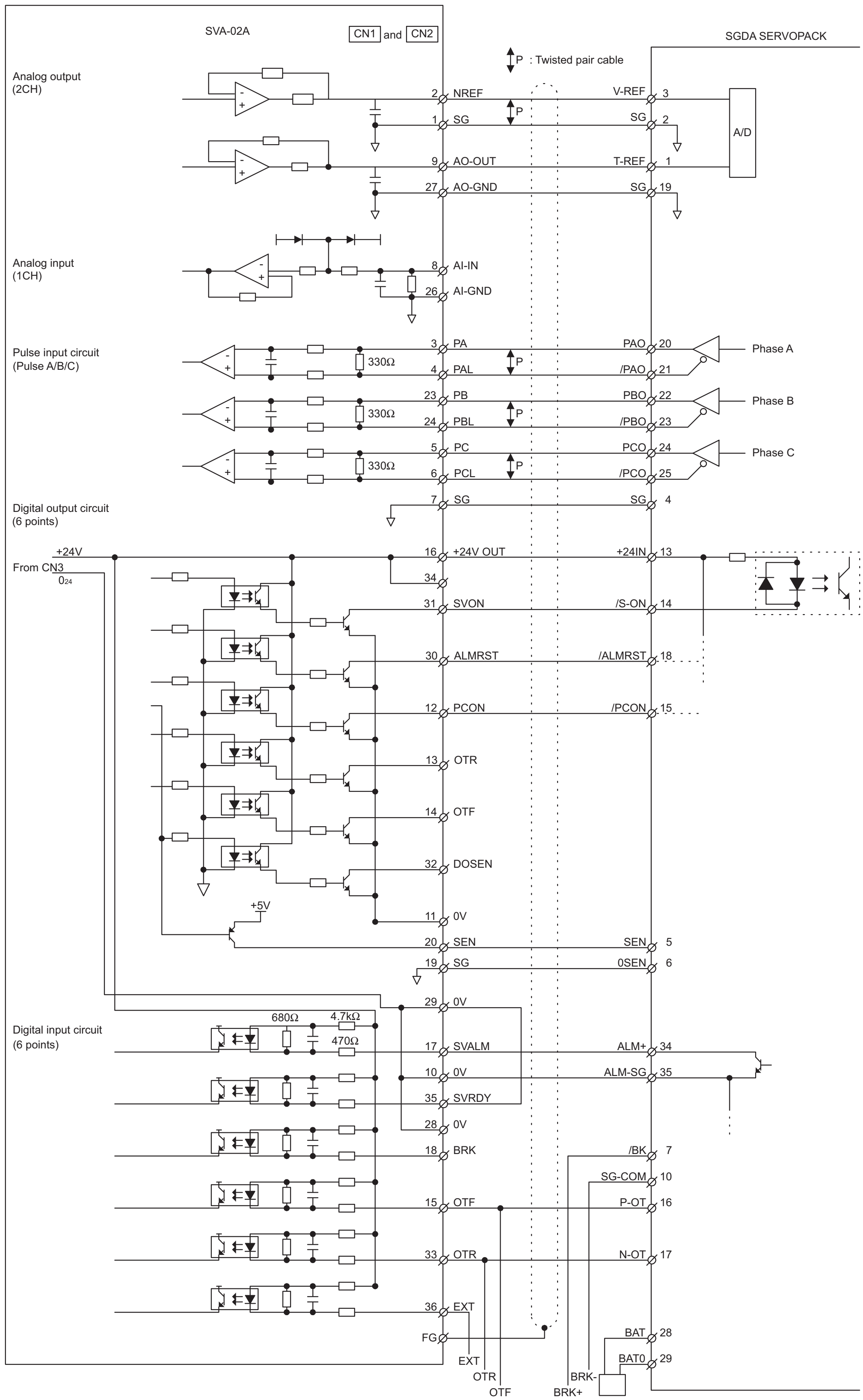
Appearance



Cable Connection Diagram



Example of Connections to SGDA-□□□S SERVOPACK



Connection Example Using JEPMC-W6070-□□ Cables

■ SGDB-□□/SGDM/SGDS SERVOPACK Connecting Cables

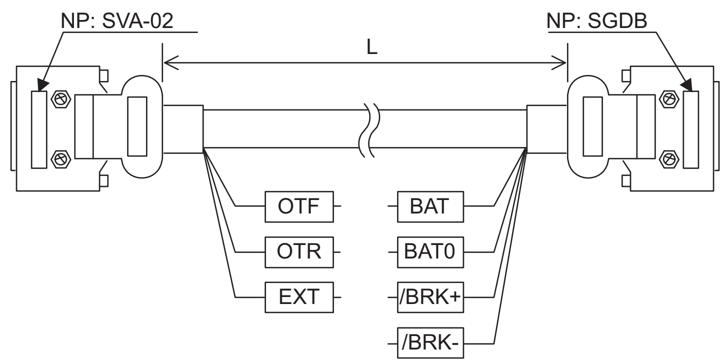
Models

JEPMC-W6071-05: 0.5 m

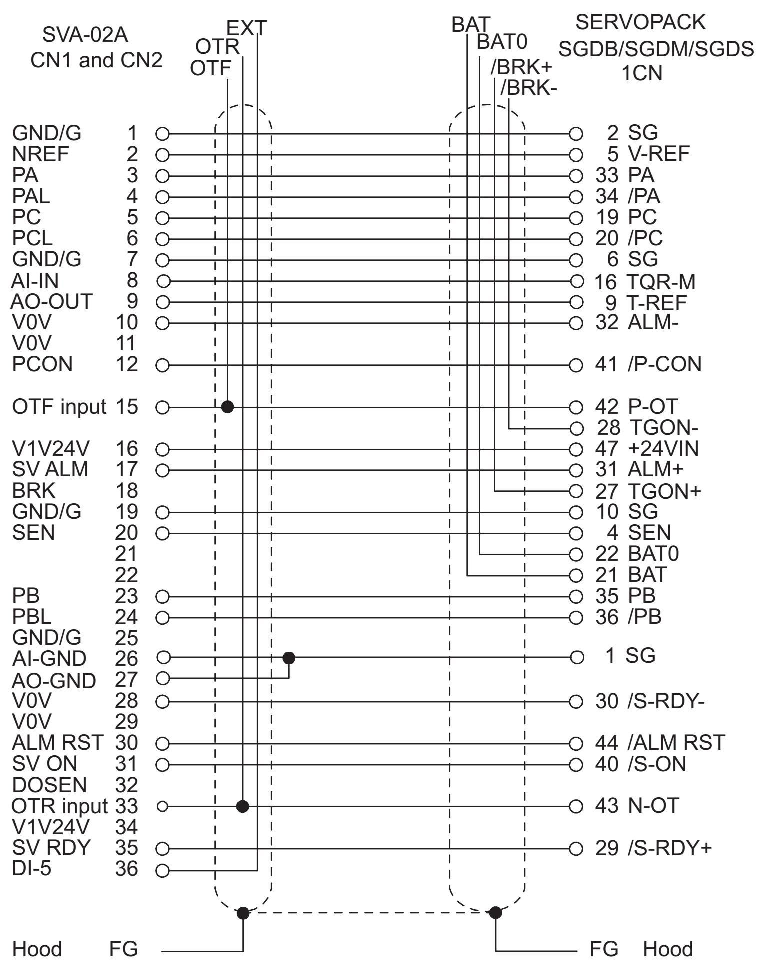
JEPMC-W6071-10: 1.0 m

JEPMC-W6071-30: 3.0 m

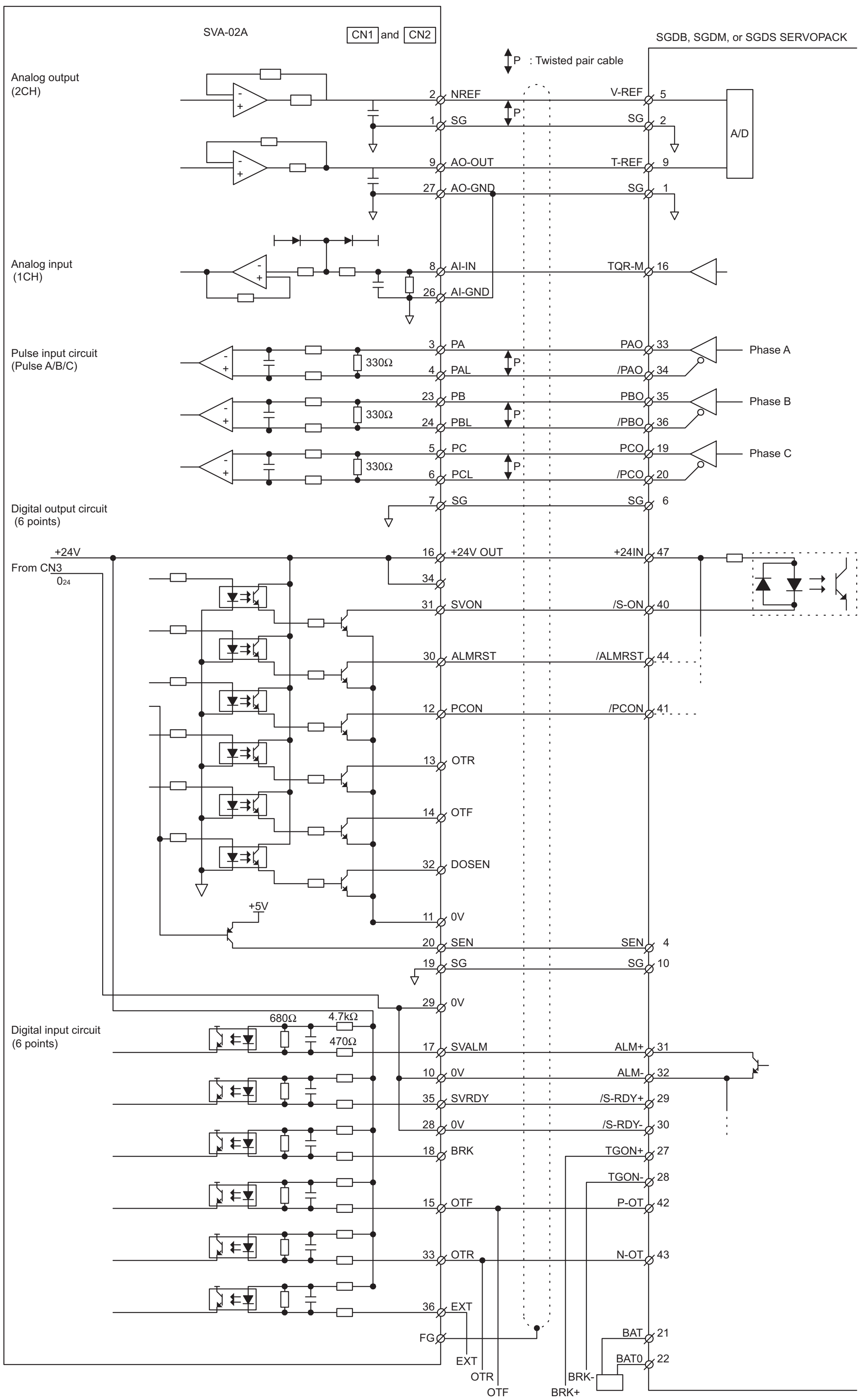
Appearance



Cable Connection Diagram



Example of Connections to SGDB-□□/SGDM/SGDS SERVOPACKs

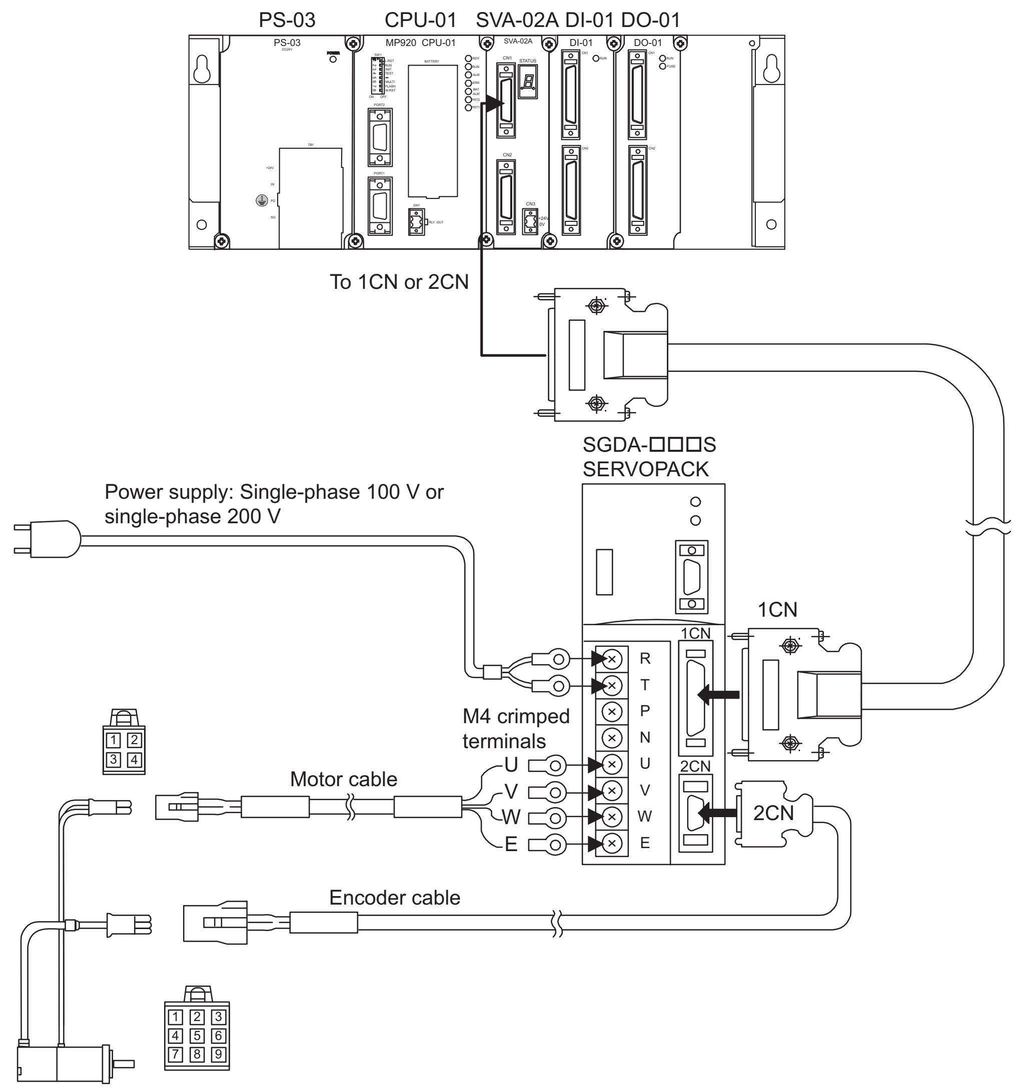


Connection Example Using JEPMC-W6071-□□ Cables

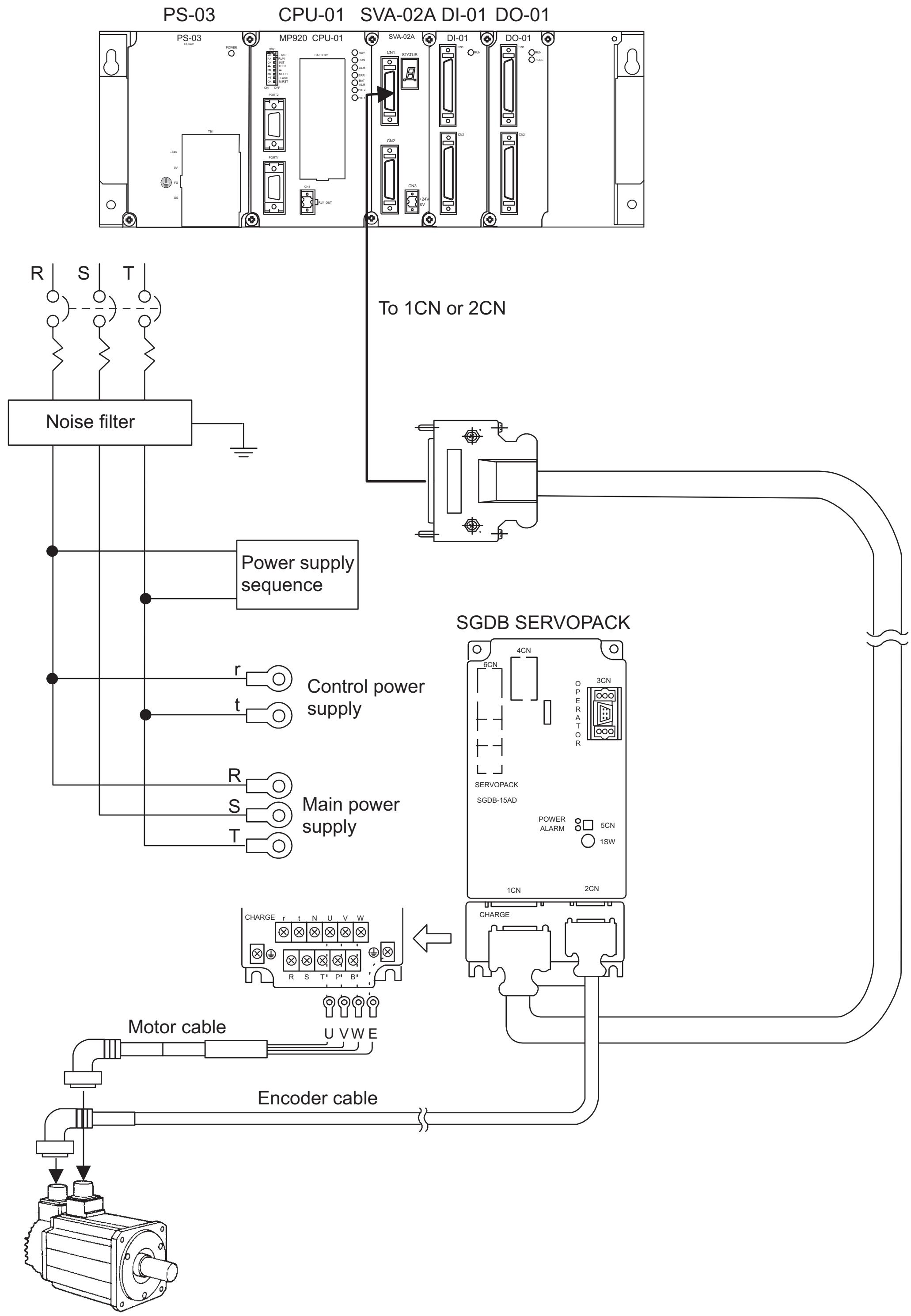
■ Connection of SERVOPACK and Servomotor

Use the special cable and encoder cable to connect the SERVOPACK and Servomotor.

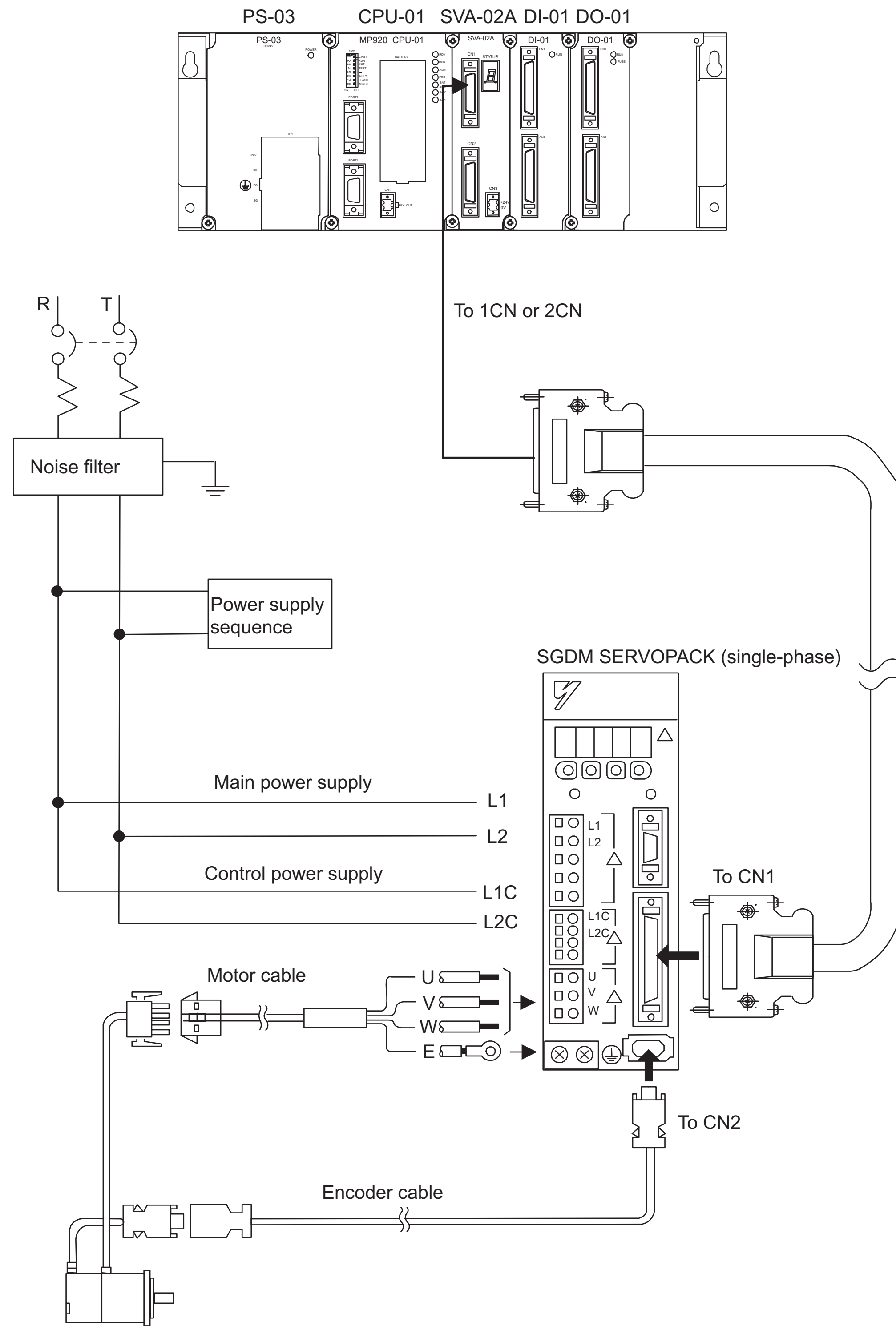
Connection with SGDA-□□□S SERVOPACK



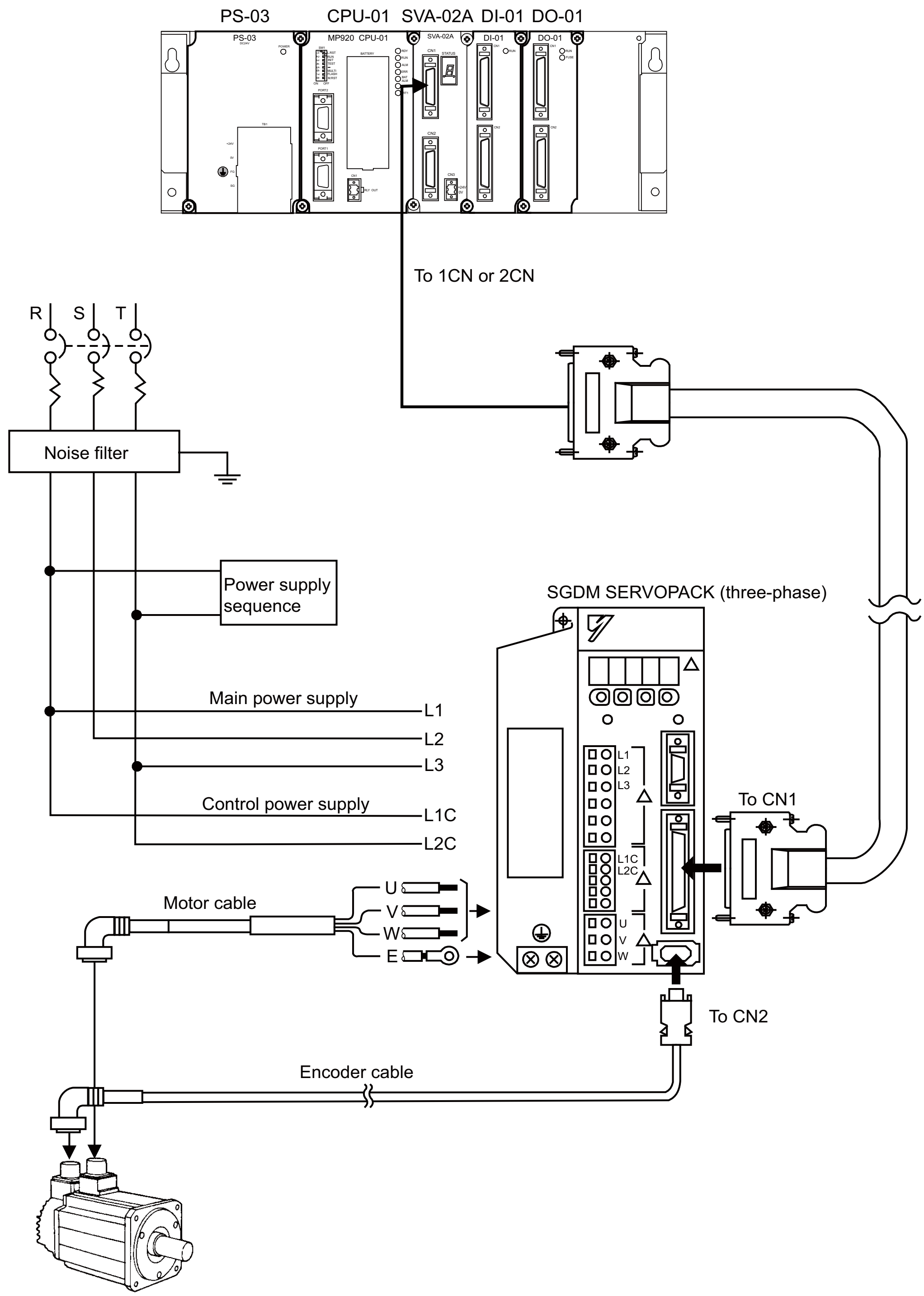
Connection with SGDB SERVOPACK



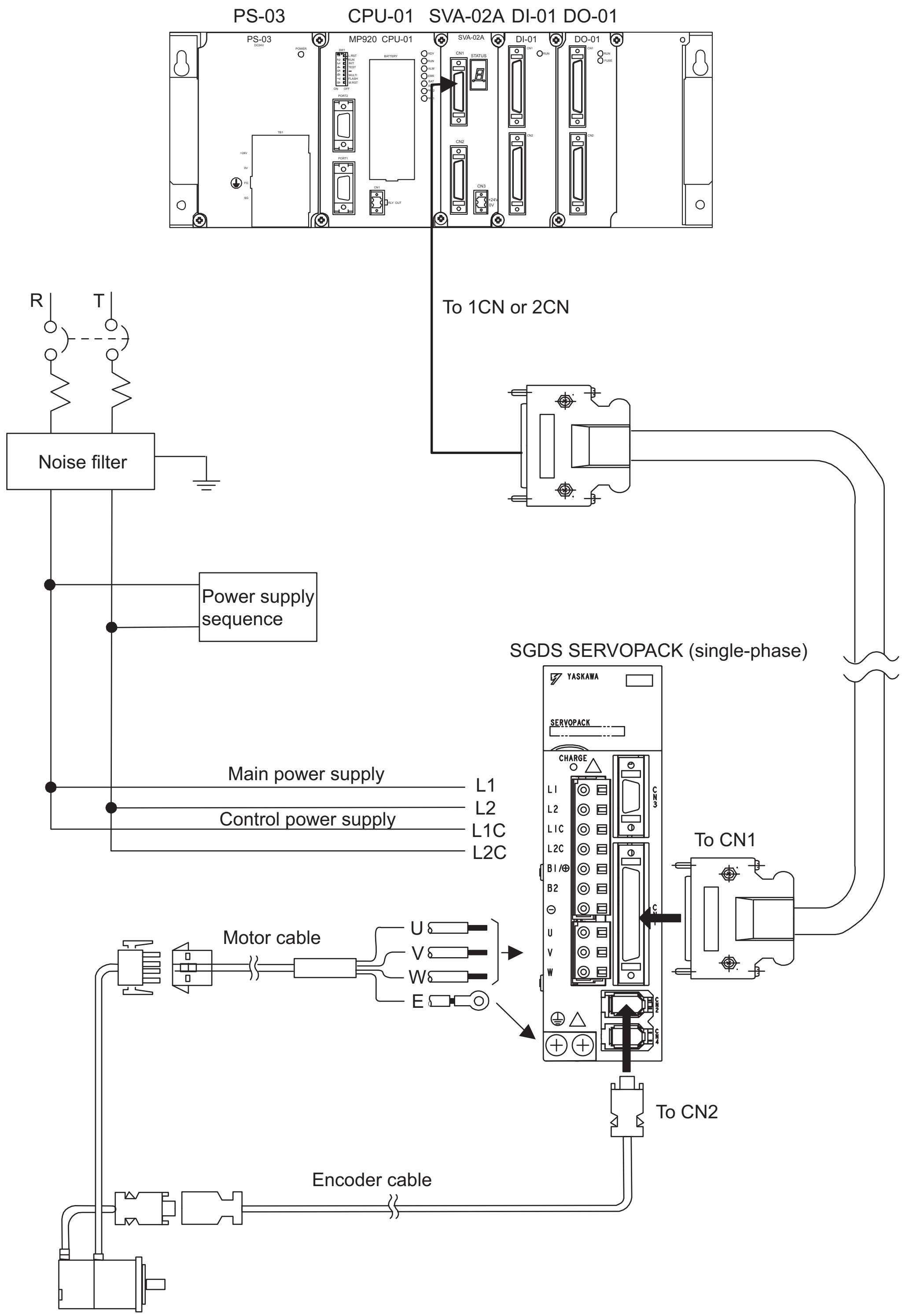
Connection with Single-phase SGDM SERVOPACK



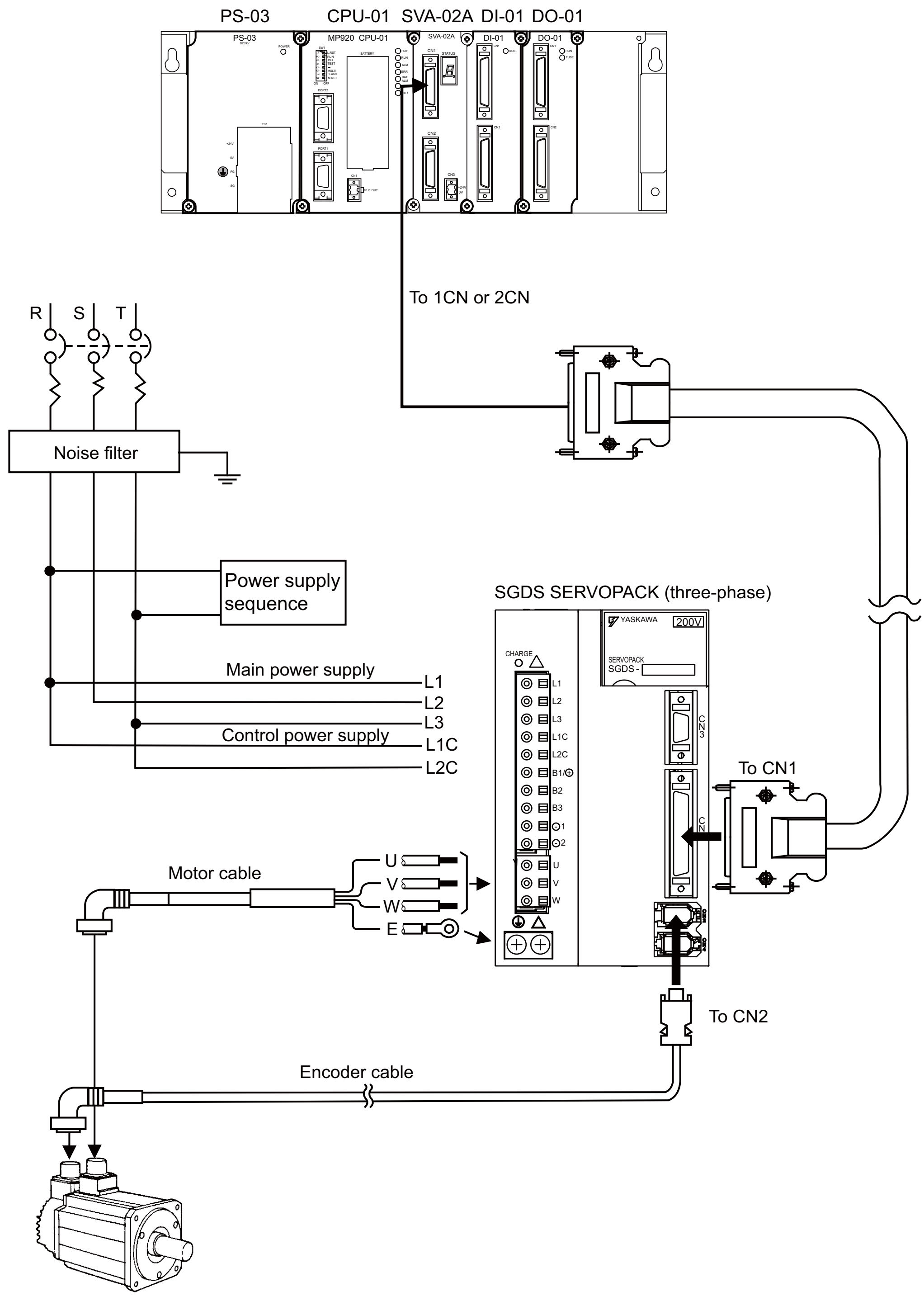
Connection with Three-phase SGDM SERVOPACK



Connection with Single-phase SGDS SERVOPACK



Connection with Three-phase SGDS SERVOPACK



5.3 Differences between SVA-01A and SVA-02A Modules

This section describes differences between the SVA-01A and SVA-02A Modules.

5.3.1 Differences in Hardware

The following table shows differences in hardware between the SVA-01A and SVA-02A Modules.

Item		SVA-01A	SVA-02A
Number of Controlled Axes per Module		4	2
Maximum Number of Modules		15	16
Maximum Number of Controlled Axes		60	32
Control Functions		Speed reference output Synchronized phase control Position control	Speed reference output Synchronized phase control Position control Torque reference output
Hardware Specifica-tions	Analog Outputs	Speed references: PWM 16 bits × 4 channels	Speed references: PWM 16 bits × 2 channels Torque references: D/A 12-bit references × 2 channels
	Analog Inputs	None	16 bits × 2 channels
	Pulse Inputs	A/B/C phase input (selected from 1×, 2×, and 4×), A/B, sign, Up/Down	A/B/C phase input (selected from 1×, 2×, and 4×), A/B, sign, Up/Down
	Pulse Latch Digital Inputs	Zero point latch input (ZERO) and external latch input (EXT) can be switched.	DI-5 (EXT)
	General-purpose Digital Inputs (Servo Connectors)	3 points × 4 channels • SV ALM • SRDY • BRK	6 points × 2 channels • SV ALM • SRDY • BRK • OTF (general-purpose) • OTR (general-purpose) • EXT latch (general-purpose)
	General-purpose Digital Outputs (Servo Connectors)	6 points × 4 channels • SV ON • ALM RST • PCON • SEN • STF • STR	6 points × 2 channels • SV ON • ALM RST • PCON • SEN • OTF (general-purpose) • OTR (general-purpose)

(cont'd)

Item		SVA-01A		SVA-02A
Hardware Specifications (cont'd)	External I/O	Inputs	6 points for each axis • OTF • ZERO • OTR • EXT • DEC • RI	None • The general DI points of servo connectors are used for the OTR, OTF, and EXT. • Allocate the DEC, RI, and RIC to the LIO Module. • ZERO cannot be used.
			1 common point for reserve • RIC	
		Outputs	2 points for each axis • BRK OUT • RO	None • BRK OUT, RO, and ROC have been deleted.
			1 common point for reserve • ROC	
	Absolute Battery Inputs	Battery inputs from external interfaces are output to SERVOPACKs via servo connectors 1CN to 4CN.		Connect the battery power supply directly to SERVOPACKs.
	+24 V Inputs for Servo I/O	+24 inputs from external interfaces are output to SERVOPACKs via servo connectors 1CN to 4CN.		Connect the +24 V input connector to the 3CN connector.

5.3.2 Differences in Servo Connectors

The following table shows differences in servo connectors between the SVA-01A and SVA-02A Modules.

Pin	Signal Name	SVA-01A	SVA-02A	Pin	Signal Name	SVA-01A	SVA-02A
1	SG	Ground (for analog)		10	0V (24V)	0 V (24 V)	
2	NREF	Speed reference		11	0V (24V)	0 V (24 V)	
3	PA	5-V differential pulse input (+)		12	PCON	P operation reference, DO2	
4	PAL	5-V differential pulse input (-)		13	OTR	Overtravel (-)	General-purpose output (OTR) DO-4
5	PC (5V)	5-V differential pulse input (+)		14	OTF	Overtravel (+)	General-purpose output (OTF) DO-3
6	PCL (5V)	5-V differential pulse input (-)		15	General-purpose DI	Not used.	General-purpose input (OTF) DI-3
7	SG	Ground		16	+24V	+24 V power supply	
8	AI_IN	Not used.	Analog input	17	SV ALM	Servo alarm input, DI-0	
9	AO_OUT	Not used.	Analog output	18	BRK	Brake ON input, DI-2	

(cont'd)

Pin	Signal Name	SVA-01A	SVA-02A	Pin	Signal Name	SVA-01A	SVA-02A
19	SG	Ground (for SEN signal)		28	0V (24V)	0 V (24 V)	
20	SEN	SEN signal		29	0V (24V)	0 V (24 V)	
21	0BAT	BAT output terminal (-) for absolute specification	Not used. (Unconnected)	30	ALM RST	Alarm reset, DO-1	
22	BAT	BAT output terminal (+) for absolute specification	Not used. (Unconnected)	31	SV ON	Servo ON, DO-0	
23	PB	5-V differential Pulse-B terminal (+)		32	SEN	SEN output for VS-866	
24	PBL	5-V differential Pulse-B terminal (-)		33	General-purpose DI	Not used.	General-purpose input (OTR) DI-4
25	SG	Ground		34	+24V	+24 V power supply	
26	AI_GND	Not used.	Analog input ground	35	SRDY	Servo ready input, DI-1	
27	AO_GND	Not used.	Analog output ground	36	General-purpose DI	Not used.	General-purpose input DI-5 (External positioning latch)

5

5.3.3 Differences in External I/O Signals

Each signal of the CN5 connector on the SVA-01A Module has been allocated to different connectors on the SVA-02A Module as shown in the following table. Note these differences during connection.

SVA-01A Module CN5 Connectors			SVA-02A Module Connectors		
Pin No.	Signal Name	Remarks	Changed to:	Remarks	
1 26	BAT 0BAT	Absolute encoder battery input terminal (+) Absolute encoder battery input terminal (-) These signals are output to the servo via the servo interface connectors of each axis.	–	Removed	Connect the absolute encoder battery input terminals to the SERVOPACK.
28	OTF IN	Axis-1 overtravel (+) inputs	Servo connector	14	General-purpose input (OTF-IN) DI-3
4	OTR IN	Axis-1 overtravel (-) inputs	Servo connector	33	General-purpose input (OTR-IN) DI-4
29	DEC	Axis-1 deceleration limit inputs	LIO/DI	–	Connect this input terminal to the DI or LIO Module, and set it in OB□□01F using a ladder logic program.
5	ZERO	Axis-1 zero point latch inputs	–	Removed	No ZERO signals are used with the SVA-02A Module.
30	EXT	Axis-1 external positioning latch inputs	Servo connector	36	General-purpose inputs (EXT latch) DI-5
6	RI	Spare axis-1 inputs	LIO/DI	–	Use a LIO or DI Module instead.
7	BRK OUT1	Axis-1 brake control outputs	–	–	Output this signal directly from the SERVOPACK to the brake.
32	RO1	Spare axis-1 outputs	LIO/DO	–	Use a LIO or DI Module instead.
–	–	–	–	–	–
23	RIC	Spare common inputs	–	Removed	–
48	ROC	Spare common outputs	–	Removed	–
24	+24 V	24-V power supply for servo	CN3	1 2	A 24-V input connector has been added.
49	+24 V	24-V power supply for servo	–	–	–
25	0 V (24 V)	0-V power supply for servo	–	–	–
50	0 V (24 V)	0-V power supply for servo	–	–	–

5.3.4 Precautions on Connecting the SVA-02A Module

Observe the following precautions when connecting the SVA-02A Module.

- Connect the 24-V servo I/O power supply to the CN3 connector.
- Connect the absolute encoder battery power supply directly to the SERVOPACK.
- Connect the OTF, OTR, and EXT signal terminals to the general-purpose input terminals on the servo connector.
- Output brake output (BRK) signals directly from the SERVOPACK to the brake.
- Zero point latch input (ZERO) signals are not used with the SVA-02A Module.
- Connect the deceleration limit (DEC) signal terminal to the LIO or DI Module, and set it in OB□□01F, using ladder logic programming.

IMPORTANT

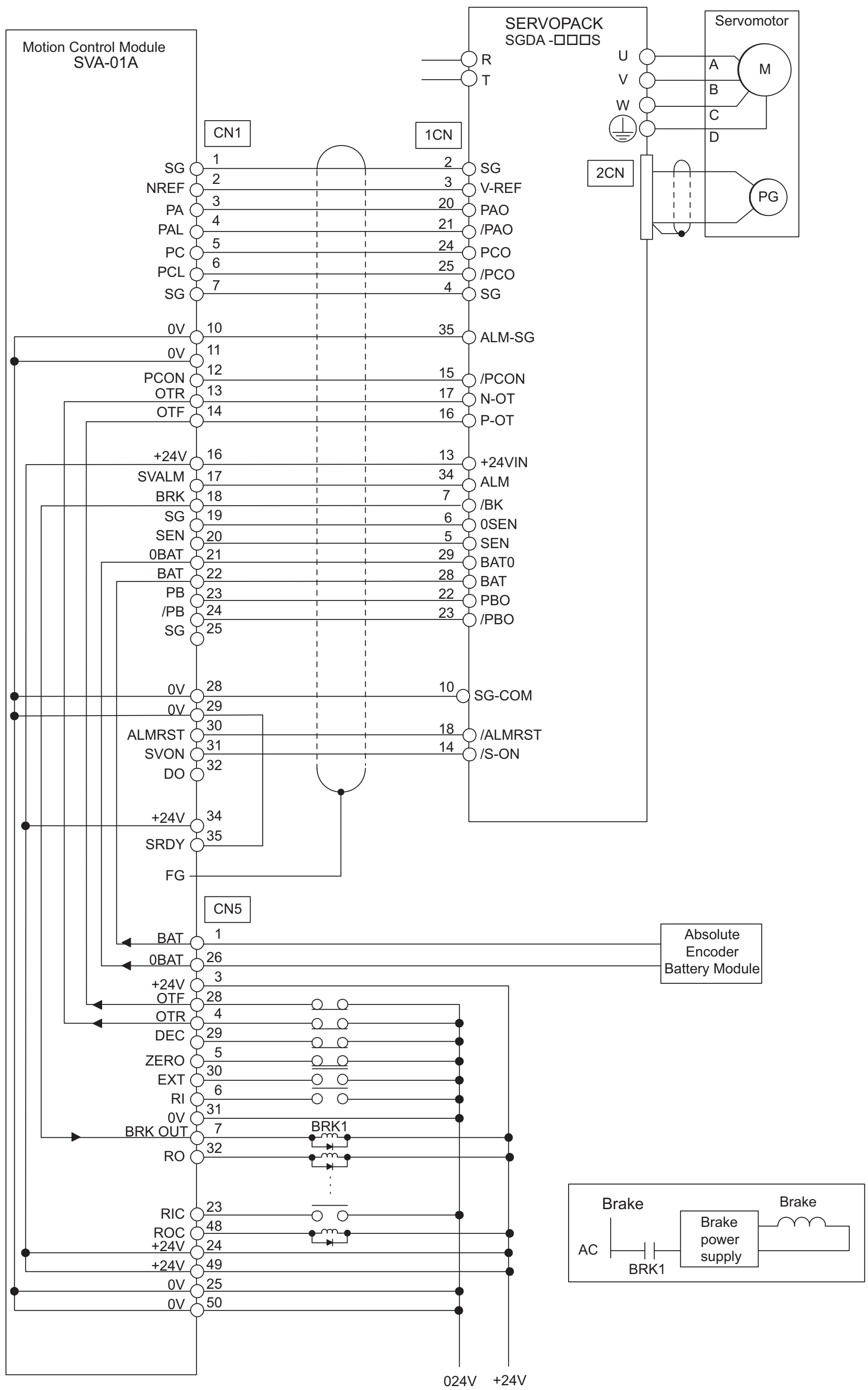
■ Overtravel Function for SVA-02A Module

Note the following items when using the overtravel function for the SVA-02A Module.

- Set bits 13 (Positive Overtravel Selection) and 14 (Negative Overtravel Selection) of fixed parameter No. 17 (Motion Controller Function Selection Flags) to 1 (Enabled).
- Connect the OTF and OTR signal terminals to the general-purpose input terminals of the CN1 and CN2 servo connectors.
  With the standard cables, the OTF and OTR signal terminals are also connected to the P-OT and N-OT terminals on the SERVOPACK. Therefore, overtravel processing for the SVA-02A Module is performed in the same way as for the SVA-01A Module.

5.3.5 Connection with SGDA-□□□S SERVOPACK

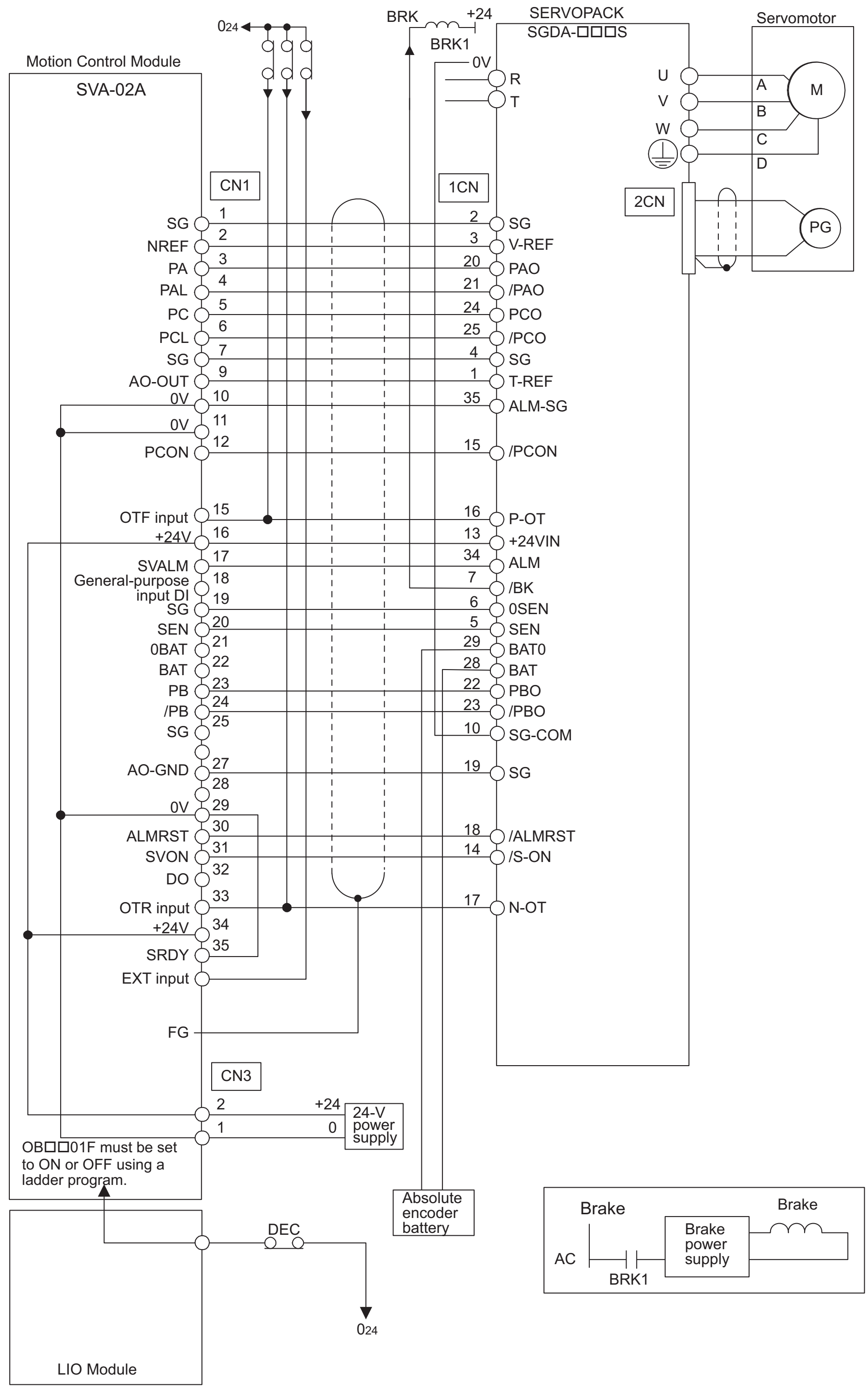
■ SVA-01A Module



The following signal terminals connected to external I/O connectors are connected to the servo connector signal terminals of each axis in the SVA-01A Module.

- 24-V power supply
- Absolute encoder battery power supply
- OTF and OTR input signals
- BRK signal

■ SVA-02A Module



IMPORTANT

The following signals for the SVA-02A Module are different from those for the SVA-01A Module.

- Connect the OTF, OTR, and EXT input terminals directly to the CN1 connector.
- Connect the BRK signal terminal from the SERVOPACK 1CN connector.
- Connect the 24-V servo I/O power supply to the CN3 connector.
- Connect the absolute encoder battery to the SERVOPACK 1CN connector.
- Connect the DEC signal input terminal to the LIO or DI Module, and create ladder logic programming to set OB☐☐01F to ON or OFF.

5

5.4 SVA-01A and SVA-02A Parameters

This section details various parameters used for the SVA-01A and SVA-02A Modules.

5.4.1 Motion Fixed Parameters

IMPORTANT

Motion fixed parameters cannot be changed if the current value of bit 0 is ON in motion setting parameter OW☐☐01, RUN Command Settings.
Positions and other data are initialized when a motion fixed parameter is changed.

Table 5.5 Motion Fixed Parameters

No.	Name		Description		Factory Setting
1	Axis Selection (USESEL)		Set whether an axis is used or not. 0: Not used. 1: Used. If an axis is set to be not used, then that axis will not be controlled and IW☐☐00 to IW☐☐3F monitoring parameters will not be updated. “0” will stored at IW☐☐00 RUN Status.		0 (Not used)
2	PG Signal Form Selections (PGSEL)		Set the form and polarity of the PG input signal.		–
		Bits 0 to 7	Not used.	–	–
		Bit 8	Pulse-A/B Input Signal Polarity Selection (ABPISEL)	Set the polarity of the pulse-A/B input signal. 0: Positive logic 1: Negative logic	0 (Positive logic)
		Bit 9	Pulse-C Input Signal Polarity Selection (CPISEL)	Set the polarity of the pulse-C input signal. 0: Positive logic 1: Negative logic	0 (Positive logic)
		Bits 10 to 15	Not used.	–	–
3	Encoder Selection (ENCSEL)		Set the type of encoder that is used. 0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as an incremental encoder.		0 (Incremental encoder)
4	Rotation Direction Selection with an Absolute Encoder (DIRINV)		Set the rotation direction when using an absolute encoder. 0: Forward rotation selection 1: Reverse rotation selection Set reverse rotation direction (= 1) in the following situations. • When the DIR terminal of the SERVOPACK is connected to 0 V and reverse rotation connection is selected when using an absolute encoder-compatible SERVOPACK. Refer to the SERVOPACK operating manual for details on reverse rotation connection with a SERVOPACK. • When the Reverse Direction Selection (Cn30 bit 8) of the VS-866 is set to ON when using an absolute encoder-compatible VS-866. Reverse the PB0 connection to ensure the same phase relationship as the SERVOPACK. Refer to the VS-866 user’s manual for details.		0 (Forward rotation)

Table 5.5 Motion Fixed Parameters (cont'd)

No.	Name	Description	Factory Setting
5	Pulse Counting Mode Selection (PULMODE)	Set the pulse counting method. Set one of the following seven modes to match the pulse read method for the system that is used. 0: Sign, ×1 1: Sign, ×2 2: Up/Down, ×1 3: Up/Down, ×2 4: A/B pulses, ×1 5: A/B pulses, ×2 6: A/B pulses, ×4	6 (A/B pulses × 4)
6	Not used.	–	–
7	Rated Motor Speed Setting (NR)	Set motor speed at rated (100%) operation in 1 min^{-1} units. Set this parameter based on the specifications of the Servomotor that is used.	3000
8	Number of Feedback Pulses per Rotation (FBppr)	Set the number of feedback pulses per Servomotor rotation (no multiplier). Set this parameter based on the specifications of the encoder that is used. • Setting range: Set a multiple of 4 between 4 and 65532 (p/r).	2048
9	D/A Output Voltage at 100% Speed (V1)	Set the D/A output voltage when the speed reference is set to 100%. Normally set the rated rotation input voltage of the servo drive. Set this parameter based on the specifications of the servo drive that is used. • Setting range: 0.001 to 10.000 (V) • D/A output = (OW□□15: Speed Reference Setting × D/A Output Voltage at 100% Speed (fixed parameter 9) / 10000 Example: D/A output voltage setting at 100% speed = 6 V If the speed reference value = 100%, then (10000 ×6 V) / 10000 = 6.0 V is output.	6.000
10	D/A Output Voltage at 100% Torque Limit (V2)	Set the D/A output voltage when the torque limit reference is set to 100%. The voltage is the same on the positive and negative sides. Normally set the current limit when using a SERVOPACK and the torque limit when using a VS-866. Set this parameter based on the specifications of the servo drive that is used. • Setting range: 0.001 to 10.000 (V) • D/A output = (OW□□02: Positive Torque Limit Setting × D/A Output Voltage at 100% Torque Limit (fixed parameter 10)) / 10000 Example: D/A Output Voltage at 100% Torque Limit = 3 V If the Positive Torque Limit Setting = 200%, then (20000 × 3 V) / 10000 = 6.0 V is output. Note: Valid only for SVA-02A (2-axis) Module.	3 V (= 3.000)
11	Input Voltage at 100% Speed Monitoring (A/D) (MV1)	Set scaling in 1 mV units in order to convert the voltage input from the A/D converter to a speed monitor value (%). • Setting range: 0.001 to 10.000 (V) The speed monitor value is calculated using the following equation and is indicated at IW□□0D: Speed Monitor. • Speed monitor value = (A/D input voltage × 10000) / Input Voltage at 100% Speed Monitoring (A/D) Example: Input voltage setting at 100% speed monitoring (A/D) = 6 V If the actual A/D input voltage = 3 V, then (3 V × 10000) / 6.0 V = 5000 is indicated at IW□□0D. Note: Valid only for SVA-02A (2-axis) Module.	6.000
12	Not used.	–	–
13	DI Latch Signal Selection (DIINTSEL)	Set the external signal that is used to latch DI. 0: Use the DI signal as a latch signal. 1: Use the Pulse C as the latch signal.	0

Table 5.5 Motion Fixed Parameters (cont'd)

No.	Name		Description		Factory Setting
14	Additional Function Selections (AFUNCSEL)		Set additional functions, such as the signal type used and signal functions.		–
		Bits 0 to 1	Not used.	–	–
		Bit 2	Limit Switch Signal Selection (LIMITSEL)	Set whether to use OB□□0IF or DI signal DI05 as the limit switch signal when returning to the zero point. 0: Use OB□□01F. 1: Use the DI signal (DI05 deceleration limit signal). When using OB□□01F, the external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□01F. Note: Valid only for SVA-01A (4-axis) Module.	0
		Bits 3 to 5	Not used.	–	–
		Bit 6	Absolute Position Read at Startup (ABSRDSEL)	Set whether or not to read absolute position data from the absolute encoder when MP920 power is turned ON. 0: Read. 1: Not read. Note: Valid only when the fixed parameter: Encoder selection is selected for the absolute encoder.	0 (Read)
		Bit 7	Motion Command Code Selection (MCMDSEL)	Set whether or not to use an OW□□20: Motion Command Code when bit 2 of OW□□00: Position Control Mode is selected. 0: Not used. 1: Used.	1 (Used)
		Bit 9	Σ-II Series SERVOPACK Selection	Set to 1 (ON) when using Σ-II series SERVOPACKs. 0: OFF, 1: ON	0 (OFF)
		Bits 12 to 15	Error Count Alarm Detection Setting Coefficient	An error is detected when P Error Counter Over (IW□□001) = Error Count Alarm Detection Setting (OW□□0F) × 2^n (n = 0 to 15)	0
15	Not used.		–		–

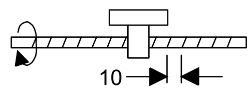
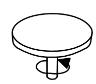
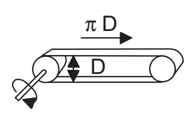
Table 5.5 Motion Fixed Parameters (cont'd)

<table>
<tr><th>No.</th><th>Name</th><th colspan="2">Description</th><th>Factory Setting</th></tr>
<tr><td>16</td><td>Simulation Mode Selection (SIMULATE)</td><td colspan="2">0: Normal operation mode
1: Simulation mode
2: Factory adjustment mode
Normally set to 0 (normal operation mode).
When setting to 1 (simulation mode), the simulation of the operation in position/phase/speed/torque control mode (only for the SVA-02A Modules) can be executed without actually connecting servo drives. Then the simulation values will be written into the servo parameters for monitoring such as position monitoring parameter.
The simulation mode can be used for debugging application programs.
Note that the following functions cannot be simulated.
• DI latch detection • Absolute position read
• Zero point return mode • A/D input (only for SVA-02A Modules)
When the simulation mode is selected, 0 is output to the DO*1 of the corresponding axis (Axis 1 to Axis 4), and 0V is output to D/A*2.
* 1. SVA-01A: Pins 12, 30, and 31 of CN1 to CN4 and pins 7, 12, 17, 22, 32, 37, 42, 47, and 48 of CN5
SVA-02A: Pins 12, 13, 14, 30, and 31 of CN1 and CN2
* 2. SVA-01A: Pins 2 of CN1 to CN4
SVA-02A: Pins 2 and 9 of CN1 and CN2
Note: Do not set to 3 (factory adjustment mode). This mode is used only for the final test before shipment.</td><td>0
(Normal operation mode)</td></tr>
<tr><td rowspan="4">17</td><td>Motion Controller Function Selection Flags (SVFUNCSEL)</td><td colspan="2">Set whether a function is enabled or disabled when a motion command is used.</td><td>–</td></tr>
<tr><td>Bits 0 to 3</td><td>Reference Unit Selection (CMD_UNIT)</td><td>Set the reference unit that is input.
0: pulse (electronic gear disabled)
1: mm
2: deg
3: inch
Set 0 to 3. When a unit is selected, the minimum unit that can be used as reference is determined by motion fixed parameter no. 18: Number of Digits Below the Decimal Point.</td><td>0
(pulse)</td></tr>
<tr><td>Bit 4</td><td>Electronic Gear Selection (USE_GEAR)</td><td>Set whether or not to use the electronic gear function.
0: Disabled
1: Enabled
The electronic gear is disabled even if this flag is enabled when pulse is selected as the reference unit.</td><td>0
(Disabled)</td></tr>
<tr><td>Bit 5</td><td>Axis Selection (PMOD_SEL)</td><td>Finite length/infinite length axis selection.
Set whether or not there is a limit on controlled axis movement.
0: Finite length axis
• The axis will have limited movement.
• The software limit function is enabled.
1: Infinite length axis
• The axis will have unlimited movement.
• The software limit function is disabled.</td><td>0
(Finite length axis)</td></tr>
</table>

Table 5.5 Motion Fixed Parameters (cont'd)

No.	Name		Description		Factory Setting
17		Bit 6	Backlash Compensation Enabled Selection (USE_BKRSH)	Set whether or not to enable backlash compensation. 0: Disabled 1: Enabled	0 (Disabled)
		Bit 7	Positive Software Limit Selection (USE_SLIMP)	Set whether or not to use the software limit function in the positive direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter 27. • Software Limit Function Enable Timing Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)
		Bit 8	Negative Software Limit Selection (USE_SLIMN)	Set whether or not to use the software limit function in the negative direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter 29. • Software Limit Function Enable Timing Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)
		Bit 9	Override Selection (USE-OV)	Set whether or not to use the override function. 0: Disabled 1: Enabled The OW□□2C: Override is used when this parameter is set to Enabled. The override is fixed at 100 if this parameter is disabled. Note: The override function allows the feed speed setting to be modified in an application.	0 (Disabled)
		Bit 10	Deceleration Limit Switch Inversion Selection (INV_DEC)	Set whether or not to invert and use the limit switch signal (speed limit switch) when returning to the zero point. 0: Not inverted 1: Invert	0 (Not inverted)
		Bits 11 to 12	Not used.	–	–
		Bit 13	Positive Overtravel Selection (OVT1-SEL)	Set whether or not to use the overtravel function in the positive direction. 0: Disabled 1: Enabled	0 (Disabled)
		Bit 14	Negative Overtravel Selection (OVT2-SEL)	Set whether or not to use the overtravel function in the negative direction. 0: Disabled 1: Enabled	0 (Disabled)
		Bit 15	Not used.	–	–
18	Number of Digits Below Decimal Point (DECNUM)		Set the number of digits to the right of the decimal point in input reference units. The minimum reference unit is determined by this parameter and Reference Unit Selection in the Motion Controller Function Selection Flags (bit 0 to bit 3).		3

Table 5.5 Motion Fixed Parameters (cont'd)

<table>
<tr><th>No.</th><th>Name</th><th colspan="2">Description</th><th>Factory Setting</th></tr>
<tr><td rowspan="4">19</td><td rowspan="4">Travel Distance Per Machine Rotation (PITCH)</td><td colspan="2">Set the load travel distance (reference unit) per load axis rotation.
• Setting range: 1 to 2^{31}-1</td><td rowspan="4">10000</td></tr>
<tr><td>Ball screw

Ball screw pitch = 10 mm</td><td>Ball screw pitch = 10 mm
Reference Unit Selection = mm
Number of digits below decimal point = 3
↓
Set the travel distance per machine rotation to 10000.</td></tr>
<tr><td>Rotating table

One rotation = 360°</td><td>One table rotation = 360°
Reference Unit Selection = deg
Number of digits below decimal point = 3
↓
Set the travel distance per machine rotation to 360000</td></tr>
<tr><td>Belt
</td><td>One roller rotation = 360°
Reference Unit Selection = mm
Number of digits below decimal point = 3
↓
Set the travel distance per machine rotation to $\pi D \times 1000$.</td></tr>
<tr><td>21</td><td>Servomotor Gear Ratio (GEAR_MOTOR)</td><td colspan="2" rowspan="2">These parameters determine the gear ratio between the motor and the load.
The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft.
• Gear ratio at Servomotor: m
• Gear ratio at load: n

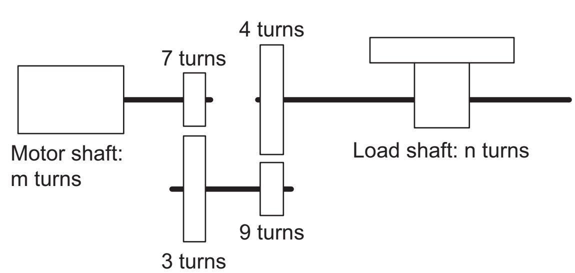
Setting Example

In the above example, the reduction ratio is n/m, or $3/7 \times 4/9 = 4/21$. The following setting would thus be made.
Servomotor Gear Ratio: 21
Load Gear Ratio: 4</td><td>1</td></tr>
<tr><td>22</td><td>Machine Gear Ratio (GEAR_MACHINE)</td><td>1</td></tr>
</table>

Table 5.5 Motion Fixed Parameters (cont'd)

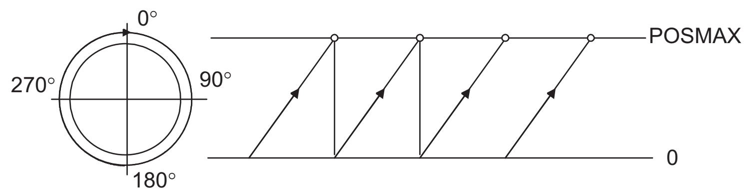
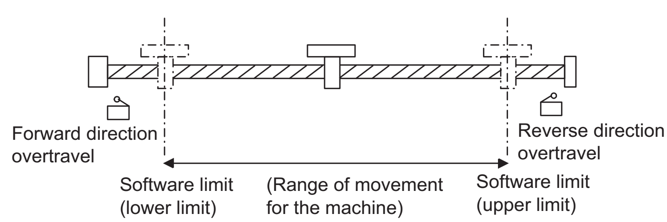
No.	Name	Description	Factory Setting
23	Infinite Length Axis Reset Position (POSMAX)	Set the reset position for a rotation when infinite length axis is set. This parameter is not valid when a finite length axis is set. • Setting range: 1 to 2^{31}-1 [reference units] Example: For a rotating load, the value will be reset every 360°. 	360000
25	Maximum Number of Absolute Encoder Turns (MAXTURN)	Set the maximum number of rotations for the absolute encoder when an absolute encoder is used. • Setting range: 1 to 2^{31}-1 [rotations] Refer to *Chapter 8 Absolute Position Detection* of *Machine Controller MP920 Use's Manual: Design and Maintenance* (SIEZ-C887-2.1) for details.	99999
27	Positive Software Limit (SLIMP)	Set the positions at which the software limit function is to operate on the machine coordinate system. • Setting range: 1 to 2^{31}-1 [reference units] Whether or not the software limits are used is set in bit 7 and bit 8 of the Servo Controller Function Selection Flags at fixed parameter no. 17. With the software limits, the upper and lower limits of the range of movement for the machine system are set at fixed parameters and the operating range is constantly monitored by the controller. 	2147483647
29	Negative Software Limit (SLIMN)		-2147483648
31	Zero Point Return Method (ZRETSEL)	Set the zero point return method when returning to the zero point (ZRET) using OW□□20: Motion Command Code. Refer to Zero Point Return Method on the next page for details.	0 (DEC + Phase-C pulse)
32	Backlash Compensation	Set the backlash compensation in reference units when the Backlash Compensation Selection (bit 6 of the Servo Controller Function Selection Flags at fixed parameter no. 17) is set to enabled.	0 (Not valid)
33	Not used.	–	–
35	Not used.	–	–
36	Bias Speed for the Exponential Acceleration/Deceleration Filter (EXPBIAS)	Set the bias speed for exponential acceleration/deceleration with bias. Note: This parameter is valid only for SVA-02A (2-axis) Modules.	0 (Not valid)

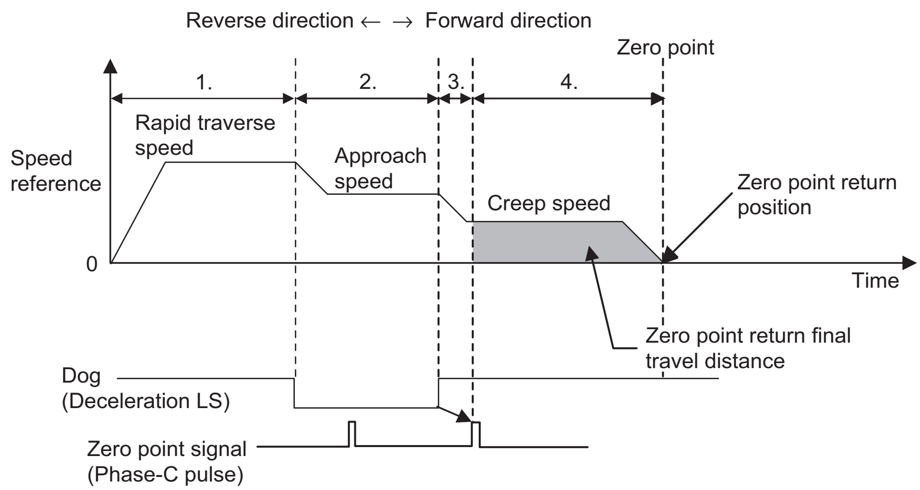
Table 5.5 Motion Fixed Parameters (cont'd)

No.	Name	Description	Factory Setting
37 to 48	Not used.	–	–

The following zero point return methods are available.

■ 0: DEC 1 + Phase-C Pulse

This method has three speed levels.



■ 1: Zero Signal

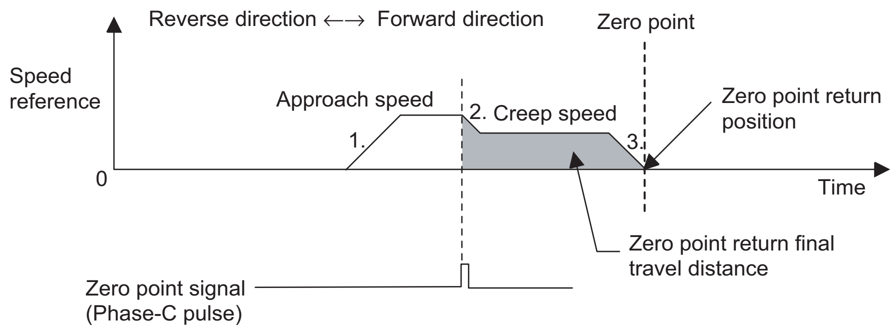
In place of the Phase-C pulse of the Phase-C pulse method, this method uses the zero signal to return to the zero point.

■ 2: DEC 1 + Zero Signal

In place of the Phase-C pulse of the DEC 1 + Phase-C pulse method, this method uses the zero signal to return to the zero point.

■ 3: Phase-C Pulse

This method uses just the Phase-C pulse of the Servomotor to return to the zero point in machines that are not equipped with deceleration LS and other capabilities.



■ 4: DEC 2 + Zero Signal

In place of the Phase-C pulse of the DEC 2 + Phase-C pulse method, this method uses the zero signal to return to the zero point.

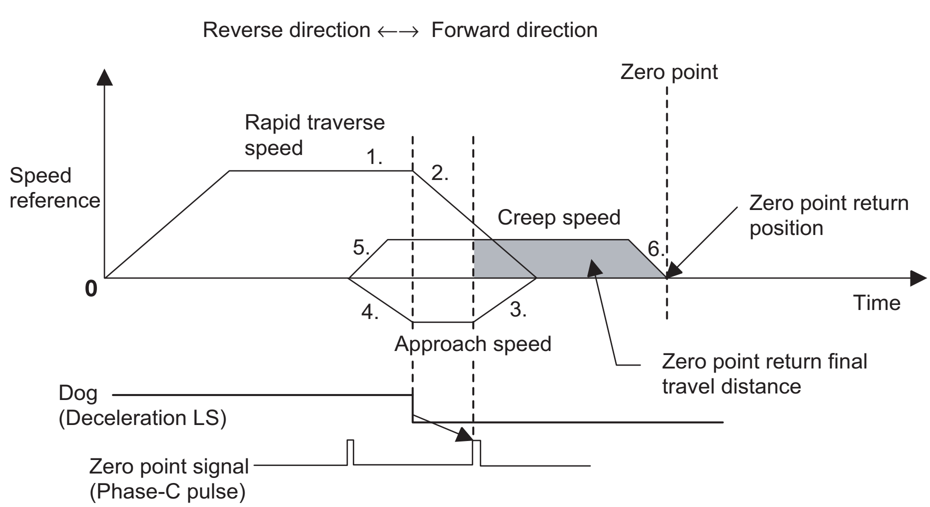
■ 5: DEC 1 + LMT + Zero Signal

In place of the Phase-C pulse of the DEC 1 + LMT + Phase-C pulse method, this method uses the zero signal to return to the zero point.

■ 6: DEC 2 + Phase-C Pulse

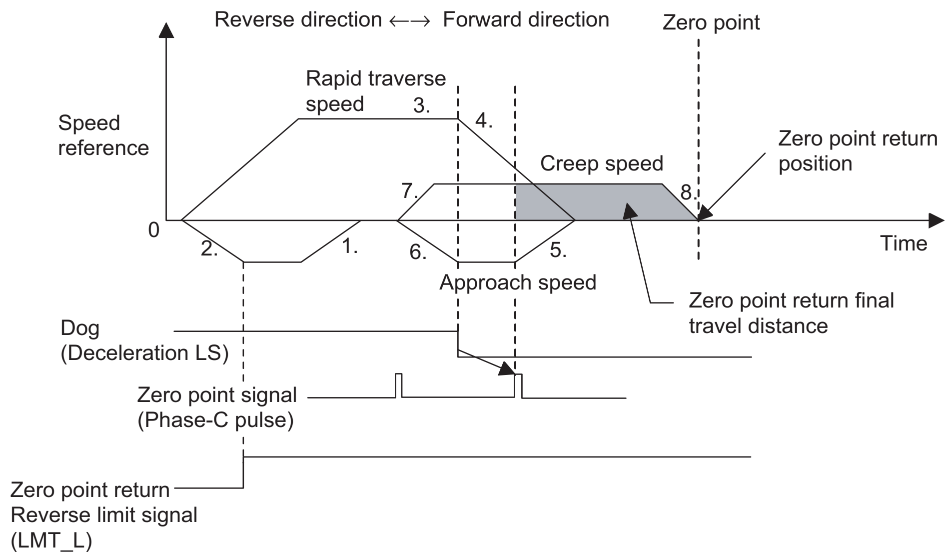
This method searches for the zero point at creep speed after going in reverse at approach speed.

It is used for machines that require excellent repeatability accuracy.



■ 7: DEC 1 + LMT + Phase-C Pulse

This method gets the current position from the forward/reverse LMT signal and escapes automatically. It can return to the zero point from any position.



5.4.2 Motion Setting Parameters

⚠ CAUTION

- Zero Point Position Offset in the Machine Coordinate System (ABSOFF)
  This register contains data used by SVA Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation.

  Obstructions may damage tools and lead to personal injury if this check is not performed.

Table 5.6 Motion Setting Parameters

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
1	RUN Mode Settings (RUNMOD)	OW☐☐00	Set the RUN mode, such as Control Mode and Alarm Reset. The bit configuration is shown below. 0: OFF, 1: ON		
		Bit 0	Speed Reference Output Mode (NCON)	Used to set Speed Reference Output Mode.	0
		Bit 1	Torque Reference Output Mode (TCON)	Used to set Torque Reference Output Mode. Note: Valid only for SVA-02A (2-axis) Module.	0
		Bit 2	Position Control Mode (PCON)	Used to set Position Control Mode.	1
		Bit 3	Phase Control Mode (PHCON)	Used to set Phase Control Mode.	0
		Bit 4	Zero Point Return Mode (ZRN)	Used to set Zero Point Return Mode.	0

■ Supplemental Explanation 1

1. The priority of the OW☐☐00: RUN Mode Settings and the OW☐☐01: RUN Command Settings is as follows:

   The highest priority control mode will be executed if both turned ON at the same time.

   High Priority ← Low Priority

   RUN > ZRN > NCON > TCON > PCON > PHCON

2. If bit 0 of OW☐☐01: RUN signal turns OFF during operation, operation will depend on the Control Mode.

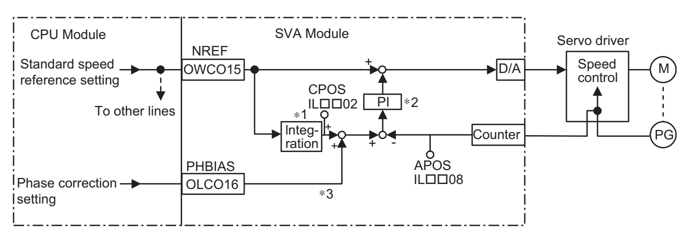
   a) Position, Speed, Phase Control, or Zero Point Return Mode

   The RUN signal will remain ON from the current speed reference until the machine decelerates to a stop in accordance with the OW☐☐0D: Linear Deceleration Time Constant that was set.

b) Torque Reference Output Mode

If the RUN signal turns OFF, 0 is output immediately as the speed reference, OFF is output for the RUN signal with the VS-866 and OFF is output as the servo ON signal with the SERVOPACK.

Table 5.6 Motion Setting Parameters (cont'd)

<table>
<tr><th>No.</th><th>Name</th><th>Register Number</th><th>Setting Range/ Bit Name</th><th>Description</th><th>Factory Setting</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">RUN Mode Settings (RUNMOD) (cont'd)</td><td>Bit 5</td><td>Phase Control Test Mode (PHTEST)</td><td>Set whether the results of phase reference calculations and PI control calculations are valid or not in Phase Control Mode.
0: Valid
1: Not valid
When Not Valid is selected, this parameter functions much like the Speed Reference Output Mode with the Filter Time Constant and Acceleration/Deceleration Time Constant set to 0.</td><td>0</td></tr>
<tr><td>Bit 6</td><td>Alarm Clear (ACR)</td><td>The following monitoring parameters will be cleared when this bit turns ON.
• IW□□00 RUN Status: Error Counter Over (bit 0) and Motion Setting Parameter Setting Error (bit 1)
• Alarms (IL□□22)</td><td>0</td></tr>
<tr><td>Bit 7</td><td>Phase Reference Disable (PHREFOFF)</td><td>Set whether to use phase control for the electronic shaft or electronic gear.
0: OFF (Electronic shaft)
1: ON (Electronic gear)
• Phase Control Loop (Electronic Shaft)


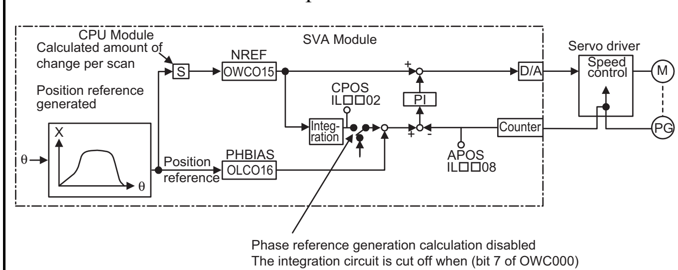
* 1. Integrates the standard speed reference and calculates the corresponding position (pulse).
* 2. Generates a speed reference from the difference ε between the target position (CPOS) and the current position (APOS). This is position (phase) correction.
* 3. When shifting phase, the amount of shift (the rotating angle of the Servomotor axis converted to pulses) is added as the phase correction setting.
• Electronic Cam Control Loop

</td><td>0</td></tr>
</table>

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
1	RUN Mode Settings (RUNMOD) (cont'd)		Bit 7 (cont'd)	Phase Reference Disable (PHREFOFF)	The electronic cam control loop cuts off the integration circuit for the standard speed reference and provides a position reference based on the phase compensation setting.	
			Bit 8	Motion Command Mode Enable/Disable (MCDSEL)	Set whether an OW□□20: Motion Command Code is used or not. 0: OFF (Disable) 1: ON (Enable) Valid when use (= 1) is set for the Motion Command Selection (bit 7 of fixed parameter number 14).	1
			Bit 9	Zero Point Return Direction Selection (ZRNDIR)	Set the direction for returning to the zero point. 0: OFF Reverse direction (position pulse in the deceleration direction) 1: ON Forward direction (position pulse in the acceleration direction)	0
			Bit 10	Absolute Position Read Request (ABSRD)	The absolute position data will be read from the absolute encoder when this bit turns ON. The bit 10 of IW□□00: Absolute Position Read Completed Signal will turn ON when the data has been read. This parameter is used if the servo driver is turned OFF while the MP920 is ON.	0
			Bit 11	Feed Forward Gain at Switching Control Mode	–	0
			Bit 12	Not used.	Set to "0."	0
			Bit 13	DI Latch Request (DINTREQ)	The current position the instant the DI latch signal turns ON is indicated in IL□□06: Machine Coordinate System Latch Position when this bit is ON. bit 11 of IW□□00: DI Latch Completed Signal will turn ON when DI latch has been completed.	0
			Bit 14	Not used.	–	0
			Bit 15	Phase Control Integration Reset (IRESET)	The PI control integration is reset if this bit turns ON in Phase Control Mode.	0
2	RUN Command Settings (SVRUNCMD)	OW□□01		Set the output signal from Motion Module to the driver as well as the RUN mode required for motion control. The bit configuration is described below.		
			Bit 0	RUN Servo ON (DO0)	Used as the servo ON signal for the driver. "1" is output from DO0 if this bit is set to "1" when SVCRDY (IB□□007) is ON.	0
			Bit 1	DO1	Used as a general-purpose DO. *1	0
			Bit 2	DO2	Used as a general-purpose DO. *1	0
			Bit 3	DO3	Used as a general-purpose DO. *1	0
			Bit 4	ROC		0
				DO4	Used as a general-purpose DO. *1	0

* These bits can be used in various applications because they are general-purpose DOs. Refer to *Supplemental Explanation 2* for the application examples where these bits are used as the outputs to the servo driver.

■ Supplemental Explanation 2

1. SVA-01A (4-axis Servo) Module

Name OW□□01	Connected to a VS-866	Connected to a SERVOPACK (SGDA, SGDB)
Bit 0 (DO0)	Run	Servo ON (SV-ON)
Bit 1 (DO1)	Failure reset (RST)	Alarm reset (ALM-RST)
Bit 2 (DO2)	Emergency stop (EMG): Logical value, i.e., turn OFF to achieve the operation.	Proportional control (P-CON)
Bit 3 (DO3)	Ready (RDY)	Not used. (ROn) CN5
Bit 4 (ROC)	Not used.	Not used. (ROC) Only for 1st axis CN5

2. SVA-02A (2-axis Servo) Module

Name	Connected to a VS-866	Connected to a SERVOPACK (SGDA, SGDB)
Bit 0 (DO0)	Run	Servo ON (SV-ON)
Bit 1 (DO1)	Failure reset (RST)	Alarm reset (ALM-RST)
Bit 2 (DO2)	Emergency stop (EMG)	Proportional control (P-CON)
Bit 3 (DO3)	Torque control selection (TSEL)	Forward overtravel (P-OT)
Bit 4 (DO4)	Ready (RDY)	Reverse overtravel (N-OT)

INFO

Refer to *5.1 SVA-01A Module* for details on the SVA-01A Module (4-axis Servo Module) connector and connector pin arrangement.

Table 5.6 Motion Setting Parameters (cont'd)

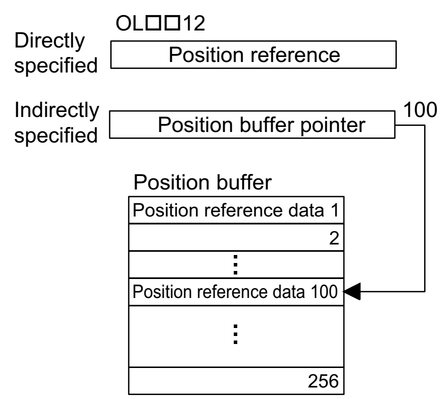
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
2	RUN Command Settings (SVRUNCMD) (cont'd)	Bits 5 to 11	Not used.	Set to "0."	0
		Bit 12	Position Reference Value Selection (USE_BUF)	Set the reference method that is used for position reference data. It is valid only when an OW□□20: Motion Command Code is used in Position Control Mode. 0: OL□□12 Use OL□□12 as directly as position reference data. 1: Position Buffer Use OL□□12 indirectly as the position buffer number.  • The position buffer is located in the SVA Module and must be written in the initial drawing at startup. • Refer to OB□□21E, OB□□21F, and OL□□3A for details on writing to the position buffer.	0
		Bit 13	Speed Reference Value Selection (SPDTYPE)	Set speed reference method for feed speed, approach speed, and creep speed. It is valid only when an OW□□20: Motion Command Code is used in Position Control Mode. 0: OL□□22 Set speed in reference units and sets rapid traverse speed at OL□□22. The setting unit for OW□□0A: Approach Speed and OW□□0B: Creep Speed are also 1 = 10 reference units/min. 1: OW□□15 Set speed using a percentage and sets rapid traverse speed at OW□□15. The setting unit for OW□□0A: Approach Speed and OW□□0B: Creep Speed are also 1 = 0.01%. Refer to *Speed reference* of *2.3.1 Prerequisites for Position Control*.	0

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
2	RUN Reference Settings (SVRUNCMD) (cont'd)	Bit 14	Speed Reference Type (XREFTYPE)	Set the type of data for OL□□12 Position Reference Setting when an OW□□20: Motion Command Code is used in Position Control Mode. 0: Absolute position method Sets the absolute position at OL□□12. 1: Incremental addition method Adds the current movement value to the previous value at OL□□12 and then sets that data at OL□□12. Note: Only the absolute position method can be set if the position reference selection is indirectly specified. Refer to *Position Reference* of *2.3.1 Prerequisites for Position Control*.	1
		Bit 15	Zero Point Return Deceleration Point Limit Signal (LSDEC)	This bit functions as a limit switch signal (deceleration LS) when returning to the zero point. It is valid when bit 2: Limit Switch Signal Selection is OFF at fixed parameter number 14: Additional Function Selections. The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□01F.	0
3	Positive Torque Limit Setting (TLIMP)	OW□□02	-32768 to 32767	Valid only for SVA-02A (2-axis) Module. Used to set torque limit referenced by the SERVOPACK and inverter. Unit: 0.01% Set a positive value (0.01% units) with a VS-866 and a negative value (0.01% units) with a SERVOPACK.	-300.00 (-300.00 %)
4	Not used.	OW□□03	–	Set to "0."	0
5	Positive Speed Limiter Setting (NLIMP)	OW□□04	0 to 32767	Set the speed limiter value for the positive and negative directions as a percentage of the rated speed. The limiter speed will be output if the compensation speeds added to the specified speed exceeds this limiter value.	150.00 (150.00%)
6	Negative Speed Limiter Setting (NLIMN)	OW□□05			150.00 (150.00%)

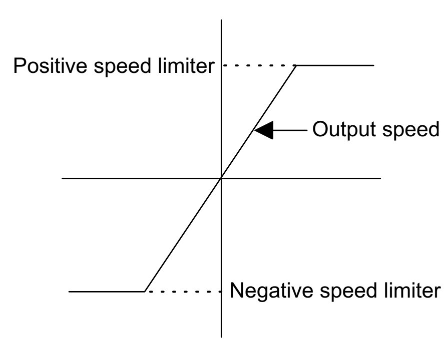


Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
7	Machine Coordinate System Zero Point Offset Setting (ABSOFF)	OL☐☐06	-2^{31} to $2^{31}-1$	Position data can be shifted by the value set in this register. See *1* of *Supplemental Explanation 3*. The parameter is valid during RUN operation, but set it while the system is OFF. This register contains data used by SVA Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation. Obstructions may damage tools and lead to personal injury if this check is not performed. Refer to *2* of *Supplemental Explanation 3*.	0
9	Not used.	OL☐☐08		Set to "0."	0

■ Supplemental Explanation 3

1. Procedure for Using the Zero Point Offset

a) Applications where Absolute Encoder Rotates in One Direction

The zero point position offset can be used in applications where the absolute encoder rotates in one direction by using OL☐☐06: Zero Point Offset Setting in the motion parameters and creating a user program that will control the absolute position.

b) Initializing the Absolute Encoder

A pulse cannot be reset within one rotation simply by shorting R-S.

For example, an initial incremental pulse corresponding to 0.5 rotations will be sent even though the absolute encoder is reset (R-S shorted) if the Servomotor stops at 95.5 rotations.

Consequently, position data corresponding to 0.5 rotations rather than 0 will be indicated at IL☐☐08: Position Monitor.

Set the following in order to set the position monitor to 0.

- Preconditions

  Initialize the absolute encoder (short R-S), restart the MP920, and then send a provisional 120 initial incremental pulses. A value of 120 will appear at the position monitor.

- Procedure

  The position can be adjusted with the Zero Point Offset. If the zero point offset is set to -120, the position monitor will show "0."

  The value set at the Zero Point Offset will be reset to "0" if the MP920 is turned OFF, so we recommend setting the parameter with Drawing A (initial processing drawing).

  Example 1: Set DWG.A as follows:

  ├ OLC006 - 0000000120 ⇒ OLC006

  Example 2: Set DWG.A as follows:

├ OLC006 - DL00022 ⇒ OLC006

Open the Register List Window and set DL00022 to 120 from the MP920 Programming Panel.

Because DL00022 (register D in DWG.A) is backed up by battery, this program will be executed and -120 will be set at OLC006 automatically when MP920 power is turned ON once the register is set.

DL00022 was used in this example, but any other D register (DL□□□□□) or M register (ML□□□□□) can be used as well.

Because the initial incremental pulse will change within a rotation every time the absolute encoder is initialized (R-S), the value -120 must be changed each time.

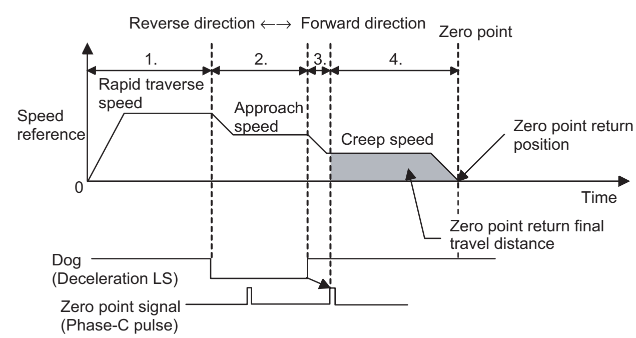
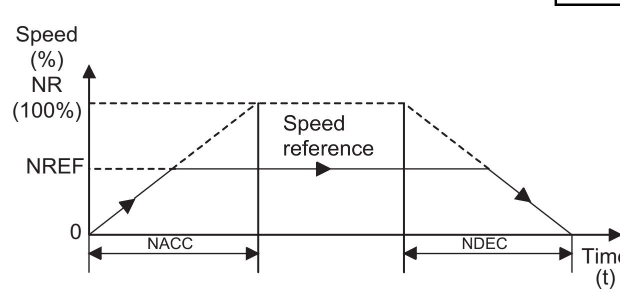
In Example 1, the user program must be changed from the Programming Panel.

In Example 2, only register data rather than the user program has to be changed and this is done from the Programming Panel.

Example 2 is the most practical method in applications like repeating machines.

2. When bit 7 (motion command code selection) of fixed parameter No. 14 is set to 1 (“Used”) and Motion Command Code Enable/Disable (OB□□008) is set to 1 (“Valid”), set the number of reference units. Otherwise, set the number of pulses.

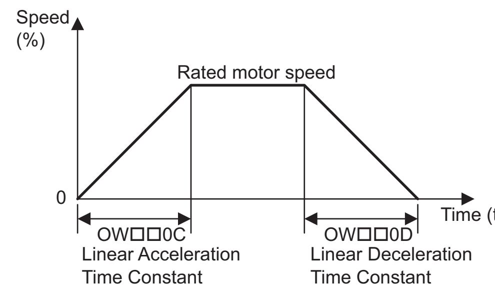
Table 5.6 Motion Setting Parameters (cont'd)

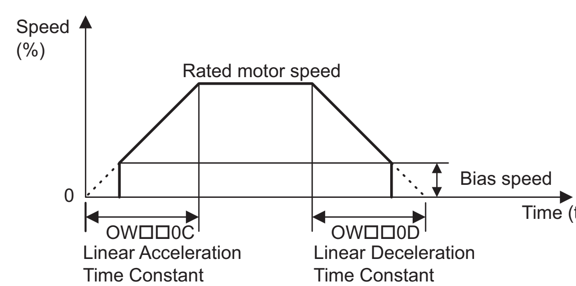
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
11	Approach Speed Setting (Napr)	OW□□0A	0 to 32767	Set the approach and creep speed when returning to the zero point ((ZRET). The setting unit depends on OB□□01D: Speed Reference Selection. 1. When OB□□01D = 0 (specified in reference units) 1 = 10^n reference units/min (n = number of digits below the decimal point) Pulse unit: 1 = 1000 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min 2. When OB□□01D = 1 (specified in reference units) When OB□□01D = 1 (% specified), then 1 = 0.01% (percentage of the rated rotation speed). Note: A percentage is specified regardless of the setting at OB□□1D in Zero Point Return Mode. 	0
12	Creep Speed Setting (Nclp)	OW□□0B	0 to 32767		0
13	Linear Acceleration Time Constant (NACC)	OW□□0C	0 to 32767	Set the linear acceleration/deceleration time for Speed, Position Control, and Zero Point Return Modes. Unit: ms Set acceleration time from 0% to 100% (rated motor speed). The deceleration time is the same as the acceleration time. 	0
14	Linear Deceleration Time Constant (NDEC)	OW□□0D	0 to 32767		0

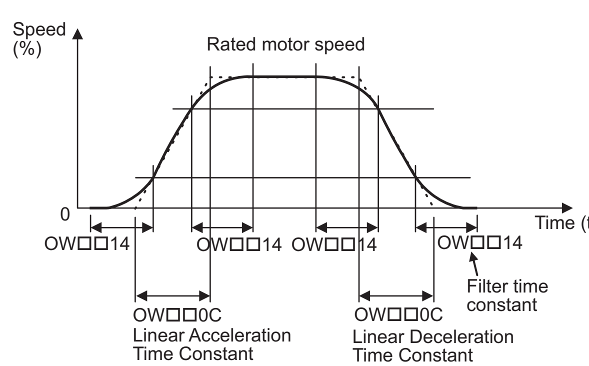
■ Acceleration/Deceleration Type

Acceleration/deceleration is broadly classified as linear, S-curve and exponential acceleration/deceleration. A bias speed can also be set for linear and exponential acceleration/deceleration.

Acceleration/Deceleration Type

<table>
<tr><th>Acceleration/ Deceleration Type</th><th>Relevant Motion Parameters</th><th>Description</th></tr>
<tr><td>Linear Acceleration/ Deceleration</td><td>• Bias speed
Motion fixed parameter No. 35
• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant</td><td>


• Set the time it takes to reach rated motor speed for the acceleration/deceleration time constant.
• Set motion fixed parameter No. 35: Bias Speed to 0.</td></tr>
<tr><td>Linear Acceleration/ Deceleration With Bias</td><td>• Bias speed
Motion fixed parameter No. 35
• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant</td><td>


Set the time it takes to reach rated motor speed at the acceleration/deceleration time constant.</td></tr>
<tr><td>S-curve Acceleration/ Deceleration (Average Move)</td><td>• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant
• OW□□14
Motion setting parameter:
Filter Time Constant Setting
• OB□□214 to OB□□217
Motion setting parameter:
Filter Type Selection</td><td>


Set the Filter Type Selection to 2 (average movement filter).</td></tr>
</table>

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
15	Positioning Completed Range Setting (PEXT)	OW□□0E	0 to 65535	Used in Position Control and Zero Point Return Modes. Set the range before bit 13 of IW□□00: Positioning Completed Signal or bit 15 of IW□□00: Zero Point Return Completed Signal turns ON. Unit: Reference unit Refer to the explanation on bit 13 of IW□□00.	10
16	Error Count Alarm Detection Setting (EOV)	OW□□0F	0 to 65535	Used in Position, Phase Control, and Zero Point Return Modes. Set the limit for outputting bit 0 of IW□□00: Error Counter Over. Outside this range, the Error Counter Over will turn ON and this value will be used as the error count in position control. Error Counter Over will not be detected if this parameter is set to "0."	65535
17	Position Loop Gain Setting (Kp)	OW□□10	0 to 32767	Set the position loop gain in the servo system. Position loop gain is needed to set response performance for the servo system. The following are setting guidelines. 40 to 250 250: Excellent response (Watch for hunting.) 40: Ordinary response Set an appropriate value for the machine rigidity, inertia, and type of Servomotor. • Setting range: 1 to 32767 [0.1/S]	300 (30.0)
18	Feed Forward Gain Setting (Kf)	OW□□11	0 to 200	Reduces positioning time by applying feed forward control. • Setting range: 0 to 200 [%] Reference position and actual position error decrease with higher settings. The machine may start to vibrate if the setting is too high.	0

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
19	Position Reference Setting (XREF) or Position Buffer Number	OL□□12	-2^{31} to $2^{31}-1$	Set the position reference. The meaning of the setting data depends on OB□□01C: Position Reference Selection and OB□□01E: Position Reference Type. Explanation ■ **Using OL□□12 as Position Reference for Absolute Position Reference Method** OB□□1C = 0: Directly specified OB□□1E = 0: Absolute position reference ■ **Using OL□□12 as Position Reference for Add Difference Method** OB□□1C = 0: Directly specified OB□□1E = 1: Add difference ■ **Using OL□□12 as Position Reference for Add Difference Method** OB□□1C = 1: Indirectly specified OB□□1E = 0: Absolute position reference Setting 1 causes setting parameter error. Refer to *Position Reference* of *2.3.1 Prerequisites for Position Control*.	0
21	Filter Time Constant Setting (NNUM)	OW□□14	1. Average move filter 0 to 255 (0 = 1 = no filter) 2. Exponential acceleration speed 0 to 32767	Set this parameter when performing simple S-curved acceleration/deceleration in speed reference output or position control mode. ■ **Speed Reference Output Mode** Calculates the average move for the speed reference (Vr) and makes that value the speed reference. ■ **Position Control Mode** Calculates the average move for the clear pulse (p) every scan and makes that value the position reference. Averaging will not be calculated in the following situations. • When switching during operation to Speed or Position Control Mode • When the average number is changed during operation ■ **OW□□20: Motion Command Code Used in Position Control Mode** The setting range for the filter time constant will vary with bit 4 to bit 7 of OW□□21: Filter Type Selection. • Filter type 1 = Exponential filter 0 to 32767 • Filter type 2 = Average move filter 0 to 255 Note: This parameter will be valid when IB□□152: Distribution Completed turns ON if the filter time constant is changed.	0

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
22	Speed Reference Setting (NREF)	OW□□15	-32768 to 32767	■ **Speed Reference Output Mode** Set the speed reference in 0.01% units. ■ **Position Control Mode** Set the speed reference in a steady state in 0.01% units. ■ **OW□□20: Motion Command Code Used in Position Control Mode** Set the rapid traverse speed in 0.01% units (percentage of the rated motor speed) when the Speed Reference Selection (OB□□1D) is set to 1. ■ **Phase Control Mode** Set the standard speed reference in 0.01% units. D/A output = (OW□□15: Speed Reference Setting × D/A Output Voltage at 100% Speed (fixed parameter 9)) / 10000 Example: When the D/A Output Voltage at 100% speed = 6 V and the speed reference = 100%, then (10000 × 6 V) / 10000 = 6.0 V is output.	0.00
23	Phase Bias Setting (PHBIAS)	OL□□16	-2^{31} to $2^{31}-1$	Set the number of compensation pulses in Phase Control Mode. Use this parameter to compensate for reference pulses in control systems with no rigidity or gain.	0
25	Speed Compensation Setting (NCOM)	OW□□18	-32768 to 32767	Set the speed compensation in 0.01% units in Phase Control Mode. OW□□18: Speed Compensation Setting is valid even in Phase Control Mode if bit 10 of OW□□21: Speed Compensation during Position Control is ON.	0
26	Proportional Gain Setting (PGAIN)	OW□□19	0 to 32767	Set proportional gain for PI control in 0.1 units in Phase Control Mode.	30.0
27	Integral Time Setting (Ti)	OW□□1A	0 to 32767	Set the integral time for PI control in 1 ms units in Phase Control Mode. Integration will be reset if the integral time is set to 0.	300 (300 ms)
28	Torque Reference Setting (TREF)	OW□□1B	-32768 to 32767	Set the torque reference in 0.01% units in Torque Reference Output Mode. D/A output = (OW□□1B: Torque Reference × D/A Output Voltage at 100% Torque Limit (fixed parameter 10)) / 10000 Example: When the D/A Output Voltage at 100% Torque Limit = 3 V and the torque reference = 50%, then (5000 × 3 V) / 10000 = 1.5 V is output. Note: Valid only for SVA-02A (2-axis) Module.	0.00

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
29	Speed Limit Setting (NLIM)	OW□□1C	-32768 to 32767	Set the speed limit in 0.01% units in Torque Reference Output Mode. D/A output = (OW□□16: Speed Limit Setting × D/A Output Voltage at 100% Speed (fixed parameter 9)) / 10000 Example: When the D/A Output Voltage at 100% Speed = 6 V and the Speed Limit = 150%, then (15000 × 6 V) / 10000 = 9.0 V is output. Note: Valid only for SVA-02A (2-axis) Module.	150.00
30	Not used.	OW□□1D		Set to "0."	0
31	Pulse Bias Setting (PULBIAS)	OL□□1E	-2^{31} to $2^{31}-1$	Used in Position Control Mode. ■ **Position Control Mode** Set the number of compensation pulses. (1-pulse units) ■ **OW□□20: Motion Command Code Used in Position Control Mode** Set in 1-pulse units when compensating reference pulses such as with backlash compensation. Compensation will not be performed however if IB□□170: Machine Lock is ON.	0
33	Motion Command Code (MCMDCODE)	OW□□20	0 to 65535	Set the motion command code for the SVA Module. This parameter can be used under the following conditions. • Motion Command Selection Used (bit 7 of fixed parameter no. 14) • Position Control Mode Selection (OB□□002) • RUN Mode Motion Setting Command Enabled (OB□□008) **Motion Commands** 0: NOP (no operation) 1: Positioning (POSING) 2: External positioning (EX-POSING) 3: Zero point return (ZRET) 4: Interpolation (INTERPOLATE) 5: Reserved for system use 6: Interpolation with position detection (LATCH) 7: Feed (FEED) 8: Step (STEP) 9: Zero point setting (ZSET)	0

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Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
34	Motion Command Control Flags (MCMDCTRL)	OW□□21		Set motion command auxiliary functions.		
			Bit 0	Command Hold (HOLD)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning or step execution using an OW□□20: Motion Command Code. IB□□151: Hold Completed turns ON when the HOLD has been completed. If this bit goes back OFF at this point, the hold is canceled and positioning restarts.	0
			Bit 1	Command Abort (ABORT)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning, zero point return, or STEP using an OW□□20: Motion Command Code. The BUSY bit (IB□□150) turns ON when ABORT is being executed, and it turns OFF when the execution of ABORT completes. Step execution can be aborted by setting the motion command to NOP.	0
			Bit 2	Direction of Movement (DIRECTION)	Set the movement direction. This bit is enabled when a Motion Command Code (OW□□20) is set to constant-speed feed or inching. 0: Forward direction 1: Reverse direction	0 (Forward direction)
			Bit 3	No Primary Lag (LAGRST)	The primary lag is reset if this bit turns ON in a position loop. It functions the same as when OW□□37: Primary Lag Constant is set to "0" and it is used in Position Control Mode or Zero Point Return Control Mode.	0
			Bit 4 to 7	Filter Type Selection (FILTERTYPE)	Set the type of acceleration filter. 0: No filter 1: Exponential filter 2: Average movement filter OW□□14: Filter Time Constant is valid if this parameter is set to "1" or "2."	0 (No filter)
			Bit 8	Position Loop P/PI Switch (POS_PPI)	Used in Position Control Mode or Zero Point Return Mode. Set whether to use P or PI control for position control. 0: P control 1: PI control	0
			Bit 9	Position Control Integration Reset (POS_IRST)	PI control integration resets if this bit turns ON when using a position loop in PI control (Refer to bit 8 of OW□□21). The parameter is used in Position Control Mode or Zero Point Return Mode.	0
			Bit 10	Speed Compensation (OW□□18) during Position Control (NCOMSEL)	Used in Position Control Mode or Zero Point Return Mode. When this bit turns ON, data set at OW□□18: Speed Compensation Setting is added as a speed compensation (1 = 0.01 %) to the position loop calculation.	0
			Bit 11	Not used.	Set to "0."	0
			Bit 12	Reverse Limit Signal for Zero Point Return (LMT_L)	This bit functions as a reverse limit signal when returning to the zero point (ZRET). The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□21C.	0

Table 5.6 Motion Setting Parameters (cont'd)

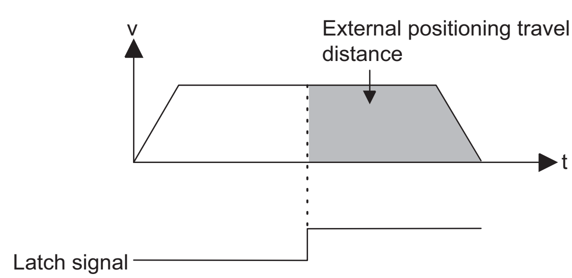
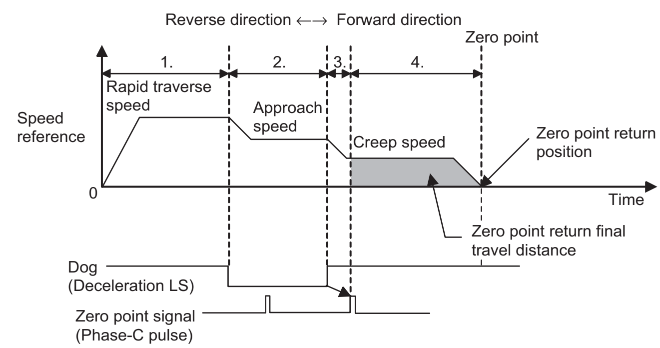
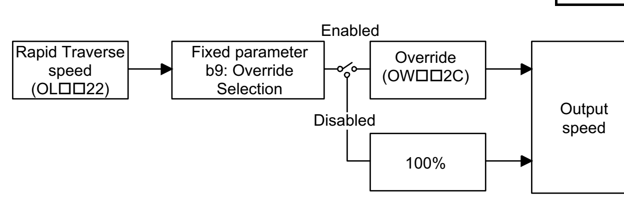
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
34	Motion Command Control Flag (MCMDCTRL) (cont'd)	Bit 13	Forward Limit Signal for Zero Point Return (LMT_R)	This bit functions as a forward limit signal when returning to the zero point (ZRET). The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□21D.	0
		Bit 14	Position Buffer Write (BUF_W)	Data set in OL□□3A: Position Buffer Write Data is stored as absolute position data in the position buffer that is set at OL□□38: Position Buffer Access Number.	0
		Bit 15	Position Buffer Read (BUF_R)	Used to check position data that is stored in the position buffer. Data from the position buffer that is specified at OL□□38: Position Buffer Access Number is stored as absolute position data in the position buffer that is set at IL□□28: Position Buffer Read Data. It takes two scans from the time the Position Buffer Read command is issued until the data is stored at IL□□28: Position Buffer Read Data.	0
35	Rapid Traverse Speed (RV)	OL□□22	0 to 2^{31}-1	Used when an OW□□20: Motion Command Code is used in Position Control Mode. Set the rapid traverse speed in 10^n reference units/min (n: Number of digits below decimal point) if OB□□01D: Speed Reference Selection is set to "0." Other setting units are expressed as follows: Pulse unit: 1 = 1000 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min	3000
37	External Positioning Travel Distance (EXMDIST)	OL□□24	-2^{31} to 2^{31}-1	Used when an OW□□20: Motion Command Code is used in Position Control Mode. Set the distance from the time the latch signal (external positioning signal) is input until the machine stops during external positioning (EX_POSING). 	0
39	Stopping Distance (STOPDIST)	OL□□26	-2^{31} to 2^{31}-1	Used by the system. Do not use it.	0
41	Step Travel Distance (STEP)	OL□□28	0 to 2^{31}-1	Set the travel distance in reference units for Step execution for the OW□□20: Motion Command Code. • Unit: Reference unit	0

Table 5.6 Motion Setting Parameters (cont'd)

<table>
<tr><th>No.</th><th>Name</th><th>Register Number</th><th>Setting Range/ Bit Name</th><th>Description</th><th>Factory Setting</th></tr>
<tr><td>43</td><td>Zero Point Return Final Travel Distance (ZRNDIST)</td><td>OL□□2A</td><td>-2^{31} to $2^{31}-1$</td><td>The machine is moved the distance set for this parameter after a valid zero point pulse is detected and then stops when returning to the zero point using an OW□□20: Motion Command Code. The final point is set as the zero point of the coordinate system.
• Unit: Reference unit


</td><td>0</td></tr>
<tr><td>45</td><td>Override (OV)</td><td>OW□□2C</td><td>0 to 32767</td><td>Set the override for the output speed as a percentage of the OL□□22: Rapid Traverse Speed in 0.01% units.
For interpolation related commands, set override in the register specified in the Group Definition Window.
Rapid Traverse Speed Output:
Rapid Traverse Speed × Override = Output speed
(OL□□22) (OW□□2C)


This parameter is valid when fixed parameter number 17: Override Selection (bit 9 of Motion Controller Function Selection Flags) is set to Enabled.</td><td>100.00</td></tr>
<tr><td rowspan="2">46</td><td rowspan="2">Position Control Flags (POSCTRL)</td><td>OW□□2D</td><td colspan="3">Set the functions related to position data managed by Motion Modules. The bit configuration is described below.</td></tr>
<tr><td>Bit 0</td><td>Machine Lock Mode Setting (MLK)</td><td>Used when an OW□□20: Motion Command Code is used in Position Control Mode.
In Machine Lock mode, only the Machine Coordinate System Calculation Position (CPOS) (IL□□02) is updated without actually moving the axis.
A change in this bit will be effective when IB□□152: (Distribution Completed) turns ON.</td><td>0</td></tr>
</table>

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
46	Position Control Flags (POSCTRL) (cont'd)		Bit 1	Request for the Preset Number of POSMAX Turns (TPRSREQ)	Request for the preset number of POSMAX turns. • With an infinite length axis, a turn is counted every time the position value exceeds POSMAX and the count is stored at monitoring parameter IL□□1E: Number of POSMAX Turns. • The number of turns can be preset at setting parameter OL□□30: Preset Data for Number of POSMAX Turns by turning ON the Request for the Preset Number of POSMAX Turns Flag. Related Parameters: • Fixed parameter No.22: Maximum Value for Infinite Length Counter • Setting parameter OL□□30: Preset Data for the Number of POSMAX Turns • Monitoring parameter IL□□1E: Number of POSMAX Turns	0
			Bit 2	ABS System Infinite Length Position Control Data Load Request (ABSLDREQ)	Used when an OW□□20: Motion Command Code is used in Position Control Mode. If this bit is ON when using an infinite length axis with an absolute encoder, position data controlled by the SVA Module will be updated with data that is set at OL□□38 and OL□□3A: Encoder Position at Shutdown and at OL□□3C and OL□□3E: Pulse Position at Shutdown. Conditions Fixed parameter No. 3: Encoder Selection 1 Fixed parameter No. 17: bit 5=1, Infinite Length Axis	0
			Bit 3	Position Monitor 2 (IL□□34) Unit Selection	Used when an OW□□20: Motion Command Code is used in Position Control Mode. Set the data unit to be indicated at Position Monitor 2 (IL□□34). 0: Reference unit Indicated as 1 = 1 reference unit. 1: Pulse unit Indicated as 1 = 1 pulse unit.	0
			Bits 4 to 15	Not used.	Set to "0."	0
47	Workpiece Coordinate System Offset (OFFSET)	OL□□2E		-2^{31} to $2^{31}-1$	Always set this parameter to "0." It is used by the system.	0
49	Preset Number of POSMAX Turns Data (TURNPRS)	OL□□30		-2^{31} to $2^{31}-1$	Used when an OW□□20: Motion Command Code is used in Position Control Mode. IL□□1E: POSMAX Number of Turns can be preset with preset data by turning ON OB□□2D1: Request for Preset Number of POSMAX Turns. It is used in situations such as when resetting the number of turns to "0."	0
51	Second In-position Width (INPWIDTH)	OW□□32		0 to 65535	Used when OW□□20: Motion Command Code is used. Set the range where bit 2 of IW□□17: Second In-position Completed will turn ON. This bit turns ON if the difference between the reference position and the feedback position is within the specified range when IB□□152: Distribution Completed turns ON.	0

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Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
52	Zero Point Position Output Width (PSETWIDTH)	OW□□33	0 to 65535	Used when an OW□□20: Motion Command Code is used in Position Control Mode. Set the zero point position range. IB□□171: Zero Point Position will turn ON if 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ Zero Point Position Output Width when IB□□156: Zero Point Return Completed Status turns ON.	10
53	Positioning Completed Check Time (PSETTIME)	OW□□34	0 to 65535	Used when OW□□20: Motion Command Code is used in Position Control Mode. Set limits for detecting bit 6 of IL□□22: Positioning Time Over in 1 = 1 ms. A positioning time over alarm will be generated if bit 13 of IW□□00: Positioning Time Completed Signal does not turn ON when this range is exceeded after bit 2 of IW□□15: Distribution Completed turns ON. The completion of positioning will not be checked if this parameter is set to "0."	0
54	Position Control Integral Time (PTi)	OW□□35	0 to 32767	Used in Position Control Mode or Zero Point Return Mode. Set integral time in 1 = 1 ms when using position loop and PI control (see bit 8 of OW□□21). Integration will not be performed if this parameter is set to "0."	300
55	Upper/lower Limit for Position Control Integration (ILIMIT)	OW□□36	0 to 32767	Used in Position Control Mode or Zero Point Return Mode. Set the upper and lower integration limits when using position loop and PI control (Refer to bit 8 of OW□□21). Integral output will be limited within the range set here when the integral output value exceeds this range.	32767
56	Primary Lag Time Constant (LAGTI)	OW□□37	0 to 32767	Used in Position Control Mode or Zero Point Return Mode. Set the primary lag time constant in the position loop in 1 = 1 ms. The primary lag will not be calculated if this parameter is set to "0."	0

Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
57	Lower-place Two Words of Encoder Position at Shutdown or Position Buffer Access Number	OL□□38	-2^{31} to $2^{31}-1$	Used when an OW□□20: Motion Command Code is used in Position Control Mode. This parameter is used in the following two ways and should be used with care. ■ **Lower-place 2 Words of Encoder Position at Shutdown** This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the lower-place two words of the encoder position at shutdown. ■ **Position Buffer Access Number** When bit 14 of OW□□21: Position Buffer Write or bit 15 of OW□□21: Position Buffer Read turns ON, the data set at this parameter will be treated as the buffer number of the position buffer. The setting range for this parameter is 1 to 256 and it is not valid if set to "0."	0
59	Upper-place Two Words of Encoder Position at Shutdown or Position Buffer Write Data	OL□□3A	-2^{31} to $2^{31}-1$	Used when an OW□□20: Motion Command Code is used in Position Control Mode. This parameter is used in the following two ways and should be used with care. ■ **Upper-place 2 Words of Encoder Position at Shutdown** This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the upper-place two words encoder position at shutdown. ■ **Position Buffer Write Data** When bit 14 of OW□□21: Position Buffer Write turns ON, the data set at this parameter will be written as absolute position data to the position buffer specified at OL□□38.	0

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Table 5.6 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
61	Lower-place Two Words of Pulse Position at Shutdown (aposL)	OL□□3C	-2^{31} to 2^{31}-1	Used when an OW□□20: Motion Command Code is used in Position Control Mode. When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the lower-place two words of the pulse position at shutdown. This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1).	0
63	Upper-place Two Words of Pulse Position at Shutdown (aposH)	OL□□3E	-2^{31} to 2^{31}-1	Used when an OW□□20: Motion Command Code is used in Position Control Mode. When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the upper-place two words of the pulse position at shutdown. This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1).	0

5.4.3 Motion Monitoring Parameters

Table 5.7 Motion Monitoring Parameters

No.	Name	Register Number	Setting Range/ Bit Name	Description
1	RUN Status (RUNSTS)	IW□□00	Monitors SVA Module operating status. The bit configuration is described below.	
		Bit 0	Error Counter Over (EOVER)	This bit is valid in Position Control Mode, Zero Point Return Mode, and Phase Control Mode. Turns ON when the IL□□0A: Position Error exceeds the OW□□0F: Error Counter Alarm Detection Setting. Note: Because control will not be interrupted, create a user program that will monitor this bit and perform other processing if application-specific processing, such as emergency stop, is required. The following items are potential causes for error alarms. 1. OW□□0F: Error Count Alarm Detection Setting is set too low. 2. The Servomotor is not operating. 3. Operation according to set references failed because the load in the machine system is too heavy. If an error occurs, the SVA Module indicators will indicate ( ) (first axis), ( ) (second axis), ( ) (third axis) and ( ) (fourth axis). The display will return to OFF when the error condition is removed and bit 6 of OW□□00: Alarm Clear turns ON.
		Bit 1	Motion Setting Parameter Setting Error (PRMERR)	Turns ON when one or more of the motion setting parameters (OW□□00 to OW□□3F) is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm will be indicated at IW□□0F: Parameter Number Out of Range.
		Bit 2	Motion Fixed Parameter Setting Error (FPRMERR)	Turns ON when a motion fixed parameter is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm plus 100 will be indicated at IW□□0F: Parameter Number Out of Range. Turns OFF automatically if an ordinary motion fixed parameter is set from the MPE720.
		Bit 3	Not used.	–
		Bit 4	Cumulative Number of Rotations Received Error (absolute encoder) (PGER)	The absolute position is sent and received over serial lines when the power supply is turned ON and bit 10 of OW□□00: Absolute Position Read Request turns ON when an absolute encoder is used. This parameter turns ON if a receive error occurs and the data is not received properly after four retries. Control of the axis will be lost if the bit turns ON. The LED indication will be the same as that for bit 0 of IW□□00: Error Counter Over and the following may be the reason why the error occurred. • Absolute encoder was not initialized. • Group alarm. • Defective servo driver, absolute encoder, or Motion Module hardware.
		Bit 5	Not used	–
		Bit 6	Not used.	–

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description
1	RUN Status (RUNSTS) (ccont'd)		Bit 7	Motion Controller RUN Ready (SVCRDY)	Turns ON when RUN preparations for the Motion Module have been completed. The following may be reason why RUN preparations are not completed. • Major damage has occurred. • Axis that is not used was selected (motion fixed parameter setting). • Motion fixed parameter setting error. • Cumulative no. of rotations received error. • Motion fixed parameters are being changed. • Absolute position is being read from the absolute encoder.
			Bit 8	Motion Controller RUN (SVCRUN)	Turns ON under the following conditions. • IB□□07: RUN Ready turns ON. • Any of OB□□000 to OB□□004: Control Mode Flags turns ON. • OB□□01: Servo ON turns ON. If an alarm is generated even though this bit is ON in Position Control Mode when an OW□□20: Motion Command Code is used, the axis will not move even if a motion command is issued. Clear the alarm, set the motion command to "NOP" for 1 scan or more, and then set the motion command again.
			Bit 9	Rotation Direction when Using Absolute Encoder (DIRINV)	Monitors the rotation direction selected for motion fixed parameters. Rotation direction when using an absolute encoder 0: Forward 1: Reverse
			Bit 10	Absolute Position Read Completed Signal (ABSRDC)	Turns ON when bit 10 of OW□□00: Absolute Position Read Request turns ON and absolute position data from the absolute encoder is read. If an error occurs, bit 4 of IW□□00: Cumulative Number of Rotations Received error will turn ON.
			Bit 11	DI Latch Completed Signal (DIINT)	Turns ON when bit 13 of OW□□00: DI Latch Request turns ON and the DI latch signal is input. The current position at this time will be indicated at IL□□06: Latch Position in Coordinate System.
			Bit 12	Feedback Pulse 0 (FBP0)	Indicates that there is no feedback pulse and is normally ON if the Servomotor is not operating. If this bit remains ON even though a reference is output, the feedback signal line from PG is very likely broken.
			Bit 13	Positioning Completed Signal (POSCOMP)	Turns ON when positioning is completed in Position Control Mode. • **Motion Commands Not Used** This bit turns ON when |IL□□08: Current Position – OL□□12: Position Reference| ≤ OW□□0E: Positioning Completed Range. • **Motion Command Used** This bit turns ON when bit 2 of IW□□15: Distribution Completed turns ON and when |IL□□08: Current Position – OL□□18: Reference Position in Machine System| ≤ OW□□0E: Positioning Completed Range.
			Bit 14	Not used.	–
			Bit 15	Zero Point Return Completed Signal (ZRNC)	Turns ON when a return to zero point is completed in Zero Point Return Mode as follows: |IL□□08: Current Position – Zero Point Position| ≤ OW□□0E: Positioning Completed Range

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description
2	General-purpose DI Monitor (SVSTS)	IW□□01		Monitors the status of input signals or general-purpose DI signals from the SERVOPACK. None of these signals are used for control in the Motion Module. Use this parameter for control in user programs as needed. The bit configuration is described below.	
			Bit 0	General-purpose DI (DI0) (SVALM)	Indicates DI0 signal status. See *1* of *Supplemental Explanation 4*.
			Bit 1	General-purpose DI (DI1) (SRDY)	Indicates DI1 signal status. See *1* of *Supplemental Explanation 4*.
			Bit 2	General-purpose DI (DI2) (BRK)	Indicates DI2 signal status. See *1* of *Supplemental Explanation 4*.
			Bit 3	Broken PG Wire	Indicates broken PG wire status (0 if the wire is broken) in SVA-01A (4-axis) Module.
				DI3 (OTF)	Indicates the status of DI3 signal in SVA-02A (2-axis) Module. It connects to DI3 when positive overtravel signals are used. See *1* of *Supplemental Explanation 4*.
			Bit 4	DI3 (OTF)	Indicates positive overtravel signal status in SVA-01A (4-axis) Module.
				DI4 (OTR)	Indicates DI4 signal status in SVA-02A (2-axis) Module. It connects to DI4 when negative overtravel signals are used. See *1* of *Supplemental Explanation 4*.
			Bit 5	DI4 (OTR)	Indicates negative overtravel signal status in SVA-01A (4-axis) Module.
				DI5 (EXT)	Indicates external latch signal status in SVA-02A (2-axis) Module.
			Bit 6	DI5 (DEC)	Indicates DI5 signal status in SVA-01A (4-axis) Module. It connects to DI5 when a deceleration limit switch signal is used. Note: It is not valid for SVA-02A (2-axis) Module.
			Bit 7	DI6 (ZERO)	Indicates ZERO signal status in SVA-01A (4-axis) Module.
				Broken PG Wire	Indicates broken PG wire status (0 if the wire is broken) in SVA-02A (2-axis) Module.
			Bit 8	DI7 (EXT)	Indicates external latch signal status in SVA-01A (4-axis) Module. Note: It is not valid for SVA-02A (2-axis) Module.
			Bit 9	DI8 (RIn)	Indicates DI8 signal status in SVA-01A (4-axis) Module. Note: It is not valid for SVA-02A (2-axis) Module.
			Bit 10	DI9 (RIC)	Indicates DI9 signal status on the first axis with SVA-01A (4-axis) Module. Note: It is not valid on the second to the fourth axis of SVA-01A (4-axis) Module or for SVA-02A (2-axis) Module.
			Bits 11 to 15	Not used.	–

■ Supplemental Explanation 4

1. The following example shows when these parameters are used for servo drive status. They are general-purpose DIs, and they can also be used in other applications.

Table 5.8 SVA-01A (4-axis) Module

Name	Connected to a VS-866	Connected to a SERVOPACK
Bit 0 (DI0)	Alarm (ALM)	Servo alarm (ALM)*
Bit 1 (DI1)	Preparations completed (RDYX)	Servo ready (S-RDY)
Bit 2 (DI2)	Operating (RUNX)	Brake input (BRK)
Bit 3	Not used.	Broken PG wire
Bit 4 (DI3)	Positive overtravel signal	Positive overtravel signal (OTF)
Bit 5 (DI4)	Negative overtravel signal	Negative overtravel signal (OTR)
Bit 6 (DI5)	Deceleration limit switch signal	Deceleration limit switch signal (DEC)
Bit 7 (DI6)	ZERO signal	ZERO signal
Bit 8 (DI7)	External latch signal	External latch signal (EXT)
Bit 9 (DI8)	Reserved.	Reserved. RIn
Bit 10 (DI9)	Reserved.	Reserved. RIC (only for one axis)

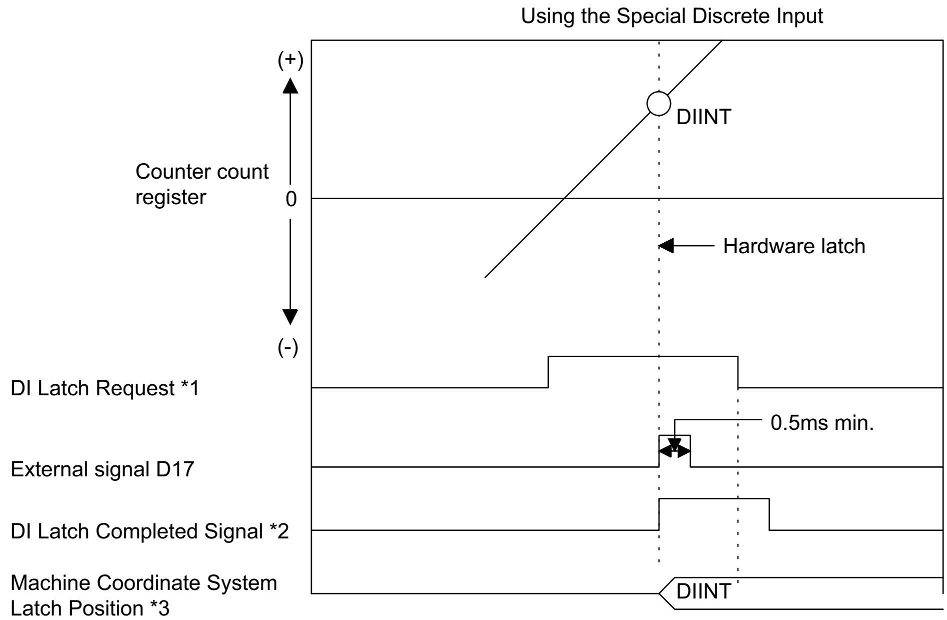
* Logical value, i.e., OFF when the operation is executed.

Table 5.9 SVA-02A (2-axis) Module

Name	Connected to a VSñ866	Connected to a SERVOPACK
Bit 0 (DI0)	Alarm (ALM)	Servo alarm (ALM)*
Bit 1 (DI1)	Preparations completed (RDYX)	Servo ready (S-RDY)
Bit 2 (DI2)	Operating (RUNX)	Brake input (BRK)
Bit 3 (DI3)	Positive overtravel signal	Positive overtravel signal (OTF)
Bit 4 (DI4)	Negative overtravel signal	Negative overtravel signal (OTR)
Bit 5 (DI5)	External latch signal	External latch signal (EXT)

* Logical value, i.e., OFF when the operation is executed.

2. When bit 7 (motion command code selection) of fixed parameter No. 14 is set to 1 (“Used”) and Motion Command Code Enable/Disable (OB☐☐008) is set to 1 (“Valid”), indicates the number of reference units. Otherwise, indicates the number of pulses.
3. The DI latch mode latches the current position in storage registers on the rising edge of an external signal. Either a special discrete input signal called the DI input or the pulse C input can be selected as the latch signal. The latch signal is selected in fixed parameter 13: DI Latch Detection.



* 1. DI Latch Request = operating mode (OW☐☐00, bit 3)
* 2. DI Latch Completed Signal = operating status (IW☐☐00, bit 3)
* 3. Machine Coordinate System Latch Position = position when DI was detected (IL☐☐06)

The machine coordinate system latch position is also stored for position control via motion commands, i.e., when the following commands are executed: the external positioning motion command (EX_POSING: OW☐☐20 = 2) and the motion program EXM command. When executed, the axis moves either the External Positioning Travel Distance (OL☐☐24) or the travel distance specified in the motion program and the axis stops.

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
3	Calculated Position in Machine Coordinate System (CPOS)	IL☐☐02	-2^{31} to $2^{31}-1$	Indicates the calculated position in a machine coordinate system controlled by SVA Modules. Normally the position data indicated at this register is the target position for each scan. See 2 of *Supplemental Explanation 4*.
5	Target Position Difference Monitor (PTGDIF)	IL☐☐04	-2^{31} to $2^{31}-1$	Indicates the amount cleared every scan.
7	Machine Coordinate System Latch Position (LPOS)	IL☐☐06	-2^{31} to $2^{31}-1$	Indicates the current position the instant the DI latch signal turned ON. See 2 of *Supplemental Explanation 4*.

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
9	Machine Coordinate System Feedback Position	IL□□08	-2^{31} to $2^{31}-1$	Indicates the current monitor position. It is valid when an H or L Drawing is executed. Note: It is not valid when an A Drawing is executed. See *2* of *Supplemental Explanation 4*.
11	Position Error (PERR)	IL□□0A	-2^{31} to $2^{31}-1$	Indicates the position error (number of pulses held). (Position error = target position – current position for each scan). It is valid in Zero Point Return Mode, Position Control Mode, and Phase Control Mode.
13	Speed Reference Output Monitor (SPDREF)	IW□□0C	-32768 to 32767	Indicates the value output at the servo drive as the speed reference output value.
14	Speed Monitor (NFB)	IW□□0D	-32768 to 32767	Scales and indicates the A/D conversion results of input analog signals at the input voltage at 100% speed monitor (A/D) setting. Speed monitor value = (A/D input voltage × 10000) / input voltage setting at 100% speed monitor (A/D) Example: Input voltage setting at 100% speed monitor (A/D) = 6 V When the actual A/D input voltage = 3 V, then (3 V × 10000) / 6.0 V = 5000 is indicated.
15	Not used.	IW□□0E	–	–
16	Out of Range Parameter Number (ERNO)	IW□□0F	Motion setting parameter: 1 to 65 Motion fixed parameter: 101 to 148	Indicates the most recent setting parameter number that exceeded the range in OW□□00 to OW□□3F motion setting parameter or motion fixed parameter settings. • Motion setting parameters: 1 to 65 • Motion fixed parameters: 101 to 148 When motion fixed parameters are used, this parameter indicates the parameter number plus 100.
17	Cumulative Rotations from Absolute Encoder (ABSREV)	IW□□10	-2^{31} to $2^{31}-1$	Indicates the cumulative number of rotations received from the absolute encoder. It is valid only when using an absolute encoder.
19	Initial Incremental Pulses from Absolute Encoder (IPULSE)	IL□□12	-2^{31} to $2^{31}-1$	Indicates the initial number of incremental pulses received from the absolute encoder. It is valid only when using an absolute encoder.
21	Motion Command Response Code (MCMDRCODE)	IW□□14	0 to 65535	Indicates the OW□□20: Motion Command Code that is currently executing. Refer to OW□□20 for details on motion commands. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
22	Motion Command Status (MCMDSTS)	IW□□15	Monitors the executing status of an OW□□20: Motion Command Code. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used. The bit configuration is described below.	
		Bit 0	Command Executing Flag (BUSY)	Indicates the motion command status. This bit is used for abort status. 0: READY (completed) 1: BUSY (processing)

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
22	Motion Command Status (MCMDSTS) (cont'd)	Bit 1	Command Hold Completed Flag (HOLDL)	Turns ON when a HOLD is completed. Refer to individual motion functions for details on the HOLD function.
		Bit 2	Distribution Completed (DEN)	Turns ON when the amount of movement cleared is completed.
		Bit 3	Zero Point Setting Completed (ZSET)	Turns ON when the zero point setting (ZSET) has been executed by OW□□20: Motion Command Code. It also turns ON when bit 3 of IW□□17: ABS System Infinite Length Position Control Data Load Request has finished execution.
		Bit 4	External Positioning Signal Latched (EX_LATCH)	Turns ON when the external positioning signal is input during external positioning (EX_POSING).
		Bit 5	Command Error End (FAIL)	Turns ON if an alarm occurs while a movement (positioning, feeding, etc.) command is being executed. Operation cannot continue once this bit turns ON. Set Motion Command Code (OW□□20) to "NOP" for one scan or more. The SVA Module LEDs will indicate (⊔) (first axis), (L) (second axis), (⊓) (third axis) or (⊔) (fourth axis) if this bit is ON.
		Bit 6	Zero Point Return Completed (ZRNC)	Turns ON when zero point return or zero point setting has been completed. Turns OFF when zero point return begins.
		Bits 7 to 15	Not used.	–
23	Number of Digits Below Decimal Monitor (DECNUMM)	IW□□16	0 to 5	Indicates motion fixed parameter No. 18: Number of Digits Below Decimal Point. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
24	Position Control Status (POSSTS)	IW□□17	Monitors status related to position controlled by SVA Modules. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used. The bit configuration is described below.	
		Bit 0	Machine Lock ON (MLKL)	Turns ON when machine lock is ON and analog signals will not be output. The axis that is being controlled will be locked and will remain stopped.
		Bit 1	Zero Point Position (ZERO)	Turns ON when zero point return (IB□□156) has been completed and when 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ OW□□83: Zero Point Position Output Width.
		Bit 2	Second In-position Completed (PSET2)	Turns ON when Distribution Completed (IW□□15 bit 2) is ON and when |IL□□08: Current Position – IL□□18: Reference Position in the Coordinate System| ≤ OW□□82: Second In-position Width.
		Bit 3	ABS System Infinite Length Position Control Data Load Completed (ABSLDE)	Turns ON when OB□□2D2: ABS System Infinite Length Position Control Data Load Request turns ON and the load has been completed. It turns OFF when OB□□2D2: ABS System Infinite Length Position Control Data Load Request turns OFF. It is valid when infinite length axis is set with an absolute encoder.

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Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
24	Position Control Status (POSSTS) (cont'd)	Bit 4	Preset Request for Number of POSMAX Turns Completed (TPRSE)	Turns ON when OB□□2D1: Request for Preset Number of POSMAX Turns is ON and presetting has been completed. It turns OFF when OB□□2D1: Request for Preset Number of POSMAX Turns goes OFF. It is valid when infinite length axis is set.
		Bit 5	Electronic Gear Enabled Selection (GEARM)	Indicates the electronic gear enabled selection at bit 4 of motion fixed parameter No. 17.
		Bit 6	Axis Selection (MODSELM)	Indicates the axis selection at bit 5 of motion fixed parameter No. 17.
		Bits 7 to 15	Not used.	–
25	Machine Coordinate System Reference Position (MPOS)	IL□□18	-2^{31} to 2^{31}-1	This parameter is the reference position in the machine coordinate system and is basically the same value at IL□□02 (CPOS). This position data cannot be updated if IB□□170: Machine Locked is ON. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
27	Not used.	IL□□1A	–	–
29	POSMAX Monitor (PMAXTURN)	IL□□1C	1 to 2^{31}-1	Indicates the infinite length axis reset position (POSMAX) at motion fixed parameter No. 23. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
31	Number of POSMAX Turns (PMAXTURN)	IL□□1E	-2^{31} to 2^{31}-1	The count at this parameter goes up and down every time the reset position (POSMAX) for the infinite length axis at motion fixed parameter No. 23 is exceeded. The parameter can be preset with OL□□30: Preset Number of POSMAX Turns and with OB□□2D1: Request for Preset Number of POSMAX Turns. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
33	Not used.	IL□□20	–	–
35	Alarms (ALARM)	IL□□22	This parameter is valid in Position Control Mode when an OW□□20: Motion Command Code is used. Alarm data and a halt to operation are indicated if this register shows anything other than "0." The register can be cleared by starting up OB□□006: Alarm Clear. If an alarm occurs, the SVA Module indicators will indicate ( ) (first axis), ( ) (second axis), ( ) (third axis) and ( ) (fourth axis). The bit configuration is described below.	
		Bit 0	Not used.	–
		Bit 1	Positive Overtravel	Turns ON when the positive overtravel signal is input and a move command is executed in the positive direction. It is valid if Enabled is selected at bit 13 of Motion Controller Function Selection Flags: Positive Overtravel Selection is enabled in motion fixed parameter No. 17.
		Bit 2	Negative Overtravel	Turns ON when the negative overtravel signal is input and a move command is executed in the negative direction. It is valid if bit 14 of Motion Controller Function Selection Flags: Negative Overtravel Selection is enabled in motion fixed parameter No. 17.

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description
35	Alarms (ALARM) (cont'd)		Bit 3	Positive Software Limit (SOTF)	Valid if IB□□156: Zero Point Return Completed turns ON when the positive software limit is enabled and a finite length axis is selected. • **OW□□20: Motion Command Code Interpolation** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≥ Positive Software Limit (motion fixed parameter No. 27). • **OW□□20: Motion Command Codes Positioning, Feed. or Step** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≤ Positive Software Limit (motion fixed parameter No. 27).
			Bit 4	Negative Software Limit (SOTR)	Valid if IB□□156: Zero Point Return Completed turns ON when the negative software limit is enabled and a finite length axis is selected. • **OW□□20: Motion Command Code Interpolation** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≤ Negative Software Limit (motion fixed parameter No. 29). • **OW□□20: Motion Command Codes Positioning, Feed. or Step** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≥ Negative Software Limit (motion fixed parameter No. 29).
			Bit 5	Not used.	–
			Bit 6	Positioning Time Over (TIMEOVER)	Turns ON if bit 13 of IW□□00: Positioning Completed Signal does not turn ON when the Positioning Completed Check Time (OW□□34) is exceeded after bit 2 of IW□□15: Distribution Completed is turned ON.
			Bits 7 to 9	Not used.	–
			Bit 10	Control Mode Error (MODERR)	Turns ON when a move command is set at OW□□20: Motion Command Code in a mode other than Position Control Mode (OB□□002 is OFF).
			Bit 11	Zero Point Not Set (ZSET_NRDT)	Turns ON when an attempt is made to execute one of the following motion commands with the bit 3 of IW□□15: Zero Point Setting Completed Signal turned OFF. • POSING • EX_POSING • INTERPOLATE • ENDOF-INTERPOLATE • LATCH It is valid when infinite length axis is set when an absolute encoder is used.
			Bits 12 to 16	Not used.	–
			Bit 17	ABS Encoder Count Exceeded	Turns ON when the absolute encoder count exceeds the range that the Motion Module can handle. It is valid if a finite length axis is set when an absolute encoder is used.
			Bit 18	Broken PG Wire Error	Turns ON when a broken PG wire is detected. It is valid when the pulse calculation method selection is set to the A/B mode in motion fixed parameters.
			Bits 19 to 31	Not used.	–

Table 5.7 Motion Monitoring Parameters (cont’d)

No.	Name	Register Number	Setting Range/ Bit Name	Description
37	Servo Driver Alarm Code (SVALARM)	IW□□24	-32768 to 32767	Indicates the error code when IB□□004: Cumulative Number of Rotations Received Error turns ON when an absolute position is read from the absolute encoder. It is valid when an absolute encoder is used.
38	Not used.	IW□□25	–	–
39	Speed Reference Output Monitor (RVMON)	IL□□26	-2^{31} to $2^{31}-1$	Indicates the travel distance every scan and is “0” when IB□□170: Machine Locked is ON. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
41	Position Buffer Read Data (CNMON)	IL□□28	-2^{31} to $2^{31}-1$	Position data from the position buffer specified at OL□□38: Position Buffer Access Number is read and stored at this parameter when motion setting parameter OB□□21F: Position Buffer Read turns ON. It takes about 2 scans from the time that OB□□21F: Position Buffer Read turns ON until data is stored at this register. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
43	Not used.	IL□□2A	–	–
45	Integral Output Monitor (YIMON)	IL□□2C	-2^{31} to $2^{31}-1$	Indicates the integral output value when position loop is used with PI control (Refer to bit 8 of OW□□21). It is valid in Position Control Mode or Zero Point Return Mode.
47	Calculated Reference Coordinate System Position (POS)	IL□□2E	-2^{31} to $2^{31}-1$	This parameter has meaning when the motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). It indicates the target position for every infinite length axis scan. Refer to *Position Monitoring* in *2.3.1 Prerequisites for Position Control* for details. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used.
49	Primary Lag Monitor (LAGMON)	IL□□30	-2^{31} to $2^{31}-1$	Indicates (PI output – Primary lag output). It is valid in Position Control Mode or Zero Point Return Mode.
51	Position Loop Output Monitor (PIMON)	IL□□32	-2^{31} to $2^{31}-1$	Indicates the position loop output value (prior to adding the calculated feed forward value). It is valid in Position Control Mode or Zero Point Return Mode.
53	Position Monitor 2 (APOS2)	IL□□34	-2^{31} to $2^{31}-1$	This parameter is valid when bit 7 (motion command code selection) of fixed parameter No. 14 is set to 1 (“Used”). It indicates the value before addition of OL□□06: Zero Point Offset. When using this parameter, add the zero point offset converted to the current unit (reference units or pulses). The setting of OB□□2D, bit 3: Position Monitor 2 Unit Selection affects the data stored for this parameter. • **OB□□2D, bit 3 = 0** Indicates the current monitored position in reference units. This parameter cannot be used if bit 5 (axis selection) of fixed parameter No. 17 is set to 1 (infinite length axis) and OL□□02: Zero Point Offset is not set to 0. • **OB□□2D, bit 3 = 1** Indicates IL□□08: Position Monitor converted to pulses.
55	Not used.	IW□□36	–	–
56	Not used.	IW□□37	–	–

Table 5.7 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
57	Lower-place 2 Words of Encoder Position at Shutdown	IL□□38	-2^{31} to 2^{31}-1	These parameters are used for ABS system infinite length position control. Encoder position at shutdown and pulse unit position at shutdown are paired data that together are called ABS system infinite length position control information. ABS system infinite length position control information must be saved periodically to M registers using a low-speed drawing (DWG.L).
59	Upper-place 2 Words of encoder position at Shutdown	IL□□3A	-2^{31} to 2^{31}-1	
61	Lower-place 2 Words of Pulse Position at Shutdown	IL□□3C	-2^{31} to 2^{31}-1	
63	Upper-place 2 Words of Pulse Position at Shutdown	IL□□3E	-2^{31} to 2^{31}-1	

6

SVB Module Specifications and Handling

This chapter describes the specifications and handling of the SVB-01 Module.

6.1 SVB-01 Module

This section describes the specifications and handling of the SVB-01 Module.

6.1.1 Hardware Specifications

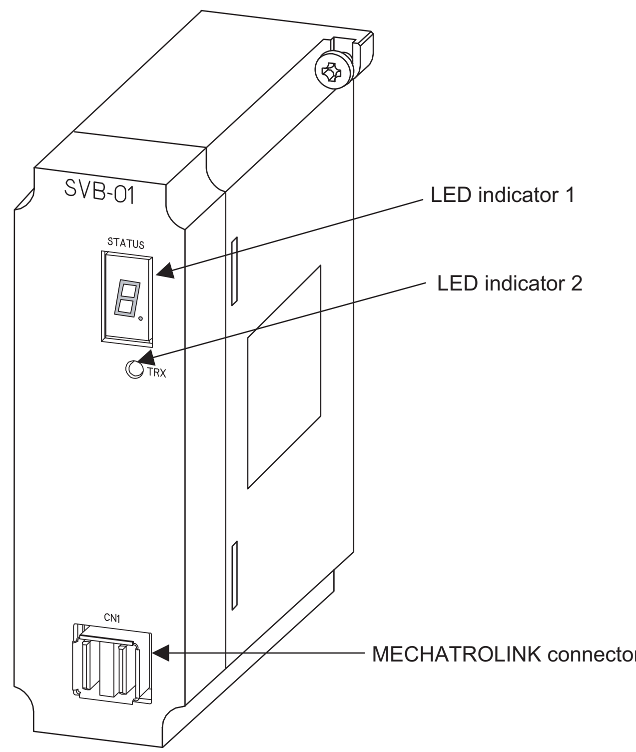
Table 6.1 shows the SVB-01 Module hardware specifications.

Table 6.1 SVB-01 Module Hardware Specifications

Item	Specifications
Name	MECHATROLINK Interface Module
Model Number	JEPMC-MC210
Description	SVB-01
Field Bus	MECHATROLINK (High-speed field network) Up to 14 stations including Servos, I/Os, and 216IF can be connected.
Connectors	USB connector (4-pin male soldering connector) Model: DUSB-APA41-B1-C50
Current Consumption	500 mA
Indicators	Modules status display LED, 7-segment LED (green)
Hot Swapping (Removal/Insertion under Power)	Not possible.
Dimensions	40 × 130 × 105 mm (W × H × D)

6.1.2 Handling

The following illustration shows the appearance of the SVB-01 MECHATROLINK Interface Module.



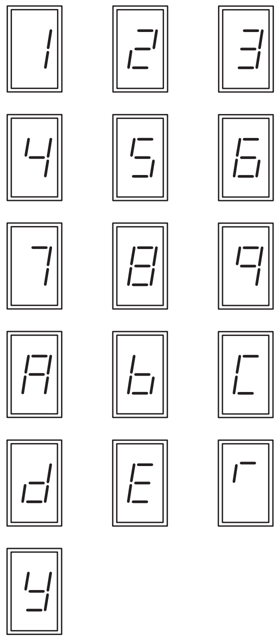
6

■ LED Indicator 1

The STATUS indicator is a 7-segment LED indicator that displays the RUN/error status of the SVB-01 Module. The following table shows the indicator display patterns.

Display	Category	Meaning
	Hardware reset	The SVB-01 Module is in hardware reset status.
	Initializing	This display appears one to six seconds after the SVB-01 Module is turned ON or reset.

(cont'd)

Display	Category	Meaning
	Normal operation	One of servo numbers 1 to 16 will be displayed. The Servo Modules is operating normally.
 or  followed by error code	Major fault	A two-digit error code appears following F. Examples: F → 0 → 1: Watchdog time over F → 0 → 2: Synchronization error F → 4 → 1: ROM diagnosis error F → 4 → 2: RAM diagnosis error F → 4 → 3: Shared memory diagnosis error F → 4 → 8: General illegal instruction interruption occurrence F → 4 → 9: Slot illegal instruction interruption occurrence F → 5 → 0: CPU address error interruption occurrence F → 5 → 2: User brake interruption occurrence F → 5 → 3: Trap instruction interruption occurrence F → 5 → 5: CERF initializing error F → 5 → 8: TLB error exception interruption occurrence F → 5 → 9: TLB error exception interruption occurrence F → 6 → 0: TLB disable exception interruption occurrence F → 6 → 1: TLB disable exception interruption occurrence F → 6 → 2: Initial page write in exception interruption occurrence F → 6 → 3: TLB protective exception interruption occurrence F → 6 → 4: TLB protective exception interruption occurrence

(cont'd)

Display	Category	Meaning
	Alarm	Displayed when the following errors occur at one of the four axes (axes 1 to 14). • Motion setting parameter setting error (Refer to IB□□001.) • Alarm occurs (Refer to IL□□22.) • Motion command abnormal-end status (when IB□□155 is ON)
	Abnormal	Displayed when the following error occurs at one of the four axes (axes 1 to 14). Fixed motion parameter setting error (Refer to IB□□002.)

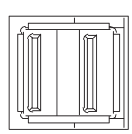
■ LED Indicator 2

The TRX indicator displays the communications status of the SVB-01 Module.


TRX

LED Name	LED Color	Meaning when Lit
TRX	Green	Transmission enabled

■ MECHATROLINK Connector (CN1)



Use MECHATROLINK cables (JEPMC-W6000-A3 or JEPMC-W6000-□□) to connect SERVOPACKs or IO350 stations.

■ Connector Specifications

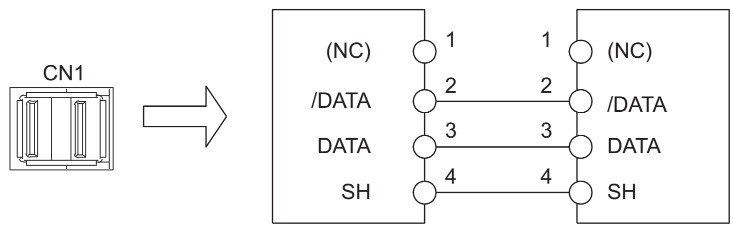
The following table shows the specifications of the connectors shown above.

Name	Connector Name	Number of Pins	Connector			Cable
			On Module	On Cable	Manufacturer	
MECHA-TROLINK Connector	CN1	4	DUSB-APA42-T11	• USB-USB type • Connector DUSB-APA41-B1-C50	DDK	JEPMC-W6000-A3 (0.3 m)
				• USB-loose wire type • Connector DUSB-APA41-B1-C50	DDK	JEPMC-W6010-01 (1 m) JEPMC-W6010-03 (3 m) JEPMC-W6010-05 (5 m)
				• USB terminator • Connector body DUSB-APA41-B1-C50	DDK	JEPMC-W6020

■ CN1 Connection

The right and left CN1 connector ports are identical. The cable end can be inserted into either of these ports.

Insert the USB Terminator (JEPMC-W6020) into the unused port.

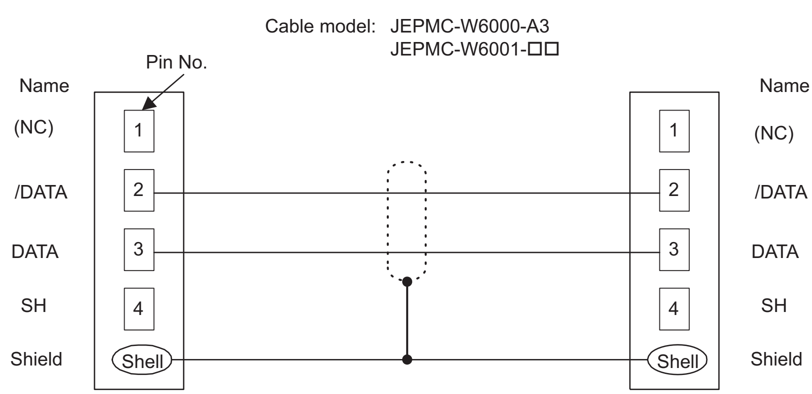


IMPORTANT

The SVB-01 Modules has a MECHATROLINK port for only one channel. Use either of the two connectors.

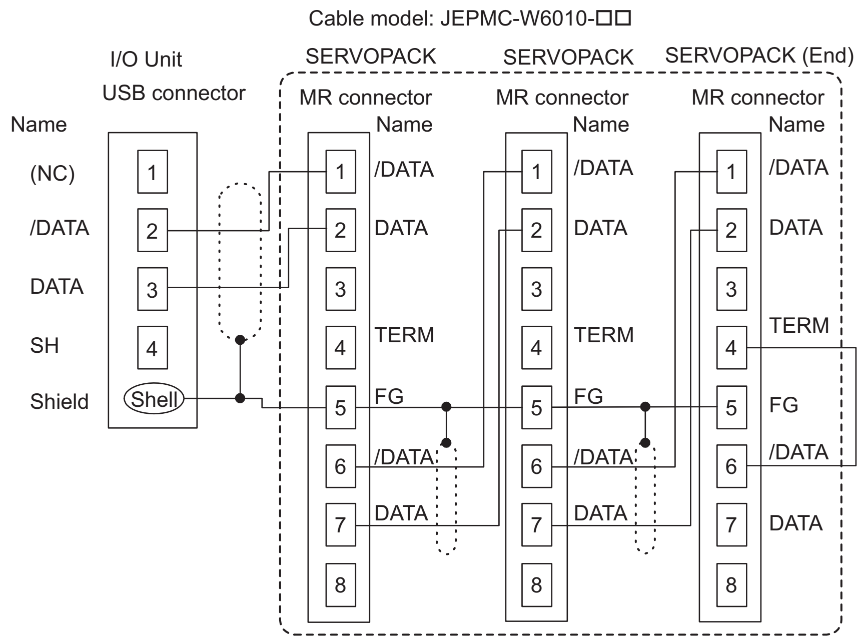
■ Connection and External View of Standard Cables

The internal cable connection between the SVB-01 Modules and the I/O Unit (IO350) is shown in the following figure.



Note: A divided core is attached to the cable model JEPMC-W6001-□□.

The following figure shows internal MECHATROLINK cable connections when multiple SERVOPACKs are connected to an SVB-01 Module (1: N cable connections).



Note: 1. The JEPMC-6010-□□ has one USB connector. For 1: N cable connections, the user is required to prepare cables with MR connectors and wires.

2. DATA lead: Red
/DATA lead: Black

3. The shield may be connected in the way described in the relevant SERVOPACK manual. For connection with MP900-series Machine Controller, the connection described in the figure above is recommended.

6

MECHATROLINK Cables

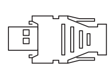
Model: JEPMC-W6000-A3

Model: JEPMC-W6001-□□

Model: JEPMC-W6010-□□

USB Terminator

Model: JEPMC-W6020



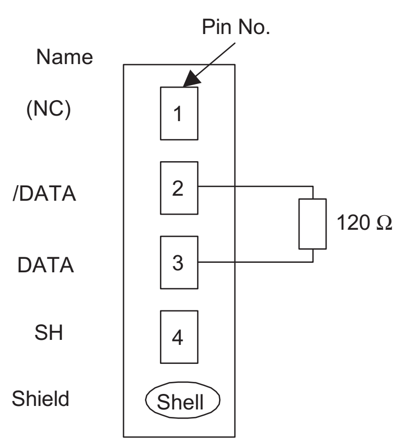
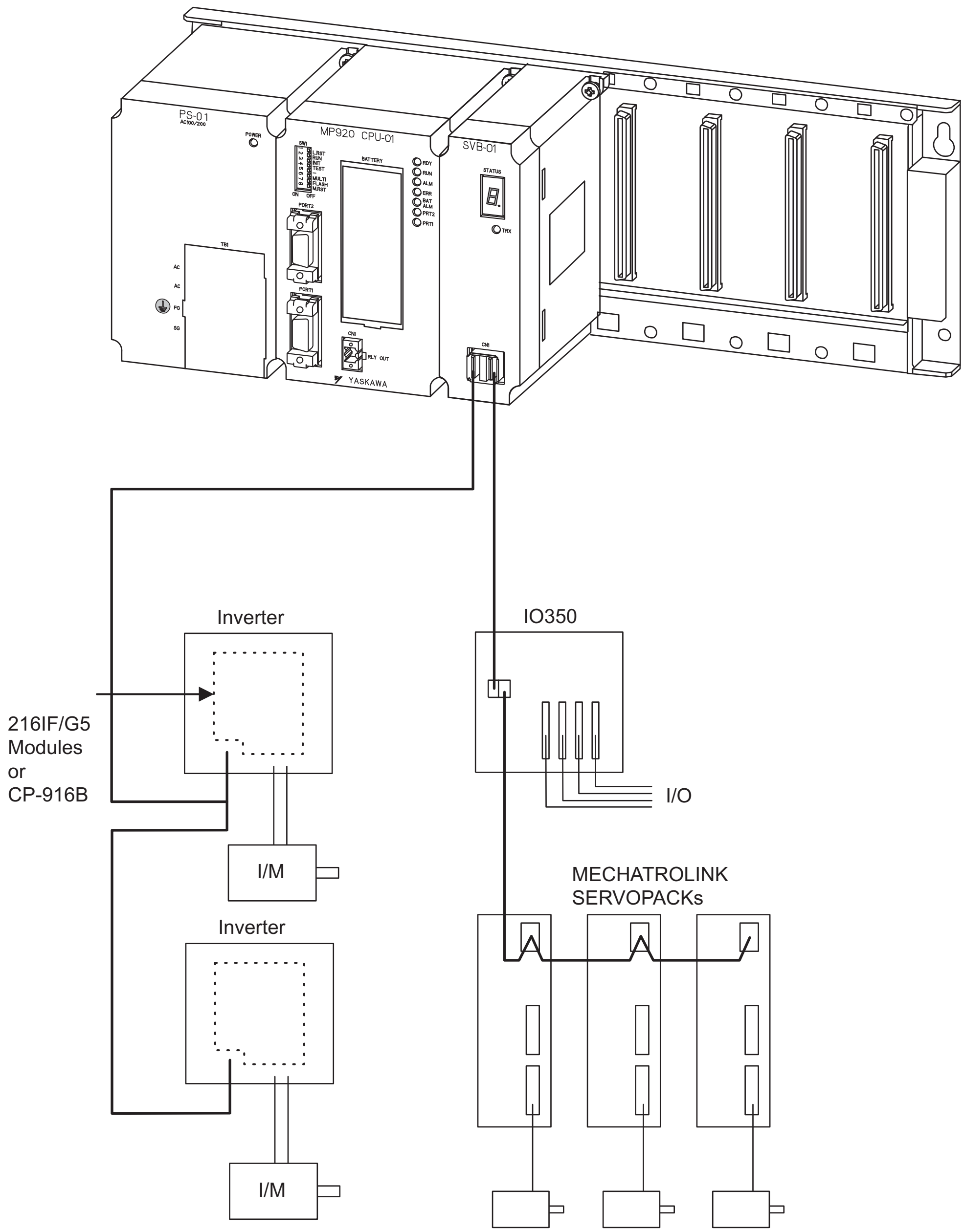


Fig. 6.1 USB Terminator Connection Diagram

■ SVB-01 System Configuration



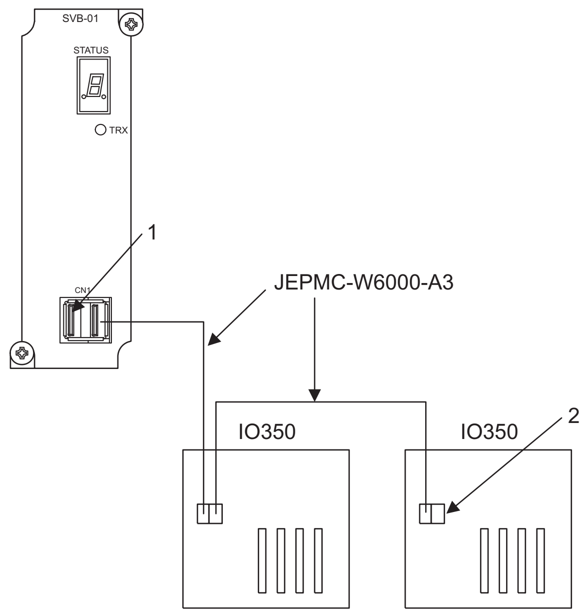
6

IMPORTANT

The connector on the SVB-01 Module has two ports, but it provides a MECHATROLINK port for only one channel. These two ports are the same, so the cable end can be inserted into either of them. Up to 14 stations can be connected to the port.

■ SVB-01 Module Connections

Connection of IO350 Unit



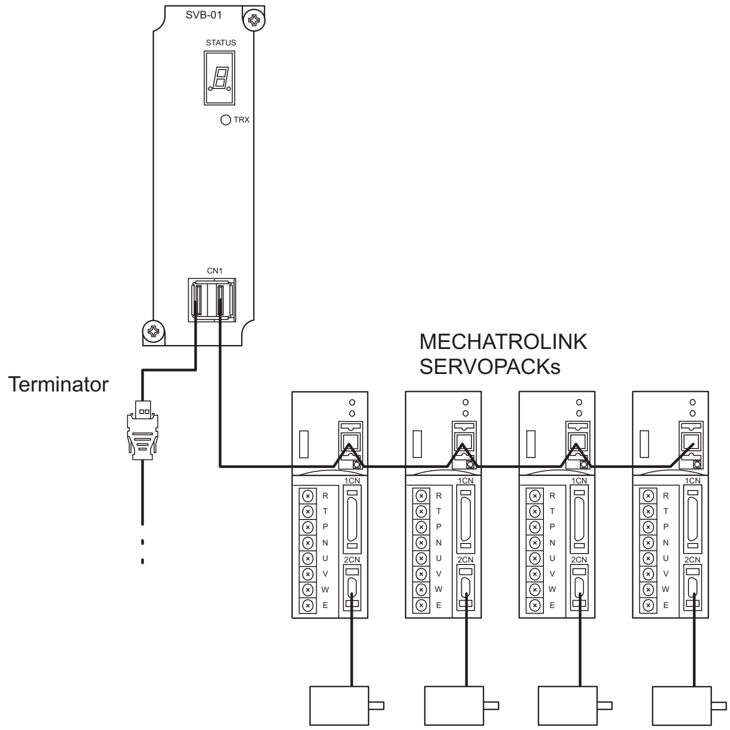
- Use a standard cable (JEPMC-W6000-A3) to connect an SVB-01 Module to an IO350 Unit or connect two IO350 stations.

IMPORTANT

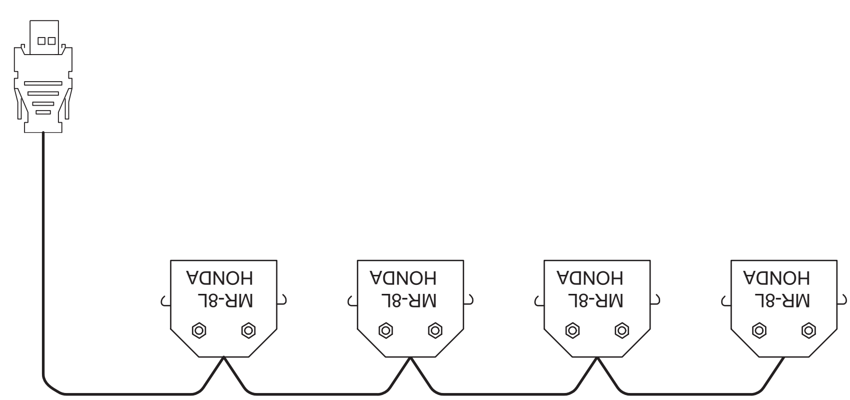
Be sure to insert a USB Terminator (JEPMC-W6020) into the end connectors indicated by 1 and 2 in the above figure. See *Cables* for the appearance and internal connection diagram of the USB Terminator.

Connection of Multiple MECHATROLINK SERVOPACKs

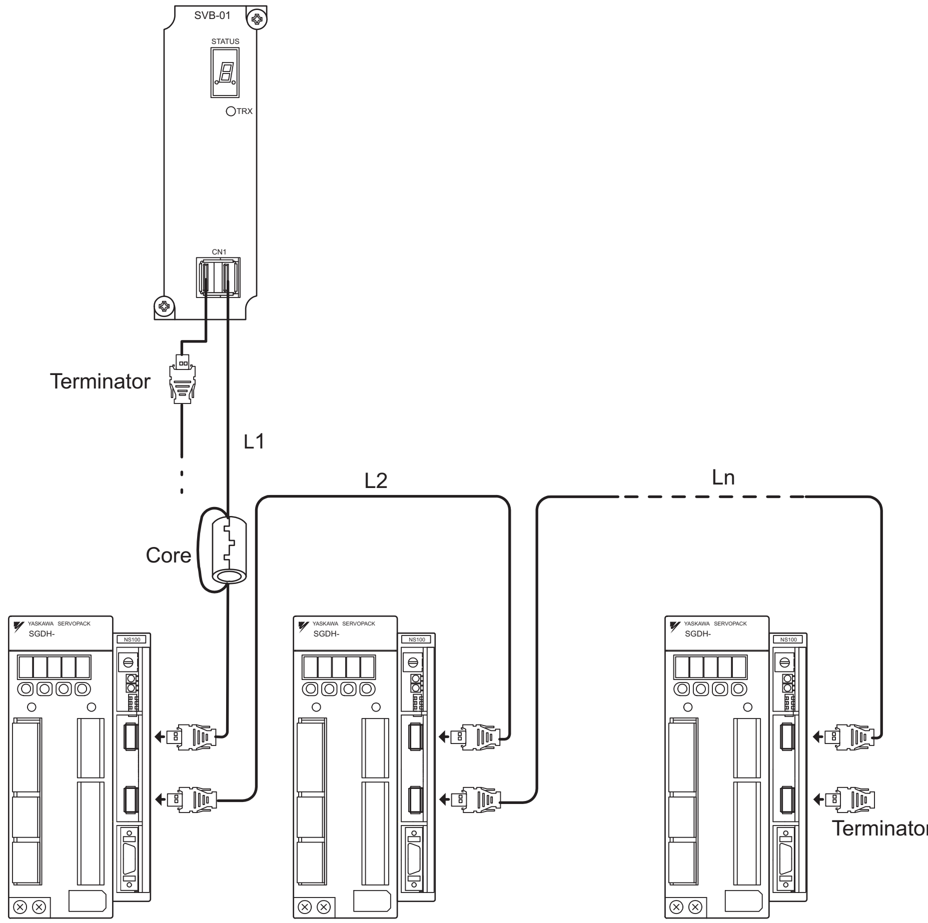
1. SGD-□□□N SERVOPACKs



To connect MECHATROLINK SERVOPACKs to an SVB-01 Module, the user must use a standard cable (JEPMC-W6010-□□) and also prepare the following cables with MR connectors and wires. Refer to *Cables* for cable appearances and internal connection diagrams.



2. SGDH-□□□E + JUSP-NS100 SERVOPACKs



Note: Use the above system under the condition L1 + L2 + L3 ··· + Ln ≤ 50 m.
The number of connectable stations is limited to 15.

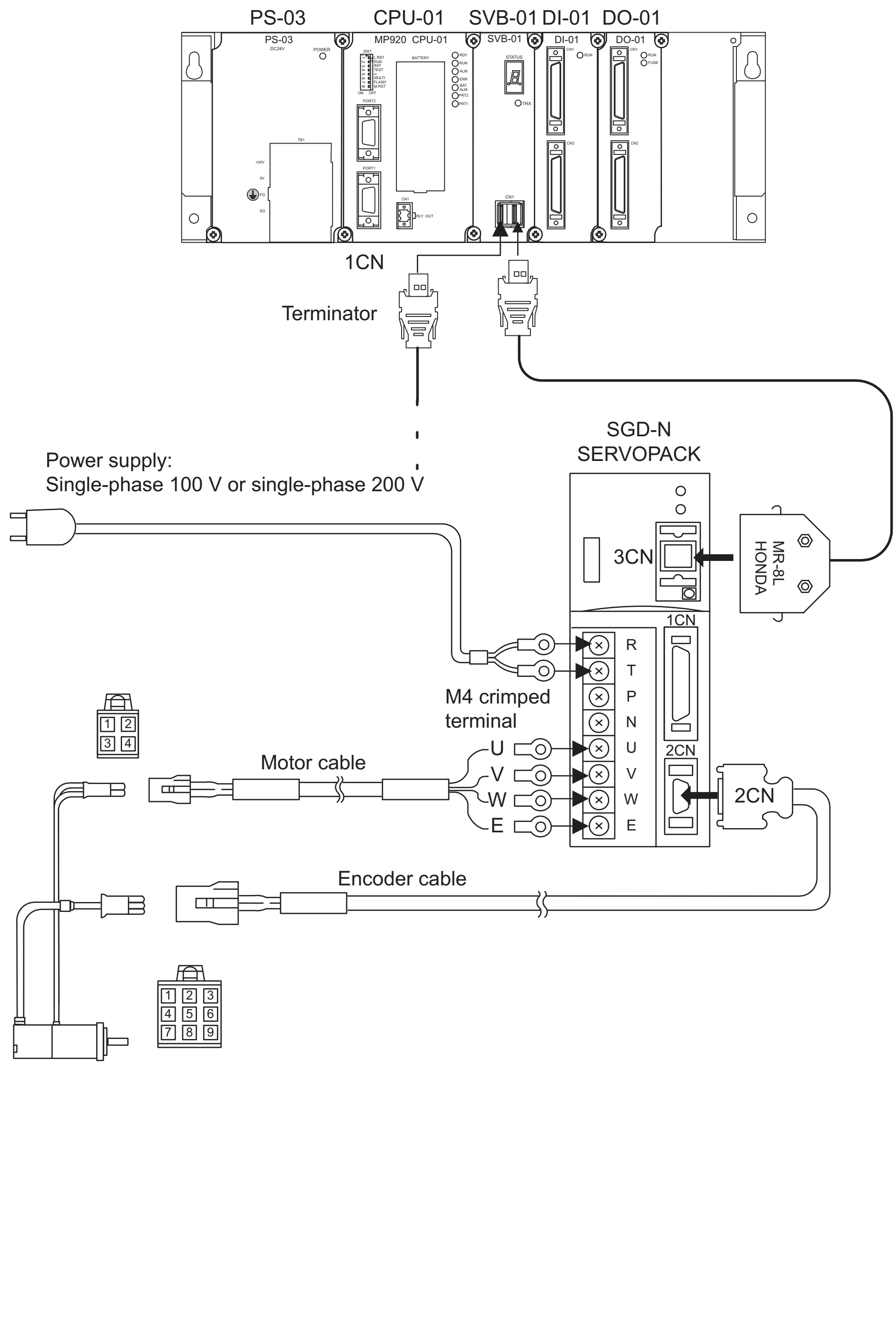
Use the cable JEPMC-W60001-□□ for the connection between the SVB-01 Module and the SGDH-□□□E + JUSP-NS100 SERVOPACK.

Refer to *6.1.2 Handling* for the cable appearance and internal connection diagrams.

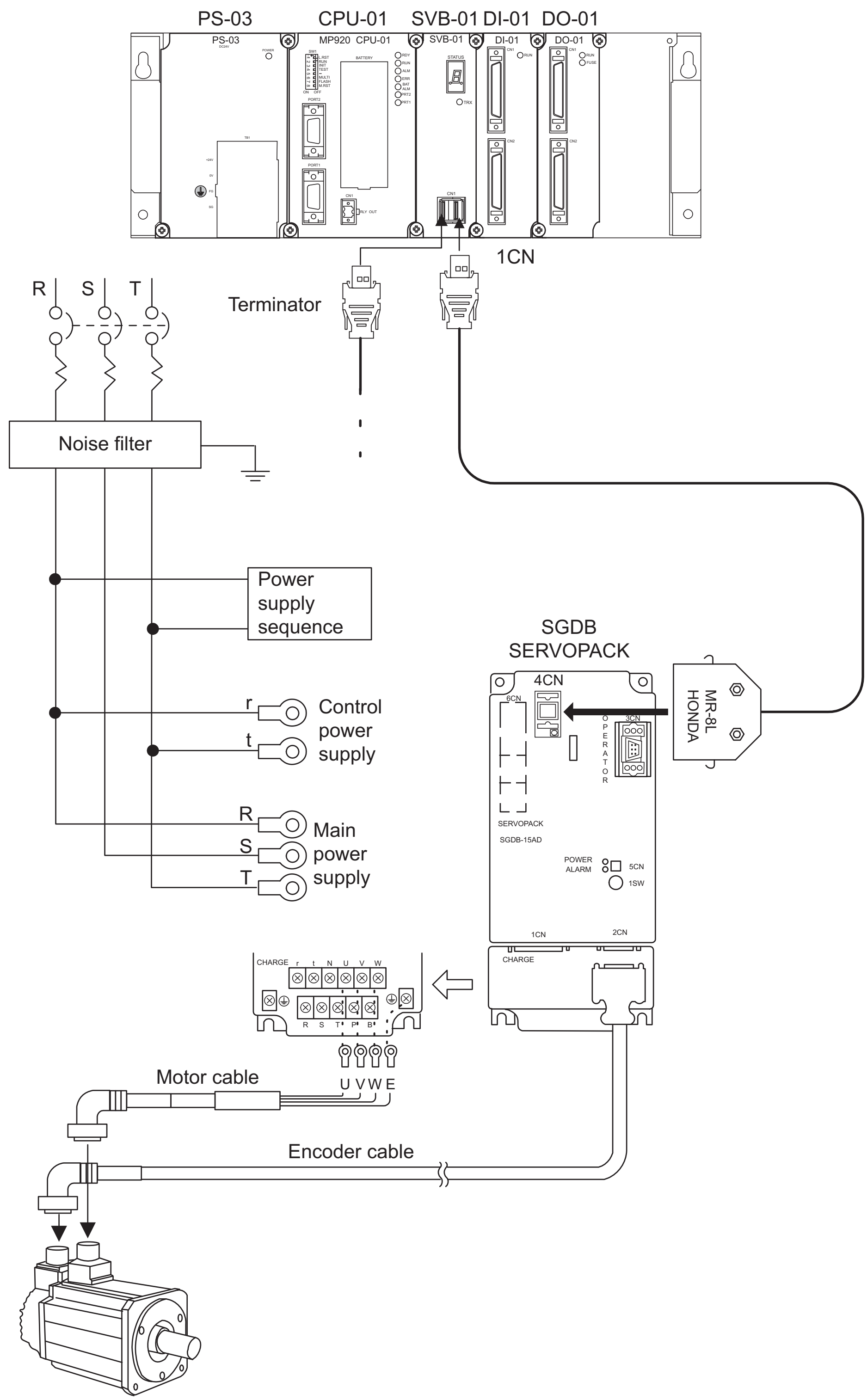
■ Connection of SERVOPACK and Servomotor

Use dedicated cables and encoder cables to connect a SERVOPACK to a Servomotor.

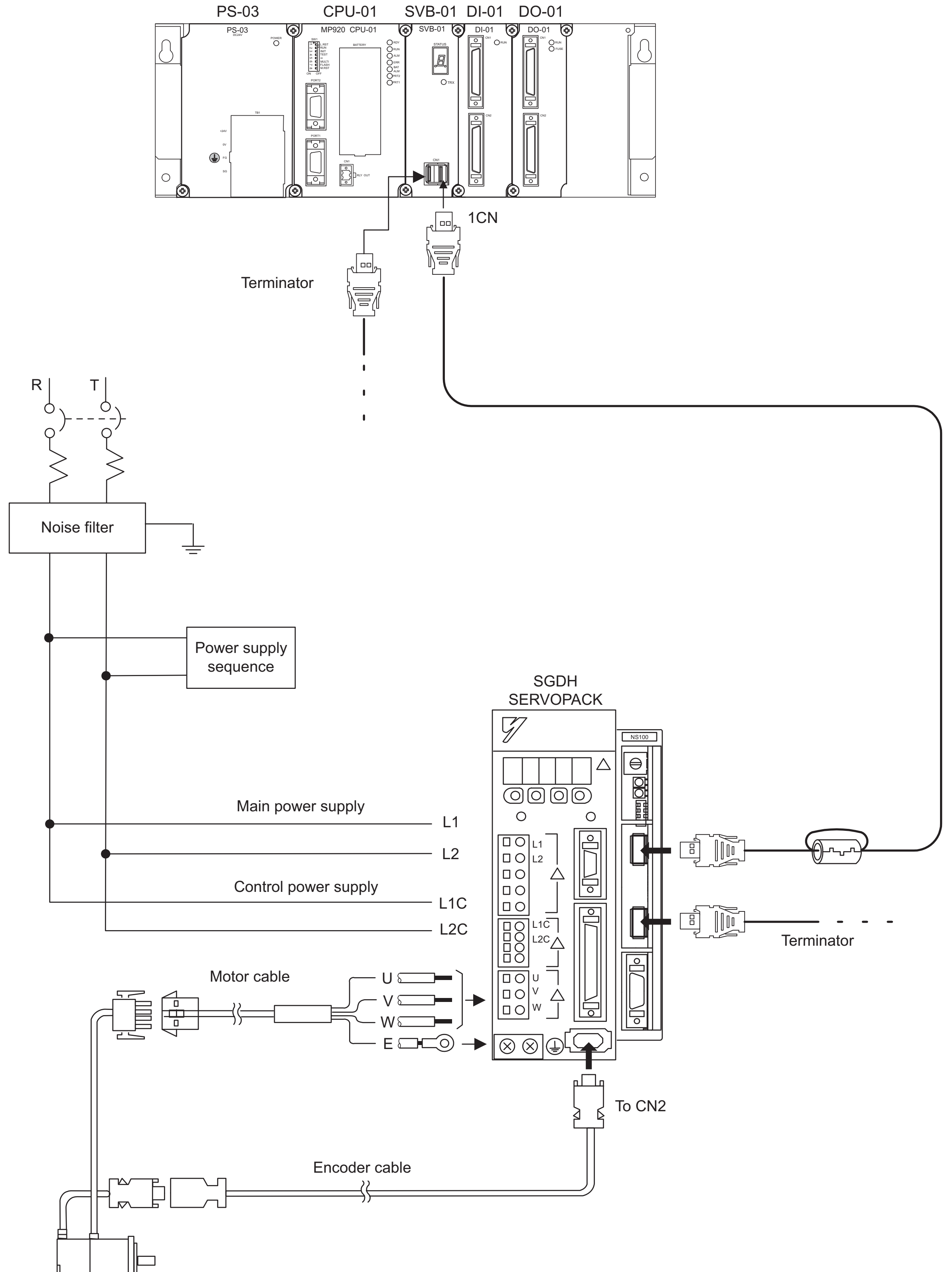
Connection with SGD-□□□N SERVOPACK



Connection with SGDB-□□□N SERVOPACK



Connection with SGDH-□□□E + JUSP-NS100 SERVOPACK



6.2 SVB-01 Parameters

6.2.1 Motion Fixed Parameters

IMPORTANT

Motion fixed parameters cannot be changed if the current value of bit 0 is ON in motion setting parameter OW☐☐01, RUN Command Settings.
Positions and other data are initialized when a motion fixed parameter is changed.

Table 6.2 Motion Fixed Parameters

No.	Name	Description	Factory Setting
1	Axis Selection (USESEL)	Set whether an axis is used or not. 0: Not used. 1: Used. If an axis is set to be not used, then that axis will not be controlled and IW☐☐00 to IW☐☐3F monitoring parameters will not be refreshed. “0” will be stored at IW☐☐00 RUN Status.	0 (Not used)
2	Not used.	–	–
3	Encoder Selection (ENCSEL)	Set the type of encoder that is used. 0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as incremental encoder	0 (Incremental encoder)
4	Not used.	–	–
5	Pulse Counting Mode Selection (PULMODE)	Set the pulse counting method. Set one of the following seven modes to match the pulse read method for the system that is used. 4: A/B pulses mode, × 1 5: A/B pulses mode, × 2 6: A/B pulses mode, × 4	6 (A/B pulses × 4)
6	Not used.	–	–
7	Rated Motor Speed Setting (NR)	Set motor speed at rated (100%) operation in 1 min^{-1} units. Set this parameter based on the specifications of the Servomotor that is used.	3000
8	Number of Feedback Pulses per Rotation (FBppr)	Set the number of feedback pulses per Servomotor rotation (no multiplier). Set this parameter based on the specifications of the encoder that is used. • Setting range: Set a multiple of 4 between 4 and 65532 (p/r).	2048
9	Number of Feedback Pulses per Rotation (For high-resolution)	Set the number of encoder pulses per Servomotor rotation without multiplication.	2048
10 to 13	Not used.	–	–
14	Additional Function Selections	Bit 9: Number of encoder pulses setting selection 0: Fixed parameter No. 8 1: Fixed parameter No. 9	–
15	Not used	–	–
16	Simulation Mode Selection (SIMULATE)	0: Normal operation mode 1: Simulation mode	0

Table 6.2 Motion Fixed Parameters (cont'd)

No.	Name		Description		Factory Setting
17	Motion Controller Function Selection Flags (SVFUNCSEL)		Set whether a function is enabled or disabled when a motion command is used.		–
		Bits 0 to 3	Reference Unit Selection (CMD_UNIT)	Set the reference unit that is input. 0: pulse (electronic gear disabled) 1: mm 2: deg 3: inch When a unit is selected, the minimum unit that can be used as reference is determined by motion fixed parameter No. 18: Number of Digits Below the Decimal Point.	0 (pulse)
		Bit 4	Electronic Gear Selection (USE_GEAR)	Set whether or not to use the electronic gear function. 0: Disabled 1: Enabled The electronic gear is disabled even if this flag is enabled when pulse is selected as the reference unit.	0 (Disabled)
		Bit 5	Axis Selection (PMOD_SEL)	Finite length/infinite length axis selection. Set whether or not there is a limit on controlled axis movement. 0: Finite length axis • The axis will have limited movement. • The software limit function is enabled. 1: Infinite length axis • The axis will have unlimited movement. • The software limit function is disabled.	0 (Finite length axis)
		Bit 6	Not used.	–	–
		Bit 7	Positive Software Limit Selection (USE_SLIMP)	Set whether or not to use the software limit function in the positive direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter No. 27. • Software Limit Function Enable Timing Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)
		Bit 8	Negative Software Limit Selection (USE_SLIMN)	Set whether or not to use the software limit function in the negative direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter No. 29. • Software Limit Function Enable Timing Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)

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Table 6.2 Motion Fixed Parameters (cont'd)

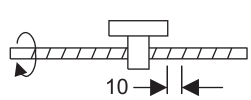
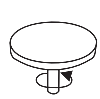
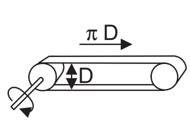
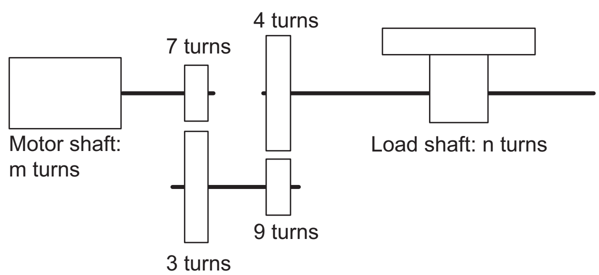
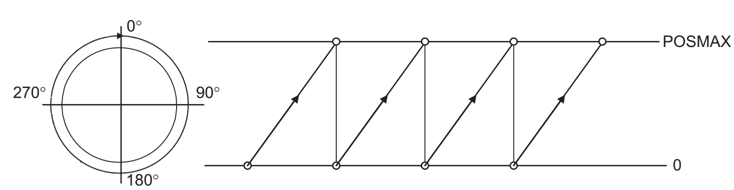
No.	Name		Description		Factory Setting
17		Bit 9	Override Selection (USE-OV)	Set whether or not to use the override function. (For interpolation related commands, set override in the register specified in the Group Definition Window.) 0: Disabled 1: Enabled The OW□□2C: Override is used when this parameter is set to Enabled. The override is fixed at 100 if this parameter is disabled. Note: The override function always the feed speed setting to be modified in an application.	0 (Disabled)
		Bits 10 to 11	Not used.	–	–
		Bit 12	Servo Drive Transparent Command Mode (THROUMOD)	In this mode, the user can directly execute MECHATROLINK servo commands. 0: Disabled 1: Enabled For MECHATROLINK servo commands, motion setting parameters OW□□30 to OW□□37 (16 bytes) are used to send command data, and motion monitoring parameters IW□□30 to IW□□37 (16 bytes) are used to receive response data.	0 (Disabled)
		Bits 13 to 14	Not used.	–	–
		Bit 15	Interpolation Command Segment Distribution Function	Always set this bit to 0 (enabled) when using interpolation-related motion commands (interpolation or interpolation with position detection).	0 (Enabled)
18	Number of Digits Below Decimal Point (DECNUM)		Set the number of digits to the right of the decimal point in input reference units. The minimum reference unit is determined by this parameter and Reference Unit Selection in the Motion Controller Function Selection Flags (bit 0 to bit 3).		3
19	Travel Distance Per Machine Rotation (PITCH)		Set the load travel distance (reference unit) per load axis rotation. • Setting range: 1 to 2^{31}-1		10000
			Ball screw  Ball screw pitch = 10 mm	Ball screw pitch = 10 mm Reference Unit Selection = mm Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to 10000.	
			Rotating table  One rotation = 360°	One table rotation = 360° Reference Unit Selection = deg Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to 360000.	
			Belt 	One roller rotation = 360° Reference Unit Selection = mm Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to $\pi D \times 1000$.	

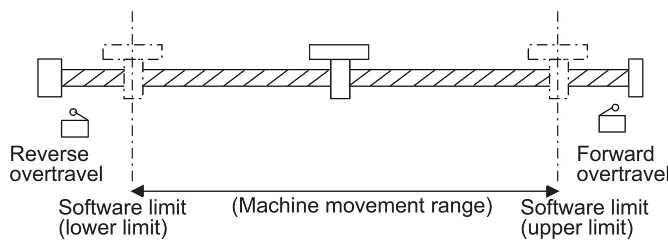
Table 6.2 Motion Fixed Parameters (cont'd)

<table>
<tr><th>No.</th><th>Name</th><th>Description</th><th>Factory Setting</th></tr>
<tr><td>21</td><td>Servomotor Gear Ratio (GEAR_MOTOR)</td><td rowspan="2">These parameters determine the gear ratio between the motor and the load.
The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft.
• Gear ratio at Servomotor: m
• Gear ratio at load: n
Setting Example


In the above example, the reduction ratio is n/m, or $3/7 \times 4/9 = 4/21$. The following setting would thus be made.
Servomotor Gear Ratio: 21
Load Gear Ratio: 4</td><td>1</td></tr>
<tr><td>22</td><td>Machine Gear Ratio (GEAR_MACHINE)</td><td>1</td></tr>
<tr><td>23</td><td>Infinite Length Axis Reset Position (POSMAX)</td><td>Set the reset position for a rotation when infinite length axis is set. This parameter is not valid when a finite length axis is set.
• Setting range: 1 to 2^{31}-1 [reference units]
Example: For rotating load, the value will be reset every 360°.

</td><td>360000</td></tr>
<tr><td>25</td><td>Maximum Number of Absolute Encoder Turns (MAXTURN)</td><td>Set the maximum number of rotations for the absolute encoder when an absolute encoder is used.
• Setting range: 1 to 2^{31}-1 [rotations]
Refer to Chapter 8 Absolute Position Detection of Machine Controller MP920 User's Manual: Design and Maintenance (SIEZ-C887-2.1) for details.</td><td>99999</td></tr>
</table>

6

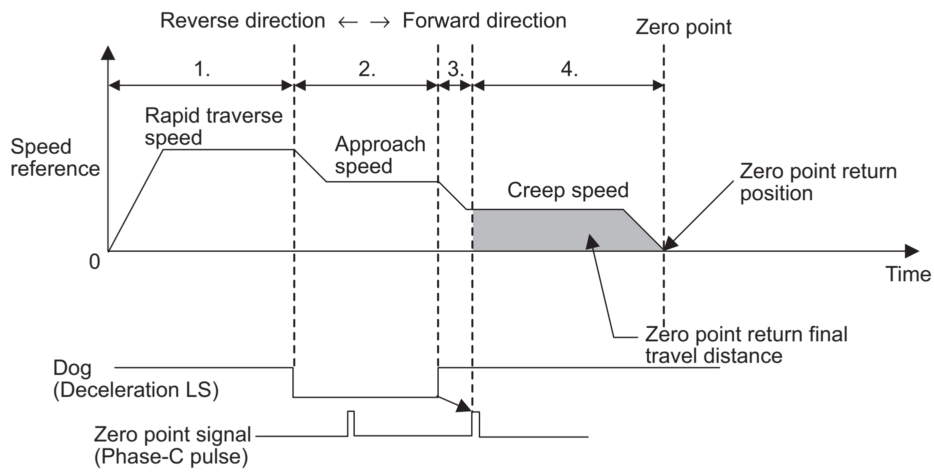
Table 6.2 Motion Fixed Parameters (cont'd)

No.	Name	Description	Factory Setting
27	Positive Software Limit (SLIMP)	Set the positions at which the software limit function is to operate on the machine coordinate system.	2147483647
29	Negative Software Limit (SLIMN)	• Setting range: 1 to 2^{31}-1 [reference units] Whether or not the software limits are used is set in bit 7 and bit 8 of the Servo Controller Function Selection Flags at fixed parameter No. 17. With the software limits, the upper and lower limits of the movement range for the machine system are set in fixed parameters and the operating range is constantly monitored by the controller. 	-2147483648
31	Zero Point Return Method (ZRETSEL)	Set the zero point return method when returning to the zero point (ZRET) using OW☐☐20: Motion Command Code. Refer to Zero Point Return Method on the next page for details. • 0: DEC1 + Phase-C pulse • 1: Zero signal • 2: DEC1 + Zero signal • 3: Phase-C pulse	0 (DEC1 + Phase-C pulse)
32 to 48	Not used.	–	–

The following sections describe the zero point return methods.

■ 0: DEC 1 + Phase-C Pulse

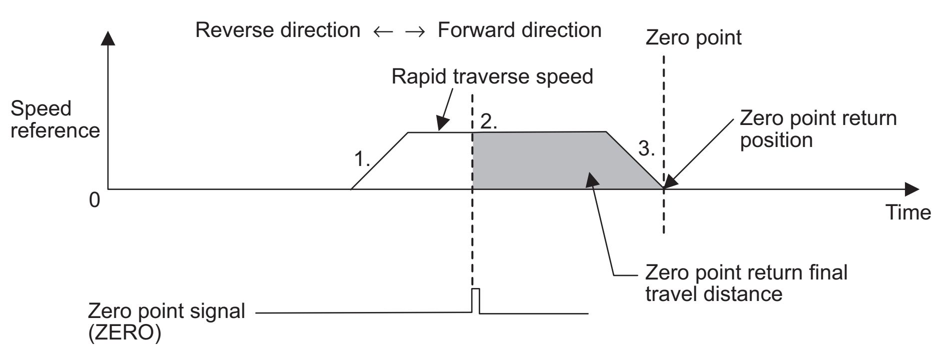
This method has three speed levels.



■ 1: Zero Signal

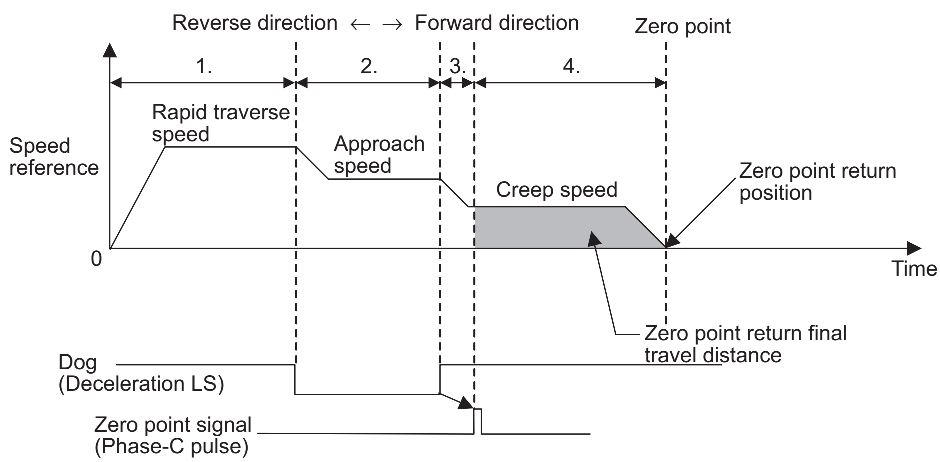
In place of the Phase-C pulse of the Phase-C pulse method, this method uses the zero signal to return to the zero point.

This method uses just the zero signal to return to the zero point in machines that are not equipped with deceleration LS and other capabilities.



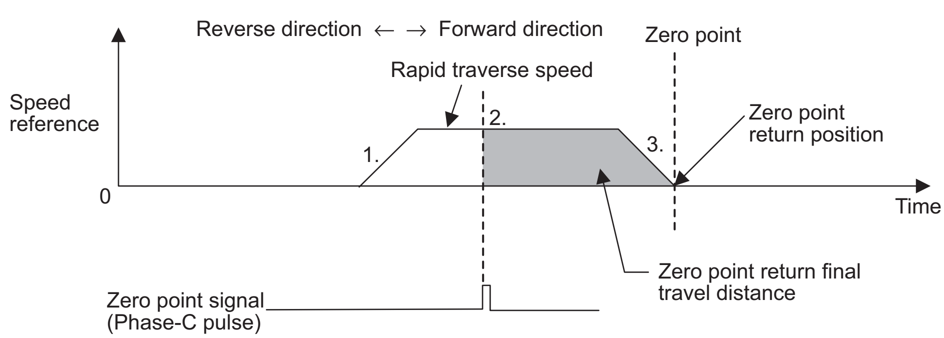
■ 2: DEC 1 + Zero Signal

In place of the Phase-C pulse of the DEC 1 + Phase-C pulse method, this method uses the zero signal to return to the zero point.



■ 3: Phase-C Pulse

This method uses just the Phase-C pulse of the Servomotor to return to the zero point in machines that are not equipped with deceleration LS and other capabilities.



6.2.2 Motion Setting Parameters

⚠ CAUTION

- Zero Point Position Offset in the Machine Coordinate System (ABSOFF)
  This register contains data used by SVA Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation.

  Obstructions may damage tools and lead to personal injury if this check is not performed.

Table 6.3 Motion Setting Parameters

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
1	RUN Mode Settings (RUNMOD)	OW□□00		Set the RUN mode, such as Control Mode and Alarm Reset. The bit configuration is shown below.		
			Bit 0	Not used.	Set to "0."	0
			Bit 1	Not used.	Set to "0."	0
			Bit 2	Position Control Mode (PCON)	Used to set Position Control Mode. 0: OFF, 1: ON	1
			Bit 3	Not used.	Set to "0."	0
			Bit 4	Not used.	Set to "0."	0
			Bit 5	Not used.	Set to "0."	0
			Bit 6	Alarm Clear (ACR)	The following monitoring parameters will be cleared when this bit turns ON. 0: OFF, 1: ON • IW□□00 RUN Status: Error Counter Over (bit 0) and Motion Setting Parameter Setting Error (bit 1) • Alarms (IL□□22)	0
			Bit 7	Not used.	Set to "0."	0
			Bit 8	Motion Command Mode Enable/Disable (MCDSEL)	Set whether an OW□□20: Motion Command Code is used or not. 0: OFF (Disable) 1: ON (Enable) For the SVB-01 Module, always set this bit to 1 (Enable).	1
			Bit 9	Zero Point Return Direction Selection (ZRNDIR)	Set the direction for returning to the zero point. 0: OFF Reverse direction (position pulse in the deceleration direction) 1: ON Forward direction (position pulse in the acceleration direction)	0
			Bits 10 to 15	Not used.	Set to "0."	0

IMPORTANT

The SVB-01 Module allows position control mode only. Therefore, do not set this parameter to another mode.

Table 6.3 Motion Setting Parameters (cont'd)

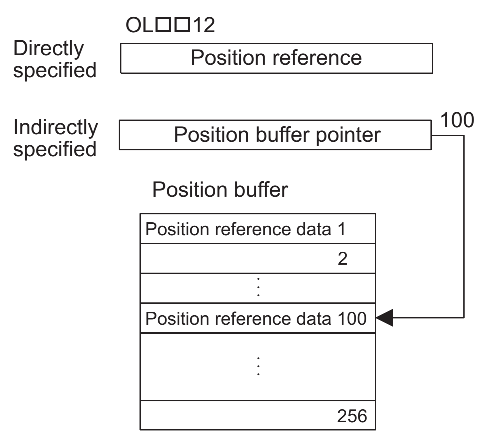
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
2	RUN Command Settings (SVRUNCMD)	OW□□01	Set the output signal from SVB-01 Modules to the driver as well as the RUN mode required for motion control. The bit configuration is described below.		
		Bit 0	Servo ON (DO0)	Used as the servo ON signal for the servo drive. The servo command is sent to the servo drive when SVCRDY (IB□□007) is set to ON and this bit is set to 1. 0: OFF, 1: ON	0
		Bits 1 to 11	Not used.	Set to "0."	0
		Bit 12	Position Reference Value Selection (USE_BUF)	Set the reference method that is used for position reference data. It is valid only when an OW□□20: Motion Command Code is used in Position Control Mode. 0: OL□□12 Use OL□□12 as directly as position reference data. 1: Position Buffer Use OL□□12 indirectly as the position buffer number.  • The position buffer is located in the SVB Modules and must be written in the initial drawing at startup. • Refer to OB□□21E, OB□□21F, and OL□□3A for details on writing to the position buffer.	0
		Bit 13	Speed Reference Value Selection (SPDTYPE)	Set the feed speed reference method. It is valid only when an OW□□20: Motion Command Code is used in Position Control Mode. 0: OL□□22 Set speed in reference units and sets rapid traverse speed at OL□□22. The setting unit is 1 = 10^n reference units/min. 1: OW□□15 Set speed using a percentage and sets rapid traverse speed at OW□□15. The setting unit is 1 = 0.01%.	0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
2	RUN Command Settings (SVRUNCMD) (cont'd)	Bit 14	Position Reference Type (XREFTYPE)	Set the type of data for OL□□12 Position Reference Setting when an OW□□20: Motion Command Code is used in Position Control Mode. 0: Absolute position method Sets the absolute position at OL□□12. 1: Incremental addition Adds the current movement value to the previous value at OL□□12 and then sets that data at OL□□12. Note: 1. Only the absolute position method can be set if the position reference selection is indirectly specified. 2. Select the incremental addition method when moving an axis by using a motion program.	1
		Bit 15	Not used.	Set to "0."	0
3 to 6	Not used.	OW□□02 to OW□□05	–	Set to "0."	0
7	Machine Coordinate System Zero Point Offset Setting (ABSOFF)	OL□□06	-2^{31} to $2^{31}-1$	Position data can be shifted by the value set in this register. See *1* of *Supplemental Explanation* below. The parameter is valid during RUN operation, but set it while the system is OFF. **This register contains data used by SVB Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation.** Obstructions may damage tools and lead to personal injury if this check is not performed. See *2* of *Supplemental Explanation* below.	0

■ Supplemental Explanation

1. Procedure for Using the Zero Point Offset

a) Applications where Absolute Encoder Rotates in One Direction

The zero point position offset can be used in applications where the absolute encoder rotates in one direction by using OL□□06: Zero Point Offset Setting in the motion parameters and creating a user program that will control the absolute position.

b) Initializing the Absolute Encoder

A pulse cannot be reset within one rotation simply by shorting R-S.

For example, an initial incremental pulse corresponding to 0.5 rotations will be sent even though the absolute encoder is reset (R-S shorted) if the Servomotor stops at 95.5 rotations.

Consequently, position data corresponding to 0.5 rotations rather than 0 will be indicated at IL□□08: Position Monitor.

Set the following in order to set the position monitor to 0.

- Preconditions

  Initialize the absolute encoder (short R-S), restart the MP920, and then send a provisional 120 initial incremental pulses. A value of 120 will appear at the position monitor.

- Procedure

  The position can be adjusted with the Zero Point Offset. If the zero point offset is set to -120, the position monitor will show "0."

  The value set at the Zero Point Offset will be reset to "0" if the MP920 is turned OFF, so we recommend setting the parameter with Drawing A (initial processing drawing).

  Example 1: Set DWG.A as follows:

  ⊦ OLC006 - 0000000120 ⇒ OLC006

  Example 2: Set DWG.A as follows:

  ⊦ OLC006 - DL00022 ⇒ OLC006

  Open the Register List Window and set DL00022 to 120 from the MP920 Programming Panel.

  Because DL00022 (register D in DWG.A) is backed up by battery, this program will be executed and -120 will be set at OLC006 automatically when MP920 power is turned ON once the register is set.

  DL00022 was used in this example, but any other D register (DL□□□□□) or M register (ML□□□□□) can be used as well.

  Because the initial incremental pulse will change within a rotation every time the absolute encoder is initialized (R-S), the value -120 must be changed each time.

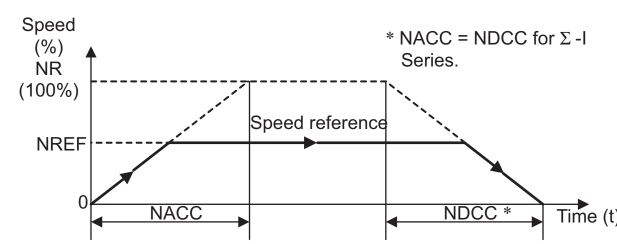
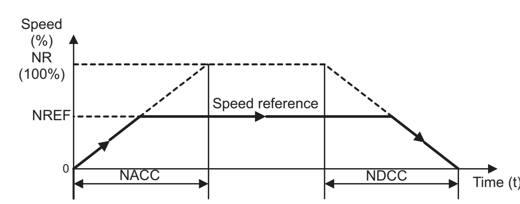
  In Example 1, the user program must be changed from the Programming Panel.

  In Example 2, only register data rather than the user program has to be changed and this is done from the Programming Panel.

  Example 2 is the most practical method in applications like repeating machines.

2. When bit 7 (motion command code selection) of fixed parameter No. 14 is set to 1 ("Used") and Motion Command Code Enable/Disable (OB□□008) is set to 1 ("Valid"), set the number of reference units. Otherwise, set the number of pulses.

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
8 to 12	Not used.	OL□□08 to OL□□0B	–	Set to "0."	0
13	Linear Acceleration Time Constant (NACC)	OW□□0C	0 to 32767	Set the linear acceleration time for Speed, Position Control, and Zero Point Return Modes. Unit: ms Set acceleration time from 0% to 100% (Rapid Traverse Speed). The deceleration time is the same as the acceleration time for Σ-I series.  	0
14	Linear Deceleration Time Constant (NDEC)	OW□□0D	0 to 32767	This parameter is valid for Σ-II series. Set the linear deceleration time for Speed, Position Control, and Zero Point Return Modes. Unit: ms Set deceleration time from 0% to 100% (Rapid Traverse Speed).  	0

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■ Acceleration/Deceleration Type

Acceleration/deceleration is broadly classified as linear, S-curve and exponential acceleration/deceleration. A bias speed can also be set for linear and exponential acceleration/deceleration.

Acceleration/Deceleration Type

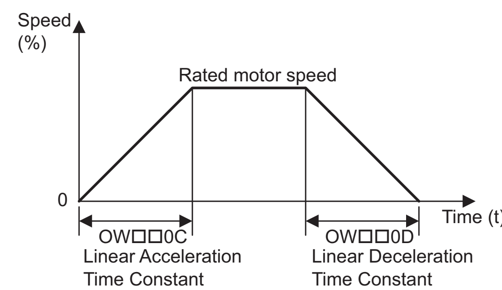
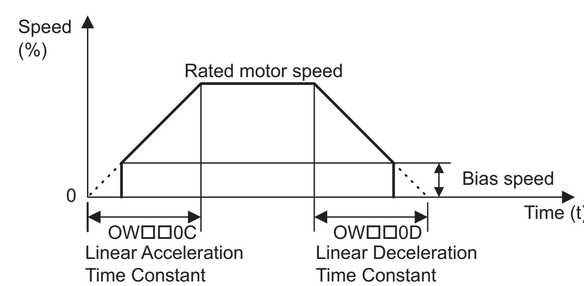
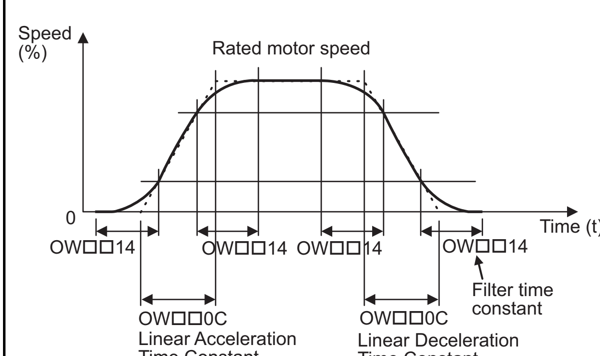
Acceleration/ Deceleration Type	Relevant Motion Parameters	Description
Linear Acceleration/ Deceleration	• Bias speed Motion fixed parameter No. 35 • OW□□0C Motion setting parameter: Linear Acceleration Time Constant • OW□□0D Motion setting parameter: Linear Deceleration Time Constant	 • Set the time it takes to reach rated motor speed for the acceleration/deceleration time constant. • Set motion fixed parameter No. 35: Bias Speed to 0.
Linear Acceleration/ Deceleration With Bias	• Bias speed Motion fixed parameter No. 35 • OW□□0C Motion setting parameter: Linear Acceleration Time Constant • OW□□0D Motion setting parameter: Linear Deceleration Time Constant	 Set the time it takes to reach rated motor speed at the acceleration/deceleration time constant.
S-curve Acceleration/ Deceleration (Average Move)	• OW□□0C Motion setting parameter: Linear Acceleration Time Constant • OW□□0D Motion setting parameter: Linear Deceleration Time Constant • OW□□14 Motion setting parameter: Filter Time Constant Setting • OB□□214 to OB□□217 Motion setting parameter: Filter Type Selection	 Set the Filter Type Selection to 2 (average movement filter).

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
15 to 16	Not used.	OW□□0D to OW□□0F	–	Set to "0."	0
17	Position Loop Gain Setting (Kp)	OW□□10	1 to 5000	Set the position loop gain in the servo system. Position loop gain is needed to set response performance for the servo system. This parameter is valid when the motion command KPS is executed. The following are setting guidelines. 40 to 250 250: Excellent response (Watch for hunting.) 40: Ordinary response Set an appropriate value for the machine rigidity, inertia, and type of Servomotor. • Setting range: 1 to 32767 [0.1/S]	300 (30.0)
18	Feed Forward Gain Setting (Kf)	OW□□11	0 to 200	Reduces positioning time by applying feed forward control. • Setting range: 0 to 200 [%] Reference position and actual position error decrease with higher settings. The machine may start to vibrate if the setting is too high.	0
19	Position Reference Setting (XREF) or Position Buffer Number	OL□□12	-2^{31} to $2^{31}-1$	Set the position reference. The meaning of the setting data depends on OB□□01C: Position Reference Selection and OB□□01E: Position Reference Type. Explanation 1. Using OL□□12 as Position Reference for Absolute Position Reference Method OB□□1C = 0: Directly specified OB□□1E = 0: Absolute position reference 2. Using OL□□12 as Position Reference for Incremental Addition Method OB□□1C = 0: Directly specified OB□□1E = 1: Incremental Addition 3. Using OL□□12 as Position Buffer Pointer OB□□1C = 1: Indirectly specified OB□□1E = 0: Absolute position reference Setting 1 causes setting parameter error. Refer to *Position Reference* in *2.3.1 Prerequisites for Position Control* for details.	0

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Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
21	Filter Time Constant Setting (NNUM)	OW□□14	• Average move filter 0 to 5100 • Exponential acceleration speed 0 to 5100	Set the time constant used for a moving average filter or exponential acceleration/deceleration filter. When Motion Command Code (OW□□20) is set to 12, the value set in this parameter is reflected as follows: 1. Reflected in the SERVOPACK Cn-0026 constant (Average Move Time) when bits 4 to 7 of OW□□21 are set to 2 (Average Movement Filter). 2. Reflected in the SERVOPACK Cn-002E constant (Exponential Acceleration Time Constant) when bits 4 to 7 of OW□□21 are set to 1 (Exponential Filter).	0
22	Speed Reference Setting (NREF)	OW□□15	-32768 to 32767	Set the rapid traverse speed in 0.01% units (percentage of the rated motor speed) when the Speed Reference Selection (OB□□1D) is set to 1.	0
23 to 29	Not used.	OL□□16 to OW□□1C	–	Set to "0."	0
30	Speed Loop Gain (Kv)	OW□□1D	1 to 20000	Set the speed loop gain for MECHATROLINK SERVOPACKs. The value set in this parameter is reflected in the SERVOPACK Cn-0004 constant (Speed Loop Gain) when Motion Command Code (OW□□20) is set to 14.	0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
33	Motion Command Code (MCMDCODE)	OW□□20	0 to 65535	Set the motion command code to the SVB Modules. This parameter can be used under the following conditions. • Motion Command Selection (bit 7 of fixed parameter No. 14) • Position Control Mode Selection (OB□□002) • RUN Mode Motion Setting Command Enabled (OB□□008) **Motion Commands** 0: NOP (no command) 1: Positioning (POSING) 2: External positioning (EX-POSING) 3: Zero point return (ZRET) 4: Interpolation (INTERPOLATE) 5: Reserved for system use 6: Interpolation with position detection (LATCH) 7: Feed (FEED) 8: Step (STEP) 9: Zero point setting (ZSET) 10: Change acceleration time constant (ACC) 11: Change deceleration time constant (DCC) Valid only for SGDH + NS100. 12: Change moving average time constant (SCC) 13: Change filter type (CHG_FILTER) 14: Change speed loop gain Kv (KVS) 15: Change position loop gain Kp (KPS) 16: Change feed forward Kf (KFS) 17: Read servo driver Cn constant (CN_RD) 18: Change servo driver Cn constant (CN_WR) 19: Monitor current servo driver alarm (ALM_MON) 20: Monitor servo driver alarm history (ALMHIST_MON) 21: Clear servo driver alarm history (ALMHIST_CLR) 22 to 65535: Not used.	0

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Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
34	Motion Command Control Flags (MCMDCTRL)	OW□□21		Set motion command auxiliary functions.		
			Bit 0	Command Hold (HOLD)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning or step execution using an OW□□20: Motion Command Code. IB□□151: Hold Completed turns ON when the HOLD has been completed. If this bit goes back OFF at this point, the hold is canceled and positioning restarts. 0: OFF, 1: ON	0
			Bit 1	Command Abort (ABORT)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning, zero point return, or STEP using an OW□□20: Motion Command Code. The BUSY bit (IB□□150) turns ON when ABORT is being executed, and it turns OFF when the execution of ABORT completes. Step execution can be aborted by setting the motion command to NOP. 0: OFF, 1: ON	0
			Bit 2	Direction of Movement (For JOG and STEP) (DIRECTION)	Set the movement direction. This bit is enabled when a Motion Command Code (OW□□20) is set to constant-speed feed or step operation. 0: Forward direction 1: Reverse direction	0 (Forward direction)
			Bit 3	Speed Loop P/PI Switch (P-PI)	0: PI control 1: P control	0 (PI control)
			Bits 4 to 7	Filter Type Selection (FILTERTYPE)	Set the type of acceleration filter. 0: No filter 1: Exponential filter 2: Average movement filter (simple S-shaped acceleration and deceleration) OW□□14: Filter Time Constant is valid if this parameter is set to"1" or "2."	0 (No filter)
			Bits 8 to 13	Not used.	Set to"0."	0
			Bit 14	Position Buffer Write (BUF_W)	Data set in OL□□3A: Position Buffer Write Data is stored as absolute position data in the position buffer that is set at OL□□38: Position Buffer Access Number. 0: OFF, 1: ON	0
			Bit 15	Position Buffer Read (BUF_R)	Data from the position buffer that is specified at OL□□38: Position Buffer Access Number is stored as absolute position data in the position buffer that is set at IL□□28: Position Buffer Read Data. This parameter is used to check position data that is stored in the position buffer. 0: OFF, 1: ON It takes two scans from the time the Position Buffer Read command is issued until the data is stored at IL□□28: Position Buffer Read Data.	0

Table 6.3 Motion Setting Parameters (cont'd)

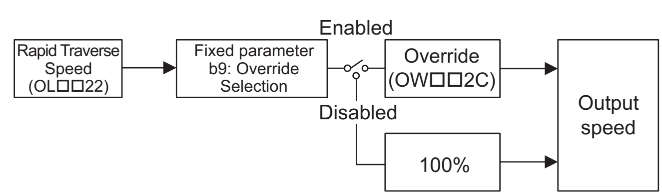
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
35	Rapid Traverse Speed (RV)	OL□□22	0 to 2^{31}-1	Set the rapid traverse speed in 10^n reference units/min (n: Number of digits below decimal point) if OB□□01D: Speed Reference Selection is set to "0." Other setting units are expressed as follows: Pulse unit: 1 = 1000 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min	3000
37	External Positioning Travel Distance (EXMDIST)	OL□□24	-2^{31} to 2^{31}-1	Set the distance the axis moves from the time a latch signal (external positioning signal) is input until the axis comes to a stop when Motion Command Code (OW□□20) is set to 2 (External Positioning). Use the same unit as for the SERVOPACK.	0
39	Stopping Distance (STOPDIST)	OL□□26	-2^{31} to 2^{31}-1	This parameter is used by the system. Do not use it.	0
41	Step Travel Distance (STEP)	OL□□28	0 to 2^{31}-1	Set the travel distance in reference units for Step execution for the OW□□20: Motion Command Code. • Unit: Reference unit	0
43 to 44	Not used.	OL□□2A	–	Set to "0."	0
45	Override (OV)	OW□□2C	0 to 32767	Set the override for the output speed as a percentage of the OL□□22: Rapid Traverse Speed in 0.01% units. For interpolation related commands, set override in the register specified in the Group Definition Window. Rapid Traverse Speed Output: Rapid Traverse Speed × Override = Output speed (OL□□22) (OW□□2C)  This parameter is valid when fixed parameter No. 17: Override Selection (bit 9 of Motion Controller Function Selection Flags) is set to Enabled.	100.0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
46	Position Control Flags (POSCTRL)	OW□□2D		Set the functions related to position data managed by SVB Modules. The bit configuration is described below.		
			Bit 0	Machine Lock Mode Setting (MLK)	The axis does not actually move, but rather IL□□02: Calculated Position in Machine Coordinate System is refreshed in Machine Lock Mode. This parameter is valid when IB□□152: Distribution Completed is ON if the bit is changed.	0
			Bit 1	Request for the Preset Number of POSMAX Turns (TPRSREQ)	Request for the preset number of POSMAX turns. •With an infinite length axis, a turn is counted every time the position value exceeds POSMAX and the count is stored at monitoring parameter IL□□1E: Number of POSMAX Turns. • The number of turns can be preset at setting parameter OL□□30: Preset Data for Number of POSMAX Turns by turning ON the Request for the Preset Number of POSMAX Turns Flag. Related Parameters: • Fixed parameter No. 23: Infinite Length Axis Reset Position (POSMAX) • Setting parameter OL□□30: Preset Data for the Number of POSMAX Turns • Monitoring parameter IL□□1E: Number of POSMAX Turns	0
			Bit 2	ABS System Infinite Length Position Control Data Load Request (ABSLDREQ)	If this bit is ON when using an infinite length axis with an absolute encoder, position data controlled by the SVB Modules will be refreshed with data that is set at OL□□38 and OL□□3A: Encoder Position at Shutdown and at OL□□3C and OL□□3E: Pulse Position at Shutdown. **Conditions** Fixed parameter No. 3: Encoder Selection 1 Fixed parameter No. 17: bit 5=1, Infinite Length Axis	0
			Bits 3 to 11	Not used.	Set to "0."	0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
46	Position Control Flags (POSCTRL) (cont'd)	Bits 12 to 15	Servodriver User Monitoring Information Selection (USRMONSEL)	These bits are used to monitor the following position information in MECHATROLINK servos. The monitor information is stored in IL□□20. 0: Reference position in the reference coordinate system 1: Machine reference position in the machine coordinate system 2: Position error 3: Feedback position in the machine coordinate system 4: Counter latch position in the machine coordinate system 5: Internal reference position in the reference coordinate system 6: Internal reference position in the reference coordinate system 7: Not used. 8: Feedback speed 9: Reference speed A: Final target reference position B: Torque reference C: Not used. D: Not used. E: Option monitor 1 F: Option monitor 2	0
47	Workpiece Coordinate System Offset (OFFSET)	OL□□2E	-2^{31} to 2^{31}-1	Always set this parameter to "0." It is used by the system.	0
49	Preset Number of POSMAX Turns Data (TURNPRS)	OL□□30	-2^{31} to 2^{31}-1	IL□□1E: POSMAX Number of Turns can be preset with preset data by turning ON OB□□2D1: Request for Preset Number of POSMAX Turns. It is used in situations such as when resetting the number of turns to "0."	0
51	Second In-position Width (INPWIDTH)	OW□□32	0 to 65535	Set the range where bit 2 of IW□□17: Second In-position Completed will turn ON. This bit turns ON if the difference between the reference position and the feedback position is within the specified range when IB□□152: Distribution Completed turns ON.	0
52	Zero Point Position Output Width (PSETWIDTH)	OW□□33	0 to 65535	Set the zero point position range. IB□□171: Zero Point Position will turn ON if 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ Zero Point Position Output Width when IB□□156: Zero Point Return Completed Status turns ON.	10
53	Positioning Completed Check Time (PSETTIME)	OW□□34	0 to 65535	Set limits for detecting bit 6 of IL□□22: Positioning Time Over in 1 = 1 ms. A positioning time over alarm will be generated if bit 13 of IW□□00: Positioning Time Completed Signal does not turn ON when this range is exceeded after bit 2 of IW□□15: Distribution Completed turns ON. The completion of positioning will not be checked if this parameter is set to "0."	0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
54	Servo Driver Cn Constant No. (Cn_No.), Current Servo Driver Alarm Monitor No., or Servo Driver Alarm History Monitor No.	OL□□35	–	This parameter can be used in the following three ways. ■ **Servo Driver Cn Constant No. (Cn_No.):** Valid when Motion Command Code (OW□□20) is set to 17 (CN_RD) or 18 (CN_WR). Bits 0 to 11: Cn constant No. Bits 12 to 15: Number of words ■ **Current Servo Driver Alarm Monitor No.:** Valid when Motion Command Code (OW□□20) is set to 19 (ALM_MON). Specify a number between 0 and 5. The alarm code corresponding to the specified monitor number is stored in IW□□24. ■ **Servo Driver Alarm History Monitor No.:** Valid when Motion Command Code (OW□□20) is set to 20 (ALMHIST_MON). Specify a number between 0 and 9. The alarm code corresponding to the specified monitor number is stored in IW□□24.	0
55	Cn Constant Change Data (Cn-DAT)	OL□□36	-2^{31} to 2^{31}-1	Valid when Motion Command Code (OW□□20) is set to 18 (CN_WR).	0
57	Lower-place Two Words of Encoder Position at Shutdown or Position Buffer Access Number	OL□□38	-2^{31} to 2^{31}-1	This parameter is used in the following two ways and should be used with care. ■ **Lower-place 2 Words of Encoder Position at Shutdown** This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the lower-place two words of the encoder position at shutdown. ■ **Position Buffer Access Number** When bit 14 of OW□□21: Position Buffer Write or bit 15 of OW□□21: Position Buffer Read turns ON, the data set at this parameter will be treated as the buffer number of the position buffer. The setting range for this parameter is 1 to 256 and it is not valid if set to "0."	0

Table 6.3 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
59	Upper-place Two Words of Encoder Position at Shutdown or Position Buffer Write Data	OL□□3A	-2^{31} to 2^{31}-1	This parameter is used in the following two ways and should be used with care. ■ **Upper-place 2 Words of Encoder Position at Shutdown** This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the upper-place two words encoder position at shutdown. ■ **Position Buffer Write Data** When bit 14 of OW□□21: Position Buffer Write turns ON, the data set at this parameter will be written as absolute position data to the position buffer specified at OL□□38.	0
61	Lower-place Two Words of Pulse Position at Shutdown (aposL)	OL□□3C	-2^{31} to 2^{31}-1	When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the lower-place two words of the pulse position at shutdown. This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1).	0
63	Upper-place Two Words of Pulse Position at Shutdown (aposH)	OL□□3E	-2^{31} to 2^{31}-1	When bit 2 of OW□□2D: ABS System Infinite Length Position Control Data Load Request turns ON, the data set at this parameter will be treated as the upper-place two words of the pulse position at shutdown. This parameter is valid when the motion fixed parameter: Encoder Selection is set to absolute encoder (= 1) and motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1).	0

6.2.3 Motion Monitoring Parameters

Table 6.4 Motion Monitoring Parameters

No.	Name	Register Number	Setting Range/ Bit Name	Description
1	RUN Status (RUNSTS)	IW☐☐00	Monitors SVB Modules operating status. The bit configuration is described below.	
		Bit 0	Not used.	–
		Bit 1	Motion Setting Parameter Setting Error (PRMERR)	Turns ON when one or more of the motion setting parameters (OW☐☐00 to OW☐☐3F) is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm will be indicated at IW☐☐0F: Parameter Number Out of Range.
		Bit 2	Motion Fixed Parameter Setting Error (FPRMERR)	Turns ON when a motion fixed parameter is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm plus 100 will be indicated at IW☐☐0F: Parameter Number Out of Range. Turns OFF automatically if an ordinary motion fixed parameter is set from the MPE720.
		Bits 3 to 6	Not used.	–
		Bit 7	Motion Controller RUN Ready (SVCRDY)	Turns ON when RUN preparations for SVB Modules have been completed. The following may be reason why RUN preparations are not completed. • Major fault has occurred. • Fixed parameter No. 1 (Axis Selection) is set to “Not used.” • Motion fixed parameter setting error occurred. • Motion fixed parameters are being changed.
		Bit 8	Motion Controller RUN (SVCRUN)	Turns ON under the following conditions. • IB☐☐07: RUN Ready turns ON. • Any of OB☐☐00 to OB☐☐004: Control Mode Flags turns ON. • OB☐☐01: Servo ON turns ON. If an alarm is generated even though this bit is ON in Position Control Mode when an OW☐☐20: Motion Command Code is used, the axis will not move even if a motion command is issued. After clearing the alarm, set the motion command to “NOP” for at least one scan and then set the motion command again.
		Bits 9 to 12	Not used.	–
		Bit 13	Positioning Completed Signal (POSCOMP)	Turns ON when MECHATROLINK SERVOPACK status is “positioning completed” (PSET = ON).
		Bits 14 to 15	Not used.	–
2	Servo Driver Status (SVSTS)	IW☐☐01	Monitors the MECHATROLINK servo status. Refer to *Status Monitor (IW☐☐01)* in *8.2 Alarms and Actions Taken*.	

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
3	Calculated Position in Machine Coordinate System (CPOS)	IL□□02	-2^{31} to $2^{31}-1$	Indicates the calculated position in a machine coordinate system controlled by SVB Modules.
5	Not used.	IL□□04	–	–
7	Machine Coordinate System Latch Position (LPOS)	IL□□06	-2^{31} to $2^{31}-1$	Indicates the latch position in a machine coordinate system controlled by SVB-01 Modules. It is refreshed when Motion Command Code (OW□□20) is set to 1 (External Positioning) or 6 (Interpolation with Position Detection Function) and latching is completed. 1 = 1 reference unit (when specified as pulse units: 1 = 1 pulse)
9	Machine Coordinate System Feedback Position (APOS)	IL□□08	-2^{31} to $2^{31}-1$	Indicates the feedback position in a machine coordinate system controlled by SVB-01 Modules. 1 = 1 reference unit (when specified as pulse units: 1 = 1 pulse) Note: The parameter value is not refreshed during machine lock.
11 to 15	Not used.	IL□□0A to IW□□0E	–	–
16	Out of Range Parameter Number (ERNO)	IW□□0F	• Motion setting parameter 1 to 64 • Motion fixed parameter 101 to 148	Indicates the most recent setting parameter number that exceeded the range in OW□□00 to OW□□3F motion setting parameter or motion fixed parameter settings. • Motion setting parameters: 1 to 64 • Motion fixed parameters: 101 to 148
17 to 20	Not used.	IW□□10 to IW□□13	–	–
21	Motion Command Response Code (MCMDRCODE)	IW□□14	0 to 65535	Indicates the OW□□20: Motion Command Code that is currently executing. Refer to OW□□20 for details on motion commands.
22	Motion Command Status (MCMDSTS)	IW□□15	Monitors the executing status of an OW□□20: Motion Command Code. The bit configuration is described below.	
		Bit 0	Command Executing Flag (BUSY)	Indicates the motion command status. This bit is used for abort status. 0: READY (completed) 1: BUSY (processing)
		Bit 1	Command Hold Completed Flag (HOLDL)	Turns ON when a HOLD is completed. Refer to individual motion functions for details on the HOLD function.
		Bit 2	Distribution Completed (DEN)	Turns ON when the amount of movement cleared is completed.
		Bit 3	Zero Point Setting Completed (ZSET)	Turns ON when the zero point setting (ZSET) has been executed by OW□□20: Motion Command Code. It also turns ON when bit 3 of IW□□17: ABS System Infinite Length Position Control Data Load Request has finished execution.

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
22	Motion Command Status (MCMDSTS) (cont'd)	Bit 4	External Positioning Signal Latched (EX_LATCH)	Turns ON when an external positioning signal is input during external positioning (EX_POSING) or interpolation with position detection functions (LATCH).
		Bit 5	Command Error End (FAIL)	Turns ON if an alarm occurs while a move (positioning, fixed speed feed, etc.) command is being executed. Operation cannot be continued once this bit turns ON. Set Motion Command Code (OW□□20) to "NOP" for at least one scan. The SVA Modules LED indicates (⊔) when this bit turns ON.
		Bit 6	Zero Point Return Completed (ZRNC)	Turns ON when zero point return or zero point setting has been completed. Turns OFF when zero point return begins.
		Bits 7 to 15	Not used.	–
23	Number of Digits Below Decimal Monitor (DECNUMM)	IW□□16	0 to 5	Indicates motion fixed parameter number 18: Number of Digits Below Decimal Point.
24	Position Control Status (POSSTS)	IW□□17	Monitors status related to position controlled by SVB Modules. It is valid in Position Control Mode when an OW□□20: Motion Command Code is used. The bit configuration is described below.	
		Bit 0	Machine Lock ON (MLKL)	Turns ON when machine lock is ON. When this bit is ON, the controlled axis is locked and remains stopped.
		Bit 1	Zero Point Position (ZERO)	Turns ON when zero point return (IB□□156) has been completed and when 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ OW□□33: Zero Point Position Output Width.
		Bit 2	Second In-position Completed (PSET2)	Turns ON when Distribution Completed (IW□□15 bit 2) is ON and when |IL□□08: Current Position – IL□□18: Reference Position in the Coordinate System| ≤ OW□□32: Second In-position Width.
		Bit 3	ABS System Infinite Length Position Control Data Load Completed (ABSLDE)	Turns ON when OB□□2D2: ABS System Infinite Length Position Control Data Load Request turns ON and the load has been completed. It turns OFF when OB□□2D2: ABS System Infinite Length Position Control Data Load Request turns OFF. It is valid when infinite length axis is set with an absolute encoder.
		Bit 4	Preset Request for Number of POSMAX Turns Completed (TPRSE)	Turns ON when OB□□2D1: Request for Preset Number of POSMAX Turns is ON and presetting has been completed. It turns OFF when OB□□2D1: Request for Preset Number of POSMAX Turns goes OFF. It is valid when infinite length axis is set.
		Bit 5	Electronic Gear Enabled Selection (GEARM)	Indicates the electronic gear enabled selection at bit 4 of motion fixed parameter No. 17.
		Bit 6	Axis Selection (MODSELM)	Indicates the axis selection at bit 5 of motion fixed parameter No. 17.
		Bits 7 to 11	Not used.	–

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
24	Position Control Status (POSSTS) (cont'd)	Bits 12 to 15	Servo Driver User Monitor Information Selection Response (USR-MONSELR)	Contain the type of monitor information that is applicable to the value stored in IL□□20 (Servo Drive User Monitor Information). 0 to F
25	Machine Coordinate System Reference Position (MPOS)	IL□□18	-2^{31} to 2^{31}-1	This parameter is the reference position in the machine coordinate system and is basically the same value at IL□□02 (CPOS). This position data cannot be refreshed if IB□□170: Machine Lock ON.
27	Not used.	IL□□1A	–	–
29	POSMAX Monitor (PMAXTURN)	IL□□1C	1 to 2^{31}-1	Indicates the infinite length axis reset position (POSMAX) at motion fixed parameter No. 23.
31	Number of POSMAX Turns (PMAXTURN)	IL□□1E	-2^{31} to 2^{31}-1	The count at this parameter goes up and down every time the reset position (POSMAX) for the infinite length axis at motion fixed parameter 23 is exceeded. The parameter can be preset with OL□□30: Preset Number of POSMAX Turns and with OB□□2D1: Request for Preset Number of POSMAX Turns.
33	Servo Driver User Monitor Information (USRMON)	IL□□20	-2^{31} to 2^{31}-1	Indicates the MECHATROLINK servo monitor information specified in bits 12 to 15 of OW□□2D.
35	Alarms (ALARM)	IL□□22	This parameter is valid in Position Control Mode when an OW□□20: Motion Command Code is used. Alarm data and a halt to operation are indicated if this register shows anything other than "0." The register can be cleared by starting up OB□□006: Alarm Clear. If an alarm occurs, the SVB Modules indicators will indicate (┘) . The bit configuration is described below.	
		Bit 0	SERVOPACK Error (SVERROR)	Turns ON when a SERVOPACK alarm is detected. For alarm details, refer to IW□□24.
		Bit 1	Positive Overtravel (OTF)	Turns ON when the positive overtravel signal is input and a move command is executed in the positive direction.
		Bit 2	Negative Overtravel (OTR)	Turns ON when the negative overtravel signal is input and a move command is executed in the negative direction.
		Bit 3	Positive Software Limit (SOTF)	Valid if IB□□156: Zero Point Return Completed turns ON when the positive software limit is enabled and an infinite length axis is selected. ■ **OW□□20: Motion Command Code Interpolation** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≥ Positive Software Limit (motion fixed parameter No. 27). ■ **OW□□20: Motion Command Codes Positioning, Feed, or Step** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≥ Positive Software Limit (motion fixed parameter no. 27).

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description
35	Alarm (ALARM) (cont'd)		Bit 4	Negative Software Limit (SOTR)	Valid if IB□□156: Zero Point Return Completed turns ON when the negative software limit is enabled and an infinite length axis is selected. ■ **OW□□20: Motion Command Code Interpolation** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≤ Negative Software Limit (motion fixed parameter No. 29). ■ **OW□□20: Motion Command Codes Positioning, Feed, or Step** This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≤ Negative Software Limit (motion fixed parameter No. 29).
			Bit 5	Servo OFF (SVOFF)	Turns ON if Motion Command Code (OW□□20) is set to a movement command such as Positioning or Step when the servo is OFF (OB□□010 is set to OFF).
			Bit 6	Positioning Time Over (TIMEOVER)	Turns ON if positioning is not completed within the time specified in OW□□34 (Positioning Completed Check Time) after command distribution is completed.
			Bit 7	Positioning Travel Distance Over (DISTOVER)	Turns ON when a move command exceeding the maximum positioning travel distance was executed.
			Bit 8	Filter Type Change Error (FIRTYPERR)	Turns ON if the filter type is changed before command distribution is completed.
			Bit 9	Filter Time Constant Change Error (FILTIMERR)	Turns ON if the filter time constant is changed before command distribution is completed.
			Bit 10	Control Mode Error (MODERR)	Turns ON when a move command is set at OW□□20: Motion Command Code in a mode other than Position Control Mode (OB□□002 is OFF).
			Bit 11	Zero Point Not Set (ZSET_NRDT)	Turns ON if a movement command is executed before the zero point is set.
			Bit 12	Not used.	–
			Bit 13	Not used.	–
			Bit 14	Servo Driver Synchronous Communications Error (WDT_NRDY)	Turns ON when a MECHATROLINK servo synchronous communications error is detected.
			Bit 15	Servo Driver Communications Error (COM_ERR)	Turns ON when two consecutive MECHATROLINK servo communications errors are detected.
			Bit 16	Servo Driver Command Timeout Error (SVTIMOUT)	Turns ON if a MECHATROLINK servo command is not completed within the specified time.

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description
35	Alarm (ALARM) (cont'd)		Bit 17	ABS Encoder Count Exceeded (ABSOVER)	Turns ON when the absolute encoder count exceeds the maximum limit for the SVB Modules.
			Bits 18 to 31	Not used.	–
37	Servo Driver Alarm Code (SVALARM)	IW□□24		-32768 to 32767	Used to monitor alarm codes that are generated in MECHATROLINK servos. Refer to *MECHATROLINK Servo Alarm Codes (IW□□24)* in *8.2 Alarms and Actions Taken* for details. Code 99H is displayed during normal operation.
38	MECHA-TROLINK Servo I/O Monitor	IW□□25		Used to monitor MECHATROLINK servo I/O monitor information.	
			Bit 0	Forward OT Input (P-OT)	Forward rotation OT input signal
			Bit 1	Reverse OT Input (N-OT)	Reverse rotation OT input signal
			Bit 2	Deceleration LS Input (DEC)	Deceleration LS input signal
			Bit 3	Encoder Phase-A Input (PA)	Encoder Phase-A input signal
			Bit 4	Encoder Phase-B Input (PB)	Encoder Phase-B input signal
			Bit 5	Encoder Phase-C Input (PC)	Encoder Phase-C input signal
			Bits 6 to 8	Not used.	–
			Bit 9	Brake status input (BRK)	Brake status input signal
			Bits 10 to 15	Not used.	–
39	Speed Reference Output Monitor (RV-MON)	IL□□26		-2^{31} to $2^{31}-1$	Used to debug the system.
41	Cn Constant Read Data (CNMON)	IL□□28		-2^{31} to $2^{31}-1$	When the motion command (OW□□20) is set to 17, the SERVO-PACK Cn constant data specified in OW□□35 is stored.
	Position Buffer Read Data (CNMON)				Position data from the position buffer specified at OL□□38: Position Buffer Access Number is read and stored at this parameter when motion setting parameter OB□□21F: Position Buffer Read turns ON. It takes about 2 scans from the time that OB□□21F: Position Buffer Read turns ON until data is stored at this register.
43	Position Reference Output Value Monitor (XREFMON)	IL□□2A		-2^{31} to $2^{31}-1$	Used to debug the system. 1 = 1 pulse
45	Not used.	IL□□2C		–	–

Table 6.4 Motion Monitoring Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description
47	Calculated Reference Co-ordinate System Position (POS)	IL□□2E	-2^{31} to $2^{31}-1$	This parameter has meaning when the motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). It indicates the target position for every infinite length axis scan.
49 to 56	Not used.	IL□□30 to IW□□37	–	–
57	Lower-place 2 Words of Encoder Position at Shutdown	IL□□38	-2^{31} to $2^{31}-1$	These parameters are used for ABS system infinite length position control. Encoder position at shutdown and pulse unit position at shutdown are paired data that together are called ABS system infinite length position control information. ABS system infinite length position control information must be saved periodically to M registers using a low-speed drawing (DWG.L).
59	Upper-place 2 Words of Encoder Position at Shutdown	IL□□3A	-2^{31} to $2^{31}-1$	
61	Lower-place 2 Words of Pulse Position at Shutdown	IL□□3C	-2^{31} to $2^{31}-1$	
63	Upper-place 2 Words of Pulse Position at Shutdown	IL□□3E	-2^{31} to $2^{31}-1$	

6.2.4 Σ Series SERVOPACK parameters

■ List of Parameters

No.	Name	Size	Units	Range	Factory Setting
Cn-0001	Memory switch 1	2	bits		0380H
Cn-0002	Memory switch 2	2	bits		0000H
Cn-0003	Load inertia	2	%	0 to 65535	100
Cn-0004	Speed loop gain	2	0.1 Hz	1 to 20000	40.0
Cn-0005	Speed loop integration time constant	2	0.01 ms	100 to 65535	20.0
Cn-0006	Emergency stop torque	2	%	0 to max.	max.
Cn-0007	Positioning proximity detection width	2	Reference units	0 to 10000	10
Cn-0008	Positive torque limit	2	%	0 to max.	max.
Cn-0009	Negative torque limit	2	%	0 to max.	max.
Cn-000A	Reserved by system.	2	–	–	0
Cn-000B	Reserved by system.	2	–	–	0000H
Cn-000C	Mode switch: Torque reference	2	%	0 to 32767	200
Cn-000E	Mode switch: Acceleration	2	0.167 r/s^2	0 to 3000	0
Cn-000F	Mode switch: Error pulse	2	pulses	0 to 10000	0
Cn-0010	Reserved by system.	2	–	–	0000H
Cn-0011	No. of encoder pulses	2	pulse/rev	513 to 32767	2048
Cn-0012	Brake timing for Servomotor stop (delay from reference to SVOFF)	2	10 ms	0 to 50	0
Cn-0013	Memory switch 3	2	bits	–	0000H
Cn-0014	Memory switch 4	2	bits	–	0000H
Cn-0015	Brake timing with servomotor running (output speed)	2	min^{-1}	0 to max.	100
Cn-0016	Brake timing with servomotor running (wait time)	2	10 ms	10 to 100	50
Cn-0017	Torque reference filter time constant	2	µs	0 to 25000	400
Cn-0018	Secondary torque reference filter time constant	2	µs	0 to 25000	0
Cn-0019	Reserved by system.	2	–	–	0000H
Cn-001A	Position loop gain	2	0.01/s	1 to 50000	40.0
Cn-001B	Positioning completed width	2	Reference units	0 to 250	7
Cn-001C	Bias	2	100 reference units/s	0 to max.	0
Cn-001D	Feed forward compensation	2	%	0 to 100	0
Cn-001E	Position error overflow range	2	Reference units	1 to 65535	65535
Cn-001F	First level linear acceleration/deceleration time constant	2	1,000 reference units/s^2	0 to 65535	0
Cn-0020	Second level linear acceleration/deceleration time constant	2	1,000 reference units/s^2	0 to 65535	100

(cont'd)

No.	Name	Size	Units	Range	Factory Setting
Cn-0021	Acceleration/deceleration time constant switching speed	2	100 reference units/s	0 to 65535	0
Cn-0022	Zero point return approach speed 1	2	100 reference units/s	0 to 65535	50
Cn-0023	Zero point return approach speed 2	2	100 reference units/s	0 to 65535	5
Cn-0024	Electronic gear ratio, numerator	2	–	1 to 32768	4
Cn-0025	Electronic gear ratio, denominator	2	–	1 to 32768	1
Cn-0026	Average move time	2	100 µs	0 to 5100	0
Cn-0027	Feed forward reference filter	2	µs	0 to 64000	0
Cn-0028	Final travel distance to zero point return	4	reference units	-2147483648 to 2147483647	100
Cn-002A	Zero point position range	2	reference units	0 to 65535	10
Cn-002B	Final travel distance to external positioning	4	reference units	-2147483648 to 2147483647	100
Cn-002D	Exponential acceleration/deceleration speed bias	2	reference units/s	0 to 32767	0
Cn-002E	Exponential acceleration/deceleration time constant	2	100 µs	0 to 5100	0
Cn-002F	Forward direction software limit	4	reference units	-2147483648 to 2147483647	819191808
Cn-0031	Reverse direction software limit	4	reference units	-2147483648 to 2147483647	-819191808
Cn-0033	Absolute encoder zero point position offset	4	reference units/s	-2147483648 to 2147483647	0
Cn-0035	Speed loop compensation constant	2	–	–	0000H
Cn-0036	Reserved by system.	2	–	–	0000H
Cn-0037	Reserved by system.	2	–	–	0000H
Cn-0038	Reserved by system.	2	–	–	0000H
Cn-0039	Reserved by system.	2	–	–	0000H
Cn-003A	Reserved by system.	2	–	–	0000H
Cn-003B	Reserved by system.	2	–	–	0000H
Cn-003C	Reserved by system.	2	–	–	0000H
Cn-003D	Reserved by system.	2	–	–	0000H
Cn-003E	Reserved by system.	2	–	–	0000H
Cn-003F	Reserved by system.	2	–	–	0000H

IMPORTANT

1. The maximum values shown in the tables differ according to the SERVOPACK capacity. Refer to the relevant SERVOPACK manuals for details on parameters.
2. Cn-35, Cn-37, and Cn-38 can be set only for SGDB-□N SERVOPACKs. They are not displayed on the parameter window for SGD-□□□N SERVOPACKs.
3. The parameters reserved by the system are not displayed on the parameter window.

■ Memory Switches

The following describes individual memory switch bits (bit parameters) from the list of SERVOPACK parameters.

Cn-001: Memory Switch 1

Cn-001: The following table describes the bits in memory switch 1.

Bit	Name	Description	Factory Setting
0	SV_ON mask	0: SV_ON/SV_OFF enabled 1: Always SV_ON	0
1	SENS_ON mask	0: SENS_ON/SENS_OFF enabled 1: Always SENS_ON	0
2	P-OT mask	0: P-OT enabled 1: P-OT signal mask (Always disabled)	0
3	N-OT mask	0: N-OT enabled 1: N-OT signal mask (Always disabled)	0
4	–		0
5	Power outage mask	0: Servo alarm after recovery from power outage 1: Power outage mask (No servo alarm with power outage recovery)	0
6	Base block power outage prevention method	0: Dynamic brake (DB) stop 1: Free run stop	0
7	Status after dynamic brake stop	0: Cancel dynamic brake. 1: Do not cancel dynamic brake.	1
8	Operation with OT stop	0: Stop according to bit 6 setting. 1: Decelerate to a stop using emergency stop torque.	1
9	Operation after decelerating to a stop using OT emergency stop torque	0: Servo OFF after decelerating to a stop 1: Zero clamp after decelerating to a stop	1
A	Position error with servo OFF	0: Clear position error. 1: Hold position error.	0
B	Mode switch function	0: Mode switch function enabled (according to bits C and D) 1: Mode switch function disabled	0
C	Mode switch selection	00: Internal torque reference 01: None (Do not use this setting.) 10: Acceleration 11: Error pulse	0
D			0
E	Encoder selection	0: Incremental encoder 1: Absolute encoder	0
F	–	–	0

IMPORTANT

Never change the factory setting of bits with a dash (–) in the name column.

Cn-002: Memory Switch 2

Cn-002: The following table describes the bits in memory switch 2.

Bit	Name	Description	Factory Setting
0	Reverse rotation mode	0: Sets counterclockwise as the forward direction. 1: Sets clockwise as the forward direction.	0
1	Zero point error detection mask	0: Sets zero point error detection (only with an absolute encoder). 1: Zero point detection mask (no detection)	0
2	–	–	0
3	–	–	0
4	–	–	0
5	–	–	0
6	Software limit check by reference target	0: No check 1: Check	0
7	–	–	0
8	Servomotor selection	0: SGM 1: SGMP	0
9	–	–	0
A	–	–	0
B	–	–	0
C	–	–	0
D	–	–	0
E	–	–	0
F	–	–	0

IMPORTANT

Never change the factory setting of bits with a dash (–) in the name column.

Cn-0013: Memory Switch 3

Cn-0013: The following table describes the bits in memory switch 3.

Bit	Name	Description	Factory Setting
0	–	–	0
1	–	–	0
2	–	–	0
3	–	–	0
4	–	–	0
5	–	–	0
6	–	–	0
7	–	–	0
8	–	–	0
9	–	–	0
A	MECHATROLINK communications error mask*	0: With communications check 1: Communications check masked	0
B	MECHATROLINK WDT error mask*	0: With WDT check 1: WDT check masked	0
C	–	–	0
D	–	–	0
E	–	–	0
F	–	–	0

* For details, refer to *7.3.3 Cn-0013: Memory Switch 3* of the Σ *Series SGM□/SGD User's Manual* (SIEZ-S800-26.3) and *7.3.3 Cn-0013: Memory Switch 3* of the Σ *Series SGM□/SGDB User's Manual* (SIEZ-S800-26.4).

IMPORTANT

Never change the factory setting of bits with a dash (–) in the name column.

6

Cn-0014: Memory Switch 4

Cn-0014: The following table describes the bits in memory switch 4.

Bit	Name	Description	Factory Setting
0	–	–	0
1	Zero point return direction	0: Forward 1: Reverse	0
2	P-SOT mask	0: P-SOT enabled 1: P-SOT disabled	0
3	N-SOT mask	0: N-SOT enabled 1: N-SOT disabled	0
4	–	–	0
5	–	–	0
6	–	–	0
7	–	–	0
8	–	–	0
9	Brake operation	0: Operate from the BRK_ON/BRK_OFF command 1: Operation from the SERVOPACK (BRK_ON/ BRK_OFF disabled)	0
A	P-OT signal	0: Positive logic 1: Negative logic	0
B	N-OT signal	0: Positive logic 1: Negative logic	0
C	DEC signal	0: Positive logic 1: Negative logic	0
D	–	–	0
E	–	–	0
F	–	–	0

IMPORTANT

1. Never change the factory setting of bits with a dash (–) in the name column.
2. Set bits 2 and 3 of SERVOPACK parameter Cn-0014 to 1 to disable P-SOT and N-SOT.
3. When using brakes, always set bit 9 of the Cn-0014 parameter to 1.

Table 6.5 Cn-0037: Motor Selection

Group	SERVOPACK	Motor	Motor No. (Cn-0037 Setting)
05	SGDB-05AN	SGMG-03A□B	171
		SGMG-05A□A	142
		SGMP-04A	126
		SGM-04A	106
10	SGDB-10AN	SGMG-06A□B	172
		SGMG-09A□A	143
		SGMG-09A□B	173
		SGMS-10A□A	163
		SGMP-08A	127
		SGM-08A	107
15	SGDB-15AN	SGMG-13A□A	144
		SGMG-12A□B	174
		SGMS-15A□A	164
		SGMP-15A	128
20	SGDB-20AN	SGMG-20A□A	145
		SGMG-20A□B	175
		SGMS-20A□A	165
30	SGDB-30AN	SGMG-30A□A	146
		SGMG-30A□B	176
		SGMS-30A□A	166
		SGMS-22A□A	155
50	SGDB-50AN	SGMG-44A□A	147
		SGMG-44A□B	177
		SGMS-40A□A	167
		SGMD-32A□A	156
		SGMS-50A□A	168
		SGMD-40A□A	157
60	SGDB-60AN	SGMG-55A□A	148
		SGMG-60A□B	178
75	SGDB-75AN	SGMG-75A□A	149
1A	SGDB-1AAN	SGMG-1AA□A	140
1E	SGDB-1EAN	SGMG-1EA□A	150

The motor to be used can be changed using the Cn-0037 parameter if it belongs to the same group.

6.2.5 Σ-II Series SERVOPACK Parameters

■ List of Parameters

The following table shows the Σ-II Series SERVOPACK parameters.

Classification	Parameter No.	Name	Size (bytes)	Units	Setting Range	Factory Setting
Function Selection Parameters	Pn000	Function Selection Basic Switches*3	2	–	–	0010
	Pn001	Function Selection Application Switches 1*1, *3	2	–	–	0000
	Pn002	Function Selection Application Switches 2*3	2	–	–	0000
	Pn003	Function Selection application Switches 3	2	–	–	0002
	Pn004	Reserved	2	–	–	0000
	Pn005	Function Selection Application Switches 5*3	2	–	–	0000
Gain-related Parameters	Pn100	Speed Loop Gain	2	Hz	1 to 2000	40
	Pn101	Speed Loop Integral Time Constant	2	10μs	15 to 51200	2000
	Pn102	Position Loop Gain	2	1/s	1 to 2000	40
	Pn103	Moment of Inertia Ratio	2	%	0 to 10000	0
	Pn104	Reserved	2	Hz	1 to 2000	40
	Pn105		2	10μs	15 to 51200	2000
	Pn106		2	1/s	1 to 2000	40
	Pn107	Bias	2	min^{-1}	0 to 450	0
	Pn108	Bias Width Addition	2	reference unit	0 to 250	7
	Pn109	Feed-forward	2	%	0 to 100	0
	Pn10A	Feed-forward Filter Time Constant	2	10μs	0 to 6400	0
	Pn10B	Gain-related Application Switches	2	–	–	0000
	Pn10C	Mode Switch Torque Reference	2	%	0 to 800	200
	Pn10D	Mode Switch Speed Reference	2	min^{-1}	0 to 10000	0
	Pn10E	Mode Switch Acceleration	2	0. 167 min^{-1}/s	0 to 3000	0
	Pn10F	Mode Switch Error Pulse	2	reference unit	0 to 10000	0
	Pn110	Online Autotuning Switches	2	–	–	0010
	Pn111	Speed Feedback Compensation*2	2	%	1 to 500	100
	Pn112	Reserved	2	%	0 to 1000	100
	Pn113		2	%	0 to 10000	1000
	Pn114		2	%	0 to 400	200
	Pn115		2	10μs	0 to 1000	32
	Pn116		2	10μs	0 to 1000	16
	Pn117		2	%	20 to 100	100
	Pn118		2	–	50 to 100	100

(cont'd)

Classification	Parameter No.	Name	Size (bytes)	Units	Setting Range	Factory Setting
Gain-related Parameters (cont'd)	Pn119	Reserved	2	1/s	1 to 2000	50
	Pn11A			0.1%	1 to 2000	1000
	Pn11B		2	Hz	1 to 150	50
	Pn11C		2	Hz	1 to 150	70
	Pn11D		2	%	0 to 150	100
	Pn11E		2	%	0 to 150	100
	Pn11F		2	ms	0 to 2000	0
	Pn120		2	10µs	0 to 51200	0
	Pn121		2	Hz	10 to 250	50
	Pn122		2	Hz	0 to 250	0
	Pn123		2	%	0 to 100	0
Position-related Parameters	Pn200	Reserved	2	–	–	0100
	Pn201		2	pulse/rev	16 to 16384	16384
	Pn202	Electronic Gear Ratio (Numerator)*3	2	–	1 to 65535	1
	Pn203	Electronic Gear Ratio (Denominator)*3	2	–	1 to 65535	1
	Pn204	Reserved	2	10µs	0 to 6400	0
	Pn205	Multiturn Limit Setting*1, *3	2	rev	0 to 65535	65535
	Pn206	Fully-closed PG pulses	2	pulse/rev	513 to 65535	16384
	Pn207	Reserved	2	–	–	0010
	Pn208		2	10µs	0 to 6400	0
Speed-related Parameters	Pn300	Reserved	2	0.01 V/rated speed	150 to 3000	600
	Pn301		2	min^{-1}	0 to 10000	100
	Pn302		2	min^{-1}	0 to 10000	200
	Pn303		2	min^{-1}	0 to 10000	300
	Pn304	JOG Speed	2	min^{-1}	0 to 10000	500
	Pn305	Soft Start Acceleration Time	2	ms	0 to 10000	0
	Pn306	Soft Start Deceleration Time	2	ms	0 to 10000	0
	Pn307	Reserved	2	10 ms	0 to 65535	40
	Pn308	Speed Feedback Filter Time Constant	2	10 ms	0 to 65535	0
Torque-related Parameters	Pn400	Reserved	2	0.1 V/rated torque	10 to 100	30
	Pn401	Torque Reference Filter Time Constant	2	10µs	0 to 65535	100
	Pn402	Forward Torque Limit	2	%	0 to 800	800
	Pn403	Reverse Torque Limit	2	%	0 to 800	800
	Pn404	Forward External Torque Limit	2	%	0 to 800	100
	Pn405	Reverse External Torque Limit	2	%	0 to 800	100

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(cont'd)

Classification	Parameter No.	Name	Size (bytes)	Units	Setting Range	Factory Setting
Torque-related Parameters (cont'd)	Pn406	Emergency Stop Torque	2	%	0 to 800	800
	Pn407	Reserved	2	min^{-1}	0 to 10000	10000
	Pn408	Torque Function Switches	2	–	–	0000
	Pn409	Notch Filter Frequency	2	Hz	50 to 2000	2000
Sequence-related Parameters	Pn500	Positioning Completed Width	2	reference unit	0 to 250	7
	Pn501	Reserved	2	min^{-1}	0 to 10000	10
	Pn502	Rotation Detection Level	2	min^{-1}	1 to 10000	20
	Pn503	Reserved	2	min^{-1}	0 to 100	10
	Pn504	NEAR Signal Width	2	reference unit	1 to 250	7
	Pn505	Overflow Level	2	256 reference units	1 to 32767	1024
	Pn506	Brake Reference - Servo OFF Delay Time	2	10 ms	0 to 50	0
	Pn507	Brake Reference Output Speed Level	2	min^{-1}	0 to 10000	100
	Pn508	Timing for Brake Reference Output during Motor Operation	2	10 ms	10 to 100	50
	Pn509	Momentary Hold Time	2	ms	20 to 1000	20
	Pn50A	Input Signal Selections 1*3	2	–	–	2881
	Pn50B	Input Signal Selections 2*3	2	–	–	8883
	Pn50C	Reserved	2	–	–	8888
	Pn50D	Reserved	2	–	–	8888
	Pn50E	Output Signal Selections 1	2	–	–	3211
	Pn50F	Output Signal Selections 2	2	–	–	0000
	Pn510	Output Signal Selections 3	2	–	–	0000
	Pn511	Output Signal Selections 5*3	2	–	–	6541
	Pn512	Output Signal Reversal Settings	2	–	–	0000
Other Parameters	Pn600	Regenerative Resistor Capacity*4	2	10 W	Depends on SERVO-PACK capacity. *5	0
	Pn601	Reserved	2	–	Depends on SERVO-PACK capacity. *5	0
Transmission Parameters	Pn800	Communications Control	2	–	–	0000
Sequence-related	Pn801	Function Selection Application Switches 6	2	–	–	0003
	Pn802	Command Masks	2	–	–	0000
	Pn803	Origin Range	2	reference unit	0 to 250	10

(cont'd)

Classification	Parameter No.	Name	Size (bytes)	Units	Setting Range	Factory Setting
Position-related Parameters	Pn804	Forward Software Limit	4	reference unit	$-2^{30}+1$ to $2^{30}-1$	819191808
	Pn806	Reverse Software Limit	4	reference unit	$-2^{30}+1$ to $2^{30}-1$	-819191808
	Pn808	Absolute Encoder Origin Offset	4	reference unit	$-2^{30}+1$ to $2^{30}-1$	0
Acceleration/ Deceleration	Pn80A	1st Step Linear Acceleration Constant	2	10000 reference units/s^2	1 to 65535	100
	Pn80B	2nd Step Linear Acceleration Constant	2	10000 reference units/s^2	1 to 65535	100
	Pn80C	Acceleration Constant Switching Speed	2	100 reference units/s	0 to 65535	0
	Pn80D	1st Step Linear Deceleration Constant	2	10000 reference units/s^2	1 to 65535	100
	Pn80E	2nd Step Linear Deceleration Constant	2	10000 reference units/s^2	1 to 65535	100
	Pn80F	Deceleration Constant Switching Speed	2	100 reference units/s	0 to 65535	0
Position Reference Filter	Pn810	Exponential Function Position Reference Filter Bias	2	100 reference units/s	0 to 65535	0
	Pn811	Exponential Function Position Reference Filter	2	100 µs	0 to 5100	0
	Pn812	Movement Average Position Reference Filter	2	100 µs	0 to 5100	0
Monitor	Pn813	Option Monitor	2	–	–	0010
Supplementary Commands	Pn814	Final Travel Distance for External Input Positioning	4	reference unit	$-2^{30}+1$ to $2^{30}-1$	100
	Pn816	Homing Mode Setting	2	–	–	0000
	Pn817	Homing Approach Speed 1	2	100 reference units/s	0 to 65535	50
	Pn818	Homing Approach Speed 2	2	100 reference units/s	0 to 65535	5
	Pn819	Final Travel Distance for Homing	4	reference unit	$-2^{30}+1$ to $2^{30}-1$	100

* 1. Do not change the multiturn limit except when using an absolute encoder for infinite length axis and for special applications. Changing this limit incorrectly or unintentionally can be dangerous.
* 2. The parameter Pn111 setting is enabled only when the parameter Pn110.1 is set to 0.
* 3. After changing the setting of this parameter, turn the power OFF to the main and control circuits. Then turn the power ON to validate the change.
* 4. Normally set to 0. When externally connecting a regenerative resistor, set the capacity (W) of the external regenerative resistor.
* 5. The upper limit is the maximum output capacity (W) of the SERVOPACK.

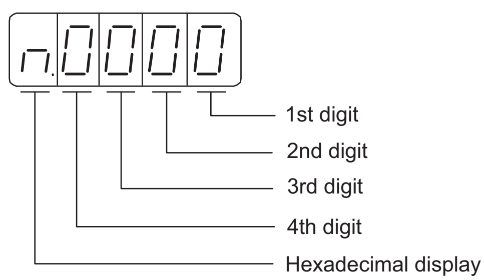
■ Definition of Display for Function Selection Parameters

Each digit of the function selection parameters has a meaning.

For example, the rightmost digit of parameter Pn000 is expressed as “Pn000.0.”

Each digit of the function selection parameters is defined as shown below. The following explains the purpose of each digit of a parameter.

- Pn000.0 or n.×××□: Indicates the value for the 1st digit of parameter Pn000.
- Pn000.1 or n.××□×: Indicates the value for the 2nd digit of parameter Pn000.
- Pn000.2 or n.×□××: Indicates the value for the 3rd digit of parameter Pn000.
- Pn000.3 or n.□×××: Indicates the value for the 4th digit of parameter Pn000.



How to Display Parameters

■ List of Switches

The following table shows the switches.

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn000 Function Selection Basic Switches	1st	Direction Selection	0	Sets CCW as forward direction.	CCW (forward rotation)
			1	Sets CW as forward direction (Reverse rotation mode).	
	2nd	Reserved	0 to B	–	–
	3rd	Axis Address	0 to F	Axis 0 to Axis 15	Axis 0
	4th	Reserved	–	–	0
Pn001 Function Selection Application Switches 1	1st	Servo OFF or Alarm Stop Mode	0	Stops the motor by applying dynamic brake (DB).	Stops the motor by applying dynamic brake (DB).
			1	Stops the motor by applying dynamic brake (DB) and then releases DB.	
			2	Makes the motor coast to a stop state without using the dynamic brake (DB).	
	2nd	Overtravel (OT) Stop Mode	0	Stops the motor by applying dynamic brake (DB) (Same method as for Pn001.0)	Stops the motor by applying dynamic brake (DB).
			1	Decelerates the motor to a stop and then sets it to servolock state.	
			2	Decelerates the motor to a stop and then sets it to coasting state.	
	3rd	AC/DC Power Input Selection	0	Not applicable to main circuit DC power input: Input AC power supply through L1, L2, (and L3) terminals.	Not applicable to main circuit DC power input
			1	Applicable to main circuit DC power input: Input DC power supply between ⊕ 1 and ⊖.	
	4th	Warning Code Output Selection	0	ALO1, ALO2, and ALO3 output only alarm codes.	Outputs only alarm codes
			1	ALO1, ALO2, and ALO3 output both alarm codes and warning codes.	
Pn002 Function Selection Application Switches 2	1st	Reserved	0 to 3	–	0
	2nd	Reserved	0 and 1	–	0
	3rd	Absolute Encoder Usage	0	Uses absolute encoder as an absolute encoder.	Uses as an absolute encoder.
			1	Uses absolute encoder as an incremental encoder.	
	4th	Fully Closed Encoder Usage	0	Does not use fully closed encoder.	Does not use fully closed encoder.
			1	Uses fully closed encoder without phase C.	
			2	Uses fully closed encoder with phase C.	
			3	Uses fully closed encoder in reverse rotation mode without phase C.	
			4	Uses fully closed encoder in reverse rotation mode with phase C.	

6

(cont'd)

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn003 Function Selection Application Switches 3	1st and 2nd	Analog Monitor 1 Torque reference monitor Analog Monitor 2 Speed reference monitor	0	Motor speed: 1 V/1000 r/min	Monitor 1: Torque reference Monitor 2: Motor speed
			1	Speed reference: 1 V/1000 r/min	
			2	Torque reference: 1 V/100%	
			3	Position error: 0.05 V/pulse	
			4	Position error: 0.05 V/100 pulses	
			5	Reference pulse frequency [r/min conversion]: 1 V/1000 r/min	
			6	Motor speed × 4: 1 V/250 r/min	
			7	Motor speed × 8: 1 V/125 r/min	
	3rd	–	–	–	0
	4th	–	–	–	0
Pn004 Function Selection Application Switches 4	1st	–	0 and 1	–	0
	2nd	–	0 and 1	–	0
	3rd	–	–	–	0
	4th	–	–	–	0
Pn005 Function Selection Application Switches 5	1st	–	0	Uses the brake of the SERVOPACK.	Uses the brake of the SERVOPACK.
		–	1	Uses BRK_ON and BRK/OFF signals from the controller.	
	2nd	–	–	–	0
	3rd	–	–	–	0
	4th	–	–	–	0
Pn10B Gain-related Application Switches	1st	Mode Switch Selection	0	Uses internal torque reference as the condition (Level setting: Pn10C).	Uses internal torque reference.
			1	Uses speed reference as the condition (Level setting: Pn10D).	
			2	Uses the acceleration as the condition (Level setting: Pn10E).	
			3	Uses position error pulse as the condition (Level setting: Pn10F).	
			4	No mode switch function available.	
	2nd	Speed Loop Control Method	0	Speed Loop Control Method PI control	PI control
			1	Speed Loop Control Method IP control	
	3rd	–	0	–	0
	4th	–	0	–	0

(cont'd)

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn110 Autotuning	1st	Online Autotuning Method Switches	0	Tunes only at the beginning of operation	Only at the beginning of operation
			1	Always tunes.	
			2	Does not perform autotuning.	
	2nd	Speed Feedback Compensation Selection	0	Applicable.	Not applicable
			1	Not applicable.	
	3rd	Friction Compensation Selection	0	Friction compensation: Disabled	Disabled
			1	Friction compensation: Small	
			2	Friction compensation: Large	
	4th	Reserved	0 to 3	–	0
Pn200 Position Control	1st	Reserved	0 to 9	–	0
	2nd	Reserved	0 to 3	–	0
	3rd	Reserved	0 to 2	–	1
	4th	Reserved	0 and 1	–	0
Pn408 Torque Function Switches	1st	Notch Filter Selection	0	Not applicable.	Not applicable
			1	Uses a notch filter for torque reference.	
	2nd	–	–	–	0
	3rd	–	–	–	0
	4th	–	–	–	0

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■ Input Signal Selections

The following table shows the input signal selections.

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn50A	1st	Reserved	0 and 1	–	1
	2nd	Reserved	0 to F	–	8: Disabled
	3rd	Reserved	0 to F	–	8: Disabled
	4th	P-OT Signal Mapping	0	Inputs from SI0 (CN1-40) input terminal.	Inputs from SI2.
			1	Inputs from SI1 (CN1-41) input terminal.	
			2	Inputs from SI2 (CN1-42) input terminal.	
			3	Inputs from SI3 (CN1-43) input terminal.	
			4	Inputs from SI4 (CN1-44) input terminal.	
			5	Inputs from SI5 (CN1-45) input terminal.	
			6	Inputs from SI6 (CN1-46) input terminal.	
			7	Enabled.	
			8	Disabled.	
			9	Inputs reverse signal from SI0 (CN1-40) input terminal.	
			A	Inputs reverse signal from SI1 (CN1-41) input terminal.	
			B	Inputs reverse signal from SI2 (CN1-42) input terminal.	
			C	Inputs reverse signal from SI3 (CN1-43) input terminal.	
			D	Inputs reverse signal from SI4 (CN1-44) input terminal.	
			E	Inputs reverse signal from SI5 (CN1-45) input terminal.	
			F	Inputs reverse signal from SI6 (CN1-46) input terminal.	
Pn50B	1st	N-OT Signal Mapping	0 to F	Same as P-OT Signal Mapping	Inputs from SI3.
	2nd	Reserved	0 to F	–	–
	3rd	/P-CL Signal Mapping	0 to F	Same as P-OT Signal Mapping	Disabled
	4th	/N-CL Signal Mapping	0 to F	Same as P-OT Signal Mapping	Disabled
Pn50C	1st	Reserved	0 to F	–	8: Disabled
	2nd	Reserved	0 to F	–	8: Disabled
	3rd	Reserved	0 to F	–	8: Disabled
	4th	Reserved	0 to F	–	8: Disabled
Pn50D	1st	Reserved	0 to F	–	8: Disabled
	2nd	Reserved	0 to F	–	8: Disabled
	3rd	Reserved	0 to F	–	8: Disabled
	4th	Reserved	0 to F	–	8: Disabled

■ Output Signal Selections

The following table shows the output signal selections.

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn50E	1st	/COIN Signal Mapping	0	Disabled.	Outputs from SO1.
			1	Outputs from SO1 output terminal.	
			2	Outputs from SO2 output terminal.	
			3	Outputs from SO3 output terminal.	
	2nd	Reserved	0 to 3	–	–
	3rd	/TGON Signal Mapping	0	Disabled.	Outputs from SO2.
			1	Outputs from SO1 output terminal.	
			2	Outputs from SO2 output terminal.	
			3	Outputs from SO3 output terminal.	
	4th	/S-RDY Signal Mapping	0 to 3	Same as /TGON Signal Mapping	Outputs from SO3.
Pn50F	1st	/CLT Signal Mapping	0 to 3	Same as /TGON Signal Mapping	Does not use.
	2nd	/VLT Signal Mapping	0 to 3	Same as /TGON Signal Mapping	
	3rd	/BK Signal Mapping	0 to 3	Same as /TGON Signal Mapping	
	4th	/WARN Signal Mapping *	0 to 3	Same as /TGON Signal Mapping	
Pn510	1st	/NEAR Signal Mapping	0 to 3	Same as /TGON Signal Mapping	
	2nd	/C-PULS Signal Mapping	0 to 3	Same as /TGON Signal Mapping	
	3rd	Reserved	–	–	0
	4th	Reserved	–	–	0
Pn511	1st	/DEC Signal Mapping	0	Inputs from SI0 (CN1-40) input terminal.	Inputs from SI1.
			1	Inputs from SI1 (CN1-41) input terminal.	
			2	Inputs from SI2 (CN1-42) input terminal.	
			3	Inputs from SI3 (CN1-43) input terminal.	
			4	Inputs from SI4 (CN1-44) input terminal.	
			5	Inputs from SI5 (CN1-45) input terminal.	
			6	Inputs from SI6 (CN1-46) input terminal.	
			7	Enabled.	
			8	Disabled.	
			9	Inputs the reverse signal from SI0 (CN1-40).	
			A	Inputs the reverse signal from SI1 (CN1-41).	Inputs from SI1.
			B	Inputs the reverse signal from SI2 (CN1-42).	
			C	Inputs the reverse signal from SI3 (CN1-43).	
			D	Inputs the reverse signal from SI4 (CN1-44).	
			E	Inputs the reverse signal from SI5 (CN1-45).	
			F	Inputs the reverse signal from SI6 (CN1-46).	

6

(cont'd)

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn511 (cont'd)	2nd	/EXT1 Signal Mapping	0 to 3	Disabled.	Inputs from SI4.
			4	Inputs from SI4 (CN1-44) input terminal.	
			5	Inputs from SI5 (CN1-45) input terminal.	
			6	Inputs from SI6 (CN1-46) input terminal.	
			7	Enabled.	
			8	Disabled.	
			D	Inputs the reverse signal from SI4 (CN1-44).	
			E	Inputs the reverse signal from SI5 (CN1-45).	
			F	Inputs the reverse signal from SI6 (CN1-46).	
			9 to F	Disabled.	
	3rd	/EXT2 Signal Mapping	0 to F	Same as /EXT1 Signal Mapping	Inputs from SI5.
	4th	/EXT3 Signal Mapping	0 to F	Same as /EXT1 Signal Mapping	Inputs from SI5.
Pn512	1st	Output Signal Reversal for SO1 Output Terminal	0	Output signal is not reversed.	Not reversed.
			1	Output signal is reversed.	
	2nd	Output Signal Reversal for SO2 Output Terminal	0	Output signal is not reversed.	Not reversed.
			1	Output signal is reversed.	
	3rd	Output Signal Reversal for SO3 Output Terminal	0	Output signal is not reversed.	Not reversed.
			1	Output signal is reversed.	
	4th	Reserved	–	–	0

* /WARN signal types: Overload, Regenerative overload, Communications warning, Data setting warning, and command warning

Note: 1. If more than one signal is assigned to one output circuit, the OR logic is applied.
2. The signals that are not detected because of the selected control mode are OFF. For example, /COIN signal is OFF in speed control mode.

■ Setting Parameters for MECHATROLINK Communications

The following table shows the setting parameters for MECHATROLINK communications.

Parameter No.	Digit Place	Name	Setting	Description	Factory Setting
Pn800	1st	MECHATROLINK Communications Check Mask (For debugging)	0	Normal status	Normal status
			1	Ignores communications errors.	
			2	Ignores WDT errors.	
			3	Ignores both communications errors and WDT timeout errors.	
	2nd	–	–	–	0
	3rd	–	–	–	0
	4th	–	–	–	0
Pn801	1st	Software Limit Function	0	Forward and reverse software limit enabled.	Enables the soft limit function
			1	Forward software limit disabled.	
			2	Reverse software limit disabled.	
			3	Software limit disabled in both directions.	
	2nd	Software Limit Operation Selection	0	Operates on absolute positions (APOS) in machine coordinate system.	Absolute positions in machine coordinate system
			1	Operates on absolute positions (APOS) in reference coordinate system.	
	3rd	Software Limit Check by References	0	No software limit check by references.	No software limit check
			1	Software limit check by references.	
	4th	–	–	–	0
Pn802	1st	SV_ON Command Mask	0	SV_ON and SV_OFF commands enabled.	Commands enabled
			1	Always servo ON.	
	2nd	SENS_ON Command Mask	0	SENS_ON and SENS_OFF commands enabled.	Commands enabled
			1	Always SENS_ON.	
	3rd	–	–	–	0
	4th	–	–	–	0
Pn813	1st	Option Monitor 1 Selection	0	Analog monitor 1 (Pn003.0)	Pn003.0
			1	Analog monitor 2 (Pn003.1)	
			2	Initial multiturn data (IMTDATA)	
			3	Encoder count value (PGCNT)	
	2nd	Option Monitor 2 Selection	0 to 3	Same as Option Monitor 1 Selection	Pn003.1
	3rd	–	–	–	0
	4th	–	–	–	0
Pn816	0	Homing Mode Setting	0	Forward	Forward
			1	Reverse	
	1	–	–	–	0
	2	–	–	–	0
	3	–	–	–	0

6.2.6 Relationship of SERVOPACK Parameters to SVB-01 Parameters

Some SVB-01 Modules parameters and SERVOPACK parameters have the same function. Set these parameters carefully.

■ List of Parameters Requiring Special Attention

The following table shows parameters with the same function.

SVB-01	Σ Series SERVOPACK	Σ-II Series SERVOPACK
OW☐☐10: Position loop gain	Cn-000A: Position loop gain	Pn102: Position loop gain
OW☐☐11: Feed forward gain	Cn-001D: Feed forward compensation	Pn109: Feed-forward
OW☐☐1D: Speed loop gain	Cn-0004: Speed loop gain	Pn100: Speed loop gain
OW☐☐0C: Linear acceleration time	Cn-0020: Second level linear acceleration/deceleration time constant Cn-002E: Exponential acceleration time constant	Pn80B: 2nd step linear acceleration time constant
OW☐☐14: Averaged number of revolutions	Cn-0026: Average move time	Pn812: Movement Average Position Reference Filter
Fixed parameter 3: Encoder selection	Cn-0001 bit E: Encoder selection	Pn002.3: Absolute encoder usage
Fixed parameter 8: Number of FB pulses per revolution	Cn-0011: No. of encoder pulses	–
Fixed parameter 22: Gear ratio, load end	Cn-0024: Electronic gear ratio, numerator	Pn202: Electronic gear ratio (numerator)
Fixed parameter 21: Gear ratio, servomotor end	Cn-0025: Electronic gear ratio, denominator	Pn203: Electronic gear ratio (denominator)
Fixed parameter 17 bit 7: Forward Stored Stroke Limit Function Selection	Cn-0014 bit 2: P-SOT mask	Pn801.1: Software limit function
Fixed parameter 17 bit 8: Reverse Stored Stroke Limit Function Selection	Cn-0014 bit 3: N-SOT mask	
Fixed parameter 27: Positive stored stroke limit	Cn-002F: Forward direction soft limit	Pn804: Forward software limit
Fixed parameter 29: Negative stored stroke limit	Cn-0031: Reverse direction soft limit	Pn806: Reverse software limit
OW☐☐33: Zero point output width	Cn-002A: Zero point position range	Pn803: Origin range
–	Cn-002B: External positioning final travel distance *	Pn819: Final travel distance for homing *

* The value set for the SERVOPACK is used for the final travel distance for homing.

■ Parameters Motion Programs Can Write

The following SERVOPACK parameters can be written from a motion program. (SERVOPACK parameters are simultaneously written whenever setting parameters are written from a motion program).

Parameter Name	Motion Program Format		MP920	Σ Series SERVOPACK	Σ-II Series SERVOPACK
2nd Step Linear Acceleration Time Constant	ACC[X]6000;	→	OW□□0C	Cn-0020	Pn80B
Average Move Time	SCC[X]6000;	→	OW□□14	Cn-0026	Pn812
2nd step Linear Deceleration Time Constant	DCC[X]	→	OW□□0D	–	Pn80E

■ Parameters SVB-01 Motion Commands Can Write

Motion commands can be used for the following parameters to write settings on the Controller to the SERVOPACK.

Parameter Name	Controller	Σ Series SERVOPACK	Σ-II Series SERVOPACK
Exponential Acceleration Time Constant	OW□□14	Cn-002E	Pn811
Speed Loop Gain	OW□□1D	Cn-0004	Pn100
Position Loop Gain	OW□□10	Cn-001A	Pn102
Feed Forward Compensation	OW□□11	Cn-001D	Pn109

The following procedure must be used to change parameters.

- Example showing the procedure for writing position loop gain from a motion program.

```
WHILE  OWxx20 <> 0;   Check to see if the motion command OW□□20 is set to 0 (NOP).
EOX;                  1-scan WAIT command
WEND;
OWxx10=200;           Position loop gain: Stores the value at OW□□10.
OWxx20=15;            Set the motion command OW□□20 to 15 (KPS command).
WHILE  IWxx14 <>15;   Waits until the command response is 15 (KPS command).
EOX;
WEND;
OWxx20=0;             Set the motion command OW□□20 to 0 (NOP).
```

■ Parameters that Must Be the Same for SVB-01 and SERVOPACK

Motion control will not function properly if the following parameters are not the same.

Parameter Name	SVB-01	Σ Series SERVOPACK	Σ-II Series SERVOPACK
Encoder Selection	Fixed Parameter 3	Cn-0001 Bit E	Depends on the number of encoder pulses.
No. of Encoder Pulses	Fixed Parameter 8	Cn-0011	

■ Parameters Set Either on Controller or SERVOPACK

Motion control will not function properly if both the following sets of parameters are used at the same time.

Parameter Name	SVB-01	Σ Series SERVOPACK	Σ-II Series SERVOPACK
Electronic Gear Ratio, Numerator	Fixed Parameter 22	Cn-0024	Pn202
Electronic Gear Ratio, Denominator	Fixed Parameter 21	Cn-0025	Pn203

IMPORTANT

Do not normally use the gear ratio parameters on the SERVOPACK. Set the following parameters at setup.

- When using a Σ Series SERVOPACK, set both parameters Cn-0024 and Cn-0025 to 1.
- When using a Σ-II Series SERVOPACK, set both parameters Pn202 and Pn203 to 1.

■ SERVOPACK Parameters That Must Not Be Used

Parameter Name	SVB-01	Σ Series SERVOPACK	Σ-II Series SERVOPACK
P-SOT Mask	Fixed Parameter 17 bit 7	Cn-0014 bit 2	Pn801.1
N-SOT Mask	Fixed Parameter 17 bit 8	Cn-0014 bit 3	Pn801.1
Forward Direction Software Limit	Fixed Parameter 27	Cn-002F	Pn804
Reverse Direction Software Limit	Fixed Parameter 29	Cn-0031	Pn806
External Positioning Travel Distance*	Setting Parameter 37	–	Pn814

* Use the setting parameter No. 37: External Positioning Travel Distance (OL□□24) for the final travel distance when executing the external positioning command. The SERVOPACK parameter Pn814 is not used.

IMPORTANT

- When using a Σ Series SERVOPACK
  Always mask P-SOT and N-SOT on SERVOPACK by setting the bits 2 and 3 of Cn-0014 to 1 at setup.
- When using a Σ-II Series SERVOPACK
  Set the 1st digit of the parameter Pn801 to 3 (software limit disabled in both directions).

■ Parameters That Look Similar but Are Different

SVB-01	SERVOPACK
Zero Point Output Width: OW□□33	Zero Point Position Range: Cn-002A

The SVB-01 parameter is used for zero point position output.

7

PO-01 Module Specification and Handling

This chapter describes the specifications and handling of the PO-01 Module and explains the PO-01 parameters in detail.

7

7.1 PO-01 Module

This section describes the hardware specifications and handling of the PO-01 Module.

7.1.1 Hardware Specifications

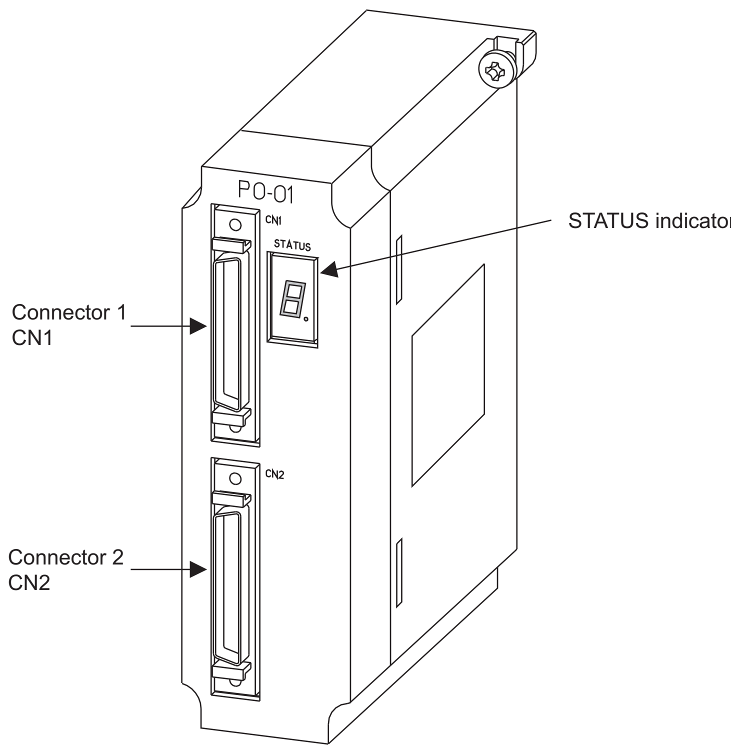
The following table shows the PO-01 hardware specifications.

Table 7.1 PO-01 Module Hardware Specifications

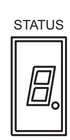
Item	Specifications	
Name	Pulse Output Module	
Model Number	JEPMC-PL210	
Description	PO-01	
Number of Controlled Axes	4	
Pulse Outputs	Method	Sign + pulse, pulse
	Maximum Frequency	500 kpps (switched using software)
	Interface	5-V differential output
	Other Functions	Positive and negative logic switchable with software. Two emergency stop modes are supported (immediate stop and deceleration to a stop).
Digital Inputs	Photocoupler isolation, current source input, 5 points × 4 channels DI_0: Separate for each power supply 5 V/5 mA, 12 V/12 mA, or 24 V/5 mA DI_1 to DI_4: Common power source, 0.5-ms filter, 24 V/5 mA	
Application Examples	DI_0	Zero point
	DI_1	Dog signal/general-purpose
	DI_2	Limit 1
	DI_3	Limit 2
	DI_4	Emergency stop/deceleration to a stop
Digital Outputs	24 V open collector (current sink type), 4 points × 4 channels Photocoupler isolation, 100 mA max.	
Application Examples	DO_0	Excitation ON
	DO_1	General-purpose output
	DO_2	General-purpose output
	DO_3	General-purpose output
Indicator	Module status LED 7-segment LED (green)	
Connectors	CN1: 1- or 2-axis connector 10250-52A2JL CN2: 3- or 4-axis connector 10250-52A2JL	
Hot Swapping (Removal/Insertion under Power)	Not possible.	
Dimensions	40 × 130 × 105 mm (W × H × D)	

7.1.2 Handling

The following illustration shows the appearance of the PO-01 Module.



■ LED Indicator



The STATUS indicator is a 7-segment LED indicator that displays the RUN/error status of the PO-01 Module. The following table shows the indicator display patterns.

Display	Category	Meaning
	Hardware reset	The PO-01 Module is in hardware reset status.
	Initializing	This display appears one to six seconds after the PO-01 Module is turned ON or reset.

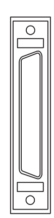
(cont'd)

Display	Category	Meaning
1 2 3 4 5 6 7 8 9 A b C d E r y	Normal operation	One of servo numbers 1 to 16 will be displayed. The PO-01 Module is operating normally.
F or F. followed by error code	Serious fault	A two-digit error code appears following F. Examples: F → 0 → 1: Watchdog time over F → 0 → 2: Synchronization error F → 4 → 1: ROM diagnosis error F → 4 → 2: RAM diagnosis error F → 4 → 3: Shared memory diagnosis error F → 4 → 4: CPU built-in timer error F → 4 → 5: JL-035 diagnosis error F → 4 → 8: General-Illegal instruction interruption occurrence F → 4 → 9: Slot-Illegal instruction interruption occurrence F → 5 → 0: CPU address error interruption occurrence F → 5 → 1: DMA address error interruption occurrence F → 5 → 2: User break interruption occurrence F → 5 → 3: Trap instruction interruption occurrence F → 5 → 4: Upd71054 diagnosis error

(cont'd)

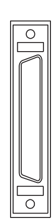
Display		Category	Meaning
	Axis 1	Abnormal	• Motion setting parameter setting error (refer to IB□□00, bit 1.) • Alarm (refer to IL□□22.) • Motion command error termination (when IB□□15, bit 5 = ON) • Motion fixed parameter setting error (refer to IB□□002.) • Emergency stop signal OFF
	Axis 2		
	Axis 3		
	Axis 4		
		Operation of other CPU stops	Indicates other Modules that do not operate. For example, CPU Module is in STOP status.

■ Pulse Output Connector 1



Connector 1 is used to connect the PO-01 Module to Axis 1/Axis 2 of Pulse Motor Driver.
CN1: Axes 1 and 2
Use the cable type JEPMC-W6060-□□.

■ Pulse Output Connector 2



Connector 2 is used to connect the PO-01 Module to Axis 3/Axis 4 of Pulse Motor Driver.
CN2: Axes 3 and 4
Use the cable type JEPMC-W6060-□□.

■ Pulse Interface Connector Specifications

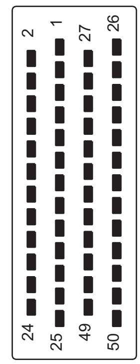
The following table shows the specifications of the connectors shown above.

Name	Connector Name	Number of Pins	Connector			Cable
			On Module	On Cable	Manufacturer	
Pulse Interface Connector	CN1 CN2	50	10250-52A2JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw lock) 10350-52F0-008 (Snap-on lock)	3M	JEPMC-W6060-05 JEPMC-W6060-10 JEPMC-W6060-30

■ Connector Pin Layout (CN1)

The pin layout of the CN1 connector is shown below.

CN1 50-pin Connector



Pin Layout on Wiring Side

2	CW1+	1	NC	27	CCW1+ (sign+)	26	NC
4	PO_0V	3	CW1-	29	PO_0V	28	CCW1- (sign-)
6	DI1_0- (24V)	5	DI1_0+	31	DO1_0	30	NC
8	DI1_1	7	DI1_0- (5/12V)	33	DO1_1	32	DO1_0 (with resistor)
10	DI1_3	9	DI1_2	35	DO1_2	34	DO1_1 (with resistor)
12	NC	11	DI1_4	37	NC	36	DO1_3
14	CW2-	13	CW2+	39	CCW2- (sign-)	38	CCW2+ (sign+)
16	DI2_0+	15	PO_0V	41	NC	40	PO_0V
18	DI2_0- (5/12V)	17	DI1_0- (24V)	43	DO2_0 (with resistor)	42	DO2_0
20	DI2_2	19	DI2_1	45	DO2_1 (with resistor)	44	DO2_1
22	DI2_4	21	DI2_3	47	DO2_3	46	DO2_2
24	0V_1	23	24V_1	49	0V_1	48	24V_1
		25	NC			50	NC

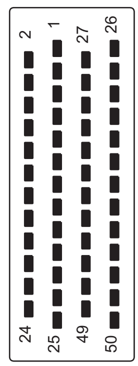
The following table shows the names and functions of the CN1 connector pins.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	NC	–	26	NC	–
2	CW1+	CH1 CW output (positive terminal)	27	CCW1+ (sign+)	CH1 CW (sign) output (positive terminal)
3	CW1-	CH1 CW output (negative terminal)	28	CCW1- (sigh-)	CH1 CW (sign) output (negative terminal)
4	PO_0V	Common to Module 0 V	29	PO_0V	Common to Module 0 V
5	DI1_0+	CH1 input_0 (positive terminal)	30	NC	–
6	DI1_0- (24 V)	CH1 input_0 (negative terminal) 24 V	31	DO1_0	CH1 DO output_0
7	DI1_0- (5/12 V)	CH1 input_0 (negative terminal) 5/12 V	32	DO1_0- (with resistor)	CH1 DO output_0 (with 1.5-kΩ resistor)
8	DI1_1	CH1 input_1	33	DO1_1	CH1 DO output_1
9	DI1_2	CH1 input_2	34	DO1_1- (with resistor)	CH1 DO output_1 (with 1.5-kΩ resistor)
10	DI1_3	CH1 input_3	35	DO1_2	CH1 DO output_2
11	DI1_4	CH1 input_4 (emergency stop)	36	DO1_3	CH1 DO output_3
12	NC	–	37	NC	–
13	CW2+	CH2 CW output (positive terminal)	38	CCW2+ (sign+)	CH2 CW (sign) output (positive terminal)
14	CW2-	CH2 CW output (negative terminal)	39	CCW2- (sign-)	CH2 CW (sign) output (negative terminal)
15	PO_0V	Common to Module 0 V	40	PO_0V	Common to Module 0 V
16	DI2_0+	CH2 input_0 (positive terminal)	41	NC	–
17	DI2_0- (24 V)	CH2 input_0 (negative terminal) 24 V	42	DO2_0	CH2 DO output_0
18	DI2_0- (5/12 V)	CH2 input_0 (negative terminal) 5/12 V	43	DO2_0 (with resistor)	CH2 DO output_0 (with 1.5-kΩ resistor)
19	DI2_1	CH2 input_1	44	DO2_1	CH2 DO output_1
20	DI2_2	CH2 input_2	45	DO2_1- (with resis-tor)	CH2 DO output_1 (with 1.5-kΩ resistor)
21	DI2_3	CH2 input_3	46	DO2_2	CH2 DO output_2
22	DI2_4	CH2 input_4 (emergency stop)	47	DO2_3	CH2 DO output_3
23	24V_1	I/O power supply input (24 V)	48	24V_1	I/O power supply input (24 V)
24	0V_1	I/O power supply input (0 V)	49	0V_1	I/O power supply input (0 V)
25	NC	–	50	NC	–

■ Connector Pin Layout (CN2)

The pin layout of the CN2 connector is shown below.

CN2 50-pin Connector



Pin Layout on Wiring Side

2	CW3+	1	NC	27	CCW3+ (sign+)	26	NC
4	PO_0V	3	CW3-	29	PO_0V	28	CCW3- (sign-)
6	DI3_0- (24V)	5	DI3_0+	31	DO3_0	30	NC
8	DI3_1	7	DI3_0- (5/12V)	33	DO3_1	32	DO3_0 (with resistor)
10	DI3_3	9	DI3_2	35	DO3_2	34	DO3_1 (with resistor)
12	NC	11	DI3_4	37	NC	36	DO3_3
14	CW4-	13	CW4+	39	CCW4- (sign-)	38	CCW4+ (sign+)
16	DI4_0+	15	PO_0V	41	NC	40	PO_0V
18	DI4_0- (5/12V)	17	DI4_0- (24V)	43	DO4_0 (with resistor)	42	DO4_0
20	DI4_2	19	DI4_1	45	DO4_1 (with resistor)	44	DO4_1
22	DI4_4	21	DI4_3	47	DO4_3	46	DO4_2
24	0V_2	23	24V_2	49	0V_2	48	24V_2
		25	NC			50	NC

The following table shows the names and functions of the CN2 connector pins.

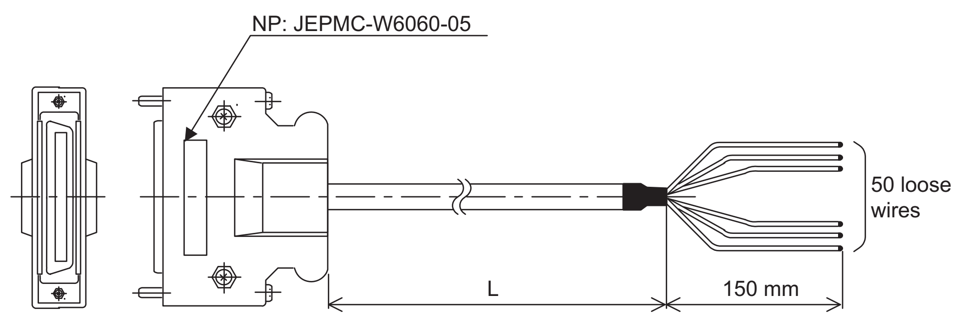
Pin	Signal Name	Function	Pin	Signal Name	Function
1	NC	–	26	NC	–
2	CW3+	CH3 CW output (positive terminal)	27	CCW3+ (sign+)	CH3 CW (sign) output (positive terminal)
3	CW3-	CH3 CW output (negative terminal)	28	CCW3- (sigh-)	CH3 CW (sign) output (negative terminal)
4	PO_0V	Common to Module 0 V	29	PO_0V	Common to Module 0 V
5	DI3_0+	CH3 input_0 (positive terminal)	30	NC	–
6	DI3_0- (24 V)	CH3 input_0 (negative terminal) 24 V	31	DO3_0	CH3 DO output_0
7	DI3_0- (5/12 V)	CH3 input_0 (negative terminal) 5/12 V	32	DO3_0- (with resistor)	CH3 DO output_0 (with 1.5-kΩ resistor)
8	DI3_1	CH3 input_1	33	DO3_1	CH3 DO output_1
9	DI3_2	CH3 input_2	34	DO3_1- (with resistor)	CH3 DO output_1 (with 1.5-kΩ resistor)
10	DI3_3	CH3 input_3	35	DO3_2	CH3 DO output_2
11	DI3_4	CH3 input_4 (emergency stop)	36	DO3_3	CH3 DO output_3
12	NC	–	37	NC	–
13	CW4+	CH4 CW output (positive terminal)	38	CCW4+ (sign+)	CH4 CW (sign) output (positive terminal)
14	CW4-	CH4 CW output (negative terminal)	39	CCW4- (sign)	CH4 CW (sign) output (negative terminal)
15	PO_0V	Common to Module 0 V	40	PO_0V	Common to Module 0 V
16	DI4_0+	CH4 input_0 (positive terminal)	41	NC	–
17	DI4_0- (24 V)	CH4 input_0 (negative terminal) 24 V	42	DO2_0	CH4 DO output_0
18	DI4_0- (5/12 V)	CH4 input_0 (negative terminal) 5/12 V	43	DO2_0- (with resistor)	CH4 DO output_0 (with 1.5-kΩ resistor)
19	DI4_1	CH4 input_1	44	DO2_1	CH4 DO output_1
20	DI4_2	CH4 input_2	45	DO4_1- (with resistor)	CH4 DO output_1 (with 1.5-kΩ resistor)
21	DI4_3	CH4 input_3	46	DO4_2	CH4 DO output_2
22	DI4_4	CH4 input_4 (emergency stop)	47	DO4_3	CH4 DO output_3
23	24V_2	I/O power supply input (24 V)	48	24V_2	I/O power supply input (24 V)
24	0V_2	I/O power supply input (0 V)	49	0V_2	I/O power supply input (0 V)
25	NC	–	50	NC	–

■ External I/O Cables

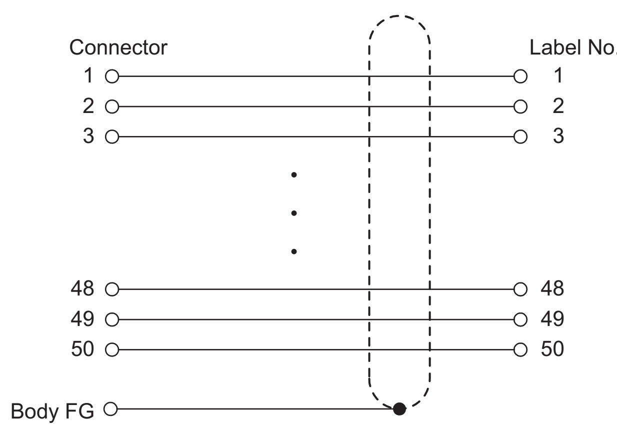
Models

JEPMC-W6060-05: 0.5 m
JEPMC-W6060-10: 1.0 m
JEPMC-W6060-30: 3.0 m

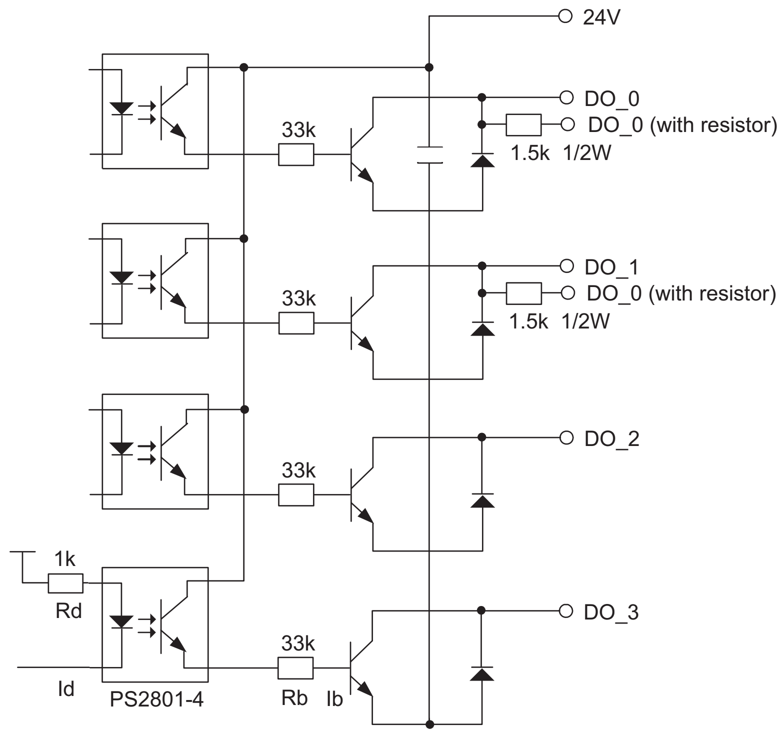
Appearance



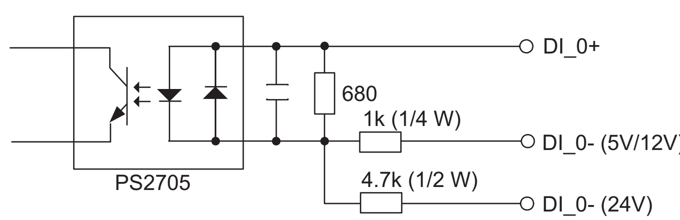
Cable Connection Diagram



■ DO Output Circuit



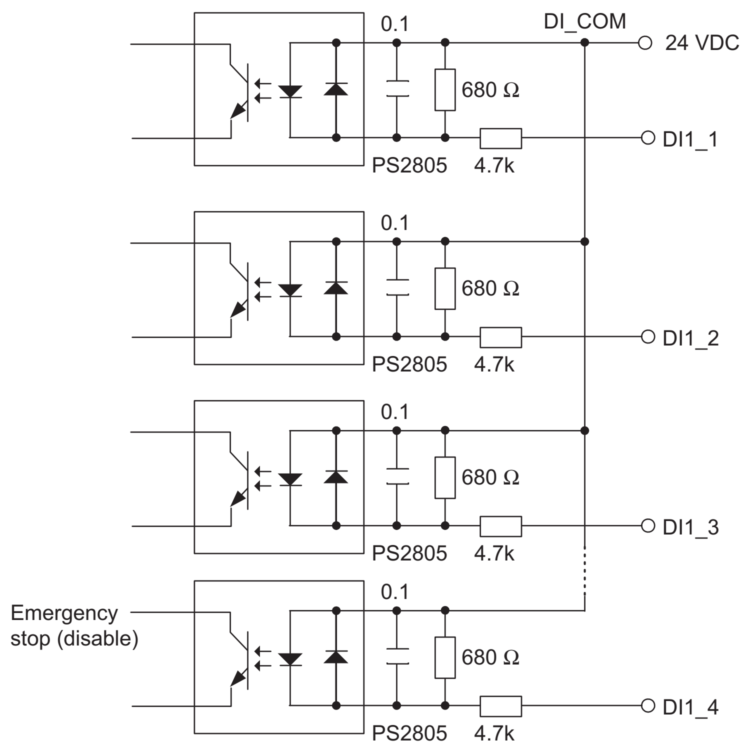
■ DI Input Circuit (DI-0)



INFO

The DI-0 input circuit is isolated from the DI-1 to DI-4 circuits.

■ DI Circuit Connection Method (DI1 to DI4)



INFO

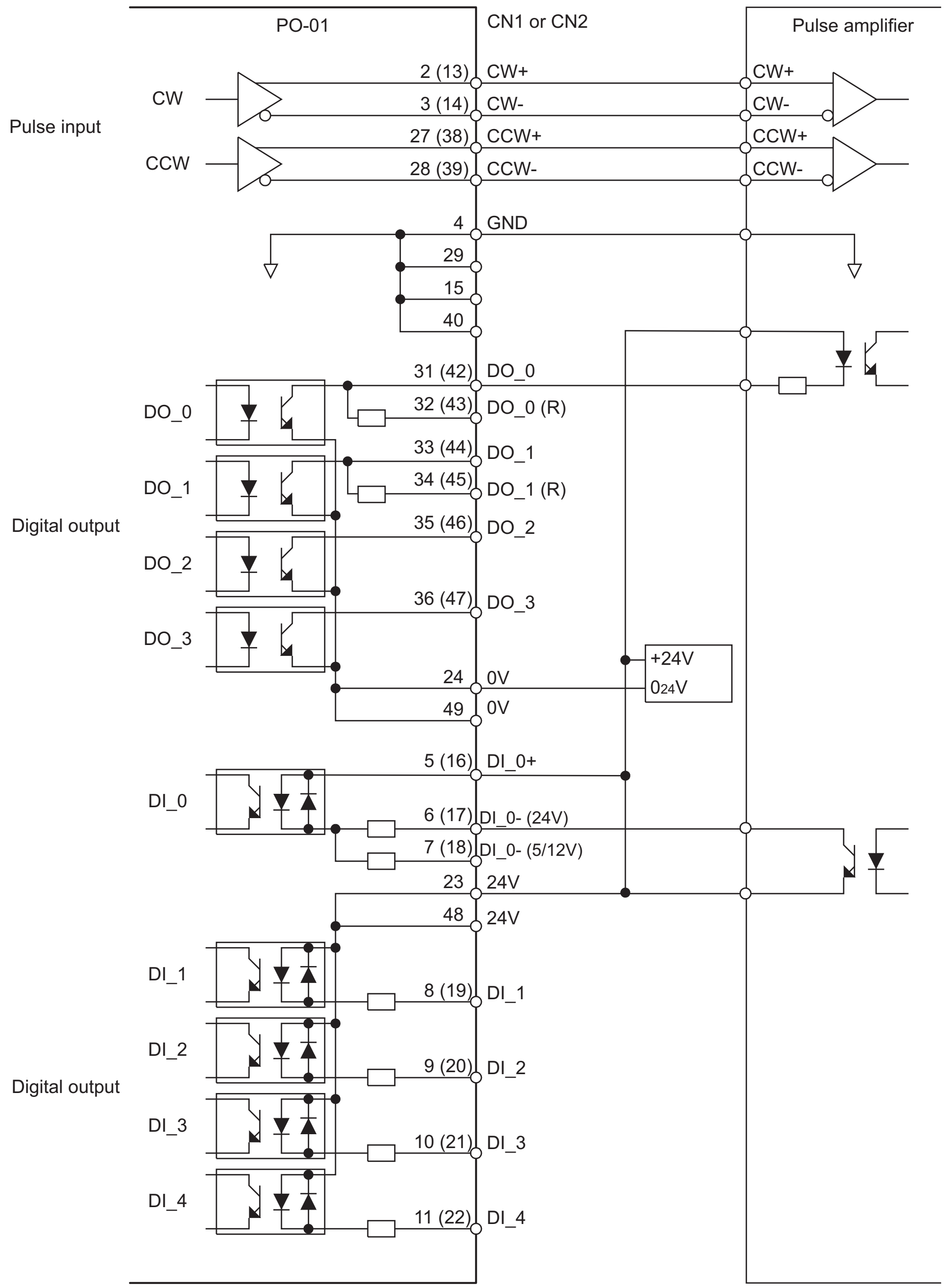
The positive terminals (DI-COM) of the DI-1 to DI-4 circuits are connected to the 24-VDC terminals.

IMPORTANT

Connect the emergency stop signal (DI-4) to start up the Module. The emergency stop signal is an NC contact.

7

■ PO-01 Module Connection Example



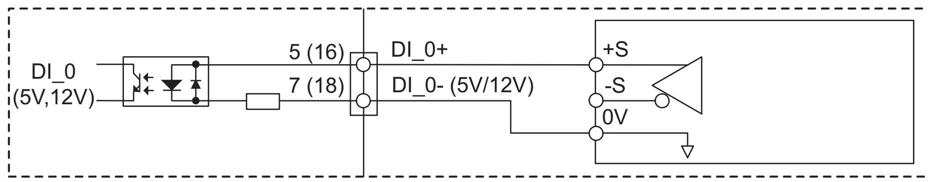
Note: The pulse input and the digital input/output have two channels for one connector. The channels for the terminal numbers □□ (□□) is as follows:

- □□: channel 1
- (□□): channel 2

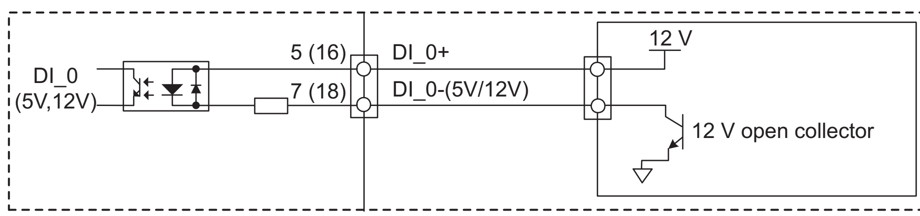
■ DI-0 Connection Examples

As well as the 24 V power supply in the diagram above, the DI-0 can also be used when using a 5 V differential input or a 12 V open collector system.

At 5 V differential input



At 12 V open collector



7

7.2 Functions

This section describes PO-01 Module functions.

7.2.1 Motion Control Functions

■ Motion Control

Each PO-01 Module can control the motion of up to four axes. The motion control functions are positioning, zero point return, interpolation, feeding, and stepping. These can be set separately for all axes. Motion control can be set for each axis individually, so there is no limitation on motion control by axis number.

A maximum 16 PO-01 Modules can be mounted in each MP920, enabling control of up to 64 axes. The maximum number of Modules is 16 total, including all other Motion Modules (such as SVA Modules).

Table 7.2 List of Motion Control Functions

Item	Specifications	
Number of Controlled Axes	64 max. (4 axes per Module, 16 Modules max.)	
Motion Parameters	Fixed parameters	MPE720 Screen setting
	Setting parameters	OW□□00 to OW□□3F (64 words/axis)
	Monitoring parameters	IW□□00 to IW□□3F (64 words/axis)
Motion Functions	POSING	Positioning
	ZRET	Zero point return
	INTERPOLATE	Interpolation
	FEED	Fixed speed feed
	STEP	Fixed length feed
Reference Units	pulse	Can be selected.
	mm	Can be selected.
	deg	Can be selected.
	inch	Can be selected.
Additional Functions	Infinite length axis selection	Can be selected.
	Override function	Can be selected.
	Software limit function	Can be selected.
	Acceleration/deceleration type	Linear (with or without bias)
		Exponential (with or without a bias setting)
		Simple S-curve
Driver	Pulse train output type: CW/CCW or sign (CCW) + pulse (CW)	

■ Reference Pulse Forms

Reference pulses are either sign + pulse train (sign) or CW/CCW. Either form outputs a 5-V differential.

Sign Reference Pulses

The CW pulse is the reference pulse train.

The CCW pulse is the sign.

The Servomotor rotates in the forward direction when the CCW pulse is high and in the reverse direction when the CCW pulse is low.

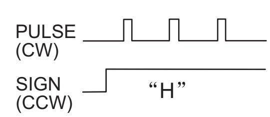
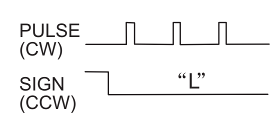
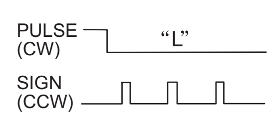
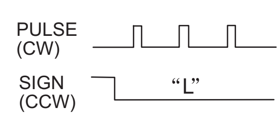
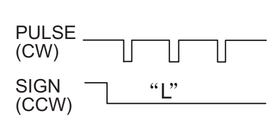
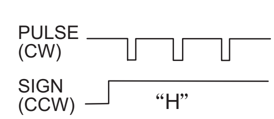
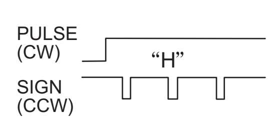
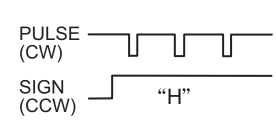
CW/CCW

The CW pulse is the reverse reference pulse for the Servomotor.

The CCW pulse is the forward reference pulse for the Servomotor.

CW/CCW output signal polarity can be reversed. The following table shows the reference pulses.

Table 7.3 Reference Pulse Forms

Motion Fixed Parameters (Parameter No. 37: Pulse Output Signal Form Selection)		Reference Pulse Form	Servomotor Forward Direction Reference (CCW Direction)	Servomotor Reverse Direction Reference (CW Direction)
Bit 8	Bits 12 to 15			
0 (Positive Logic)	1	Sign + pulse train		
	0	CW pulse + CCW pulse		
1 (Negative Logic)	1	Sign + pulse train		
	0	CW pulse + CCW pulse		

■ Maximum Pulse Output Frequency

The reference pulse output from the PO-01 Module is determined by the high-speed scan time set on the CPU Module and by the maximum pulse output frequency set at motion fixed parameters.

$0 \leq |\text{reference pulse (kpps)}| \leq |\{\text{Max Hz (10 kHz)} \times 10 \times \text{Ts (ms)} - 2\} / \text{Ts (ms)}|$

- Max Hz: Fixed parameter No. 38: Maximum Pulse Output Frequency (Units: 10 kHz)
- Ts: High-speed scan time for the CPU Module (Units: ms)

Maximum Reference Pulse Example 1

Ts = 1 (1.0 ms), maximum pulse output frequency = 10 (100 kHz):

Maximum reference pulse = $(10 \times 10 \times 1.0-2) / 1.0 = 98.0$ (kpps)

Maximum Reference Pulse Example 2

Ts = 2 (2.0 ms), maximum pulse output frequency = 20 (200 kHz):

Maximum reference pulse = $(20 \times 10 \times 2.0-2) / 2.0 = 199.0$ (kpps)

If the feed speed (reference pulse) is set higher than the maximum reference pulse shown above, then an overspeed alarm (IB□□227 = ON) will be generated and the machine will stop.

IMPORTANT

1. The pulse output frequency is the same for all four axes. Set the same value for all axes whether they are used or not.
   When different values are set, then the maximum pulse output frequency setting for the smallest axis number being used will be used for all four axes, as shown in the following example.

	Applicable Axis	Maximum Frequency
Axis 1	Axis not used	100 kHz
Axis 2	Axis used	10 kHz
Axis 3	Axis used	20 kHz
Axis 4	Axis not used	40 kHz

   In the above case, the 10 kHz setting for Axis 2 will be used for all four axes. If Axis 1 is changed so that it is also used, then the setting for all four axes will be the 100 kHz setting for Axis 1. If Axis 1 is not used and Axis 2 is changed so that it is also not used, then the setting for all four axes will be the 20 kHz setting for Axis 3.
2. Set an integer using 200 ÷ maximum pulse output frequency (1 = 10 Hz) for the maximum pulse output frequency setting. In other words, set 1, 2, 4, 5, 8, 10, 20, 25, 40 or 50 for the maximum pulse output frequency setting.

7.2.2 Motion Functions

■ Motion Commands

The motion control functions for the PO-01 Module include positioning (POSING), zero point return (ZRET), interpolation (INTERPOLATE), fixed speed feed (FEED) and fixed length feed (STEP) which can be set individually for all axes.

Table 7.4 List of Motion Functions

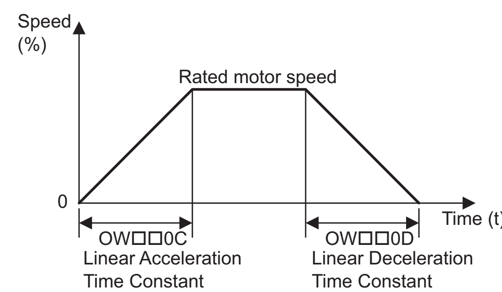
Function	Description
Positioning (POSING)	Positions axes using the specified acceleration/deceleration time constants and the specified feed speed.
Zero Point Return (ZRET)	Positions axes by moving them only the distance traveled to return to the zero point using the zero point signal. There are four ways to return to the zero point.
Interpolation (INTERPOLATE)	Performs interpolated feed using position data distributed by the CPU Module every high-speed scan.
Fixed Speed Feed (FEED)	Performs infinite rapid traverse feeding in the specified direction using the specified acceleration/deceleration time constants and the specified feed speed. When the NOP command is executed, the system will decelerate to a stop.
Fixed Length Speed (STEP)	Positions axes in the specified direction for the specified travel distance (step distance) at rapid traverse speed according to the specified acceleration/deceleration time constants.

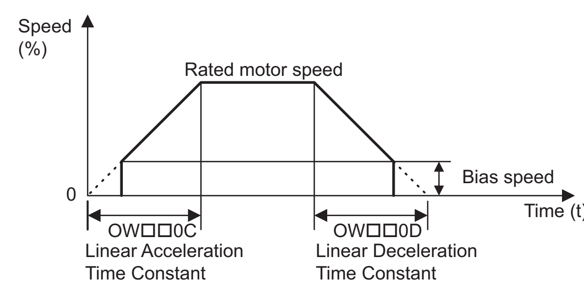
7

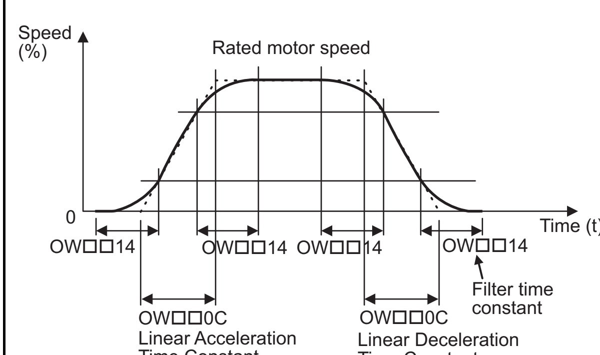
■ Acceleration/Deceleration Type

Acceleration/deceleration is broadly classified as linear, S-curve and exponential acceleration/deceleration. A bias speed can also be set for linear and exponential acceleration/deceleration.

Table 7.5 Acceleration/Deceleration Type

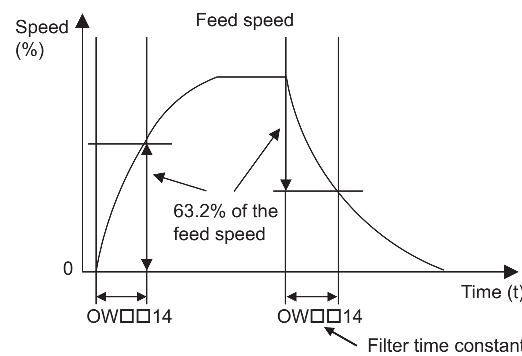
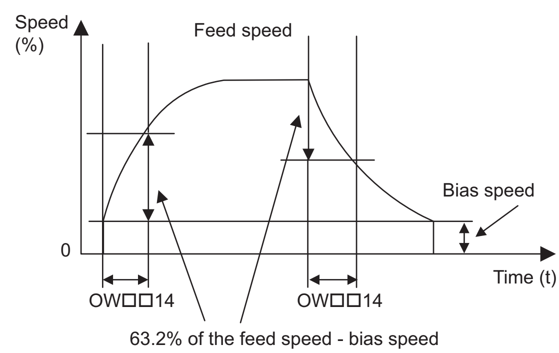
<table>
<tr><th>Acceleration/ Deceleration Type</th><th>Relevant Motion Parameters</th><th>Description</th></tr>
<tr><td>Linear Acceleration/ Deceleration</td><td>• Bias speed
Motion fixed parameter No. 35
• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant</td><td>

• Set the time it takes to reach rated motor speed for the acceleration/deceleration time constant.
• Set motion fixed parameter No. 35: Bias Speed to 0.</td></tr>
<tr><td>Linear Acceleration/ Deceleration With Bias</td><td>• Bias speed
Motion fixed parameter No. 35
• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant</td><td>

Set the time it takes to reach rated motor speed at the acceleration/deceleration time constant.</td></tr>
<tr><td>S-curve Acceleration/ Deceleration (Average Move)</td><td>• OW□□0C
Motion setting parameter:
Linear Acceleration Time Constant
• OW□□0D
Motion setting parameter:
Linear Deceleration Time Constant
• OW□□14
Motion setting parameter:
Filter Time Constant Setting
• OB□□214 to OB□□217
Motion setting parameter:
Filter Type Selection</td><td>

Set the Filter Type Selection to 2 (average movement filter).</td></tr>
</table>

Table 7.5 Acceleration/Deceleration Type (cont'd)

Acceleration/ Deceleration Type	Relevant Motion Parameters	Description
Exponential Acceleration/ Deceleration	• OW□□0C Motion setting parameter: Linear Acceleration Time Constant • OW□□0D Motion setting parameter: Linear Deceleration Time Constant • OW□□14 Motion setting parameter: Filter Time Constant Setting • OB□□214 to OB□□217 Motion setting parameter: Filter Type Selection • Bias Speed for the Exponential Acceleration/Deceleration Filter (motion fixed parameter No. 36)	 • Set the linear acceleration/deceleration time constants (OW□□0C and OW□□0D) to 0. • Set the Filter Type Selection to 1 (exponential acceleration/deceleration). • Set the Bias Speed for the Exponential Acceleration/ Deceleration Filter to 0.
Exponential Acceleration/ Deceleration With Bias	• OW□□0C Motion setting parameter: Linear Acceleration Time Constant • OW□□0D Motion setting parameter: Linear Deceleration Time Constant • OW□□14 Motion setting parameter: Filter Time Constant Setting • OB□□214 to OB□□217 Motion setting parameter: Filter Type Selection • Bias Speed for the Exponential Acceleration/Deceleration Filter (motion fixed parameter No. 36)	 • Set the linear acceleration/deceleration time constants (OW□□0C and OW□□0D) to 0. • Set the Filter Type Selection to 1 (exponential acceleration/deceleration).

7.2.3 Program Example

This section shows an example of a simple user program. The program runs a test to confirm pulse motor operation and then performs a simple feed operation as an example.

■ Feed Example

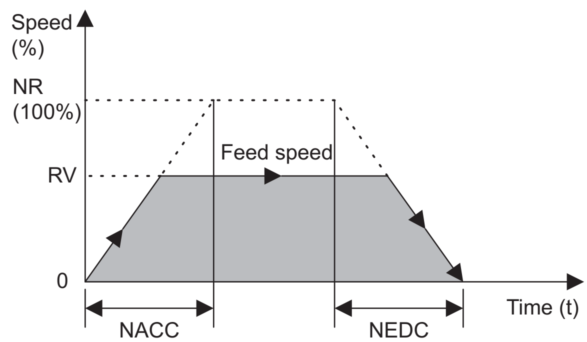


Fig. 7.1 Feed Example

1. Set the motion fixed parameters for your machine.

   The following table shows relevant parameters when a PO-01 Module is used.

Table 7.6 Examples of Fixed Parameter Settings

No.	Name	Setting Range	Meaning	Setting Example
7	Rated Motor Speed Setting	1 to 32000	Rated Servomotor speed	400 r/mm
17	Motion Controller Function Selection Flags	0, 1, 2, 3	Bits 0 to 3: Reference unit selection	0 (Pulse)
33	Number of Pulses Per Motor Rotation	1 to 2^{31}-1	Number of reference pulses needed to turn the Servomotor one rotation.	200 pulses
38	Maximum Pulse Output Frequency	1 to 50	1 = 10 kHz	10 (100 kHz)

2. Set the motion setting parameters used in Position Control Mode.

   There are three ways to set the motion setting parameters.

   - From the MPE720 Setting Parameter Window
   - From the ladder logic program
   - From the motion program

Table 7.7 Examples of Setting Parameter Settings

Name	Register No.	Setting Range	Meaning	Setting Example
RUN Mode Settings	OW□□00	–	Bit 2: Position Control Mode Bit 8: Motion Command Code Enabled Selection	104 H
Linear Acceleration Time Constant	OW□□0C	0 to 32767	Acceleration time until the rated motor speed is reached.	500 ms
Linear Deceleration Time Constant	OW□□0D	0 to 32767	Deceleration time from the rated motor speed until a speed of 0 is reached.	500 ms
Motion Command Code	OW□□20	0 to 65535	Motion command 7 = Feed	7
Rapid Traverse Speed	OL□□22	0 to 2^{31}-1	Distance moved using the FEED, STEP, and POSING commands.	400000 pulse/min

■ Programming Example

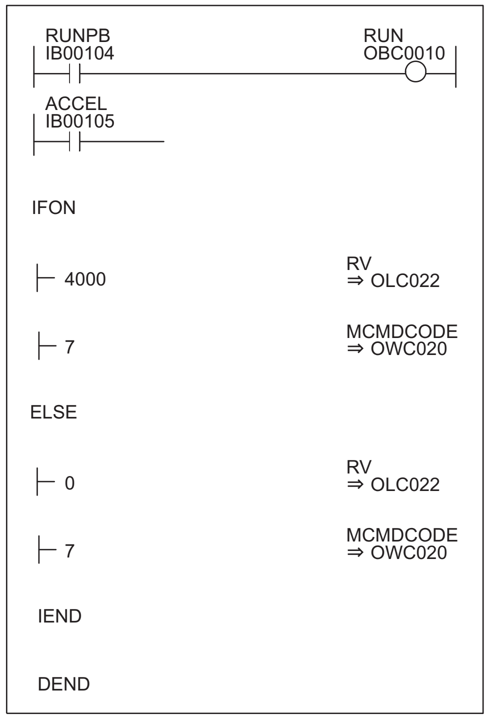
The user program shown in DWG.A was created to set the initial values shown in the figure below. The initial values can also be entered on the Setup Parameters Tab Page from the MPE720 and then saved to achieve the same settings. The initial values that are saved will be set for motion parameters automatically when the MP920 is turned ON. The user program created in DWG.A is thus only an alternate means of setting initial settings, and we recommend using the Setup Parameters Tab from the MPE720 to set and save the parameters to simplify making the initial settings.

├ 500	NACC ⇒ OWC00C	Linear Acceleration Time Constant (NACC)
	NDEC ⇒ OWC00D	Linear Deceleration Time Constant (NDEC)
├ H104	RUNMOD ⇒ OWC000	Run Mode Settings (RUNMOD) (Position Control Mode Selection, Motion Commancd Code Enabled)
DEND		

Fig. 7.2 Initial Settings (DWG A01)

7

The following is an extremely simplified programming example. In actual applications, the contents of all related registers would be controlled from the user program.



RUN command to the driver (excitation ON)

Speed feed will start when IB00104 turns ON.

Low-speed feed at 400,000 pulses/min will begin within the specified acceleration time (NACC) when the ACCELERATION command (IB00105) turns ON. The machine will decelerate to a stop (speed reference) in the specified deceleration time (NDEC) when IB00105 turns OFF.

Note: The pulse unit time is 1 = 100 pulses/min for rapid traverse speed (OLC022). Therefore set 4000 to indicate 400,000 pulses/min.

Fig. 7.3 Feed Reference (DWG H01)

7.2.4 Out-of-step Detection

■ Module Configuration Example

Use the MP920 Counter Module (CNTR-01) to detect out-of-step operation with the program shown in DWG.H□□.

The following figure shows an example of Module configuration.

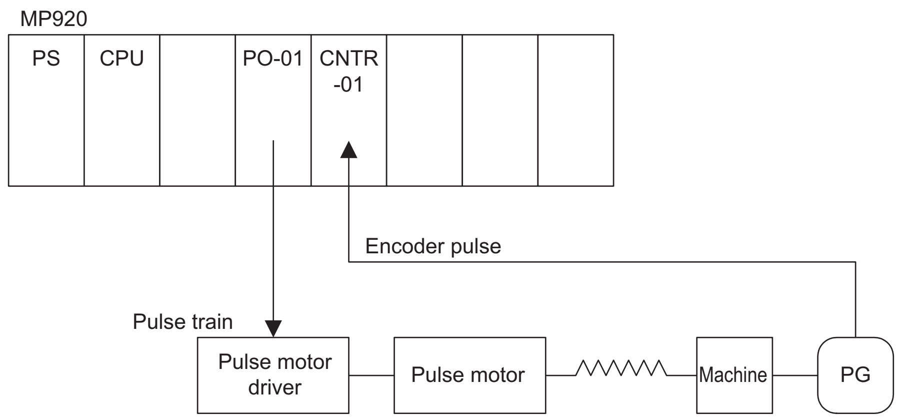


Fig. 7.4 Example of a Module Configuration for Out-of-step Detection

■ Out-of-step Detection Procedure

Out-of-step operation is detected by converting the pulse motor position reference (calculated feedback position: P_i) from the counter value (FB position: N_i) at the Counter Module (CNTR-01) and then determining the difference between that calculation result (P_i) and the reference position (M_i).

The feedback position (P_i) is calculated using the number of incremental pulses per scan and the counter value from the CNTR-01 Module to handle infinite length positioning as well.

The following equation is used for this calculation.

- Reference position: $M_i = M_{i-1}$ + number of pulses output per scan (IL□□2A of PO-01)
- FB position: $P_i = \dfrac{P_{i-1} + \text{number of incremental pulses per scan (IL□□□2)} \times M + \text{the remainder}}{n \times N}$

N: Number of encoder pulses per Servomotor rotation
M: Number of reference pulses per Servomotor rotation
n: Encoder pulse multiplier (n = 1, 2, 4)

Therefore, the following situation is considered out of step.

- $|M_i - P_i| > \varepsilon$ (ε = error width user setting)

Use the PO-01 Module monitor parameter for number of output pulses in XREFMON: IL□□2A for Mi. Use the number of incremental pulses per scan in PDV: IL□□□□ + 2 from the Counter Module input data for the number of incremental pulses per scan.

■ Application Program Example

The monitor parameter from the PO-01 Module (number of output pulses: IL□□2A) and input data from the Counter Module (CNTR-01) (number of incremental pulses: IL□□02) are used to create an out-of-step detection program in a high-speed scan program (DWG.H□□).

Axis 1 of PO-01 Module number 1 is used in this example. Be sure to change the register number of the monitor parameter (ILC02A) if you use another axis.

CNTR-01 Module input data is allocated from IW1000 to IW100F. Be sure to change the register number of the input data (IL1002) if you use another allocation. Set the Counter Mode to Frequency Measurement.

The following figure shows an example of an application program for out-of-step detection.

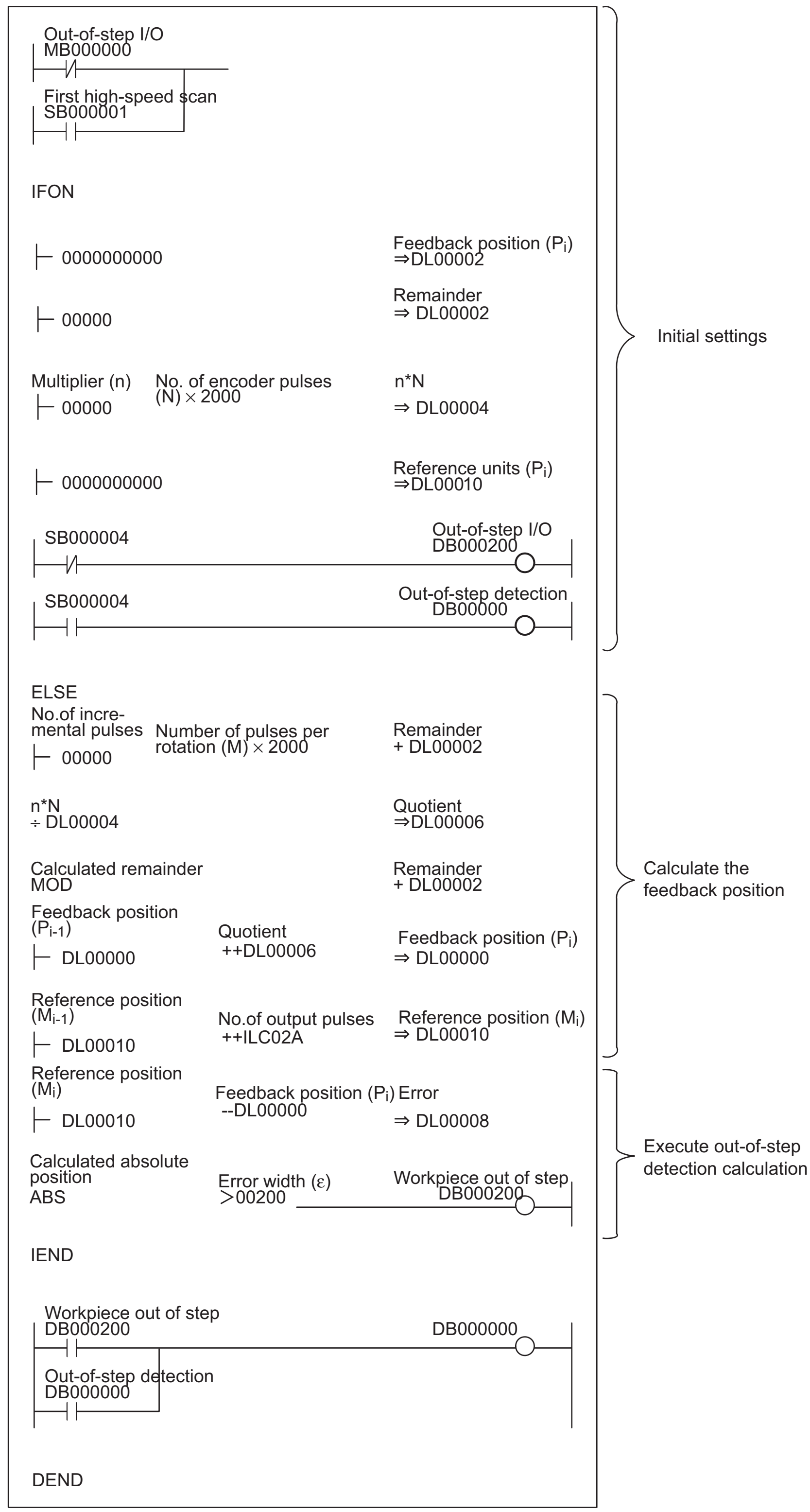


Fig. 7.5 Example of an Application Program for Out-of-step Detection

The example application program shown on the previous page is briefly explained below.

Initial Settings

The following initial settings are set when out-of-step detection is OFF (MB000000 is OFF). Create a separate application program for out-of-step detection ON/OFF timing.

- Calculated feedback position (DL00000) = 0
- Remainder from the calculated feedback position calculation (DL00002) = 0
- DL00004 = Encoder pulse multiplier (n) × number of encoder pulses per Servomotor rotation (N)

  Note: The encoder pulse multiplier (n) = 4 and the number of encoder pulses per Servomotor rotation (N) = 2000 in this particular example, but use settings appropriate for your machine.
- Reference position (DL00010) = 0

Feedback Position Calculation

The feedback position (P_i) is calculated from the following: The input data for the Counter Module (number of pulses per scan: IL1002), the number of reference pulses per Servomotor rotation (M), the encoder pulse multiplier (n), and the number of reference pulses per Servomotor rotation (M).

Note: The number of reference pulses per Servomotor rotation (M) = 2000 in this particular example, but use settings appropriate for your machine.

Execute Out-of-step Detection Calculation

If the absolute difference between the reference position (M_i) and the calculated feedback position (P_i) exceeds the error width (ε), then the situation is considered out of step and OB00000 turns ON.

Note: The error width (ε) = 200 in this particular example, but use settings appropriate for your machine.

INFO

■ Guidelines for Setting Error Width

Set the error width to four times the number of output pulses per scan when the Servomotor is running at the rated motor speed (rpm).

- NR: Rated motor speed (rpm)
- Ts: High-speed scan setting (ms)

We get the following result if NR = 300 (rpm), the number of reference pulses per Servomotor rotation = 2000 pulses, and Ts = 5.

- $\varepsilon = \{ (300 \times 2000 \times 5) \div (60 \times 1000) \} \times 4 = 200$

7.2.5 Emergency Stop

The PO-01 Module has a separate emergency stop input signal (DI04) for every axis.

■ Emergency Stop Procedure

The emergency stop procedure consists of either an immediate stop through hardware or deceleration to a stop through software. Either procedure can be selected through motion fixed parameters.

Table 7.8 Emergency Stop Parameters

Motion Fixed Parameter	Name	Description
No. 14 Bit 5	Emergency Stop Signal Selection	Selects an emergency stop procedure when the emergency stop signal (DI04) is input. 0: Emergency stop: Immediate stop through hardware 1: Deceleration to a stop: Deceleration to a stop through software. The rate of deceleration is set in motion setting parameter OW□□0D.

When an emergency stop signal (DI04) is input, the machine will stop according to one of the preceding stop procedures and the deceleration to a stop signal (IW□□01 bit 4) in the emergency stop signal motion parameter will turn ON.

The PO-01 Module position when the emergency stop signal is input (PO-01 Module control position) will also be held if the machine comes to an emergency stop through hardware, but this position may not be the actual machine system stop position depending on various factors, such as being out of step due to the emergency stop or because of load conditions. If the position is incorrect, clear the motion command code, reset the alarm after the emergency stop is canceled, return to the zero point, and reset the position.

■ Procedure for Canceling an Emergency Stop

This section describes the procedure for canceling an emergency stop.

1. Cancel the emergency stop input signal (DI04).
2. Turn OFF Excitation ON (OW□□01 bit 0).
3. Turn ON and then OFF the Cancel Bit for the Emergency Stop/Deceleration Stop Signal (OW□□01 bit 11).

   Note: The emergency stop/deceleration stop signal will not be canceled simply by canceling the emergency stop input signal (DI04). If emergency stop/decelerate to a stop is canceled, then the emergency stop/deceleration stop signal (IW□□01 bit 4) in the motion monitoring parameters will turn OFF.

4. Clear the motion command code (OW□□20) to 0.

   Note: If an emergency stop signal (DI04) is input while the axis is moving, then Command Error End (IW□□15 bit 5) will turn ON. Operation cannot be restarted in this case.
   Command Error End (IW□□15 bit 5) can be canceled (turned OFF) by setting the motion command code (OW□□20) to 0.

5. Turn ON and then OFF the alarm clear (OW☐☐00 bit 6).

   Note: If an emergency stop signal (DI04) is input while the axis is moving, then Excitation OFF (IL☐☐22 bit 5) will turn ON. Operation cannot be restarted in this case. Excitation OFF (IL☐☐22 bit 5) can be canceled (turned OFF) by turning ON, and then OFF the Alarm Clear (OW☐☐00 bit 6).

The above procedure completes preparations for restarting operation. After this is completed, restart operation using the normal run sequence.

■ Procedure for Restarting Operation

This section describes the procedure for restarting normal operation.

1. Turn ON the Position Control Mode (OW☐☐00 bit 2).

   This is not required if the Position Control Mode is already ON.
2. Turn ON Excitation ON (OW☐☐01 bit 0).
3. Set zero point return (ZRET) in the motion command code and return to the zero point.

   Note: The position controlled by the PO-01 Module (CPOS: IL☐☐02) and the actual machine system position do not have to be the same.
4. The normal operation program will be executed.

IMPORTANT

Operation will remain stopped as long as Emergency Stop/Deceleration Stop Signal (IW☐☐01 bit 4) is ON so be sure to cancel the emergency stop.

7.3 PO-01 Parameters

7.3.1 Motion Fixed Parameters

IMPORTANT

Motion fixed parameters cannot be changed when bit 0 of motion setting parameter No. 2: RUN Command Settings (OW□□01) is ON. Position data and other data will be initialized if a motion fixed parameter is changed.

Table 7.9 Motion Fixed Parameters

No.	Name	Description	Factory Setting
1	Axis Selection (USESEL)	Set whether an axis is used or not. 0: Not used. 1: Used. If an axis is set to be not used (= 0), then that axis will not be controlled and IW□□00 to IW□□3F monitoring parameters will not be updated. “0” will stored at IW□□00 RUN Status.	0 (Not used)
2 to 6	Not used.	–	–
7	Rated Motor Speed Setting (NR)	Set motor speed at rated (100%) operation in 1 r/min units. Set this parameter based on the specifications of the Servomotor that is used.	100
8 to 13	Not used.	–	–

7

Table 7.9 Motion Fixed Parameters (cont'd)

No.	Name	Description		Factory Setting
14	Additional Function Selections (AFUNCSEL)	Set additional functions, such as the signal type used and signal functions.		–
	Bits 0 to 1	Not used.	–	–
	Bit 2	Limit Switch Signal Selection (LIMITSEL)	Set whether to use OB□□0IF or DI signal DI05 as the limit switch signal when returning to the zero point. 0: Use OB□□01F. 1: Use the DI signal (DI5 deceleration limit signal). When using OB□□01F, the external signal (DI signal input by the LIO_01 or other Module) must be connected (i.e., programmed) to OB□□01F in the user program.	0 (OB□□01F)
	Bit 3	Reverse Limit Signal Selection for Zero Point Return (LMT_LSEL)	Set whether to use OB□□21C (= 0) or DI signal DI2 (= 1) as the reverse limit signal for zero point return when zero point return signals (DEC1 + LMT + ZERO signals) are received. 0: Use OB□□21C. 1: Use the DI signal. When using OB□□21C, the external signal (DI signal input by the LIO-01 or other Module) must be connected (i.e., programmed) to OB□□21C in the user program.	0 (OB□□21C)
	Bit 4	Forward Limit Signal Selection for Zero Point Return (LMT_RSEL)	Set whether to use OB□□21D (= 0) or DI signal DI03 (= 1) as the forward limit signal for zero point return when zero point return signals (DEC1 + LMT + ZERO signals) are received. 0: Use OB□□21D. 1: Use the DI signal. When using OB□□21D, the external signal (DI signal input by the LIO-01 or other Module) must be connected (i.e., programmed) to OB□□21D in the user program.	0 (OB□□21D)
	Bit 5	Emergency Stop (DI) Signal Selection (EMGSEL)	Set the stop method used when an emergency stop signal (DI04) is input. 0: Emergency stop (H/W) An immediate stop will be performed by hardware without software (stop by hardware). 1: Deceleration to a stop (S/W) A deceleration to a stop will be performed according to the setting of motion setting parameter No. 14: Linear Deceleration Time Constant (OW□□0D) (stop by software).	0 (Emergency stop)
	Bit 6	Not used.	–	0
	Bit 7	Motion Command Code Selection (MCMDSEL)	Always set this bit to 1. 0: Not used 1: Used	1 (Used)
	Bit 8	Excitation ON Output Signal Polarity Selection	0: Positive logic 1: Negative logic	0
	Bits 9 to 15	Not used.	–	–
15	Not used.	–		–
16	Not used.	–		–

Table 7.9 Motion Fixed Parameters (cont'd)

No.	Name			Description	Factory Setting
17	Motion Controller Function Selection Flags (SVFUNCSEL)		Set whether a function is enabled or disabled when a motion command is used.		–
		Bits 0 to 3	Reference Unit Selection (CMD_UNIT)	Set the reference unit that is input. 0: pulse (electronic gear disabled) 1: mm 2: deg 3: inch When a unit is selected, the minimum unit that can be used as reference is determined by motion fixed parameter No. 18: Number of Digits Below the Decimal Point.	0 (pulse)
		Bit 4	Electronic Gear Selection (USE_GEAR)	Set whether or not to use the electronic gear function. 0: Disabled 1: Enabled The electronic gear is disabled even if this flag is enabled when pulse is selected as the reference unit.	0 (Disabled)
		Bit 5	Axis Selection (PMOD_SEL)	Finite length/infinite length axis selection. Set whether or not there is a limit on controlled axis movement. 0: Finite length axis • The axis will have limited movement. • The software limit function is enabled. 1: Infinite length axis • The axis will have unlimited movement. • The software limit function is disabled.	0 (Finite length axis)
		Bit 6	Not used.	–	0
		Bit 7	Positive Software Limit Selection (USE_SLIMP)	Set whether or not to use the software limit function in the positive direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter No. 27. • Software Limit Function Enable Timing: Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)
		Bit 8	Negative Software Limit Selection (USE_SLIMN)	Set whether or not to use the software limit function in the negative direction when an OW□□20: Motion Command Code is used. 0: Disabled 1: Enabled Set the software limit at fixed parameter No. 29. • Software Limit Function Enable Timing: Valid after IB□□156: Zero Point Return Completed turns ON.	0 (Disabled)

7

Table 7.9 Motion Fixed Parameters (cont'd)

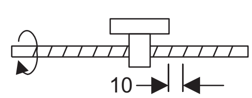
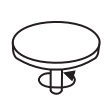
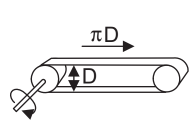
No.	Name	Description		Factory Setting
17	Bit 9	Override Selection (USE-OV)	Set whether or not to use the override function. (For interpolation related commands, set override in the register specified in the Group Definition Window.) 0: Disabled 1: Enabled The OW☐☐2C: Override is used when this parameter is set to Enabled. The override is fixed at 100 if this parameter is disabled. Note: The override function always the feed speed setting to be modified in an application.	0 (Disabled)
	Bit 10	Deceleration Limit Switch Inversion Selection (INV_DEC)	Set whether or not to invert and use the limit switch signal (deceleration limit switch) when returning to the zero point. 0: Not inverted 1: Invert	0 (Not inverted)
	Bits 11 to 15	Not used.	–	–
18	Number of Digits Below Decimal Point (DECNUM)	Set the number of digits to the right of the decimal point in input reference units. The minimum reference unit is determined by this parameter and Reference Unit Selection in the Motion Controller Function Selection Flags (bit 0 to bit 3).		3
19	Travel Distance Per Machine Rotation (PITCH)	This parameter determines the load travel amount (reference units) per load axis rotation. • Setting range: 1 to 2^{31}-1		10000
		Ball screw  Ball screw pitch = 10 mm	Ball screw pitch = 10 mm Reference Unit Selection = mm Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to 10000.	
		Rotating table  One rotation = 360°	One table rotation = 360° Reference Unit Selection = deg Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to 360000	
		Belt 	One roller rotation = 360° Reference Unit Selection = mm Number of digits below decimal point = 3 ↓ Set the travel distance per machine rotation to $\pi D \times 1000$.	

Table 7.9 Motion Fixed Parameters (cont'd)

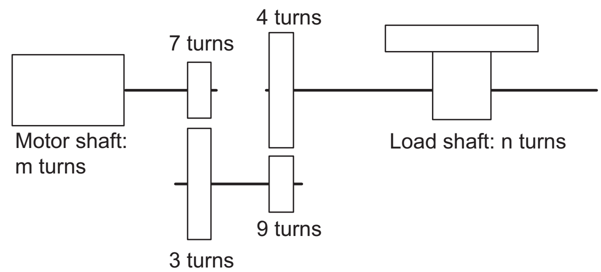
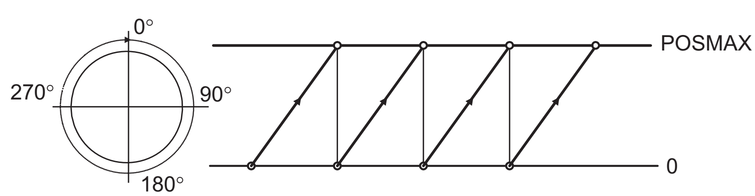
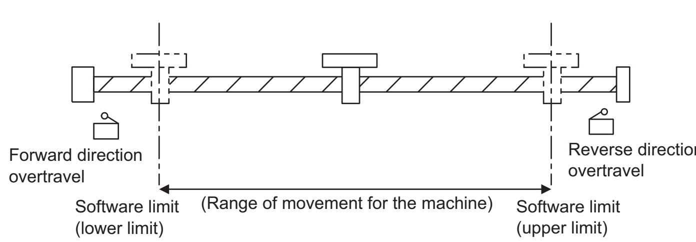
No.	Name	Description	Factory Setting
21	Servomotor Gear Ratio (GEAR_MOTOR)	These parameters determine the gear ratio between the motor and the load. The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft. • Gear ratio at Servomotor: m • Gear ratio at load: n Setting Example  In the above example, the reduction ratio is n/m, or $3/7 \times 4/9 = 4/21$. The following setting would thus be made. Servomotor Gear Ratio: 21 Load Gear Ratio: 4	1
22	Machine Gear Ratio (GEAR_MACHINE)		1
23	Infinite Length Axis Reset Position (POSMAX)	Set the reset position for a rotation when infinite length axis is set. This parameter is not valid when a finite length axis is set. • Setting range: 1 to 2^{31}-1 [reference units] Example: For a rotating load, the value will be reset every 360°. 	360000
25	Not used.	–	0
27	Positive Software Limit (SLIMP)	Set the positions at which the software limit function is to operate on the machine coordinate system. • Setting range: 1 to 2^{31}-1 [reference units] Whether or not the software limits are used is set in bit 7 and bit 8 of the Servo Controller Function Selection Flags at fixed parameter No. 17. With the software limits, the upper and lower limits of the range of movement for the machine system are set at fixed parameters and the operating range is constantly monitored by the controller. 	2147483647
29	Negative Software Limit (SLIMN)		-2147483648

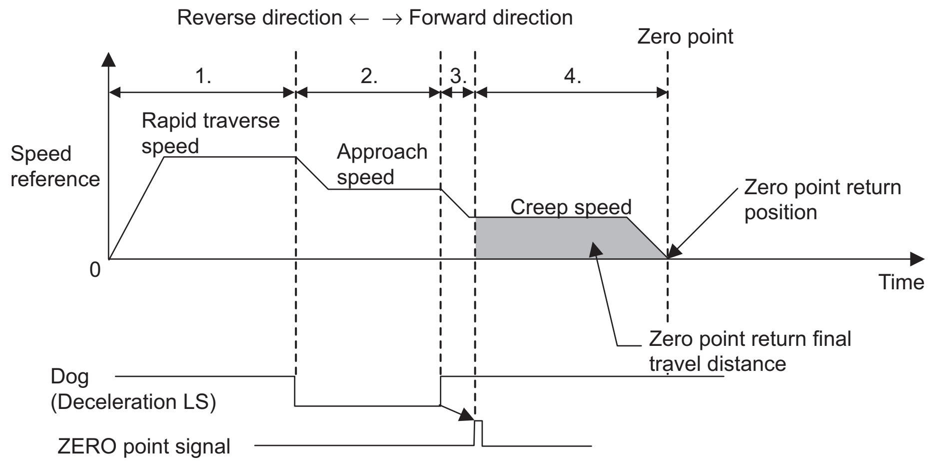
Table 7.9 Motion Fixed Parameters (cont’d)

<table>
<tr><th>No.</th><th colspan="2">Name</th><th colspan="2">Description</th><th>Factory Setting</th></tr>
<tr><td>31</td><td colspan="2">Zero Point Return Method (ZRETSEL)</td><td colspan="2">Set the zero point return method when returning to the zero point (ZRET) using OW□□20: Motion Command Code.
2: DEC1 + ZERO signal
4: DEC2 + ZERO signal
5: DEC1 + LMT + ZERO signal
Refer to Zero Point Return Method on the next page for details.</td><td>0
(DEC1 + ZERO signal)</td></tr>
<tr><td>32</td><td colspan="2">Not used.</td><td colspan="2">–</td><td>–</td></tr>
<tr><td>33</td><td colspan="2">Number of Pulses Per Motor Revolution (For simulation) (MPPS)</td><td colspan="2">Set the number of reference pulses per pulse motor revolution.
Set this parameter according to the specifications of the pulse motor and pulse motor driver.</td><td>200</td></tr>
<tr><td>35</td><td colspan="2">Bias Speed (BIASSPD)</td><td colspan="2">Set the bias speed for linear acceleration/deceleration with bias.
Set 0 when using linear acceleration/deceleration without bias.</td><td>0</td></tr>
<tr><td>36</td><td colspan="2">Bias Speed for the Exponential Acceleration/Deceleration Filter (EXPBIAS)</td><td colspan="2">Set the bias speed for exponential acceleration/deceleration with bias.</td><td>0</td></tr>
<tr><td rowspan="5">37</td><td colspan="2">Pulse Output Signal Form Selection (POSEL)</td><td colspan="2">Set the polarity and output method of pulse signals output by the PO-01 Module.</td><td></td></tr>
<tr><td rowspan="4"></td><td>Bits 0 to 7</td><td>Not used.</td><td>–</td><td>0</td></tr>
<tr><td>Bit 8</td><td>Pulse Output Signal Polarity Selection (ABPOSEL)</td><td>Set positive logic (= 0) or negative logic (= 1) as the polarity of pulse signals that the PO-01 Module outputs to the Pulse Motor Driver.
0: Positive logic, 1: Negative logic
Set this bit according to the specifications of the Pulse Motor Driver.</td><td>0
(Positive logic)</td></tr>
<tr><td>Bits 9 to 11</td><td>Not used.</td><td>–</td><td>0</td></tr>
<tr><td>Bits 12 to 15</td><td>Pulse Output Method Selection (POUTMODE)</td><td>Set CW/CCW mode (= 0) or sign mode (= 1) as the output method of pulse signals that the PO-01 Module outputs to the Pulse Motor Driver.
0: CW/CCW mode
1: Sign mode
Set this bit according to the specifications of the Pulse Motor Driver.</td><td>0
(CW/CCW mode)</td></tr>
<tr><td>38</td><td colspan="2">Maximum Pulse Output Frequency (MAXHZ)</td><td colspan="2">Set the maximum frequency of pulse signals that the PO-01 Module outputs to the Pulse Motor Driver.
Set this bit according to the specifications of the Pulse Motor Driver (such as pulse width).
Unit: 1 = 10 kHz
Set one of the following values: 1, 2, 4, 5, 8,10, 20, 25, 40, and 50.
Always set the same value for all four axes (including unused axes).</td><td>10
(100 kHz)</td></tr>
<tr><td>39 to 48</td><td colspan="2">Not used.</td><td colspan="2">–</td><td>–</td></tr>
</table>

The following sections describe the zero point return methods.

■ 2: DEC 1 + Zero Point Signal

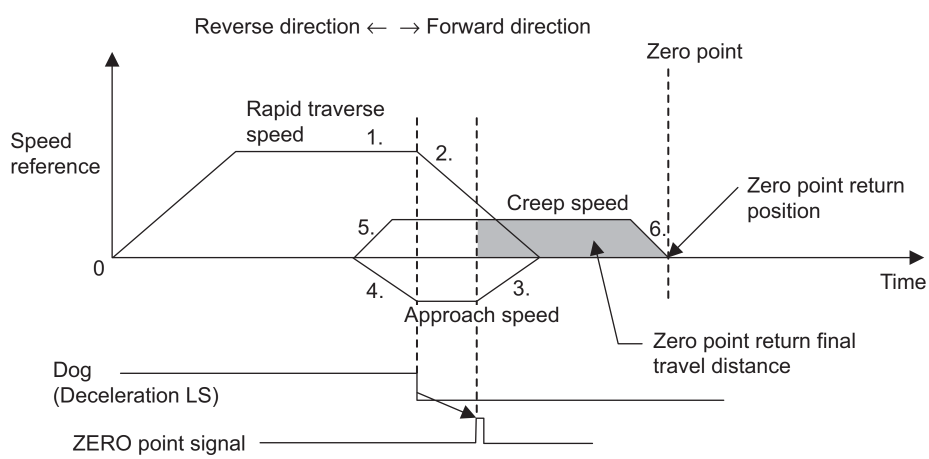
This method has three speed levels.



■ 4: DEC 2 + Zero Point Signal

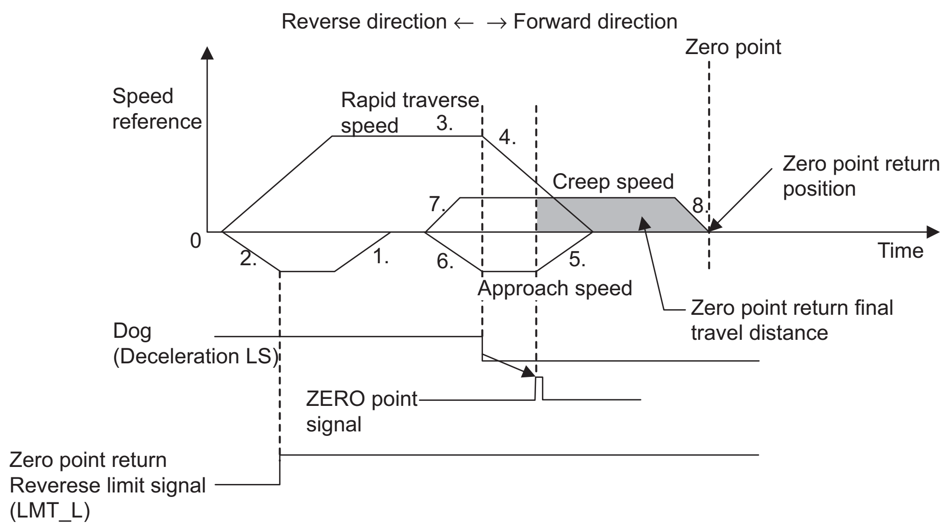
This method searches for the zero point at creep speed after going in reverse at approach speed.

It is used for machines that require a high level of repeatability.



■ 5: DEC 1 + LMT + Zero Point Signal

This method gets the current position from the forward/reverse LMT signal and escapes automatically. It can return to the zero point from any position.



7.3.2 Motion Setting Parameters

⚠ CAUTION

- Zero Point Position Offset in the Machine Coordinate System (ABSOFF)
  This register contains data used by PO-01 Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation.

  Obstructions may damage tools and lead to personal injury if this check is not performed.

Table 7.10 Motion Setting Parameters

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
1	RUN Mode Settings (RUNMOD)	OW□□00	Set the RUN mode, such as Control Mode and Alarm Reset. The bit configuration is shown below.		
		Bit 0	Not used.	Set to “0.”	0
		Bit 1	Not used.	Set to “0.”	0
		Bit 2	Position Control Mode (PCON)	Used to set Position Control Mode. 0: OFF, 1: ON	1 (Used)
		Bit 3	Not used.	Set to “0.”	0
		Bit 4	Not used.	Set to “0.”	0
		Bit 5	Not used.	Set to “0.”	0
		Bit 6	Alarm Clear (ACR)	The following monitoring parameters will be cleared when this bit turns ON. • IW□□00 RUN Status: Error Counter Over (bit 0) and Motion Setting Parameter Setting Error (bit 1) • Alarms (IL□□22) 0: OFF, 1: ON	0
		Bit 7	Not used.	Set to “0.”	0
		Bit 8	Motion Command Mode Enable/Disable (MCDSEL)	Set whether an OW□□20: Motion Command Code is used or not. 0: Disable 1: Enable Always set to “1.”	1
		Bit 9	Zero Point Return Direction Selection (ZRNDIR)	Set the direction for returning to the zero point. 0: OFF Reverse direction (position pulse in the deceleration direction) 1: ON Forward direction (position pulse in the acceleration direction)	0
		Bits 10 to 15	Not used.	Set to “0.”	0

Table 7.10 Motion Setting Parameters (cont'd)

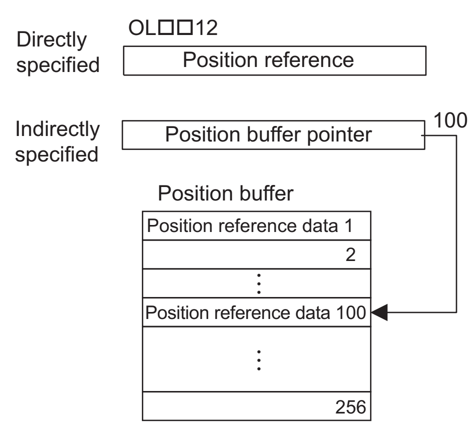
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
2	RUN Command Settings (SVRUNCMD)	OW□□01	Set the output signal from the PO-01 Module to the driver as well as the RUN mode required for motion control. The bit configuration is described below.		
		Bit 0	Excitation ON signal (RUN) (DO0)	Used as the excitation ON signal for the driver. "1" is output from DO0 if this bit is set to 1 when SVCRDY (IB□□007) is set to ON. 0: OFF, 1: ON	0
		Bits 1 to 3	DO1 to DO3	Used as an general-purpose DO. 0: OFF, 1: ON	0
		Bits 4 to 10	Not used.	Set to "0."	0
		Bit 11	Emergency Stop/Deceleration to a Stop Reset (EMRST)	Cancels emergency stop and deceleration stop signals. This bit is valid when RUN (bit 0 of OW□□01) is set to OFF.	0
		Bit 12	Position Reference Value Selection (USE_BUF)	Set the reference method that is used for position reference data. 0: OL□□12 Use OL□□12 as directly as position reference data. 1: Position buffer Use OL□□12 indirectly as the position buffer number.  • The position buffer is located in the PO-01 Module and must be written in the initial drawing at startup. • Refer to OB□□21E, OB□□21F, and OL□□3A for details on writing to the position buffer.	0

Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
2	RUN Command Settings (SVRUNCMD) (cont'd)		Bit 13	Speed Reference Value Selection (SPDTYPE)	Set speed reference method for feed speed, approach speed, and creep speed. It is valid only when an OW□□20: Motion Command Code is used in Position Control Mode. 0: OL□□22 Set speed in reference units and sets rapid traverse speed at OL□□22. The setting unit for OW□□0A: Approach Speed and OW□□0B: Creep Speed are also 1 = 10 reference units/min. 1: OW□□15 Set speed using a percentage and sets rapid traverse speed at OL□□15. The setting unit for OW□□0A: Approach Speed and OW□□0B: Creep Speed are also 1 = 0.01%. Refer to *Speed Reference* in *2.3.1 Prerequisites for Position Control*.	0
			Bit 14	Speed Reference Type (XREFTP)	Set the data type for OL□□12. 0: Absolute position method Sets the absolute position at OL□□12. 1: Incremental addition method Adds the current movement amount to the previous value at OL□□12 and then sets that data at OL□□12. Note: This is an absolute position method if the position reference selection is indirectly specified. Refer to *Position Reference* in *2.3.1 Prerequisites for Position Control*.	1
			Bit 15	Zero Point Return Deceleration Point Limit Signal (LSDEC)	This signal functions as a limit switch signal (deceleration LS) when returning to the zero point. It is valid when bit 2: Limit Switch Signal Selection is OFF at fixed parameter number 14: Additional Function Selections. The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□01F.	0
3 to 6	Not used.	OW□□02 to OW□□05		–	Set to "0."	0
7	Machine Coordinate System Zero Point Offset Setting (ABSOFF)	OL□□06		-2^{31} to $2^{31}-1$	Position data can be shifted by the value set in this register. The parameter is valid during RUN operation, but set it while the system is OFF. This register contains data used by PO-01 Modules for position control and the following movements are affected if this register is set incorrectly. Check to see if the data is set correctly prior to starting operation. Obstructions may damage tools and lead to personal injury if this check is not performed.	0
9	Not used.	OL□□08		–	Set to "0."	0

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Table 7.10 Motion Setting Parameters (cont'd)

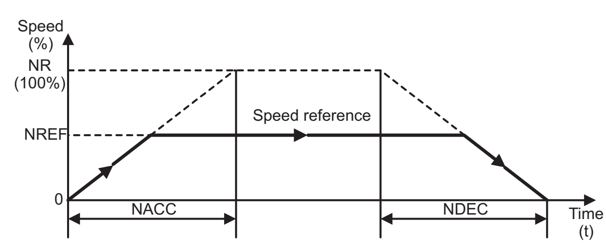
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
11	Approach Speed Setting (Napr)	OW□□0A	0 to 32767	Set the approach and creep speed when returning to the zero point (ZRET). The setting unit depends on OB□□01D: Speed Reference Selection. • When OB□□01D = 0 (specified in reference units) 1 = 10^n reference units/min (n = number of digits below the decimal point) Pulse unit: 1 = 100 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min • When OB□□01D = 1 (specified in reference units) When OB□□01D = 1 (% specified), then 1 = 0.01% (percentage of the rated rotation speed).	0
12	Creep Speed Setting (Nclp)	OW□□0B	0 to 32767		0
13	Linear Acceleration Time Constant (NACC)	OW□□0C	0 to 32767	Set the linear acceleration/deceleration time. Unit: ms Set acceleration time from 0% to 100% (rated motor speed). The deceleration time is the same as the acceleration time.  	0
14	Linear Deceleration Time Constant (NDEC)	OW□□0D	0 to 32767		0
15 to 18	Not used.	OW□□0E to OW□□11	–	Set to "0."	0

Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
19	Position Reference Setting (XREF) or Position Buffer Number	OL□□12	-2^{31} to $2^{31}-1$	Set the position reference. The meaning of the setting data depends on OB□□01C: Position Reference Selection and OB□□01E: Position Reference Type. Example: • Using OL□□12 as Position Reference for Absolute Position Reference Method OB□□1C = 0: Directly specified OB□□1E = 0: Absolute position reference • Using OL□□12 as Position Reference for Add Difference Method OB□□1C = 0: Directly specified OB□□1E = 1: Add difference • Using OL□□12 as Position Reference for Add Difference Method OB□□1C = 1: Indirectly specified OB□□1E = 0: Absolute position reference (Always set 0.) Refer to *Position Reference* in *2.3.1 Prerequisites for Position Control*.	0
21	Filter Time Constant Setting (NNUM)	OW□□14	1. Average move filter 0 to 255 (0 = 1 = no filter) 2. Exponential acceleration speed 0 to 32767	The setting range for the filter time constant will vary with bit 4 to bit 7 of OW□□21: Filter Type Selection. • Filter type 1 = Exponential filter 0 to 32767 • Filter type 2 = Average move filter o to 255 Note: This parameter will be valid when IB□□152: Distribution Completed turns ON if the filter time constant is changed.	0
22	Speed Reference Setting (NREF)	OW□□15	-32768 to 32767	Set the rapid traverse speed in 0.01% units (percentage of the rated motor speed) when the Speed Reference Selection (OB□□1D) is set to 1.	0
23 to 30	Not used.	OW□□16 to OW□□ID	–	Set to "0."	0
31	Pulse Bias Setting (PULBIAS)	OL□□1E	-2^{31} to $2^{31}-1$	The number of pulses set in this register (1 = 1 pulse) are output as compensation pulses when SVCRUN (IB□□08) is set to ON and Machine Lock ON (IB□□170) is set to OFF. The set number of pulses is added to reference pulses and these combined pluses are output for each scan. Use this parameter when compensating reference pulses, such as with backlash compensation. Note: Setting a too large value may result in out-of-step operation.	0

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Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
33	Motion Command Code (MCMD-CODE)	OW□□20	0 to 65535	Set the motion command code to the PO-01 Module. This parameter can be used under the following conditions. • Motion Command Selection (bit 7 of fixed parameter no. 14) • Position Control Mode Selection (OB□□002) • RUN Mode Motion Setting Command Enabled (OB□□008) **Motion Commands** 0: NOP (no command) 1: Positioning (POSING) 2: Not used. 3: Zero point return (ZRET) 4: Interpolation (INTERPOLATE) 5: Reserved for system use 6: Not used. 7: Feed (FEED) 8: Step (STEP) 9: Zero point setting (ZSET)	0
34	Motion Command Control Flags (MCMDCTRL)	OW□□21	Set motion command auxiliary functions.		
		Bit 0	Command Hold (HOLD)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning or step execution using an OW□□20: Motion Command Code. IB□□151: Hold Completed turns ON when the HOLD has been completed. If this bit goes back OFF at this point, the hold is canceled and positioning restarts. 0: OFF, 1: ON	0
		Bit 1	Command Abort (ABORT)	The machine decelerates to a stop if this bit turns ON while an axis is moving during positioning, zero point return, or STEP using an OW□□20: Motion Command Code. The BUSY bit (IB□□150) turns ON when ABORT is being executed, and it turns OFF when the execution of ABORT completes. Step execution can be aborted by setting the motion command to NOP. 0: OFF, 1: ON	0
		Bit 2	Direction of Movement (For JOG and STEP) (DIRECTION)	Set the movement direction. This bit is enabled when a Motion Command Code (OW□□20) is set to constant-speed feed or inching. 0: Forward direction 1: Reverse direction	0 (Forward direction)
		Bit 3	No Compensation for Feed Speed Remainder (REMCUT)	Always set this bit to 0. 0: OFF, 1: ON	0

Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number		Setting Range/ Bit Name	Description	Factory Setting
34	Motion Command Control Flags (MCMDCTRL) (cont'd)		Bits 4 to 7	Filter Type Selection (FILTER-TYPE)	Set the type of acceleration filter. 0: No filter 1: Exponential filter 2: Average movement filter OW□□14: Filter Time Constant is valid if this parameter is set to "1" or "2."	0 (No filter)
			Bits 8 to 11	Not used.	Set to "0."	0
			Bit 12	Reverse Limit Signal for Zero Point Return (LMT_L)	This bit functions as a reverse limit signal when returning to the zero point (ZRET). The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□21C. 0: OFF, 1: ON	0
			Bit 13	Forward Limit Signal for Zero Point Return (LMT_R)	This bit functions as a forward limit signal when returning to the zero point (ZRET). The external signal (DI signal input by the LIO-01 or other Module) in the user program must be connected (i.e., programmed) to OB□□21D. 0: OFF, 1: ON	0
			Bit 14	Position Buffer Write (BUF_W)	Data set in OL□□3A: Position Buffer Write Data is stored as absolute position data in the position buffer that is set at OL□□38: Position Buffer Access Number. 0: OFF, 1: ON	0
			Bit 15	Position Buffer Read (BUF_R)	Data from the position buffer that is specified at OL□□38: Position Buffer Access Number is stored as absolute position data in the position buffer that is set at IL□□28: Position Buffer Read Data. This parameter is used to check position data that is stored in the position buffer. It takes two scans from the time the Position Buffer Read command is issued until the data is stored at IL□□28: Position Buffer Read Data. 0: OFF, 1: ON	0
35	Rapid Traverse Speed (RV)	OL□□22		0 to 2^{31}-1	Set the rapid traverse speed in 10^n reference units/min (n: Number of digits below decimal point) if OB□□01D: Speed Reference Selection is set to "0." Other setting units are expressed as follows: Pulse unit: 1 = 100 pulses/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min This parameter is used when an OW□□20: Motion Command Code is used in Position Control Mode.	0
37	Not used.	OW□□24		–	Set to "0."	0
39	Stopping Distance (STOPDIST)	OL□□26		-2^{31} to 2^{31}-1	This parameter is used by the system. Do not use it.	0

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Table 7.10 Motion Setting Parameters (cont'd)

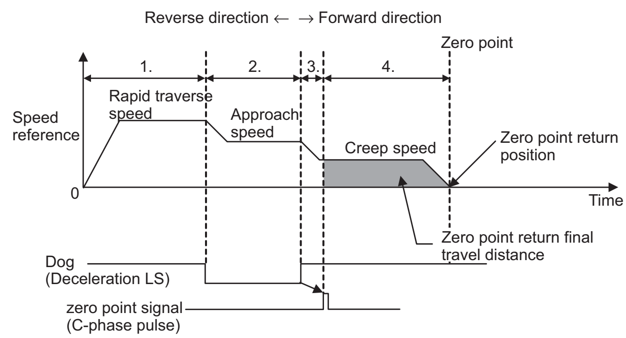
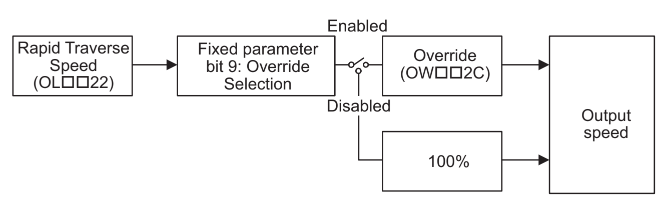
No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
41	Step Travel Distance (STEP)	OL□□28	0 to 2^{31}-1	Set the travel distance in reference units for Step execution for the OW□□20: Motion Command Code. • Unit: Reference unit	0
43	Zero Point Return Final Travel Distance (ZRNDIST)	OL□□2A	-2^{31} to 2^{31}-1	The machine is moved the distance set for this parameter after a valid zero point pulse is detected and then stops when returning to the zero point using an OW□□20: Motion Command Code. The final point is set as the zero point of the coordinate system. • Unit: Reference unit 	0
45	Override (OV)	OW□□2C	0 to 32767	Set the override for the output speed as a percentage of the OL□□22: Rapid Traverse Speed in 0.01% units. For interpolation related commands, set override in the register specified in the Group Definition Window. Rapid Traverse Speed Output Rapid Traverse Speed × Override = Output speed (OL□□22) (OW□□2C)  This parameter is valid when fixed parameter No. 17: Override Selection (bit 9 of Motion Controller Function Selection Flags) is set to Enabled.	10000

Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
46	Position Control Flags (POSCTRL)	OW□□2D		Set the functions related to position data managed by PO-01 Modules. The bit configuration is described below.	
		Bit 0	Machine Lock Mode Setting (MLK)	In Machine Lock mode, only the Machine Coordinate System Calculation Position (CPOS) (IL□□02) is updated without actually moving the axis. A change in this bit will be effective when IB□□152: Distribution Completed turns ON. 0: OFF, 1: ON	0
		Bit 1	Request for the Preset Number of POSMAX Turns (TPRSREQ)	Request for the preset number of POSMAX turns. 0: OFF, 1: ON • With an infinite length axis, a turn is counted every time the position value exceeds POSMAX and the count is stored at monitor parameter IL□□1E: Number of POSMAX Turns. • The number of turns can be preset at setup parameter OL□□30: Preset Data for Number of POSMAX Turns by turning ON the Request for the Preset Number of POSMAX Turns Flag. Related Parameters: • Fixed parameter 22: Maximum Value for Infinite Length Counter • Setting parameter OL□□30: Preset Data for the Number of POSMAX Turns • Monitoring parameter IL□□1E: Number of POSMAX Turns	0
		Bits 2 to 15	Not used.	Set to "0."	0
47	Workpiece Coordinate System Offset (OFFSET)	OL□□2E	-2^{31} to 2^{31}-1	Always set this parameter to "0." It is not used directly by PO-01 Module.	0
49	Preset Number of POSMAX Turns Data (TURNPRS)	OL□□30	-2^{31} to 2^{31}-1	IL□□1E: POSMAX Number of Turns can be preset with preset data by turning ON OB□□2D1: Request for Preset Number of POSMAX Turns. It is used in situations such as when resetting the number of turns to "0."	0
51	Not used.	OW□□32	–	Set to "0."	0
52	Zero Point Position Output Width (PSETWIDTH)	OW□□33	0 to 65535	Set the zero point position range. IB□□171: Zero Point Position will turn ON if 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ Zero Point Position Output Width when IB□□156: Zero Point Return Completed Status turns ON.	10
53 to 56	Not used.	OW□□34	–	Set to "0."	0

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Table 7.10 Motion Setting Parameters (cont'd)

No.	Name	Register Number	Setting Range/ Bit Name	Description	Factory Setting
57	Position Buffer Access Number	OL☐☐38	1 to 256	Position Buffer Access Number When bit 14 of OW☐☐21: Position Buffer Write or bit 15 of OW☐☐21: Position Buffer Read turns ON, the data set at this parameter will be treated as the buffer number of the position buffer. The setting range for this parameter is 1 to 256 and it is not valid if set to "0."	0
59	Position Buffer Write Data	OL☐☐3A	-2^{31} to $2^{31}-1$	Position Buffer Write Data When bit 14 of OW☐☐21: Position Buffer Write turns ON, the data set at this parameter will be written as absolute position data to the position buffer specified at OL☐☐38.	0
61 to 63	Not used.	OW☐☐3C to OL☐☐3F	–	Set to "0."	0

7.3.3 Motion Monitoring Parameters

Table 7.11 Motion Monitoring Parameters

No.	Name	Register No.	Setting Range/ Bit Name	Description
1	RUN Status (RUNSTS)	IW□□00	Monitors PO-01 Module operating status. The bit configuration is described below.	
		Bit 0	Not used.	–
		Bit 1	Motion Setting Parameter Setting Error (PRMERR)	Turns ON when one or more of the motion setting parameters (OW□□00 to OW□□3F) is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm will be indicated at IW□□0F: Parameter Number Out of Range.
		Bit 2	Motion Fixed Parameter Setting Error (FPRMERR)	Turns ON when a motion fixed parameter is set outside the setting range. In this case, the most recent motion setting parameter number that caused the setting range alarm plus 100 will be indicated at IW□□0F: Parameter Number Out of Range. This parameter will turn OFF automatically if an ordinary motion fixed parameter is set from the MPE720.
		Bits 3 to 6	Not used.	–
		Bit 7	Motion Controller RUN Ready (SVCRDY)	Turns ON when RUN preparations for the PO-01 Module have been completed. The following may be reason why RUN preparations are not completed. • Major damage has occurred. • Axis that is not used was selected (motion fixed parameter setting). • Motion fixed parameter setting error. • Motion fixed parameters are being changed.
		Bit 8	Motion Controller RUN (SVCRUN)	Turns ON under the following conditions. • IB□□07: RUN Ready turns ON. • OB□□002: Position Control Mode Flag turns ON. • OB□□010: Excitation ON signal turns ON. When this bit is ON and an alarm is generated, the axis will not move even if a motion command is issued. Clear the alarm, set the motion command to “NOP” for 1 scan or more, and then set the motion command again.
		Bits 9 to 12	Not used.	–
		Bit 13	Positioning Completed Signal (POSCOMP)	Turns ON when Distribution Completed (bit 2 of IW□□15) turns ON as follows: |IL□□08: Current Position – IL□□18: Machine Coordinate System Reference Position| ≤ OW□□0E: Positioning Completed Range
		Bits 14, 15	Not used.	–

Table 7.11 Motion Monitoring Parameters (cont'd)

No.	Name	Register No.	Setting Range/ Bit Name	Description
2	General-purpose DI Monitor (SVSTS)	IW□□01	Monitors the status of input signals, special-purpose DI signals, or general-purpose DI signals from the Pulse Motor Driver. DI00 to DI03 can be used as special-purpose signals for zero point return. DI04 is a special-purpose signal for emergency stop or deceleration stop. DI01 to DI03 can also be used as general-purpose DI. The bit configuration is described below.	
		Bit 0	Zero Point Signal or General-purpose DI (HW_ZRRO/ DI0)	Indicates input 0 signal status. Input 0 serves as a zero point signal for zero point return. It can be used as general-purpose DI except for zero point return.
		Bit 1	Limit Switch Signal or General-purpose DI (DEC/DI1)	Indicates input 1 signal status. Input 1 can be used as either a reverse limit signal for zero point return or a general-purpose DI according to the setting of bit 2 (Limit Switch Signal Selection) of motion fixed parameter No. 14 (Additional Function Selections). For details, refer to *7.3.1 Motion Fixed Parameters*.
		Bit 2	Reverse Limit Signal for Zero Point Return or General-purpose DI (LMT_L/DI2)	Indicates input 2 signal status. Input 2 can be used as either a zero point return limit signal for reverse rotation or a general-purpose DI according to the setting of bit 3 (Reverse Limit Signal Selection for Zero Point Return) of motion fixed parameter No. 14 (Additional Function Selections). For details, refer to *7.3.1 Motion Fixed Parameters*.
		Bit 3	Forward Limit Signal for Zero Point Return or General-purpose DI (LMT_R/DI3)	Indicates input 3 signal status. Input 3 can be used as either a forward limit signal for zero point return or a general-purpose DI according to the setting of bit 4 (Forward Limit Signal Selection for Zero Point Return) of motion fixed parameter No. 14 (Additional Function Selections). For details, refer to *7.3.1 Motion Fixed Parameters*.
		Bit 4	Emergency Stop Signal or Deceleration Stop Signal (EMRGNCY/ DI4)	Indicates input 4 signal status. Input 4 indicates the status of latched signal rather than actual signal. When Input 4 is input, the signal is first latched, and then this bit is set to 1 until the Excitation ON Signal (OB□□010) turns OFF and EMRST (OB□□01B) turns OFF. While this bit is set to 1, operation cannot be continued. The PO-01 Module LEDs will indicate (⊔) (first axis), (L) (second axis), (Π) (third axis) and (⊔)(fourth axis) if this bit is ON.
		Bits 5 to 15	Not used.	–
3	Calculated Position in Machine Coordinate System (CPOS)	IL□□02	-2^{31} to $2^{31}-1$	Indicates the calculated position in a machine coordinate system controlled by PO-01 Modules. Normally the position data indicated at this register is the target position for each scan.
5	Target Position Difference Monitor (PTGDIF)	IL□□04	-2^{31} to $2^{31}-1$	Indicates the amount cleared every scan.
7 to 15	Not used.	IW□□06 to IW□□0E	–	–

Table 7.11 Motion Monitoring Parameters (cont'd)

No.	Name	Register No.	Setting Range/ Bit Name	Description
16	Out of Range Parameter Number (ERNO)	IW□□0F	1. Motion setting parameter 1 to 65 2. Motion fixed parameter 101 to 148	Indicates the most recent setup parameter number that exceeded the range in OW□□00 to OW□□3F motion setting parameter or motion fixed parameter settings. • Motion setting parameters: 1 to 65 • Motion fixed parameters: 101 to 148
17 to 20	Not used.	IW□□10 to IW□□13	–	–
21	Motion Command Response Code (MCMDRCODE)	IW□□14	0 to 65535	Indicates the OW□□20: Motion Command Code that is currently executing. Refer to OW□□20 for details on motion commands.
22	Motion Command Status (MCMDSTS)	IW□□15	Monitors the executing status of an OW□□20: Motion Command Code. The bit configuration is described below.	
		Bit 0	Command Executing Flag (BUSY)	Indicates the motion command status. This bit is used for abort status. 0: READY (completed) 1: BUSY (processing)
		Bit 1	Command Hold Completed Flag (HOLDL)	Turns ON when a HOLD is completed. Refer to individual motion functions for details on the HOLD function.
		Bit 2	Distribution Completed (DEN)	Turns ON when the amount of movement cleared is completed.
		Bit 3	Zero Point Setting Completed (ZSET)	Turns ON when the zero point setting (ZSET) has been executed by OW□□20: Motion Command Code.
		Bit 4	Not used.	–
		Bit 5	Command Error End (FAIL)	Turns ON if an alarm occurs while a movement (positioning, feed, etc.) command is being executed. Operation cannot continue once this bit turns ON. Set Motion Command Code (OW□□20) to "NOP" for at least one scan. The PO-01 Module LEDs will indicate ( ) (first axis), ( ) (second axis), ( ) (third axis) and ( )(fourth axis) if this bit is ON.
		Bit 6	Zero Point Return Completed (ZRNC)	Turns ON when zero point return or zero point setting has been completed. It turns OFF when zero point return begins.
		Bits 7 to 15	Not used.	–
23	Number of Digits Below Decimal Monitor (DECNUMM)	IW□□16	0 to 5	Indicates motion fixed parameter No. 18: Number of Digits Below Decimal Point.

Table 7.11 Motion Monitoring Parameters (cont'd)

No.	Name	Register No.	Setting Range/ Bit Name	Description
24	Position Control Status (POSSTS)	IW□□17	This parameter indicates status related to position controlled by PO-01 Modules.	
		Bit 0	Machine Lock ON (MLKL)	Turns ON when machine lock is ON and pulses will not be output. The axis that is being controlled will be locked and will remain stopped.
		Bit 1	Zero Point Position (ZERO)	Turns ON when zero point return (IB□□156) has been completed and when 0 ≤ |IL□□18: Reference Position in Machine Coordinate System| ≤ OW□□83: Zero Point Position Output Width.
		Bit 2	Second In-position Completed (PSET2)	Turns ON when Distribution Completed (bit 2 of IW□□15) turns ON.
		Bit 3	Not used.	–
		Bit 4	Preset Request for Number of POSMAX Turns Completed (TPRSE)	Turns ON when OB□□2D1: Request for Preset Number of POSMAX Turns is ON and presetting has been completed. It turns OFF when OB□□2D1: Request for Preset Number of POSMAX Turns goes OFF and is valid when infinite length axis is set.
		Bit 5	Electronic Gear Enabled Selection (GEARM)	Indicates the electronic gear enabled selection at bit 4 of motion fixed parameter number 17.
		Bit 6	Axis Selection (MODSELM)	Indicates the axis selection at bit 5 of motion fixed parameter number 17.
		Bits 7 to 15	Not used.	–
25	Machine Coordinate System Reference Position (MPOS)	IL□□18	-2^{31} to $2^{31}-1$	This parameter is the reference position in the machine coordinate system and is basically the same value at IL□□02 (CPOS). This position data cannot be updated if IB□□170: Machine Locked is ON.
27	Not used.	IL□□1A	–	–
29	POSMAX Monitor (PMAXTURN)	IL□□1C	1 to $2^{31}-1$	Indicates the infinite length axis reset position (POSMAX) at motion fixed parameter number 23.
31	Number of POSMAX Turns (PMAXTURN)	IL□□1E	-2^{31} to $2^{31}-1$	The count at this parameter goes up and down every time the reset position (POSMAX) for the infinite length axis at motion fixed parameter 23 is exceeded. The parameter can be preset with OL□□30: Preset Number of POSMAX Turns and with OB□□2D1: Request for Preset Number of POSMAX Turns.
33	Not used.	IL□□20	–	–

Table 7.11 Motion Monitoring Parameters (cont'd)

No.	Name	Register No.	Setting Range/ Bit Name	Description
35	Alarms (ALARM)	IL□□22	Alarm data and a halt to operation are indicated if this register shows anything other than "0." The register can be cleared by starting up OB□□006: Alarm Clear. If an alarm occurs, the PO-01 Module indicators will indicate (⌟) (first axis), (∟) (second axis), (⊓) (third axis) and (⊔)(fourth axis). The bit configuration is described below.	
		Bits 0 to 2	Not used.	–
		Bit 3	Positive Software Limit (SOTF)	This bit is valid if IB□□156: Zero Point Return Completed turns ON when the positive software limit is enabled and an infinite length axis is selected. 1. OW□□20: Motion Command Code Interpolation This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≥ Positive Software Limit (motion fixed parameter No. 27). 2. OW□□20: Motion Command Codes Positioning, Feed, or Step This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≥ Positive Software Limit (motion fixed parameter No. 27).
		Bit 4	Negative Software Limit (SOTR)	This bit is valid if IB□□156: Zero Point Return Completed turns ON when the negative software limit is enabled and an infinite length axis is selected. 1. OW□□20: Motion Command Code Interpolation This bit turns ON when IL□□18: Reference Position in Machine Coordinate System + OL□□26: Stopping Distance ≤ Negative Software Limit (motion fixed parameter No. 29). 2. OW□□20: Motion Command Codes Positioning, Feed, or Step This bit turns ON when IL□□18: Reference Position in Machine Coordinate System ≤ Negative Software Limit (motion fixed parameter No. 29).
		Bit 5	Excitation OFF (SVOFF)	Turns ON if Motion Command Code (OW□□20) is set to a movement command such as POSITIONING or STEP while the system is in excitation OFF status.
		Bit 6	Not used.	–
		Bit 7	Overspeed (DISTOVER)	Turns ON when an attempt is made to output the number of pulses that exceeds the maximum pulse output frequency for each scan.
		Bit 8	Not used.	–
		Bit 9	Not used.	–
		Bit 10	Control Mode Error (MODERR)	Turns ON when a move command is set at OW□□20: Motion Command Code in a mode other than Position Control Mode (OB□□002 is OFF).
		Bits 11 to 31	Not used.	–
37	Not used.	IW□□24	–	–
38	Not used.	IW□□25	–	–
39	Speed Reference Output Monitor (RVMON)	IL□□26	-2^{31} to $2^{31}-1$	Indicates the travel distance every scan and is "0" when IB□□170: Machine Locked is ON.

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Table 7.11 Motion Monitoring Parameters (cont'd)

No.	Name	Register No.	Setting Range/ Bit Name	Description
41	Position Buffer Read Data (CNMON)	IL□□28	-2^{31} to $2^{31}-1$	Position data from the position buffer specified at OL□□38: Position Buffer Access Number is read and stored at this parameter when motion setting parameter OB□□21F: Position Buffer Read turns ON. It takes about 2 scans from the time that OB□□21F: Position Buffer Read turns ON until data is stored at this register.
43	Number of Output Pulses (XREFMON)	IL□□2A	-2^{31} to $2^{31}-1$	Indicates the number of pulses output for each scan. It is set to 0 while the system is in machine lock status.
45	Not used.	IL□□2C	–	–
47	Calculated Reference Coordinate System Position (POS)	IL□□2E	-2^{31} to $2^{31}-1$	This parameter has meaning when the motion fixed parameter: Axis Selection (bit 5 of the Motion Controller Function Selection Flags) is set to an infinite length axis (= 1). It indicates the target position for every infinite length axis scan.
49 to 63	Not used.	IW□□30	–	–

8

Troubleshooting

This chapter describes the troubleshooting procedure when a Motion Module alarm occurs.

8

8.1 Overview of Alarms

This section describes alarms that occur while using a Motion Module.

8.1.1 Description of Motion Alarms

Motion alarms in the MP920 are classified as alarms detected in motion programs and axis alarms detected in SERVOPACK units.

The failure location can be determined and appropriate corrections can be taken simply by checking the contents of the alarm output register set from the Define Group Window for motion program alarms and the contents of monitor parameter: Alarms (IL□□22) for axis alarms.

■ Motion Alarms, Classification 1

The following section describes MP920 Motion Module alarm classifications.

Run Status (IW□□00)

The run status setting error bit will turn ON if a setting in motion fixed or setting parameters is not within the setting range.

With an SVA-01A/02A Module, the run status is also reported as an Error Count Error and a Cumulative Motor Speed Receive Error.

Alarm (IL□□22)

Alarms are reported for motion command used in Position Control Mode. Details of any alarm is reported for each axis.

Program Alarm

The alarm output register for program alarms is specified from the Group Definition Window.

Details for program alarms are output to the alarm output register specified from the Group Definition Window for any alarm that occurs while a motion program is being executed.

Module LED Indicator

The Module LED indicator displays the execute/error status of a Motion Module in a 7-segment LED indicator pattern.

■ Motion Alarms, Classification 2

Motion alarms are reported for the SVA-01A/02A, PO-01 and SVB-01.

SVA-01A/02A and PO-01

Run Status (RUNSTS)
IW□□00

- Bit1: PRMERR
  Motion setting parameter setting error
- Bit2: FPRMERR
  Motion fixed parameter setting error

→ Out of range parameter number (ERNO)
W□□0F

- Bit0: EOVER
  Error counter over
- Bit4: PGER
  Cumulative number of rotations received error

Alarms (ALARM)
IL□□22

Bit1: OTF	Positive overtravel
Bit2: OTR	Negative overtravel
Bit3: SOTF	Positive software limit
Bit4: SOTR	Negative software limit
Bit5: SVOFF	Servo power OFF
·	
·	
Bit17: ABSOVER	ABS encoder count exceeded
Bit18: PGLFLT	Broken PG wire error

Motion program alarms

Alarm output status specified from the Group Definitions Window

Program alarms

- 2h: Zero division error
- 10h: Circumference specified alarm with radius specified
- 11h: Interpolation feed speed exceeded
- 12h: No interpolation feed speed
  ·
  ·
- 20h: REG data error

Axis alarms

- 80h: Logical axis use disabled
- 81h: POSMAX exceeded in infinite length axis designation
- 82h: Distance the axis moved exceeded LONG_MAX
  ·
  ·
- 89h: Beyond the ACC/SCC/DCC setting range

Motion Module LED indicator

Displays the execute/error status of Motion Modules: 7-segment LED indicator

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SVB-01

Run Status (RUNSTS)
IW□□00

- Bit1: PRMERR
  Motion setting parameter setting error
- Bit2: FPRMERR
  Motion fixed parameter setting error

→ Out of range parameter number (ERNO)
W□□0F

Alarms (ALARM)
IL□□22

Bit0: SVERROR	Servopack error
Bit1: OTF	Positive overtravel
Bit2: OTR	Negative overtravel
Bit3: SOTF	Positive software limit
Bit4: SOTR	Negative software limit
Bit5: SVOFF	Servo power OFF
.	
.	
Bit17: ABSOVER	ABS encoder count exceeded

Servo Drive alarm code (SVALARM)
IW□□24

00:	Absolute data error
02:	Parameter destruction
10:	Overcurrent
11:	Ground fault
.	
.	
F3:	Power loss

Motion program alarms

Alarm output status specified from the Group Definitions Window

Program alarms
- 2h: Zero division error
- 10h: Circumference specified for radius specification
- 11h: Interpolation feed speed exceeded
- 12h: No interpolation feed speed
  .
  .
- 20h: REG data error

Axis alarms
- 80h: Logical axis use disabled
- 81h: POSMAX exceeded in infinite length aixs designation
- 82h: Distance the axis moved exceeded LONG_MAX
  .
  .
- 89h: Beyond the ACC/SCC/DCC setting range

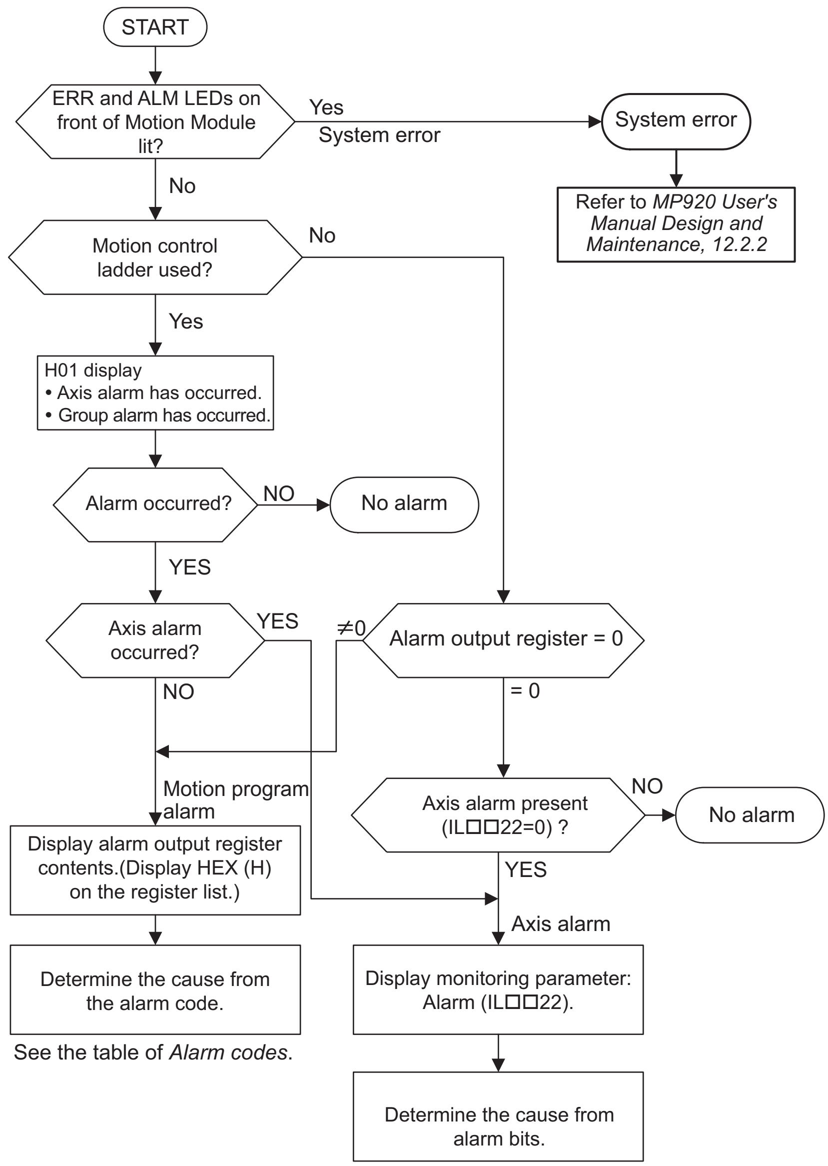
Motion Module LED indicator

Displays the execute/error status of Motion Modules: 7-segment LED indicator

8.1.2 Processing Flow for Motion Alarms

■ Troubleshooting Flow

The following illustration shows the troubleshooting flow when a motion alarm occurs.



8

8.2 Alarms and Actions Taken

This section describes individual alarms and the actions that should be taken.

8.2.1 Alarm IL□□22

This section describes the axis alarm flag (IL□□22).

Alarm data will be reported at IL□□22 if a motion command is used in Position Control Mode. Some alarm will not occur for certain Motion Modules. Refer to the following table for applicability.

IL□□22	Alarm	SVA-01A	SVA-02A	SVB-01	PO-01
Bit 0	SERVOPACK Error	No	No	Yes	No
Bit 1	Positive Overtravel	Yes	Yes	Yes	No
Bit 2	Negative Overtravel	Yes	Yes	Yes	No
Bit 3	Positive Software Limit	Yes	Yes	Yes	Yes
Bit 4	Negative Software Limit	Yes	Yes	Yes	Yes
Bit 5	Servo OFF (Excitation ON)	No	No	Yes	Yes
Bit 6	Positioning Time Over	Yes	Yes	Yes	No
Bit 7	Positioning Travel Distance Exceeded (Speed Exceeded)	No	No	Yes	Yes
Bit 8	Filter Type Change Error	No	No	Yes	No
Bit 9	Filter Time Constant Change Error	No	No	Yes	No
Bit 10	Control Mode Error	Yes	Yes	Yes	Yes
Bit 11	Zero Point Not Set	Yes	Yes	Yes	No
Bit 12	Not used.	–	–	–	–
Bit 13	Not used.	–	–	–	–
Bit 14	Servo Drive Synchronous Communications Error	No	No	Yes	No
Bit 15	Servo Drive Communications Error	No	No	Yes	No
Bit 16	Servo Drive Command Timeout Error	No	No	Yes	No
Bit 17	Absolute Encoder Count Exceeded	Yes	Yes	Yes	No
Bit 18	Broken PG Wiring	Yes	Yes	No	No

Note: Yes: Supported, No: Not supported

■ SERVOPACK Error

SVA-01A	SVA-02A	SVB-01A	PO-01A
Not supported	Not supported	Supported	Not supported

Detection Timing
• Detects a SERVOPACK alarm in the alarm control area (normal times). This bit is not used with the SVA-01A or SVA-02A Modules. It is used to monitor the SVALM signal at IW□□00 bit 0 and requires a ladder logic program in the user application that will stop the machine (STOP and SERVO OFF commands).
Alarm Processing
• The command that is currently executing will be terminated. Positioning will be stopped (deceleration to a stop) if a SERVOPACK alarm occurred while the POSING command is being executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• The cause will vary with alarm details. Since alarm details are monitored at IW□□24, refer to the table of SERVOPACK Alarms on the next page.
Action Taken
• Check the SERVOPACK alarm and eliminate the cause of the alarm. • Reset the alarm.

INFO

1. This status bit will turn ON if an alarm classified as a servo alarm in the MECHATROLINK servo alarm codes occurs.
2. If IW□□00 bit 0 (SVALM signal) turns ON when using an SVA-01A or SVA-02A Module, connect a Digital Operator to the SERVOPACK to check alarm details from the table of *Analog Servo Alarms*.

■ MECHATROLINK Servo Alarm Code (IW□□24)

When IL□□22 bit 0 (SERVOPACK Error) is ON, a Servo Driver alarm will be generated. For details on MECHATROLINK servo alarm codes, refer to the following table.

No.	Name	Register Number	Code	Meaning	Error Type
24	Servo Driver Alarm Code	IW□□24	99	Normal	–
			94	Parameter setting alarm	Warning
			95	MECHATROLINK command alarm	Warning
			96	MECHATROLINK communications error alarm	Warning
			00	Absolute data error	Servo alarm
			02	Parameter breakdown	Servo alarm
			10	Overcurrent	Servo alarm
			11	Ground fault	Servo alarm
			40	Overvoltage	Servo alarm
			51	Overspeed	Servo alarm
			71	Overload (instantaneous)	Servo alarm
			72	Overload (continuous)	Servo alarm
			80	Absolute encoder error	Servo alarm
			81	Absolute encoder backup error	Servo alarm
			82	Absolute encoder checksum error	Servo alarm
			83	Absolute encoder battery error	Servo alarm
			84	Absolute encoder data error	Servo alarm
			85	Absolute encoder overspeed	Servo alarm
			B1	Gate array 1 error	Servo alarm
			B2	Gate array 2 error	Servo alarm
			B3	Current feedback Phase-U error	Servo alarm
			B4	Current feedback Phase-V error	Servo alarm
			B5	Watchdog detector error	Servo alarm
			C1	Servo runaway	Servo alarm
			C2	Encoder phase error detected	Servo alarm
			C3	Encoder Phase-A/Phase-B disconnection	Servo alarm
			C4	Encoder Phase-C disconnection	Servo alarm
			C5	Incremental encoder initial pulse error	Servo alarm
			D0	Position deviation overflow	Servo alarm
			E5	MECHATROLINK synchronous error	Communications alarm
			E6	MECHATROLINK communications error	Communications alarm
			F3	Power loss	Servo alarm

■ Analog Servo Alarms

IB□□010 (SVALM) will turn ON if an alarm occurs with a SERVOPACK connected to an SVA-01A or SVA-02A Module. Connect a Digital Operator to the SERVOPACK to check alarm details.

Table 8.1 List of Analog Servo Alarms

Indicator	Alarm Name	Alarm	SGDA	SGDB	SGDM
A.00	Absolute Data Error	Absolute data cannot be received or an improper absolute value was received.	Yes	Yes	No
A.02	Parameter Destruction	Incorrect sum check result for a parameter.	Yes	Yes	Yes
A.03	Main Circuit Detection Error	Improper power circuit detection data.	No	No	Yes
A.04	Parameter Setting Error	Parameter setting exceeds the setting range.	Yes	Yes	Yes
A.05	Combination Error	Servomotor and SERVOPACK capacity combination is incorrect.	No	No	Yes
A.10	Overcurrent or Heat Sink Overheat	Overcurrent flowed through the power transistor. The heat sink overheated. (SGDM)	Yes	Yes	Yes
A.30	Regeneration Error	Regenerative processing circuit failed.	Yes	Yes	Yes
A.31	Position Error Pulse Overflow	Position error pulse exceeded the parameter (overflow) value.	Yes	Yes	No
A.32	Regeneration Overload	Regenerative energy exceeds the capacity of the regenerative resistor.	No	No	Yes
A.40	Overvoltage	Main circuit voltage is unusually high.	Yes	Yes	Yes
A.41	Undervoltage	Main circuit voltage is falling.	No	No	Yes
A.51	Overspeed	Servomotor rotation speed is unusually high.	Yes	Yes	Yes
A.70	Overload	Torque exceeds the rated level. (High and low load)	Yes	No	No
A.71	Overload (High Load)	Operation for several seconds to several tens of seconds at torque significantly above the rated level.	No	Yes	Yes
A.72	Overload (Low Load)	Continuous operation at torque above the rated level.	No	Yes	Yes
A.73	Dynamic Brake Overload	Rotating energy with dynamic brake operation exceeds dynamic brake resistor capacity.	No	No	Yes
A.74	Inrush Resistance Overload	The main circuit power supply frequently turned ON and OFF.	No	No	Yes
A.7A	Heat Sink Overheat	SERVOPACK heat sink overheated.	No	No	Yes
A.80	Absolute Encoder Error	Improper number of pulses per absolute encoder rotation.	Yes	Yes	Yes
A.81	Absolute Encoder Backup Error	All encoder power supplies OFF and position data cleared.	Yes	Yes	Yes
A.82	Absolute Encoder Checksum Error	Incorrect sum check results for encoder memory.	Yes	Yes	Yes
A.83	Absolute Encoder Battery Error	Voltage dropped in the backup battery for the absolute encoder.	Yes	Yes	Yes
A.84	Absolute Encoder Data Error	Improper absolute data received.	Yes	Yes	Yes
A.85	Absolute Encoder Overspeed	Encoder operated at high speed when power was turned ON.	Yes	Yes	Yes
A.86	Encoder Overheat	Encoder internal temperature too high.	No	No	Yes

Table 8.1 List of Analog Servo Alarms (cont'd)

Indicator	Alarm Name	Alarm	SGDA	SGDB	SGDM
A.A1	Heat Sink Overheat	SERVOPACK heat sink overheated.	No	Yes	No
A.b1	Speed Reference A/D Error (Reference Mechanism Read Error)	A/D converter for the speed reference input failed.	Yes	Yes	Yes
A.b2	Torque Reference A/D Error	A/D converter for the torque reference input failed.	No	No	Yes
A.bF	System Alarm	SERVOPACK system alarm occurred.	No	No	Yes
A.c1	Servo Crash Detection	Servomotor runaway.	Yes	Yes	Yes
A.c2	Encoder Phase Error Detection	Improper encoder A, B or C phase output.	Yes	Yes	No
A.c3	Encoder Phase-A/B Disconnection	Encoder A and B phases are disconnected.	Yes	Yes	No
A.c4	Encoder Phase-C Disconnection	Encoder C phase is disconnected.	Yes	Yes	No
A.c8	Encoder Clear Error or Multi-turn Limit Setting Error	Absolute encoder rotation count cleared incorrectly or could not be set properly.	No	No	Yes
A.c9	Encoder Communications Error	Communications between the encoder and SERVO-PACK failed.	No	No	Yes
A.cA	Encoder Parameter Error	Encoder parameters have been destroyed.	No	No	Yes
A.cb	Encoder Echo Back Error	Improper content in encoder communications.	No	No	Yes
A.do	Position Error Exceeded	Position error pulse exceeded the parameter (Pn505) setting.	No	No	Yes
F1	Missing Power Line Phase	One of main power supply phases is disconnected.	No	Yes	Yes
F3	Instantaneous Power Interruption Error	Power interruption exceeded one cycle with the power supply synchronized to the AC power supply.	Yes	Yes	No
A99	No error	Normal run status.	Yes	Yes	No
A--	No error	Normal run status.	No	No	Yes

Note: Yes: Supported, No: Not supported

■ Positive Overtravel and Negative Overtravel

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Not supported

Detection Timing
• Detected by the position control section while a motion command was being executed in Position Control Mode. (Normal operation) • Overtravel detected when OT signal turned OFF in the movement direction.
Alarm Processing
• The SERVOPACK will execute a stop. The parameter settings will determine the stop procedure and the procedure after stopping. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON. • Controller processing. The SVA will output the zero speed reference, the SVB will decelerate the machine to a stop because the command was canceled, and follow-up processing (aligning the reference position to the current machine position every scan cycle) will be performed.
Errors and Causes
• A reference exceeding the machine movement limit was issued. The movement command reference exceeded the movement range in manual operation. • Overtravel signal error.
Action Taken
• Check the overtravel signal. • Check the program and manual operation. • Clear the motion command code, reset the alarm, and then move the axis back to eliminate overtravel. (References in the overtravel direction will be disabled and another alarm will occur.)

IMPORTANT

We recommend the following settings in the SERVOPACK to prevent vertical axes from falling and to prevent vibration at the overtravel boundary.

- Decelerate to a stop in an emergency stop.
- Set zero clamp status after decelerating to a stop.

■ Positive Software Limit and Negative Software Limit

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Supported

Detection Timing
• Enabled when using a motion command in Position Control Mode and is detected by the position control section. • Enabled after returning to the zero point or after the zero point setting is completed.
Alarm Processing
• The machine will decelerate to a stop at the software limit. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• A reference exceeding the software limit of the machine was issued. The motion program reference exceeded the movement range. The movement range was exceeded in manual operation.
Action Taken
• Check the program and manual operation. • Clear the motion command code, reset the alarm, and then move the axis back to eliminate overtravel. (References in the overtravel direction will be disabled and another alarm will occur.)

■ Servo OFF (Excitation ON)

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Supported

Detection Timing
• Enabled only in Position Control Mode and detected if a movement command is issued with the Servo OFF (Excitation OFF).
Alarm Processing
• The specified move command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• A movement command was issued with the Servo OFF (Excitation OFF). (POSITIONING, EXTERNAL POSITIONING, STEP, FEED, etc.)
Action Taken
• Clear the motion command code, reset the alarm, and then turn the Servo ON (Excitation OFF).

■ Positioning Time Over

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Not supported

Detection Timing
• Positioning was not completed within the time set at OW□□34 (Positioning Complete Check Time) after reference distribution was completed.
Alarm Processing
• Execution of the command will be aborted. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• Poor response because of incorrect position and speed loop gain. • OW□□34 (Positioning Complete Check Time) too short. • Insufficient Servomotor capacity for the machine load. • Improper connection between the SERVOPACK and Servomotor.
Action Taken
• Check parameters related to SERVOPACK characteristics (all gains). • Check the connection between the SERVOPACK and Servomotor. • Check for sufficient Servomotor capacity. • Check OW□□34 (Positioning Complete Check Time).

INFO

This check will not be performed if OW□□34 (Positioning Complete Check Time) is set to 0.

■ Positioning Travel Distance Exceeded (Speed Exceeded)

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Supported

Detection Timing
• Enabled when an electronic gear is used and is detected when the positioning command is issued (SVB-01).
Alarm Processing
• The movement command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• A move command exceeding the positioning movement limit was issued (SVB-01). (POSITIONING, STEP, or EXTERNAL POSITIONING command) • A speed command exceeding fixed parameter No. 38 (Maximum Pulse Output Frequency) was issued (PO-01).
Action Taken
• Check the amount of move specified for the axis that is being positioned (SVB-01). • Check the speed specified for the axis that is being positioned (PO-01).

8

■ Filter Type Change Error

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Not supported

Detection Timing
• Detected only when a motion command is used in Position Control Mode. (Detected by the motion command processing section)
Alarm Processing
• Filter type change command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• With an interpolation command (interpolation or interpolation with the position detection), an error will occur if the filter type change command is specified before distribution has been finished for the command (IB□□153 OFF). • The filter type change command will be ignored for positioning (POSITIONING, EXTERNAL POSITIONING, STEP, FEED) and other commands. (An error will not occur.)
Action Taken
• Check the Distribution Completed (IB□□153 ON) status and then revise the program that executes the filter type change command.

INFO

The command that is being executed will not stop even if an error occurs. A stop program is needed in the user ladder logic program if you want to stop a command that is being executed.

■ Filter Time Constant Change Error

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Not supported

Detection Timing
• Enabled only when a motion command is used in Position Control Mode. (Detected by the motion command processing section)
Alarm Processing
• The command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• With an interpolation command (interpolation or interpolation with the position detection), an error will occur if the filter time constant change command is specified before distribution has been finished for the command (IB□□153 OFF). • The filter time constant change command will be ignored for positioning (POSITIONING, EXTERNAL POSITIONING, STEP, FEED) and other commands. (An error will not occur.)
Action Taken
• Check the Distribution Completed (IB□□153 ON) status and then revise the program that executes the filter time constant change command.

INFO

The command that is being executed will not stop even if an error occurs. A stop program is needed in the user ladder logic program if you want to stop a command that is being executed.

■ Control Mode Error

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Supported

Detection Timing
• Enabled only when a motion command is used and is detected by the motion command processing section for the command specified at OW□□20 (Motion Command Code).
Alarm Processing
• The command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• A motion command (POSITIONING, STEP, etc.) is set at OW□□20 (Motion Command Code) in a mode other than Position Control Mode.
Action Taken
• Change the control mode to Position Control Mode (OB□□002 ON) and then set the command at OW□□20 (Motion Command Code).

■ Zero Point Not Set

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Not supported

Detection Timing
• Enabled only in Position Control Mode. • Enabled only when infinite length axis is set using an absolute encoder. The error is detected when the command is set at OW□□20 (Motion Command Code). Command: POSITIONING, EXTERNAL POSITIONING, INTERPOLATION, OR INTERPOLATION WITH POSITION DETECTION
Alarm Processing
• The command will not be executed. • Bit 5 (command error end) of IW□□15 (Motion Command Status) will turn ON.
Errors and Causes
• A move command is set without setting zero point (IW□□153 OFF).
Action Taken
• Clear the motion command, reset the alarm, and set the zero point.

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■ Servo Drive Synchronous Communications Error

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Not supported

Detection Timing
• Detected by the communications control section during synchronous communications between the controller and MECHATROLINK SERVOPACK.
Alarm Processing
• The command that is being executed will be terminated.
Errors and Causes
• An error occurred during MECHATROLINK communications. (Cable disconnected, noise on the communications path)
Action Taken
• Check the MECHATROLINK cable and then reset the alarm.

■ Servo Drive Communications Error

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Not supported

Detection Timing
• Detected by the communications control section when a controller and MECHATROLINK SERVOPACK are connected.
Alarm Processing
• The command that is being executed will be terminated. • The SERVOPACK will turn OFF.
Errors and Causes
• MECHATROLINK communications stopped. (Cable disconnected, noise on the communications path)
Action Taken
• Check the MECHATROLINK cable and then reset the alarm.

■ Servo Drive Command Timeout Error

SVA-01A	SVA-02A	SVB-01	PO-01
Not supported	Not supported	Supported	Not supported

Detection Timing
• Detects while a motion command is being executed. • Detected by the MECHATROLINK communications control section during the servo command response check in each processing section.
Alarm Processing
• The command that is being executed will be terminated.
Errors and Causes
• A MECHATROLINK servo command was not completed within the specified time (3 s).
Action Taken
• Check the connection between the Motion Module and the MECHATROLINK SERVOPACK. • Check the MECHATROLINK SERVOPACK alarm.

INFO

This occurs when MECHATROLINK SERVOPACK Modules are allocated with SERVOPACK power OFF.

■ Absolute Encoder Count Exceeded

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Supported	Not supported

Detection Timing
• Enabled only in Position Control Mode. • Enabled only when an electronic gear is used while infinite length axis is set with an absolute encoder and this error is detected by the position control section when power is turned ON.
Alarm Processing
• Absolute position data read from the absolute encoder will be ignored when the sensors are ON.
Errors and Causes
• A calculation error occurred when absolute position data read from the absolute encoder was converted from pulse to reference units when power is turned ON.
Action Taken
• Review settings like the motion fixed parameter gear ratio and number of encoder pulses.

8

■ Broken PG Wiring

SVA-01A	SVA-02A	SVB-01	PO-01
Supported	Supported	Not supported	Not supported

Detection Timing
• Enabled only in Position Control Mode, Phase Control Mode, and Zero Point Return Mode with the pulse count system selected (A/B mode). The PG broken wire detection signal is monitored in scan cycles through software. Note: The PG broken wire detection signal is detected by a hardware circuit.
Alarm Processing
• Stop • Position loop processing will be stopped and the machine will decelerate to a stop using the open loop speed reference. • The servo OFF command will be executed after decelerating to a stop. • Create a user application that will set acceleration/deceleration time to 0 when a broken PG wire is detected if you want to stop immediately rather than decelerating to a stop.
Errors and Causes
• Improper or disconnected encoder wiring. • Encoder or SERVOPACK failure. • SVA Module failure.
Action Taken
• Check the encoder wiring. • Contact Maintenance.

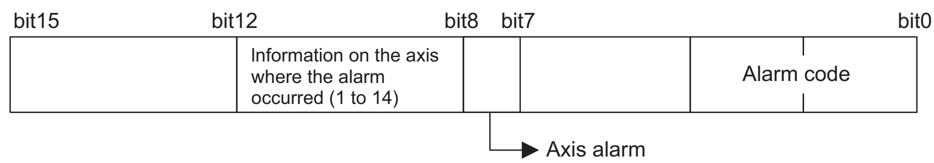
■ Status Monitor (IW☐☐01)

The status of a MECHATROLINK SERVOPACK can be monitored through monitoring parameter IW☐☐01 for an SVB-01 Module.

Bit No.	Alarm Name	Meaning
Bit 0	Alarm (ALARM)	0: No alarm 1: Alarm
Bit 1	Warning (WARNG)	0: No warning 1: Warning
Bit 2	Command Ready (CMDRDY)	0: Receive command disabled (busy) 1: Receive command enabled (ready)
Bit 3	Servo ON (SVON)	0: Servo OFF (base blocking) 1: Servo ON (base blocking canceled)
Bit 4	Main Power Supply ON (PON)	0: Main power supply OFF 1: Main power supply ON
Bit 5	Machine Lock (MLOCK)	0: Machine lock OFF 1: Machine lock ON
Bit 6	Zero Point (ZPOINT)	0: APOS (absolute position) outside zero point range 1: APOS (absolute position) within zero point range
Bit 7	Positioning Completed (PSET)	0: Command distribution not completed or APOS outside positioning completed range 1: Command distribution completed and APOS within positioning completed range
Bit 8	Distribution Completed (DEN)	0: Positioning reference is being distributed 1: Positioning reference has been distributed
Bit 9	Torque Limiting (T_LIM)	0: No torque limiting 1: Torque limiting
Bit 10	Latch Completed (L.SOT)	0: Latch not completed 1: Latch completed
Bit 11	Positioning Proximity (NEAR)	0: APOS outside positioning proximity range 1: APOS within positioning proximity range
Bit 12	Forward Software Limit (P-SOT)	0: Below the forward software limit 1: Above the forward software limit
Bit 13	Reverse Software Limit (N-SOT)	0: Below the reverse software limit 1: Above the reverse software limit
Bit 14	Reserved by system.	–
Bit 15	Reserved by system.	–

8.2.2 Motion Alarm Configuration

The following illustration shows the motion alarm configuration stored in the alarm output register that is set in the Group Definition Window.



■ List of Motion Program Alarm Codes

The following table lists the Motion Program Alarm Codes. Use HEX(H) for the Display Mode when displaying the register list.

Name	Alarm Code	Contents	Remedy
Program Alarm	0	No alarm	Check the alarm details on the instructions of the motion program that was being run when an alarm occurred.
	1	–	
	2	Division-by-zero error	
	3	–	
	4	–	
	10h	Circumference specified alarm for radius specification	
	11h	Exceeded the interpolation feed speed	
	12h	No interpolation feed speed specified	
	13h	Out of range after changing acceleration and deceleration parameters	
	14h	Circular length exceeds LONG_MAX	
	15h	No vertical axis specified for circular plane specification	
	16h	No horizontal axis specified for circular plane specification	
	17h	Exceeded the exponent axis	
	18h	Exceeded the specified number of turns	
	19h	Radius exceeds LONG_MAX	
	1Ah	Center point specification error	
	1Bh	Emergency stop command executing	
	1Ch	Linear interpolation block distance traveled exceeds LONG_MAX	
	1Dh	FMX not defined	
	1Eh	Address T outside the range	
	1Fh	Address P outside the range	
	20h	REG data error	

(cont'd)

Name	Alarm Code	Contents	Remedy
Axis Alarm*	80h	Logic-control axis use prohibited	Check the alarm details on the instructions of the motion program that was being run when an alarm occurred.
	81h	Value exceeding POSMAX specified at Infinite Length Mode Axis specification.	
	82h	Axis travel distance exceeds LONG_MAX	
	83h	Illegal control mode	
	84h	Duplicate motion commands	
	85h	Duplicate motion command response	
	86h	Illegal motion command mode	
	87h	Outside the VEL data range setting	
	88h	Outside the INP data range setting	
	89h	Outside the ACC/SCC/DCC data range setting	
	8Ah	T command in MVT instruction is 0.	
	8Bh	The command cannot be executed by the Motion Module.	

* Axis numbers are stored in bits 8 to 11 when an axis alarm occurs.

8.2.3 Motion Module Error Displays and Actions Taken

■ Servo Number LED Display

The status LED indicator displays the servo number (1 to 16) when the Motion Module is normally operating in Online Mode.

Table 8.2 LED1 (7-segment LED)

Indicator	Color	When Lit
STATUS	Green	Displays the servo number or an error.

Table 8.3 Indicator Display Status

Display	Meaning	Remedy
8.	Hardware reset status	The hardware has been reset. Check the CPU-01 Module DIP switch settings, and correct them as necessary. If the status does not change, replace the Module.
0.	Initializing	1. The system usually enters this status for one to six seconds after the system is turned ON or reset. If the Servo Module is set up so that an Absolute Encoder is connected, and the interface with the Absolute Encoder causes an error, this status will last for 30 seconds per axis. 2. This status lasts if the system enters a permanent loop in an A Drawing of PLC (CPU1/CPU2). 3. This display indicates that the SVA Module is not registered in the Module definitions. To use the Module, register it in the Module definitions and then specify the SVA fixed parameters and the setting parameters for each axis. 4. If 1 to 3 above do not apply, replace the Module. 5. If the problem persists, a hardware error (such as a synchronization error during initialization for the link between the PLC (CPU1/CPU2) and the SVA Module) may be the cause of the problem. Replace other Modules and racks one at a time to isolate the problem cause.
1	Servo number: No. 1	A servo number (1 to 16) is displayed when the servo is operating normally without an error or alarm. Note, however, that this indicator display also appears when “no axis” is selected.
2	Servo number: No. 2	
3	Servo number: No. 3	
4	Servo number: No. 4	
5	Servo number: No. 5	
6	Servo number: No. 6	
7	Servo number: No. 7	
8	Servo number: No. 8	
9	Servo number: No. 9	

Table 8.3 Indicator Display Status (cont'd)

Display	Meaning	Remedy
A	Servo number: No. 10	A servo number (1 to 16) is displayed when the servo is operating normally without an error or alarm. Note, however, that this indicator display also appears when "no axis" is selected.
b	Servo number: No. 11	
C	Servo number: No. 12	
d	Servo number: No. 13	
E	Servo number: No. 14	
r	Servo number: No. 15	
y	Servo number: No. 16	

8

■ LED Indicator Alarm Displays

When an error or alarm occurs, refer to the following table.

Table 8.4 LED Indicator Alarm Displays

Display	Meaning		Remedy
F or F. followed by error code	Serious fault (operation stop) F→0→1 : Watchdog time over F→0→2 : Synchronization error F→4→1 : ROM diagnosis error F→4→2 : RAM diagnosis error F→4→3 : Shared memory diagnosis error F→4→4 : Built-in CPU timer diagnosis error F→4→5 : Timer diagnosis error F→4→6 : NVRAM read error F→4→7 : NVRAM write error F→4→8 : General illeagal instruction interruption occurrence F→4→9 : Slot illegal instruction interrupition occurrence F→5→0 : CPU address error interruption occurrence F→5→1 : DMA address error interruption occurrence F→5→2 : User break interruption occurrence F→5→3 : Trap instruction interruption occurrence		A Motion Module hardware error has occurred. Replace the Module. 1. A watchdog time over error may occur when the user program processing time exceeds the scan time setting. Check the user program and the scan time setting. 2. A synchronization error indicates a problem with synchronization between the PLC (CPU1/CPU2) and a Servo Module. Check the error contents of the CPU Module. If they are normal, replace racks and Modules one at a time to isolate the cause of the problem. Note: The alarm displays shown here are applicable to SVA-01A, SVA-02A, and PO-01 Modules.
┘	Axis 1	Alarm (SVRDY “ON”) 1. Error fault 2. Setting parameter setting error Abnormal (SVRDY “OFF”) 1. Fixed parameter setting error 2. Absolute encoder interface error	Check the contents of IW☐☐00 + the axis offset to determine which of the items shown on the left is the cause of the problem. A setting parameter setting error indicates that any of the values specified in the setting parameters are outside the allowable range. Check the setting parameter settings, and correct them as necessary. A fixed parameter setting error indicates that any of the values specified in the fixed parameters are outside the allowable range. Check the fixed parameter settings, and correct them as necessary. For an absolute encoder interface error, initialize the absolute encoder.
L	Axis 2		
Π	Axis 3		
⊔	Axis 4		
P	Operation of other CPU stops		Some other Module is stopped. Check other Modules. For example, check whether the PLC (CPU1/CPU2) is stopped.
¬	Absolute position reading retry status		A retry has been performed for absolute positioning read processing during initialization executed by turning ON or resetting the system when fixed parameter No. 3 (Encoder Selection) is set to 1 (Absolute Encoder).
┘			
L			
Γ			

INFO

The above alarm displays are applicable to the SVA-01A Module only. For alarm displays of other Modules, refer to *LED Indicator* in *Chapters 5*, *Chapters 6*, and *Chapters 7*.

9

Application Precautions

This chapter summarizes precautions that should be observed when using MP920 Motion Modules.

9

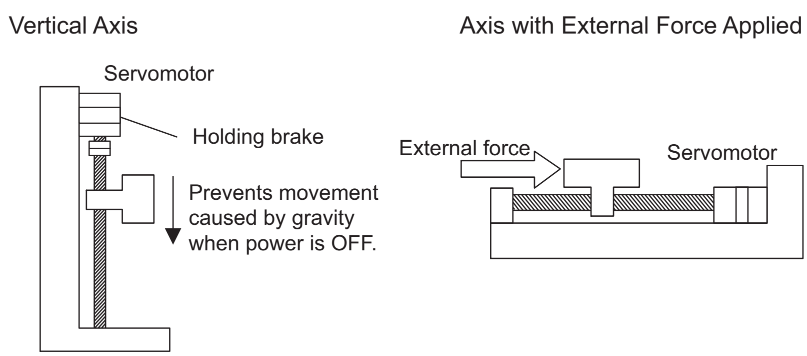
9.1 Vertical Axis Control

This section describes the procedure for connecting and setting parameters when a SERVOPACK is used to control a vertical axis.

9.1.1 Overview

A motor with a brake is used to hold the movable section so that it will not fall due to gravity or external force if system power is turned OFF whenever a SERVOPACK is used to control a vertical axis or an axis with external force applied.

The SERVOPACK brake interlock output (BK) signal controls holding brake operation for a motor with a brake. The MP920 Motion Module does not have brake control, and you must use the SERVOPACK holding brake function instead.

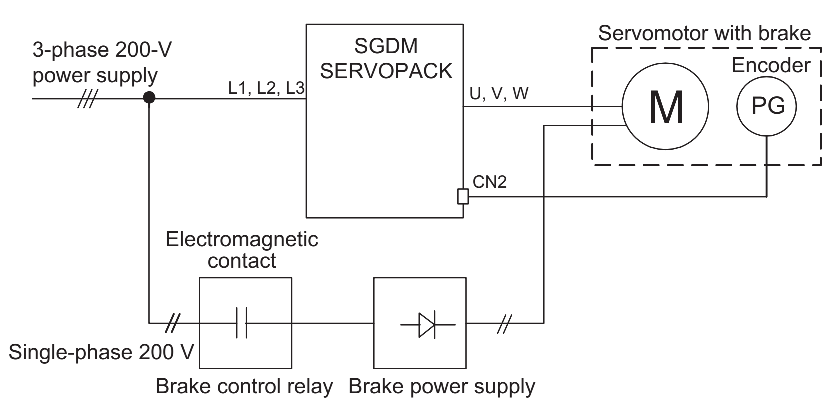


IMPORTANT

The brake built into an SGM Servomotor with a brake is a non-excitation brake that is used only for holding and not for braking. Be sure to use the brake strictly for maintaining a Servomotor in the stopped position. Brake torque is 100% of the rated torque of the Servomotor in for the SGM and is 120% with the SGDB.

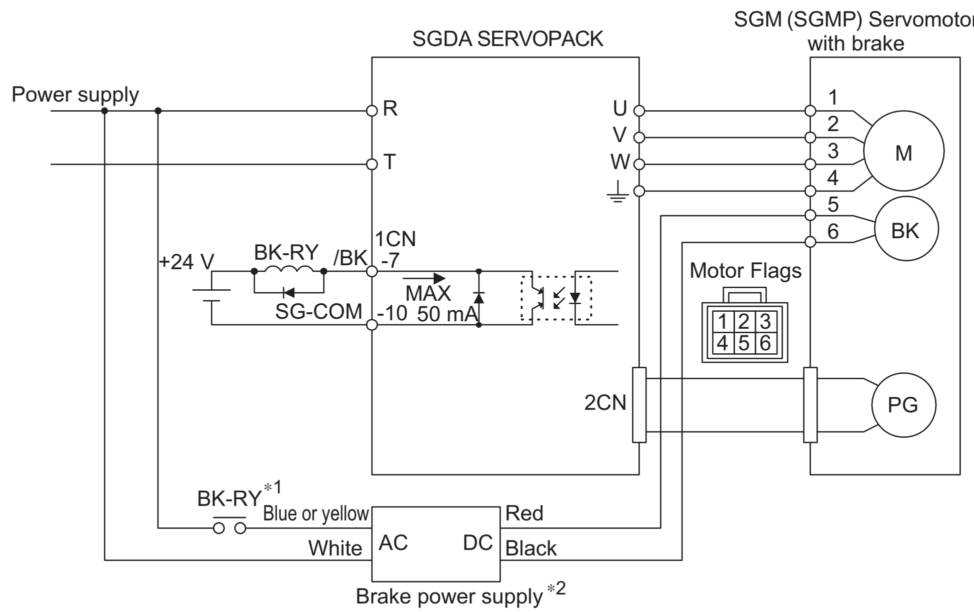
SGDM Application Example

Create a brake ON/OFF circuit using the SERVOPACK contact output signal /BK and the brake power supply. The following example shows a standard connection example.



9.1.2 SGDA SERVOPACK Connections

■ Connection Example



* 1. Brake control relay
* 2. Brake power supplies are available in either 200 or 100-V models.

■ Parameter Settings

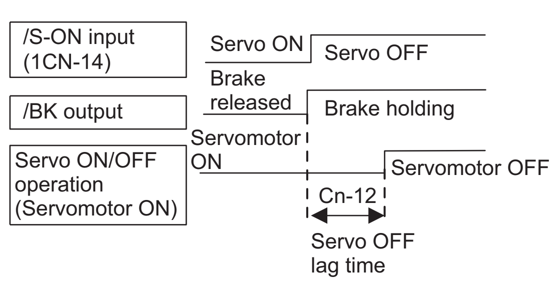
The following section shows SERVOPACK parameters for brake control.

Cn-12 (Time Lag from Brake Reference to Servo OFF)

Use the following parameter if brake ON timing causes the machine to move slightly due to gravity or other forces.

Cn-12	Time Lag from Brake Reference to Servo OFF	Units: 10 ms	Setting Range: 0 to 50	Factory Setting: 0	Speed/torque control and position control

Set the brake control output signal /BK and servo OFF operation (Servomotor output stop) timing when you use a Servomotor with brake.



INFO

This setting determines the timing for stopping the Servomotor. Set Cn-15 and Cn-16 for brake operation with the Servomotor running.

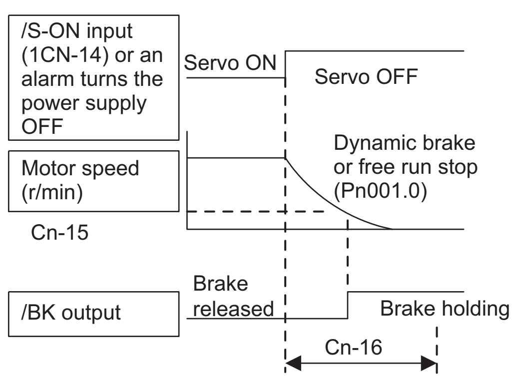
/BK output (brake operation) and the servo are turned OFF at the same time for the factory settings. In this case, the machine may move slightly due to gravity depending on the machine configuration and brake characteristics. This movement can be eliminated by delaying servo OFF operation.

Cn-15 and Cn-16 (Brake Output Speed Level and Timing during Motor Operation)

Use the following parameters to apply the holding brake when the Servomotor is stopped during Servomotor operation.

Cn-15	Brake Output Speed Level during Motor Operation	Units: r/min	Setting Range: 0 to max. speed	Factory Setting: 100	Speed/torque control and position control
Cn-16	Brake Output Timing during Motor Operation	Units: 10 ms	Setting Range: 0 to 100	Factory Setting: 50	Speed/torque control and position control

When using a Servomotor with brake, be sure to set the brake timing when the /S-ON signal (1CN-14) is input while the Servomotor is running or when an alarm turns the servo OFF.

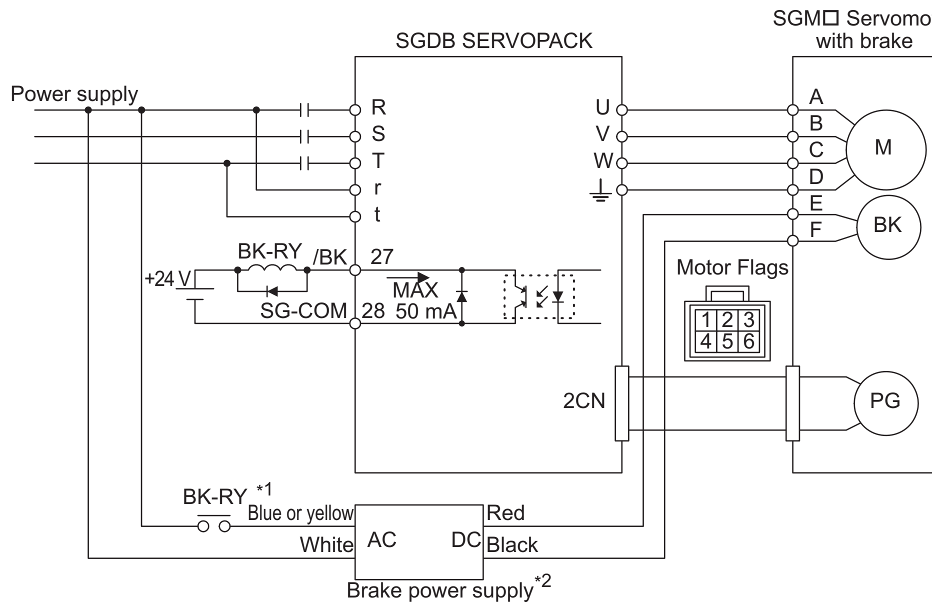


INFO

The Servomotor brake is designed only for holding purposes. The brake must be applied with proper timing when the Servomotor stops. Adjust this parameter while monitoring machine operation.

9.1.3 SGDB SERVOPACK Connections

■ Connection Example



* 1. Brake control relay

* 2. Brake power supplies are available in either 200 or 100-V models.

■ Parameter Settings

Cn-2D (OUTSEL Output Signal Selection)

The following parameter setting selects which 1CN pin will output the BK signal.

Cn-2D	OUTSEL Output Signal Selection	Setting Range: 110 to 666	Factory Setting: 210	Speed/torque control and position control

Selects which signal the 1CN pin will output.

1 s Digit	Selects the 1CN-25, 26 (/COIN, /V-CMP) function.
10 s Digits	Selects the 1CN-27, 28 (/TGON) function.
100 s Digits	Selects the 1CN-29, 30 (/S-RDY) function.

Setting	Function
0	/COIN, /V-CMP Only assigned to 1CN-25 and 26
1	/TGON
2	/S-RDY
3	/CLT
4	/BK
5	OL report
6	OL alarm

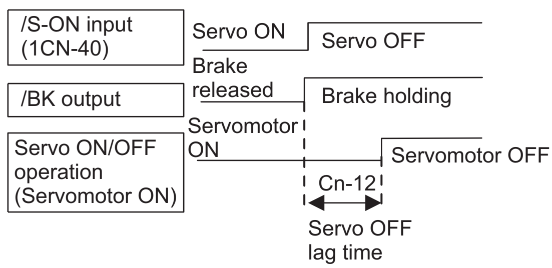
Note: Set Cn-2D = □4□. /BK is output from 1CN-27 and 28 with the MP920.

Cn-12 (Time Lag from Brake Reference to Servo OFF)

Use the following parameter if brake ON timing causes the machine to move slightly due to gravity or other forces.

Cn-12	Time Lag from Brake Reference to Servo OFF	Units: 10 ms	Setting Range: 0 to 50	Factory Setting: 0	Speed/torque control and position control

Set the brake control output signal /BK and servo OFF operation (Servomotor output stop) timing when you use a Servomotor with brake.



INFO

This setting determines the timing for stopping the Servomotor. Set Cn-15 and Cn-16 for brake operation with the Servomotor running.

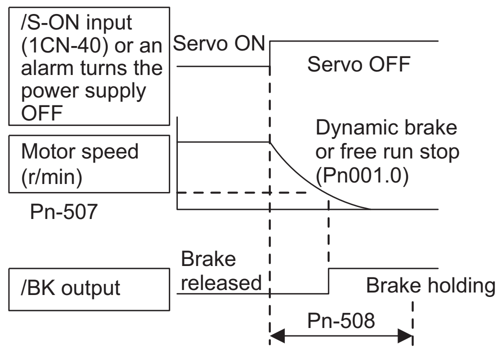
/BK output (brake operation) and the servo are turned OFF at the same time for the factory settings. In this case, the machine may move slightly due to gravity depending on the machine configuration and brake characteristics. This movement can be eliminated by delaying servo OFF operation.

Cn-15 and Cn-16 (Brake Output Speed Level and Timing during Motor Operation)

Use the following parameters to apply the holding brake when the Servomotor is stopped during Servomotor operation.

Cn-15	Brake Output Speed Level during Motor Operation	Units: r/min	Setting Range: 0 to max. speed	Factory Setting: 100	Speed/torque control and position control
Cn-16	Brake Output Timing during Motor Operation	Units: 10 ms	Setting Range: 0 to 100	Factory Setting: 50	Speed/torque control and position control

When using a Servomotor with brake, be sure to set the brake timing when the /S-ON signal (1CN-40) is input while the Servomotor is running or when an alarm turns the servo OFF.



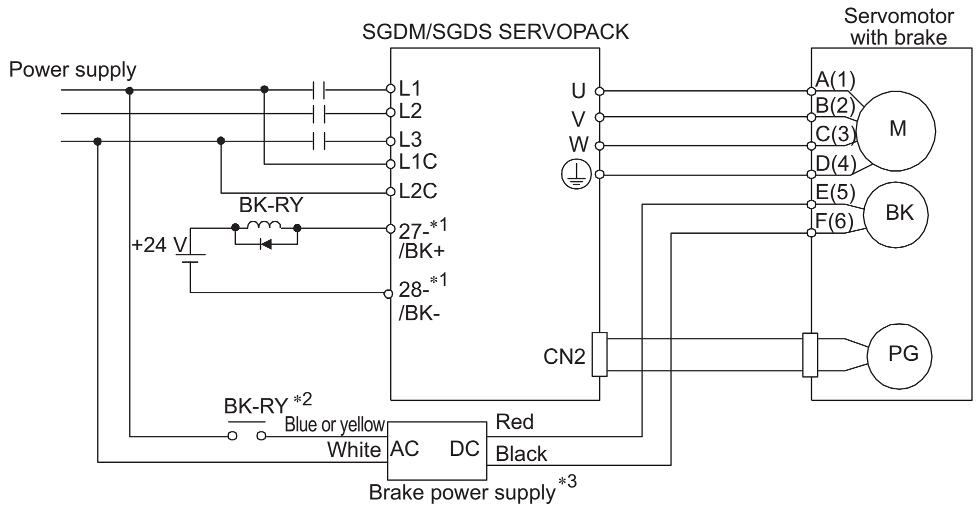
INFO

The Servomotor brake is designed only for holding purposes. The brake must be applied with proper timing when the Servomotor stops. Adjust this parameter while monitoring machine operation.

9

9.1.4 SGDM/SGDS SERVOPACK Connections

■ Connection Example

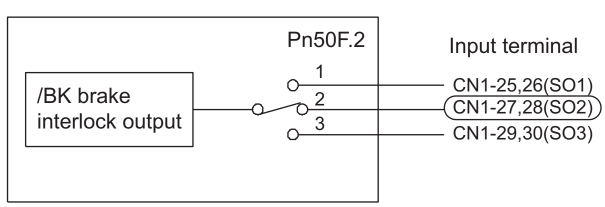


* 1. Parameter PN50F. 2 is the allocated output terminal number.
* 2. Brake control relay
* 3. Brake power supplies are available in either 200 or 100-V models.

■ Parameter Settings

The following parameter setting selects which 1CN pin will output the BK signal.

Pn50F	Output Signal Selection 2	Factory Setting: 0	Speed/torque control and position control



Selects which terminal will output /BK. (Set 2.)

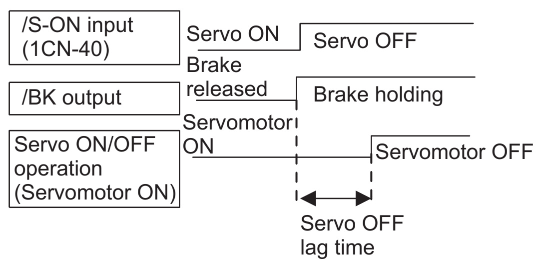
Parameter No.	Setting	Output Terminal (CN1)	
		1	2
Pn50F.2	0	–	–
	1	25	26
	2	27	28
	3	29	30

Pn506 (Time Lag from Brake Reference to Servo OFF)

Use the following parameter if brake ON timing causes the machine to move slightly due to gravity or other forces.

Pn506	Time Lag from Brake Reference to Servo OFF	Units: 10 ms	Setting Range: 0 to 50	Factory Setting: 0	Speed/torque control and position control

Set the brake control output signal /BK and servo OFF operation (Servomotor output stop) timing when you use a Servomotor with brake.



INFO

This setting determines the timing for stopping the Servomotor. Set Pn507 and Pn508 for brake operation with the Servomotor running.

/BK output (brake operation) and the servo are turned OFF at the same time for the factory settings. In this case, the machine may move slightly due to gravity depending on the machine configuration and brake characteristics. This movement can be eliminated by delaying servo OFF operation.

Pn507 and Pn508 (Brake Output Speed Level and Timing during Operation)

Use the following parameters to apply the holding brake when the Servomotor is stopped during Servomotor operation.

Pn507	Brake Output Speed Level during Motor Operation	Units: r/min	Setting Range: 0 to 10000	Factory Setting: 100	Speed/torque control and position control
Pn508	Brake Output Timing during Motor Operation	Units: 10 ms	Setting Range: 0 to 100	Factory Setting: 50	Speed/torque control and position control

When using a Servomotor with brake, be sure to set the brake timing when the /S-ON signal (CN1-40) is input while the Servomotor is running or when an alarm turns the servo OFF.

INFO

The Servomotor brake is designed only for holding purposes. The brake must be applied with proper timing when the Servomotor stops. Adjust this parameter while monitoring machine operation.

9

9.2 Overtravel Function

This section describes the procedure for using the overtravel function.

9.2.1 Overview

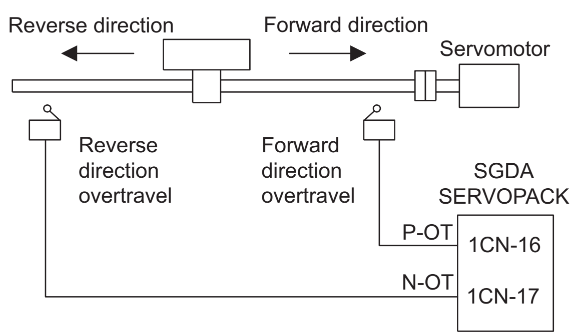
The overtravel function will force the movable part of the machine to stop when it exceeds its movable range. Overtravel stop is available for the MP920 Motion Module when SERVOPACK functions are used.

SERVOPACK connections and parameter settings will vary with the model of SERVOPACK. The following section describes the connection and setting procedure.

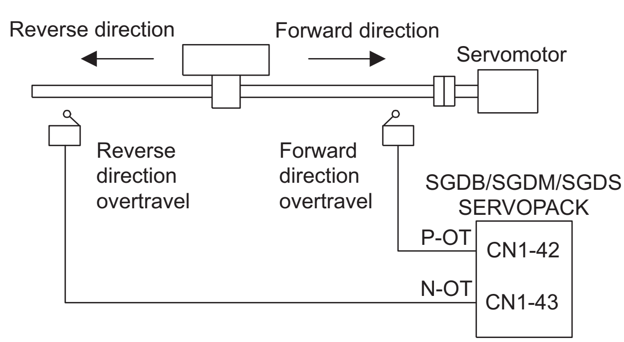
9.2.2 Overtravel Input Signal Connections

You must connect the input signal from the following overtravel limit switch to the appropriate pin number on the SERVOPACK 1CN connector to use the overtravel function.

SGDA Connection



SGDB/SGDM/SGDS Connection



P-OT	When ON 1CN-16 and 1CN-42 at low level	Forward drive enabled, normal operation
	When OFF 1CN-16 and 1CN-42 at high level	Forward drive disabled (reverse movement)
N-OT	When ON 1CN-17 and 1CN-43 at low level	Reverse drive enabled, normal operation
	When OFF 1CN-17 and 1CN-43 at high level	Reverse drive disabled (forward movement)

9.2.3 Parameter Settings

■ Overtravel Input Signal ON/OFF Settings

Set the following parameters to switch between overtravel input signal ON and OFF operation.

SGDM and SGDS SERVOPACKs

Parameter No.	Description	Setting	Meaning	Factory Setting
Pn50A.4	P-OT signal mapping	2	Uses the P-OT (forward run prohibited) input signal. (Forward run prohibited when open, and forward run permitted at 0V.)	2
		8	Fixed the signal to invalid.	
Pn50B.1	N-OT signal mapping	3	Uses the N-OT (reverse run prohibited) input signal. (Reverse run prohibited when open, and reverse run permitted at 0V.)	3
		8	Fixed the signal to invalid.	

Note: We recommend the shaded settings.

SGDA and SGDB SERVOPACKs

Parameter No.	Description	Setting	Meaning	Factory Setting
Cn-01 Bit 2	P-OT input signal ON (Use)/OFF (Not use)	0	Uses the P-OT (forward run prohibited) input signal. (Forward run prohibited when open, and forward run permitted at 0V.)	0
		1	Does not use the P-OT (forward run prohibited) input signal. (Forward run always permitted.)	
Cn-01 Bit 3	N-OT input signal ON (Use)/OFF (Not use)	0	Uses the N-OT (reverse run prohibited) input signal. (Reverse run prohibited when open, and reverse run permitted at 0V.)	0
		1	Does not use the N-OT (reverse run prohibited) input signal. (Reverse run always permitted.)	

Note: We recommend the shaded settings.

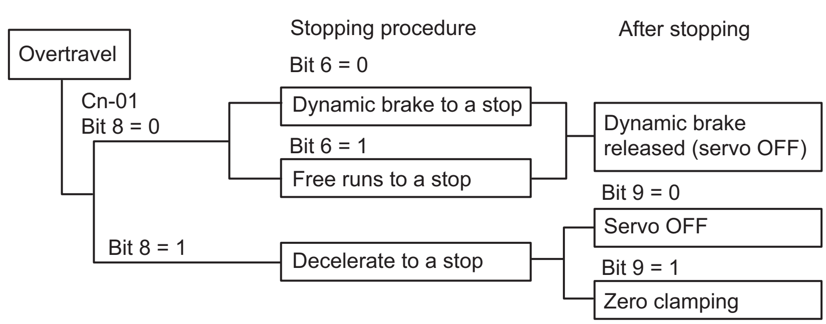
■ Servomotor Stop Procedure Selection with Overtravel

Set the following parameters according to the Servomotor stop procedure if overtravel is set to ON. Select the procedure for stopping if P-OT or N-OT is input while the Servomotor is running.

SGDA and SGDB

Select the stopping procedure as well as the procedure after stopping if the OT signal is input while the Servomotor is running.

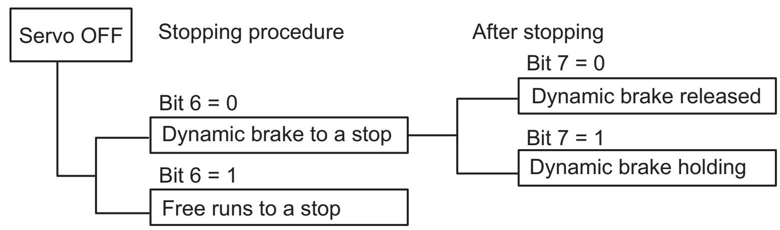
Parameter No.	Description	Setting	Meaning	Factory Setting
Cn-01 bit 8	Servomotor stopping procedure for over-travel	0	Same stopping procedure as for servo OFF: Dynamic brake or free run to a stop (select using CN-01 bit 6)	0
		1	Decelerate to a stop at the preset torque (setting: CN-06 EMGTRQ emergency stop torque)	
Cn-01 bit 9	Processing after stop-ping Servomotor for overtravel	0	Servo turns OFF after decelerating to a stop.	0
		1	Zero clamping after decelerating to a stop.	



Selects the stopping procedure and procedure after stopping when the servo turns OFF.

Parameter No.	Description	Setting	Meaning	Factory Setting
Cn-01 bit 6	Servomotor stopping procedure for servo OFF	0	Stops by dynamic brake (DB).	0
		1	Free runs to a stop. Servomotor turns OFF and the machine stops by mechanical friction.	
Cn-01 bit 7	Processing after stop-ping Servomotor for servo OFF	0	The dynamic brake is released after it is used for stopping.	0
		1	The dynamic brake is not released after it is used for stopping.	

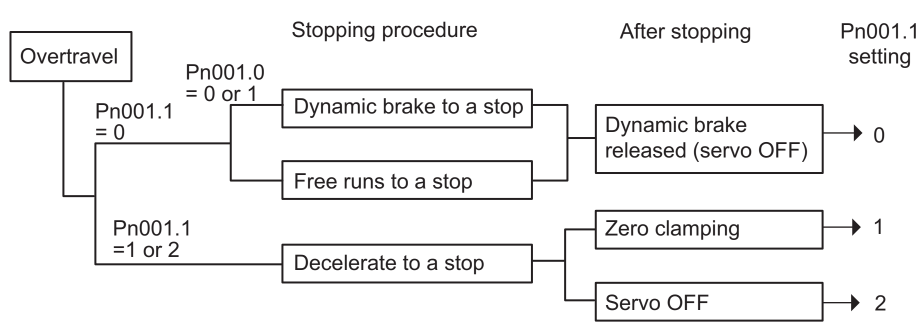
9



SGDM and SGDS

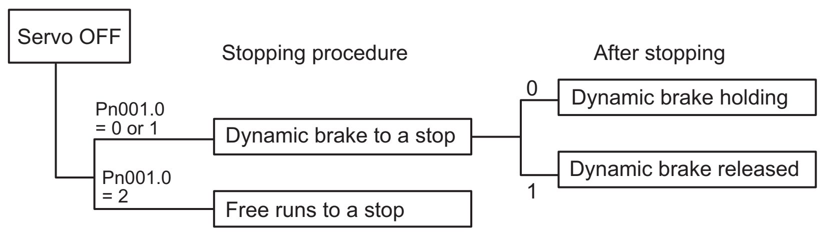
Select the stopping procedure as well as the processing to be performed after stopping the Servomotor if the OT signal is input while the Servomotor is running.

Parameter No.	Description	Setting	Meaning	Factory Setting
Pn001.1	Servomotor stopping procedure for over-travel	0	Use the same stopping method that is used when the servo turns OFF (according to Pn001.0)	0
		1	The servo locks in Zero Clamp Mode after deceleration to a stop with less than the preset torque. (Torque setting: Pn406 emergency stop torque)	
		2	Placed in free-run status after deceleration to a stop with less than the preset torque. (Torque setting: Pn406 emergency stop torque)	



Select the stopping procedure and processing to be performed after stopping the Servomotor when the servo turns OFF.

Parameter No.	Description	Setting	Meaning	Factory Setting
Pn001.0	Servomotor stopping procedure for servo OFF	0	Stops by dynamic brake (DB). Maintains dynamic brake status after stopping the machine with the dynamic brake.	0
		1	Stops by dynamic brake, releases the brake, then set to free-runs status.	
		2	Free runs to a stop. Servomotor turns OFF and the machine stops by mechanical friction.	

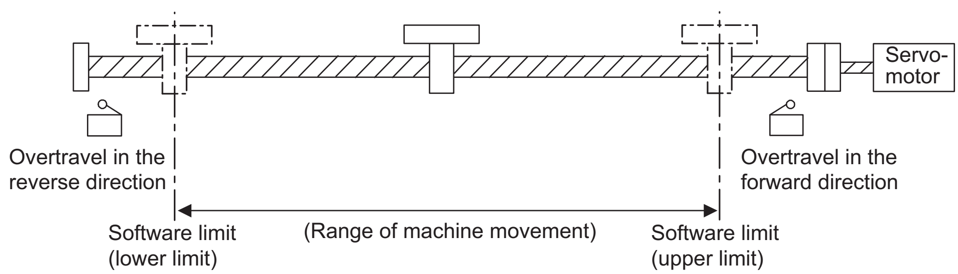


9.3 Software Limit Function

This section describes the software limit function.

9.3.1 Overview

The software limit function is used to set upper and lower limits in fixed parameters for machine range of movement so the controller can constantly monitor the operating range of the machine. The function prevents machine overrun or damage due to incorrect operation or incorrect references in the motion program.



9.3.2 Fixed Parameter Settings

The following fixed parameters must be set to use the software limit function.

Parameter No.	Name	Units	Setting Range
17	Motion Controller Function Selection Flags Bit 7: Positive Software Limit Selection Bit 8: Negative Software Limit Selection	–	 0: Enabled, 1: Disabled 0: Enabled, 1: Disabled
27	Positive Software Limit	1 = Reference units	-2147483648 to 2147483647
29	Negative Software Limit	1 = Reference units	-2147483648 to 2147483647

Set the upper and lower software limits for the machine coordinate system.

The machine coordinate system is determined by returning to the zero point.

The software limit function is implemented after the machine returns to the zero point.

Be sure to return to the zero point after power is turned ON.

The following table shows the effect of software limits in each operating mode.

Axis Movement	Check	Remarks
Interpolation	Yes	• Constantly checks the software limit range during interpolation movement and decelerates to a stop at the software limit position.
Feed	Yes	• Executes a command to move to the software limit position when the software limit function is enabled. • Can move back to within the stroke after an error is cleared.
Positioning Step	Yes	• Positions the axis at the upper software limit and generates an alarm if a positioning command is executed to move to a position beyond the software limits.

IMPORTANT

The software limit function will be enabled after returning to the zero point in Position Control Mode or after the zero point is set.

9.3.3 Processing after an Alarm

■ Alarm Data

A forward/reverse direction software limit alarm will occur if an axis exceeds the software limit. This alarm can be monitored from the monitoring parameter alarm (IL□□22).

Name	Register No.	Meaning	
Alarms (ALARM)	IL□□22	Bit 3: SOTF	Positive software limit
		Bit 4: SOTR	Negative software limit

■ Clearing a Software Limit Alarm

The following procedure is used to clear alarm status generated by a software limit alarm.

1. Alarm Reset

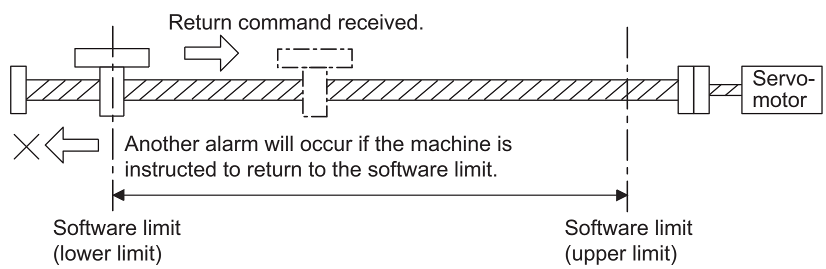
   Turn ON Alarm Clear (bit 6) of RUN Mode Settings (OW□□00).

   The alarm at IL□□22 will be cleared.

Name	Register Setting	Meaning	
RUN Mode Settings	OW□□00	Bit 6: ACR	Alarm clear

2. Return

   The FEED and STEP commands can be used to move the machine back inside the software limit.



9

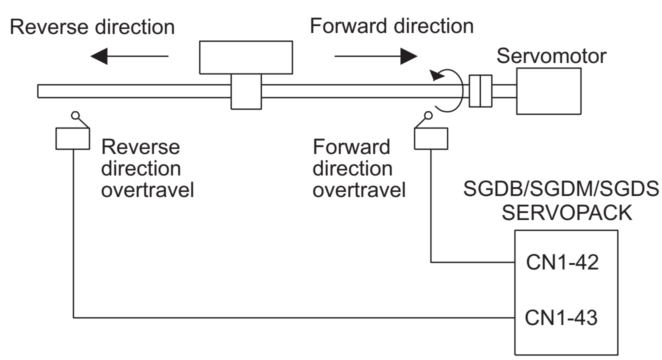
9.4 Reverse Rotation Mode

This section describes the procedure used to set parameters when using the Reverse Rotation Mode setting in a SERVOPACK connected to an SVA Module.

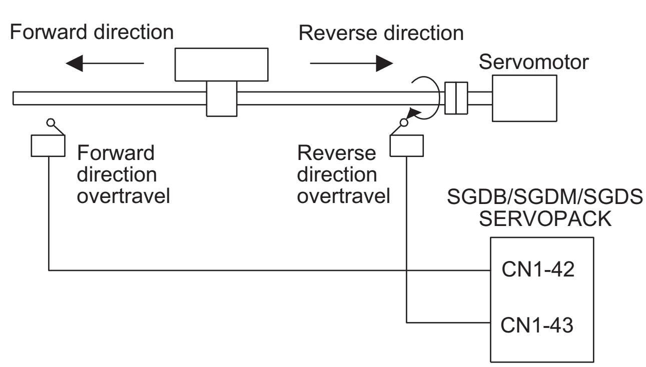
9.4.1 Overview

SERVOPACKs are equipped with a Reverse Rotation Mode that inverts the direction of Servomotor rotation without rewiring the Servomotor. Only the direction of Servomotor rotation is inverted in Reverse Rotation Mode. Here the direction in which the axis moves (+, -) is reversed, but nothing else changes.

■ Standard Setting Operation



■ Operation in Reverse Rotation Mode



The following parameters may or may not be set depending on the applicable type of Motion Module and encoder when Reverse Rotation Mode control is used in machine or other configurations.

The following section describes the parameters related to Reverse Rotation Mode operation.

SERVOPACK Reverse Rotation Mode Parameter Settings

Parameter		Description	Setting	Meaning	Factory Setting
SGDA, SGDB	SGDM, SGDS				
Cn-02 bit 0	Pn000.0	Rotation Direction Selection	0	Counterclockwise when viewing the Servomotor from the load end is the forward direction (standard setting).	0
			1	Clockwise when viewing the Servomotor from the load end is the forward direction (Reverse Rotation Mode).	

Fixed Parameters for the SVA Module

Parameter No.	Name	Description	Factory Setting
4	Rotation Direction Selection with an Absolute Encoder (DIRINV)	Specifies the rotation direction when using an absolute encoder. 0: Forward rotation selection 1: Reverse rotation selection	0 (Forward rotation selection)

9.4.2 Absolute Encoder Setting

Set the following parameters when using an absolute encoder with the SVA Module to set the Reverse Rotation Mode on the SERVOPACK and invert the rotation direction of the Servomotor.

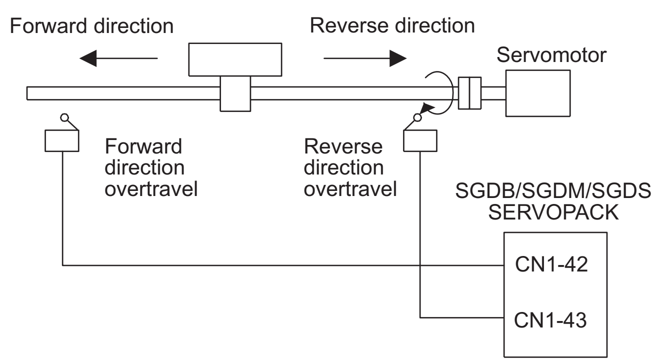
Set these settings carefully. Improper settings will cause incorrect operation.

Setting the Rotation Direction Selection SERVOPACK Parameter

Parameter		Description	Setting	Meaning	Factory Setting
SGDA, SGDB	SGDM, SGDS				
Cn-02 bit 0	Pn000.0	Rotation Direction Selection	0	Counterclockwise when viewing the Servomotor from the load end is the forward direction (standard setting).	0
			1	Clockwise when viewing the Servomotor from the load end is the forward direction (Reverse Rotation Mode).	

Fixed Parameters for the SVA Module

Parameter No.	Name	Description		Factory Setting
4	Rotation Direction Selection with an Absolute Encoder (DIRINV)	Specifies the rotation direction when using an absolute encoder.		0 (Forward rotation selection)
		0	Forward rotation selection	
		1	Reverse rotation selection	



INFO

- Set the following items as shown to use the standard Servomotor rotation direction setting.
  - Set the SERVOPACK Parameter (Rotation Direction Selection) to 0 (standard setting).
  - Set the SVA Module fixed parameter No. 4 (Rotation Direction Selection with an Absolute Encoder) to 0 (forward rotation selection).
- Connect the overtravel signals according to the movement of the machine (forward and reverse). See *9.2 Overtravel Function* for more details.

9.4.3 Incremental Encoder Setting

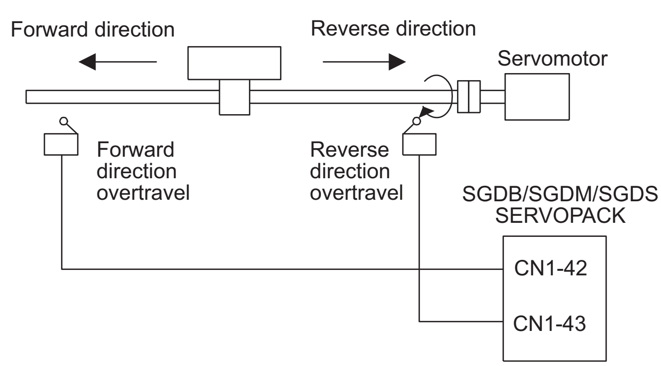
Set the following Rotation Direction Selection SERVOPACK Parameter when using an incremental encoder with the SVA Module to set the Reverse Rotation Mode on the SERVOPACK and invert the rotation direction of the Servomotor.

Set these settings carefully. Improper settings will cause incorrect operation.

Setting the Rotation Direction Selection SERVOPACK Parameter

Parameter		Description	Setting	Meaning
SGDA, SGDB	SGDM, SGDS			
Cn-02 bit 0	Pn000.0	Rotation Direction Selection	0	Counterclockwise when viewing the Servomotor from the load end is the forward direction (standard setting).
			1	Clockwise when viewing the Servomotor from the load end is the forward direction (Reverse Rotation Mode).

The SVA Module fixed parameter No. 4 (Rotation Direction Selection with an Absolute Encoder) is only enabled when using an absolute encoder and does not have to be set when using an incremental encoder.



IMPORTANT

Be sure to set the SERVOPACK Parameter Cn-0002 bit 0 (Rotation Direction Selection) to 1 regardless of the type of encoder that is used to set the Reverse Rotation Mode on the SERVOPACK connected to an SVB-01 Module and to reverse the Servomotor rotation direction.

9

10

CNTR-01 Module Specifications and Handling

This chapter describes the specifications and handling of the CNTR-01 Counter Module.

10.1 CNTR-01 Module

This section describes the hardware specifications and handling of the CNTR-01 Module.

10.1.1 Hardware Specifications

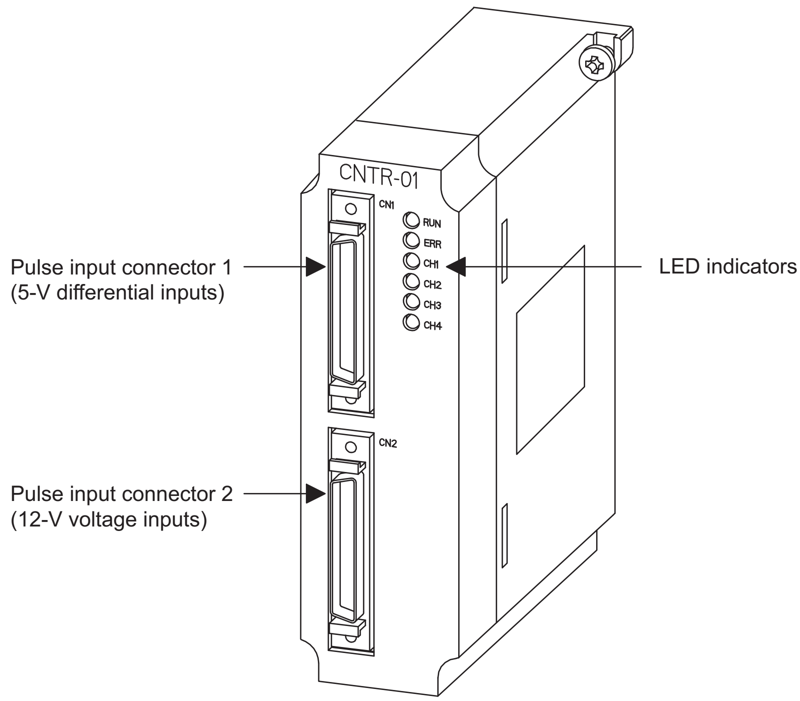
The following table shows the hardware specifications of the CNTR-01 Module.

Table 10.1 CNTR-01 Module Hardware Specifications

Item	Specifications		
Name	Counter Module		
Model Number	JEPMC-PL200		
Description	CNTR-01		
Number of Channels	4		
Input Circuit Method (Selected via Software)	5-V Differential Input	12-V Voltage Input	
	Response frequency: 2 MHz RS-422	Response frequency: 120 kHz 12 V 7 mA, current source input Photocoupler insulation	
Input Method (Selected via Software)	Phase-A/B/C mode (×1, ×2, or ×4)	Up/Down mode (×1 or ×2)	Sign mode (×1 or ×2)
Counter Function (Selected via Software)	Reversible counter	Interval counter	Frequency measurement
	Maximum frequency: 2 MHz (for 5-V different input)		
Coincidence Interruption	Output to CPU Module via system bus. DO signals are output at the same time.		
Coincidence Output	4 points, 24 V, 50 mA current sinking output, photocoupler isolation		
PI Latch Input	4 points, 24 V, 50 mA current sinking output, photocoupler isolation		
Current Consumption	530 mA		
Indicators	Module status LED indicators RUN (green) Operating normally/stopped ERR (red) Normal/Module failure COUNT1 (green) CH1 counting Up/Down COUNT2 (green) CH2 counting Up/Down COUNT3 (green) CH3 counting Up/Down COUNT4 (green) CH4 counting Up/Down		
Connectors	CN1: 10250-52A2JL (5-V input, 4 channels) CN2: 10250-52A2JL (12-V input, 4 channels)		
Hot Swapping (Removal/Insertion under Power)	Not possible.		
Dimensions	40 × 130 × 105 mm (W × H × D)		

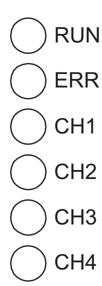
10.1.2 Handling

The following illustration shows the appearance of the CNTR-01 Module.



■ LED Indicators

These LED indicators display the run or error status of the CNTR-01 Counter Module.



LED Name	Indicator	Meaning when ON
RUN	Green	System operating normally.
ERR	Red	Fault occurred (lit or flashing).
CH1	Green	CH1 counter pulse is being input.
CH2	Green	CH2 counter pulse is being input.
CH3	Green	CH3 counter pulse is being input.
CH4	Green	CH4 counter pulse is being input.

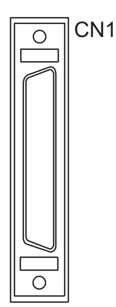
10

The following table shows the LED indicators when an error occurs in a CNTR-01 Module.

Error (Detected by Online Self-diagnostic Function)	LED Indicator		
	RUN	ERR	CH1 to CH4
ROM Diagnostic Error	Lit	Flashes once	Indefinite
RAM Diagnostic Error	Lit	Flashes twice	Indefinite
Shared Memory Diagnostic Error	Lit	Flashes 3 times	Indefinite
CPU Built-in Timer Diagnostic Error	Lit	Flashes 4 times	Indefinite
Timer Diagnostic Error	Lit	Flashes 5 times	Indefinite
General Illegal Command Interrupt	Not lit	Flashes once	Indefinite
Slot Illegal Command Interrupt	Not lit	Flashes twice	Indefinite
CPU Address Error Interrupt	Not lit	Flashes 3 times	Indefinite
DMA Address Error Interrupt	Not lit	Flashes 4 times	Indefinite
User Brake Interrupt	Not lit	Flashes 5 times	Indefinite
Trap Command Interrupt	Not lit	Flashes 6 times	Indefinite
Watchdog Timer Expired	Lit	Flashes 15 times	Indefinite

■ Pulse Input Connector 1

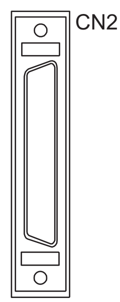
5-V Differential Pulse Input Connector



This connector is used to connect 5-V differential pulse input signal terminals to the CNTR-01 Module.
Number of Channels: 4

■ Pulse Input Connector 2

12-V Voltage Pulse Input + Latch Input + Coincidence Detection Output Connector



This connector is used to connect 12-V voltage pulse input, latch input, and coincidence detection output signal terminals to a CNTR-01 Module.
Number of Channels: 4

IMPORTANT

The CNTR-01 Module uses up to 4 channels. Select either a 5-V differential input or a 12-V voltage input for each channel.

■ Connector Specifications

The following table shows the specifications of the pulse input connectors.

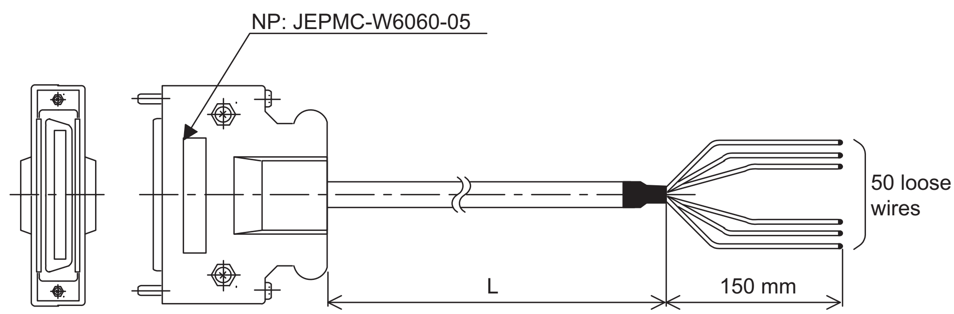
Name	Connector Name	Number of Pins	Connector			Cable
			On Module	On Cable	Manufacturer	
Pulse Input Connector 1	CN1	50	10250-52A2JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw lock) 10350-52F0-008 (One-touch lock)	3M	JEPMC-W6060-□□
Pulse Input Connector 2	CN2	50	10250-52A2JL	• Connector body: 10150-3000VE • Shell: 10350-52A0-008 (Screw lock) 10350-52F0-008 (One-touch lock)	3M	JEPMC-W6060-□□

■ External I/O Cables

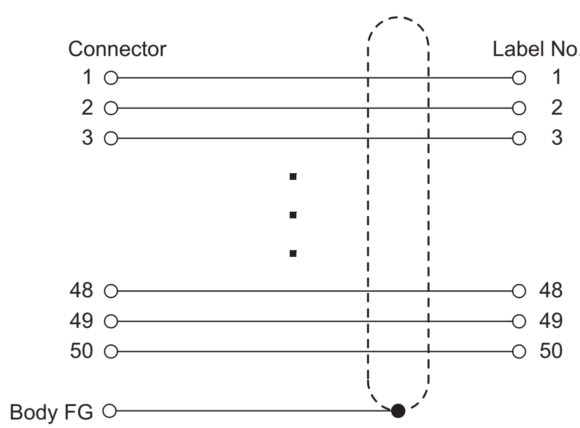
Models

JEPMC-W6060-05: 0.5 m
JEPMC-W6060-10: 1.0 m
JEPMC-W6060-30: 3.0 m

Appearance

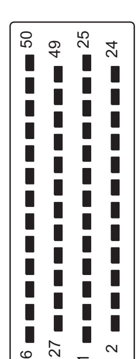


Cable Connection Diagram



■ Connector Pin Layout (CN1)

The pin layout of the CN1 connector is shown below.



Pin Layout on Wiring Side

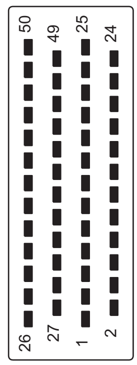
50	–	49	–	25	–	24	–
48	GND	47	-5PC4	23	GND	22	+5PC4
46	-5PB4	45	-5PA4	21	+5PB4	20	+5PA4
44	–	43	–	19	–	18	–
42	GND	41	-5PC3	17	GND	16	+5PC3
40	-5PB3	39	-5PA3	15	+5PB3	14	+5PA3
38	–	37	GND	13	–	12	GND
36	-5PC2	35	-5PB2	11	+5PC2	10	+5PB2
34	-5PA2	33	–	9	+5PA2	8	–
32	–	31	GND	7	–	6	GND
30	-5PC1	29	-5PB1	5	+5PC1	4	+5PB1
28	-5PA1	27	–	3	+5PA1	2	–
26	–			1	–		

The following table shows the names and functions of the CN1 connector pins.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	–	–	26	–	–
2	–	–	27	–	–
3	+5PA1	+PI 5V Phase-A 1	28	-5PA1	-PI 5V Phase-A 1
4	+5PB1	+PI 5V Phase-B 1	29	-5PB1	-PI 5V Phase-B 1
5	+5PC1	+PI 5V Phase-C 1	30	-5PC1	-PI 5V Phase-C 1
6	GND	Ground	31	GND	Ground
7	–	–	32	–	–
8	–	–	33	–	–
9	+5PA2	+PI 5V Phase-A 2	34	-5PA2	-PI 5V Phase-A 2
10	+5PB2	+PI 5V Phase-B 2	35	-5PB2	-PI 5V Phase-B 2
11	+5PC2	+PI 5V Phase-C 2	36	-5PC2	-PI 5V Phase-C 2
12	GND	Ground	37	GND	Ground
13	–	–	38	–	–
14	+5PA3	+PI 5V Phase-A 3	39	-5PA3	-PI 5V Phase-A 3
15	+5PB3	+PI 5V Phase-B 3	40	-5PB3	-PI 5V Phase-B 3
16	+5PC3	+PI 5V Phase-C 3	41	-5PC3	-PI 5V Phase-C 3
17	GND	Ground	42	GND	Ground
18	–	–	43	–	–
19	–	–	44	–	–
20	+5PA4	+PI 5V Phase-A 4	45	-5PA4	-PI 5V Phase-A 4
21	+5PB4	+PI 5V Phase-B 4	46	-5PB4	-PI 5V Phase-B 4
22	+5PC4	+PI 5V Phase-C 4	47	-5PC4	-PI 5V Phase-C 4
23	GND	Ground	48	GND	Ground
24	–	–	49	–	–
25	–	–	50	–	–

■ Connector Pin Layout (CN2)

The pin layout of the CN2 connector is shown below.



Pin Layout on Wiring Side

50	24PC4	49	12PC4	25	–	24	12/24VC4
48	12PB4	47	12PA4	23	12VB4	22	12VA4
46	24PC3	45	12PC3	21	–	20	12/24VC3
44	12PB3	43	12PA3	19	12VB3	18	12VA3
42	–	41	24PC2	17	–	16	–
40	12PC2	39	12PB2	15	12/24VC2	14	12VB2
38	12PA2	37	24PC1	13	12VA2	12	–
36	12PC1	35	12PB1	11	12/24VC1	10	12VB1
34	12PA1	33	–	9	12VA1	8	–
32	PIL4	31	PIL2	7	PIL3	6	PIL1
30	+24V	29	–	5	+24V	4	–
28	COIN4	27	COIN2	3	COIN3	2	COIN1
26	0V1 (24V)			1	0V1 (24V)		

The following table shows the names and functions of the CN2 connector pins.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	0V1 (24 V)	Coincidence output ground	26	0V1 (24 V)	Coincidence output ground
2	COIN1	CH1 coincidence output	27	COIN2	CH2 coincidence output
3	COIN3	CH3 coincidence output	28	COIN4	CH4 coincidence output
4	–	–	29	–	–
5	+24V	External power supply for PIL	30	+24V	External power supply for PIL
6	PIL1	CH1 PI latch input	31	PIL2	CH2 PI latch input
7	PIL3	CH3 PI latch input	32	PIL4	CH4 PI latch input
8	–	–	33	–	–
9	12VA1	Power supply + 12 V Phase-A 1	34	12PA1	PI 12 V Phase-A 1
10	12VB1	Power supply + 12 V Phase-B 1	35	12PB1	PI 12 V Phase-B 1
11	12/24VC1	Power supply + 12/ 24 V Phase-C 1	36	12PC1	PI 12 V Phase-C 1
12	–	–	37	24PC1	PI 24 V Phase-C 1
13	12VA2	Power supply + 12 V Phase-A 2	38	12PA2	PI 12 V Phase-A 2
14	12VB2	Power supply + 12 V Phase-B 2	39	12PB2	PI 12 V Phase-B 2
15	12/24VC2	Power supply + 12/ 24 V Phase-C 2	40	12PC2	PI 12 V Phase-C 2
16	–	–	41	24PC2	PI 24 V Phase-C 2
17	–	–	42	–	–
18	12VA3	Power supply + 12 V Phase-A 3	43	12PA3	PI 12 V Phase-A 3
19	12VB3	Power supply + 12 V Phase-B 3	44	12PB3	PI 12 V Phase-B 3
20	12/24VC3	Power supply + 12/ 24 V Phase-C 3	45	12PC3	PI 12 V Phase-C 3
21	–	–	46	24PC3	PI 24 V Phase-C 3
22	12VA4	Power supply + 12 V Phase-A 4	47	12PA4	PI 12 V Phase-A 4
23	12VB4	Power supply + 12 V Phase-B 4	48	12PB4	PI 12 V Phase-B 4
24	12/24VC4	Power supply + 12/ 24 V Phase-C 4	49	12PC4	PI 12 V Phase-C 4
25	–	–	50	24PC4	PI 24 V Phase-C 4

10.2 Using the CNTR-01 Module

This section explains how to use the CNTR-01 Module.

10.2.1 Overview

■ Module Overview

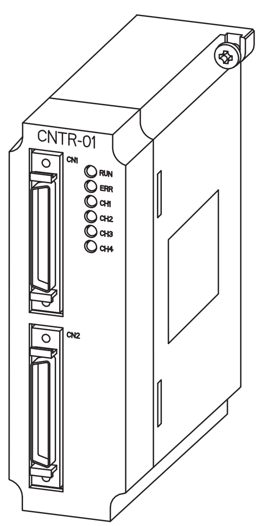
The CNTR-01 Module is equipped with 4 pulse input (PI) channels.

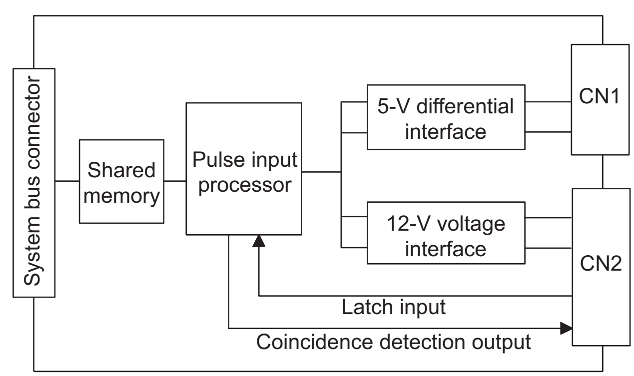
Each channel can accept either 5-V differential or 12-V voltage pulses. Connect 5-V differential inputs to connector CN1 and 12-V voltage inputs to connector CN2.

The CNTR-01 Module provides a PI latch function, which latches the counter value when a latch signal is received, and a coincidence detection function, which generates an output signal and outputs an interrupt signal to the CPU-01 Module when the count matches a preset value.

The following three methods can be used to count pulse input (PI) signals.

- Reversible counter
- Interval counter
- Frequency measurement





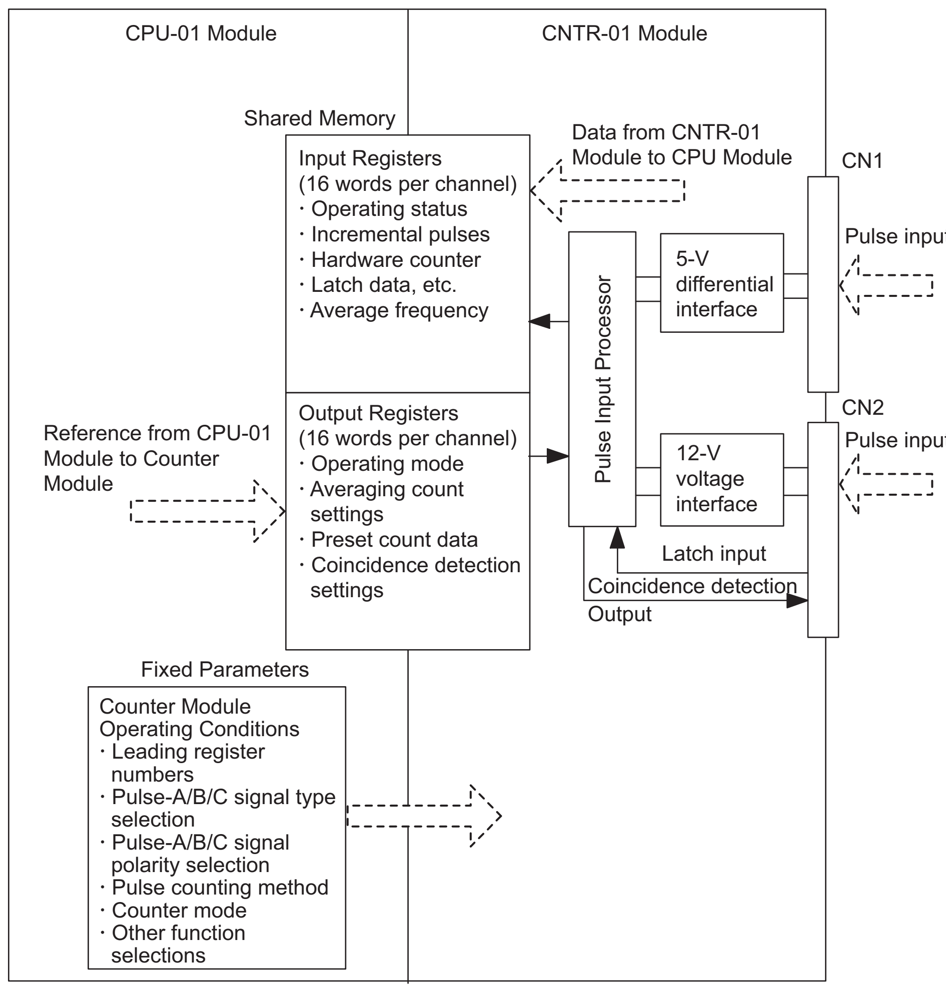
INFO

- Count data is input at regular intervals for each CPU-01 Module scan (high-speed or low-speed). During each scan, count data is simultaneously input for all four channels.
- The user can specify whether each channel is to be used or not to be used. The processing times for the CNTR-01 Module and CPU-01 Module can be reduced accordingly.
- The user must select up to four channels from a total of eight channels: Four 5-V input channels on the CN1 connector and four 12-V input channels on the CN2 connector.

■ Module Configuration

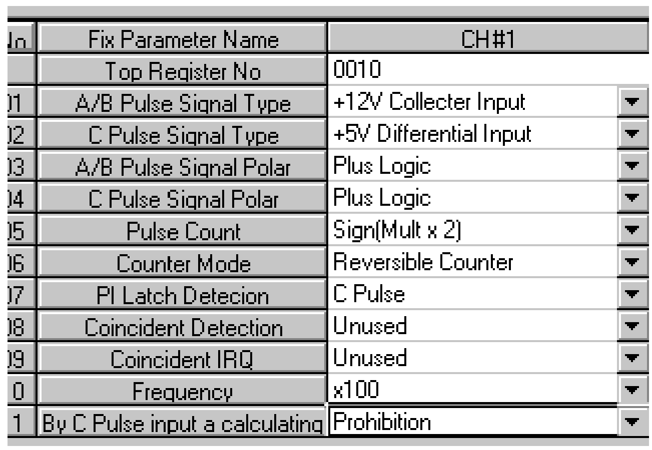
The Counter Module executes the functions specified in fixed parameters and output registers, and outputs status information and counter values to input registers.

The following illustration shows data flow for the CNTR-01 Module.



10.2.2 Fixed Parameters

Set the Counter Module operating conditions for each channel.



No	Fix Parameter Name	CH#1
	Top Register No	0010
01	A/B Pulse Signal Type	+12V Collecter Input
02	C Pulse Signal Type	+5V Differential Input
03	A/B Pulse Signal Polar	Plus Logic
04	C Pulse Signal Polar	Plus Logic
05	Pulse Count	Sign(Mult x 2)
06	Counter Mode	Reversible Counter
07	PI Latch Detecion	C Pulse
08	Coincident Detection	Unused
09	Coincident IRQ	Unused
0	Frequency	x100
1	By C Pulse input a calculating	Prohibition

INFO

1. Set fixed parameters using the MPE720 Module Definition Window. Fixed parameters cannot be changed from ladder logic programs.
2. Set "-" as the **Top Register No** (leading register number) for channels that are not to be used.

10

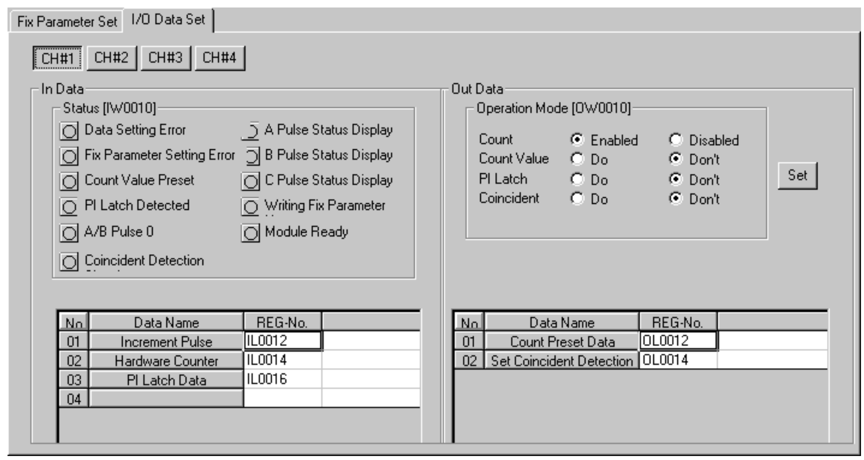
The following table shows the details of each fixed parameter.

No.	Name	Description	Default Value
–	Top register No (leading register number)	Specify the leading I/O register number to be used for each channel. Specify "–" for channels not to be used.	The register number specified on the Module Definition Window will be automatically assigned.
1	Pulse-A/B Signal Type	Specify either +5V Differential Input or +12V Collector Input.	+5-V Differential Input
2	Pulse-C Signal Type	Specify either +5V Differential Input or +12V Collector Input.	+5-V Differential Input
3	Pulse-A/B Signal Polar	Specify either Plus Logic or Negative Logic as pulse A/B signal polarity.	Plus Logic (positive logic)
4	Pulse-C Signal Polar	Specify either Plus Logic or Negative Logic as pulse C signal polarity.	Plus Logic (positive logic)
5	Pulse Count Method	Specify one of the following pulse counting modes. • Sign mode (×1) • Sign mode (×2) • Up/Down mode (×1) • Up/Down mode (×2) • Pulse-A/B mode (×1) • Pulse-A/B mode (×2) • Pulse-A/B mode (× 4)	Pulse A/B mode (× 4)
6	Counter Mode	Specify one of the following counter modes. • Reversible Counter • Interval Counter • Frequency Measurement	Reversible Counter
7	PI Latch Detection	Specify one of the following external signals for PI latch detection. • PI Latch: Uses PI latch input signal. • Pulse -C: Uses Pulse-C as a PI latch detection signal.	PI Latch
8	Coincident Detection	Specify whether to use coincidence detection.	Not used.
9	Coincident IRQ	Specify whether to use a coincidence interrupt. This function is valid only when coincidence detection is selected.	Not used.
10	Frequency	Select the number of detectable frequency digits from the values shown below when the counter mode is set to Frequency Measurement. ×1, ×10, ×100, ×1000	× 100
11	By Pulse-C input a calculating	Specify whether to enable or disable the counter while pulse C is being input.	Prohibition (Disabled)

10.2.3 Setting I/O Data

I/O data includes data reported by the Counter Module, operating status data, and settings and request flags sent to the Counter Module as references.

The I/O Data Setting Window is shown below.



The contents of I/O data is described below.

■ In Data (Input Data)

Input data is reported by the Counter Module to the CPU Module. It is stored in the input registers of the CPU Module at the beginning of each scan.

Name	Register Number	Range	Meaning	Reversible Counter	Interval Counter	Frequency Measurement
Status	IW□□□□	Each bit	–	√	√	√
Reserve	IW□□□□ + 1	–	–	–	–	–
Increment Pulse	IL□□□□ + 2	0 to $\pm 2^{31}$-1	1 = 1 pulse	√	–	√
Hardware Counter	IL□□□□ + 4	0 to $\pm 2^{31}$-1	1 = 1 pulse	√	√	√
PI Latch Data, Interval Data, or Detected Frequency	IL□□□□ + 6	0 to $\pm 2^{31}$-1	1 = 1 pulse			
			Reversible Counter: PI Latch Data	√	–	–
			Interval Counter: Interval Data	–	√	–
			Frequency Measurement: Detected Frequency	–	–	√
Average Frequency	IL□□□□ + 8	0 to $\pm 2^{31}$-1	1 = 1 pulse	–	–	√
Reserve	IW□□□□ + A to IW□□□□ + F	–	–	–	–	–

Note: √: Supported, –: Not supported

10

■ Out Data (Output Data)

Output data is used as references for the Counter Module. It is output to the Counter Module at the beginning of each scan.

Name	Register Number	Range	Meaning	Reversible Counter	Interval Counter	Frequency Measurement
Operating Mode	OW□□□□	Individual bits	1 = 1 time 0 = No averaging	√	√	√
Averaging Count Setting	OW□□□□ + 1	0 to 255	1 = 1 pulse	–	–	√
Count Preset Data	OL□□□□ + 2	0 to $\pm 2^{31}$-1	1 = 1 pulse	√	–	–
Set Coincidence Detection	OL□□□□ + 4	0 to $\pm 2^{31}$-1	1 = 1 pulse	√	√	√
Reserve	OW□□□□ + 6 to OW□□□□ + F	–	–	–	–	–

Note: √: Supported, –: Not supported

■ Status (Operating Status)

Bit No.	Name	Reversible Counter	Interval Counter	Frequency Measurement
0	Data Setting Error	√	√	√
1	Fixed Parameter Setting Error	√	√	√
2	Count Value Preset	√	–	–
3	PI Latch Detected (1: PI latch detected)	√	–	–
4	Pulse A/B 0 (1: Within feedback pulse ±1)	√	√	√
5	Coincidence Detected (1: Coincidence detection signal ON)	√	√	√
6	Pulse A Status (1: High, 0: Low)	√	√	√
7	Pulse B Status (1: High, 0: Low)	√	√	√
8	Pulse C Status (1: High, 0: Low)	√	√	√
9	Writing Fixed Parameter (Online parameters are being written)	√	√	√
10	Not used.	–	–	–
11	Not used.	–	–	–
12	Not used.	–	–	–
13	Not used.	–	–	–
14	Not used.	–	–	–
15	Module Ready (1: Started normally)	√	√	√

Note: √: Supported, –: Not supported

■ Operating Mode

Bit No.	Name	Reversible Counter	Interval Counter	Frequency Measurement
0	Count (1: Counting disabled)	√	√	–
1	Count Value (1: Count preset request enabled)	√	–	–
2	PI Latch (1: PI latch detection request enabled)	√	–	–
3	Coincidence (1: Coincidence detection request enabled)	√	√	√
4	Not used.	–	–	–
5	Not used.	–	–	–
6	Not used.	–	–	–
7	Not used.	–	–	–
8	Not used.	–	–	–
9	Not used.	–	–	–
10	Not used.	–	–	–
11	Not used.	–	–	–
12	Not used.	–	–	–
13	Not used.	–	–	–
14	Not used.	–	–	–
15	Not used.	–	–	–

Note: √: Supported, –: Not supported

■ Pulse Count Methods

The following pulse count methods can be selected using fixed parameter 05 (Pulse Count).

Table 10.2 Pulse Count Methods

Count Type	Pulse Count Method*1	Multiplication*2	Pulse C Function
Reversible Counter	Sign mode	× 1	Stops the counter while pulse C is being input. Note: Fixed parameter 11 can be used to enable or disable the counter.
		× 2	
	A/B mode	× 1	
		× 2	
		× 4	
	Up/Down mode	× 1	
		× 2	
Interval Counter	Sign mode	× 1	Latches the count result and resets the counter at the rising edge of pulse C.
		× 2	
	A/B mode	× 1	
		× 2	
		× 4	
	Up/Down mode	× 1	
		× 2	
Frequency Measurement	Sign mode	× 1	Pulse C is not used (or pulse C is invalid).
		× 2	
	A/B mode	× 1	
		× 2	
		× 4	
	Up/Down mode	× 1	
		× 2	

* 1. Pulse Count Method

• Sign Mode

Positive Logic 5-V Differential Input:

Increments the count if pulse A is input when pulse B is at low level. (Positive for frequency measurements.)

Decrements the count if pulse A is input when pulse B is at high level. (Negative for frequency measurements.)

Negative Logic 5-V Differential Input:

Decrements the count if pulse A is input when pulse B is at high level. (Positive for frequency measurements.)

Increments the count if pulse A is input when pulse B is at low level. (Negative for frequency measurements.)

Positive Logic 12-V Pull-up Collector Input:

Decrements the count if pulse A is input when pulse B is at high level. (Positive for frequency measurements.)

Increments the count if pulse A is input when pulse B is at low level. (Negative for frequency measurements.)

Negative Logic 12-V Pull-up Collector Input:

Increments the count if pulse A is input when pulse B is at low level. (Positive for frequency measurements.)

Decrements the count if pulse A is input when pulse B is at high level. (Negative for frequency measurements.)

- A/B Mode

Positive or Negative Logic:

Increments the count when the phase of pulse A advances from that of pulse B. (Positive for frequency measurements.)

Decrements the count when the phase of pulse A lags behind that of pulse B. (Negative for frequency measurements.)

- Up-down Mode

Positive or Negative Logic:

Adds a pulse when pulse A is input. (Positive for frequency measurements.)

Subtracts a pulse when pulse B is input. (Negative for frequency measurements.)

* 2. Multiplication

Positive Logic:

×1: Counts at the rising edge of pulse A.

×2: Counts at the rising and falling edges of pulse A.

×3: Counts at the rising and falling edges of pulses A and B

Negative Logic:

×1: Counts at the falling edge of pulse A.

×2: Counts at the rising and falling edges of pulse A.

×3: Counts at the rising and falling edges of pulses A and B.

Table 10.3 External Input Pulse Timing

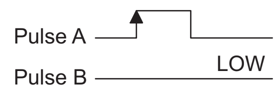
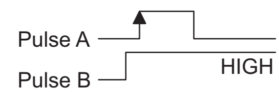
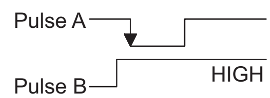
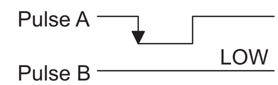
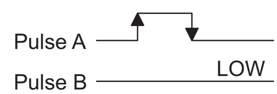
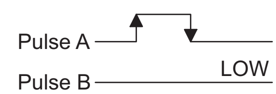
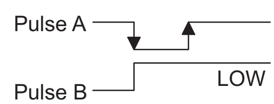
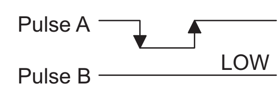
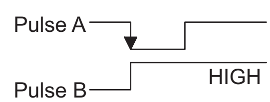
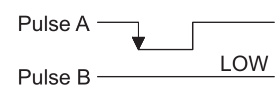
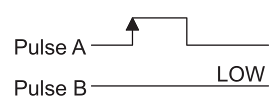
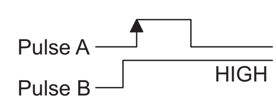
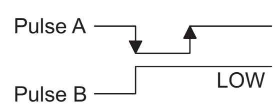
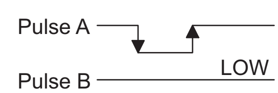
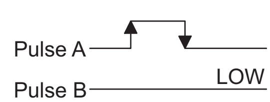
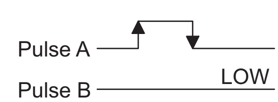
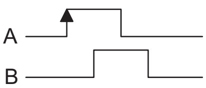
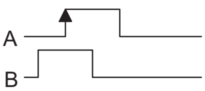
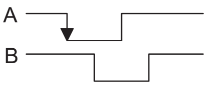
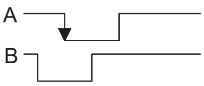
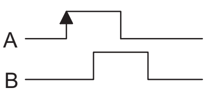
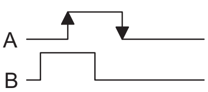
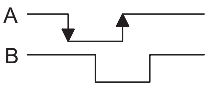
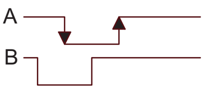
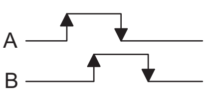
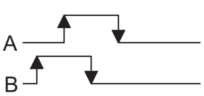
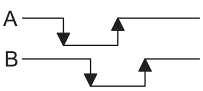
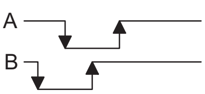
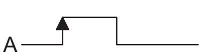
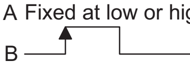
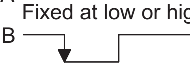
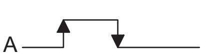
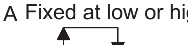
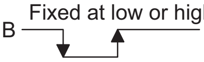
Pulse Count Method		Polarity	Increment (Forward Rotation)	Decrement (Reverse Rotation)
Sign Mode (5-V Different Input)	×1	Positive Logic		
		Negative Logic		
	×2	Positive Logic		
		Negative Logic		
Sign Mode (12-V Pull-up Collector Input)	×1	Positive Logic		
		Negative Logic		
	×2	Positive Logic		
		Negative Logic		

Table 10.3 External Input Pulse Timing (cont'd)

Pulse Count Method		Polarity	Increment (Forward Rotation)	Decrement (Reverse Rotation)
A/B Mode	× 1	Positive Logic	Pulse A Pulse B 	Pulse A Pulse B 
		Negative Logic	Pulse A Pulse B 	Pulse A Pulse B 
	× 2	Positive Logic	Pulse A Pulse B 	Pulse A Pulse B 
		Negative Logic	Pulse A Pulse B 	Pulse A Pulse B 
	× 4	Positive Logic	Pulse A Pulse B 	Pulse A Pulse B 
		Negative Logic	Pulse A Pulse B 	Pulse A Pulse B 
Up-down Mode	× 1	Positive Logic	Pulse A  Fixed at low or high Pulse B	Pulse A Fixed at low or high Pulse B 
		Negative Logic	Pulse A  Pulse B Fixed at low or high	Pulse A Fixed at low or high Pulse B 
	× 2	Positive Logic	Pulse A  Fixed at low or high Pulse B	Pulse A Fixed at low or high Pulse B 
		Negative Logic	Pulse A  Pulse B Fixed at low or high	Pulse A Fixed at low or high Pulse B 

10.3 Counter Modes

This section explains the counter modes for the CNTR-01 Module.

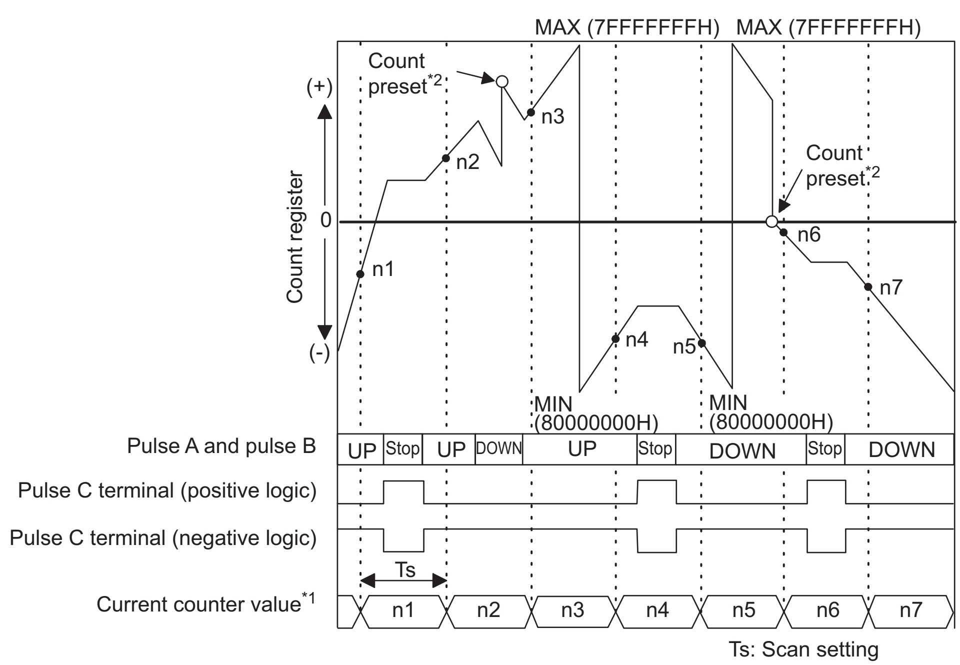
10.3.1 Reversible Counter Mode

The Reversible Counter Mode increments or decrements the count according to pulse A and pulse B inputs. Counting is interrupted during pulse C input.

Note: Fixed parameter 11 can be used to stop or start counting for pulse C inputs.

The following functions are possible in Reversible Counter Mode depending on output register designations.

- Count Prohibited: Disables counting.
- Count Preset: Forcibly changes count values.
- PI Latch Detection: Writes the counter value to memory when an external signal is input.
- Coincidence Detection: Outputs an external output signal when the Set Coincidence Detection output register value and the current counter value are the same.



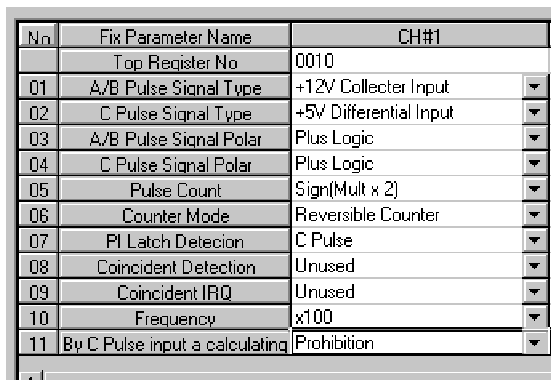
* 1. Current counter value = Hardware counter (IL□□□□ + 4)
* 2. Count preset = Count preset data (OL□□□□ + 2)

■ Reversible Counter Settings

Use the following settings when using the Counter Module as a reversible counter.

Fixed Parameter Settings

Specify **Reversible Counter** in fixed parameter 06 (Counter Mode).



Set the other parameters to suit the operating conditions.

I/O Data Settings

When the counter mode is set to **Reversible Counter**, the I/O data will be displayed as shown below.

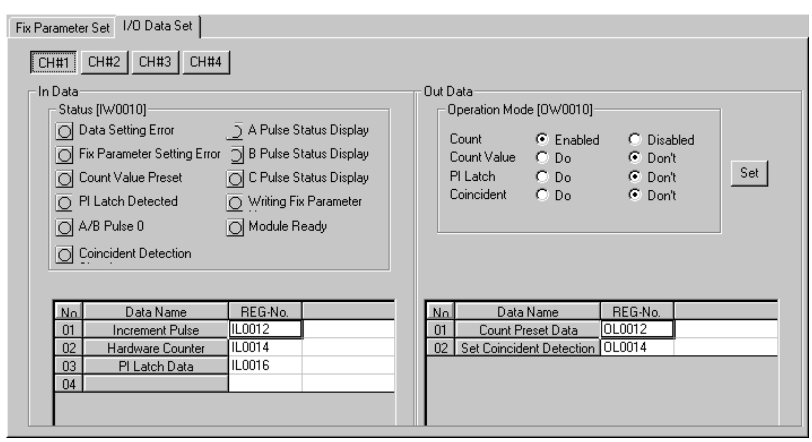


Table 10.4 Input Data

Name	Register No.	Range	Meaning
Status	IW□□□□	Each bit	–
Increment Pulse	IL□□□□ + 2	0 to $\pm 2^{31}$-1	1 = 1 pulse
Hardware Counter	IL□□□□ + 4	0 to $\pm 2^{31}$-1	1 = 1 pulse
PI Latch Data	IL□□□□ + 6	0 to $\pm 2^{31}$-1	1 = 1 pulse

Table 10.5 Output Data

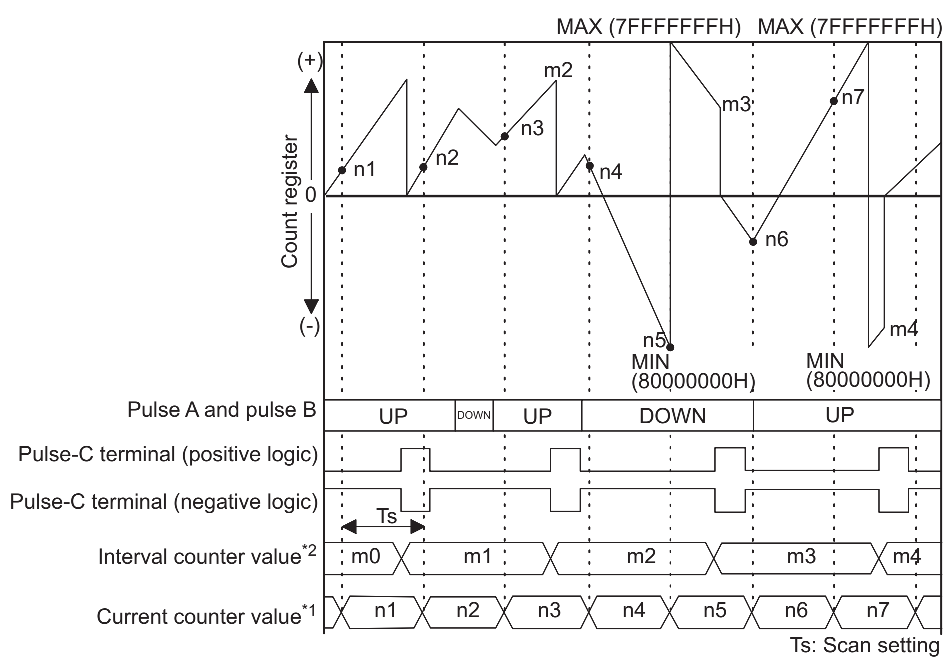
Name	Register No.	Range	Meaning
Operating Mode	OW□□□□	Each bit	–
Count Preset Data	OL□□□□ + 2	0 to $\pm 2^{31}$-1	1 = 1 pulse
Set Coincident Detection	OL□□□□ + 4	0 to $\pm 2^{31}$-1	1 = 1 pulse

10.3.2 Interval Counter Mode

The Interval Counter Mode increments and decrements the count according to pulse A and pulse B inputs. In this mode, the count will be latched on the rising edge of pulse C to reset the counter. The latched interval count is stored in the input register each scan. The current counter value is stored as the current hardware counter value.

The following functions are possible in Interval Counter Mode depending on output register designations.

- Count Prohibit: Disables counting.
- Coincidence Detection: Outputs an external output signal when the Set Coincidence Detection output register value and the current counter value are the same.



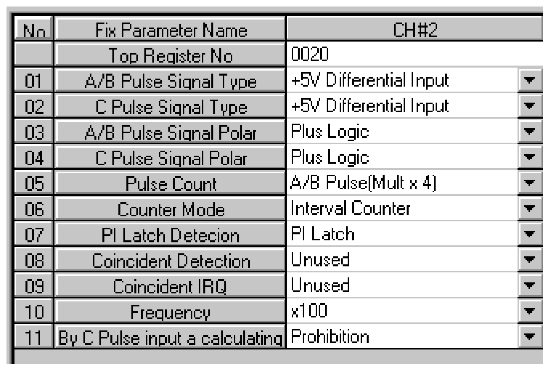
* 1. Current counter value = Hardware counter (IL□□□□ + 4)
* 2. Interval counter value = Interval data (OL□□□□ + 6)

■ Interval Counter Settings

Use the following settings when using the Counter Module as an interval counter.

Fixed Parameter Settings

Specify **Interval Counter** in fixed parameter 06 (Counter Mode).



No	Fix Parameter Name	CH#2
	Top Register No	0020
01	A/B Pulse Signal Type	+5V Differential Input
02	C Pulse Signal Type	+5V Differential Input
03	A/B Pulse Signal Polar	Plus Logic
04	C Pulse Signal Polar	Plus Logic
05	Pulse Count	A/B Pulse(Mult x 4)
06	Counter Mode	Interval Counter
07	PI Latch Detecion	PI Latch
08	Coincident Detection	Unused
09	Coincident IRQ	Unused
10	Frequency	x100
11	By C Pulse input a calculating	Prohibition

Set the other parameters to suit the operating conditions.

I/O Data Settings

I/O data will be displayed as shown below when the counter mode is set to Interval Counter.

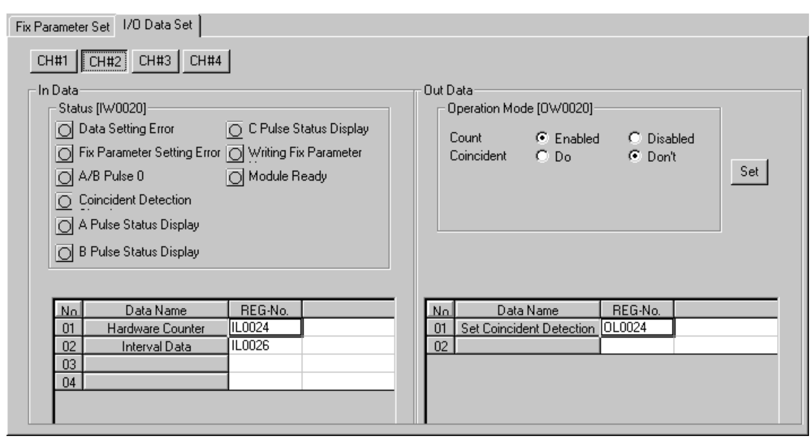


Table 10.6 Input Data

Name	Register No.	Range	Meaning
Status	OW□□□□	Each bit	–
Hardware Counter	OL□□□□ + 4	0 to ± 2^{31}-1	1 = 1 pulse
Interval Data	OIL□□□□ + 6	0 to ± 2^{31}-1	1 = 1 pulse

10

Table 10.7 Output Data

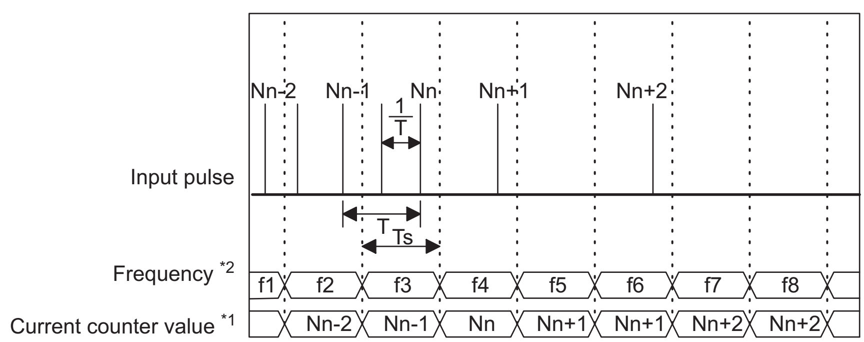
Name	Register No.	Range	Meaning
Operating Mode	OW□□□□	Each bit	–
Set Coincidence Detection	OL□□□□ + 4	0 to ± 2^{31}-1	1 = 1 pulse

10.3.3 Frequency Measurement

Frequency is measured according to pulse A and pulse B pulse trains. The detected frequency is stored in the input register each scan. The current count is stored as the current hardware counter value.

The following function is possible in Frequency Measurement Mode, depending on output register designations.

- Coincidence Detection: Outputs an external output signal when the Set Coincidence Detection output register value and the current counter value match.



* 1. Current counter value = Hardware counter (IL□□□□ + 4)
* 2. Frequency = Average frequency (OL□□□□ + 8)

INFO

■ Frequency Measurement Principles

The frequency is calculated as follows:

- $F = \dfrac{Nn-Nn-1}{T} \times MULT$

Nn-1 and Nn: Current counter value for the input pulse for each high-speed or low-speed scan.
T: Time between input pulses. Measurement unit: 8 MHz = 0.125µs
MULT: Frequency coefficient set in the fixed parameter.

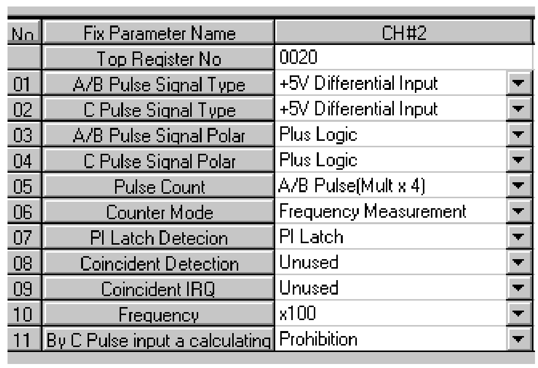
The above equation is used to calculate the frequency when there is one or more pulses input during the measurement cycle. If, however, there is no pulse inputs, the calculation result will be a value estimated from the previous frequency. True values are calculated for measurement cycles during which a pulse has been input.

■ Setting Frequency Measurement Functions

Use the following settings when using the Counter Module for frequency measurement.

Fixed Parameter Settings

Specify **Frequency Measurement** in fixed parameter 06 (Counter Mode).



Set other parameters to suit the operating conditions.

I/O Data Settings

I/O data will be displayed as shown below when the counter mode is set to Frequency Measurement.

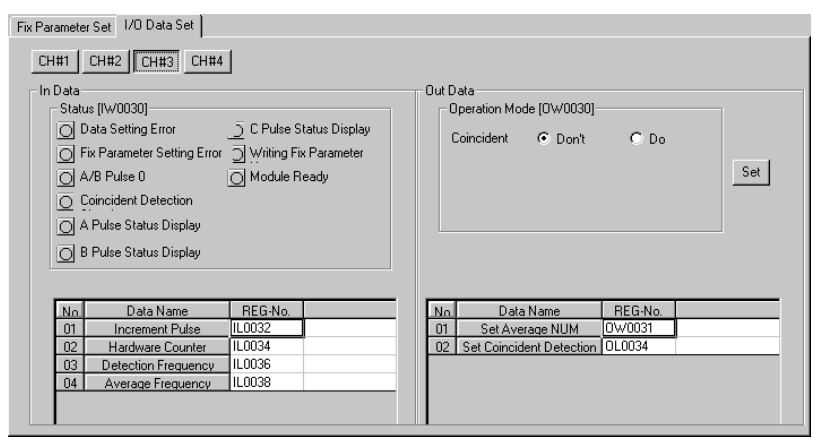


Table 10.8 Input Data

Name	Register No.	Range	Meaning
Status	OW□□□□	Each bit	–
Increment Pulse	OL□□□□ + 2	0 to ± 2^{31}-1	1 = 1 pulse
Hardware Counter	OL□□□□ + 4	0 to ± 2^{31}-1	1 = 1 pulse
Detection Frequency	OL□□□□ + 6	0 to ± 2^{31}-1	1 = 1 pulse
Average Frequency	OL□□□□ + 8	0 to ± 2^{31}-1	1 = 1 pulse

10

Table 10.9 Output Data

Name	Register No.	Range	Meaning
Operating Mode	OW□□□□	Each bit	–
Set Average Number	OL□□□□ + 1	0 to ± 255	1 = 1 pulse
Set Coincident Detection	OL□□□□ + 4	0 to ± 2^{31}-1	1 = 1 pulse

■ Coincidence Output and Interrupt Functions

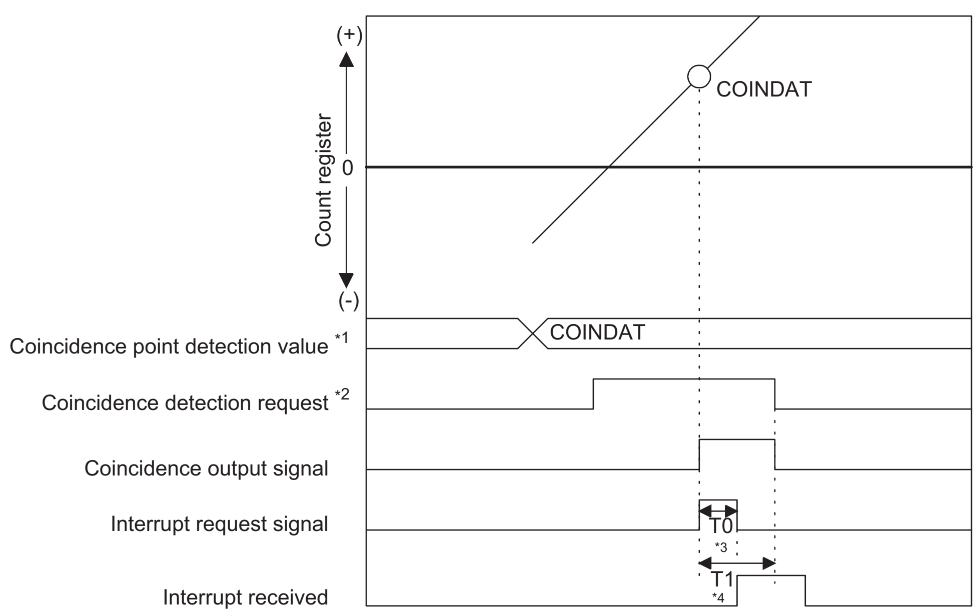
The Coincidence Output and Coincidence Interrupt Functions output an external signal (coincidence detection signal) and an interrupt signal to the CPU Module when a preset output register setting (coincidence detection setting: OL□□□□ + 4) and the current counter value are the same.

The Coincidence Output Function is enabled when fixed parameter 08 (Coincident Detection) is set to “Used.”

The Coincidence Interrupt Function is enabled when fixed parameter 09 (Coincident IRQ) is set to “Used.”

IMPORTANT

The Coincidence Output and Coincidence Interrupt functions can be used in Reversible Counter, Interval Counter, and Frequency Measurement modes.

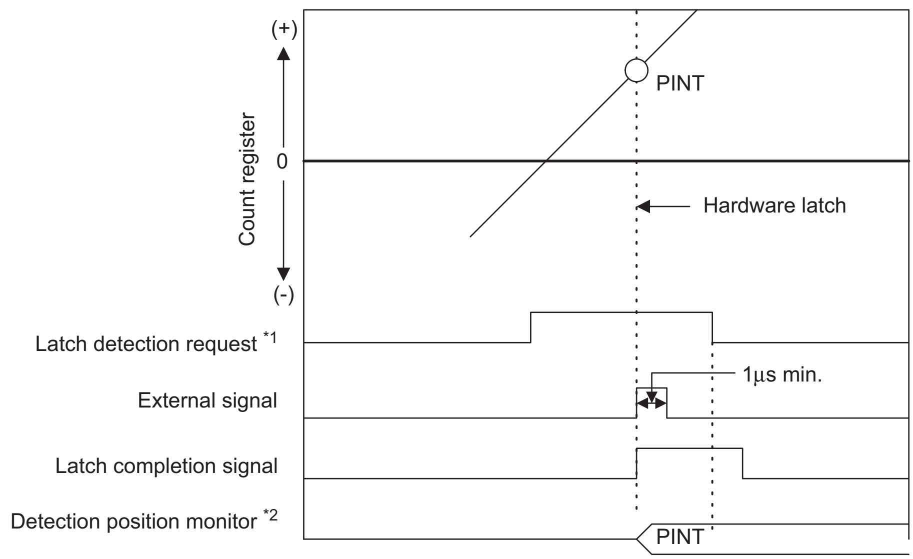


* 1. Coincidence point detection value=Coincidence detection setting (IL□□□□+4)
* 2. Coincidence detection request = Operating mode (OL□□□□ Bit 3)
* 3. T0: The maximum time period from when the CPU Module has received an interrupt signal until the interrupt processing is started (70 to 120 µs.)
* 4. T1: The time from when the interrupt request signal is received until the execution of DWG.I (interrupt drawing) is started.
For normal program execution: Approx. 90 to 170 µs.
For direct I/O instruction execution: Approx. 90 to (1460 + 40 + n) µs
N: No. of direct I/O words, 8 max.

■ PI Latch Function

The PI Latch Function latches the current value at the moment an external signal is input (or at the rising edge of an external signal) and stores it in a register.

Either a special-purpose discrete input (PI input) or the pulse C input can be selected as the external signal. Specify the external signal in fixed parameter 07 (PI Latch Detection).



* 1. PI latch detection request = Operating mode (IL□□□□ Bit 12)
* 2. PI detection position monitor = PI latch monitor (OL□□□□ + 6)

IMPORTANT	The PI Latch Function can be used only in Reversible Counter Mode.

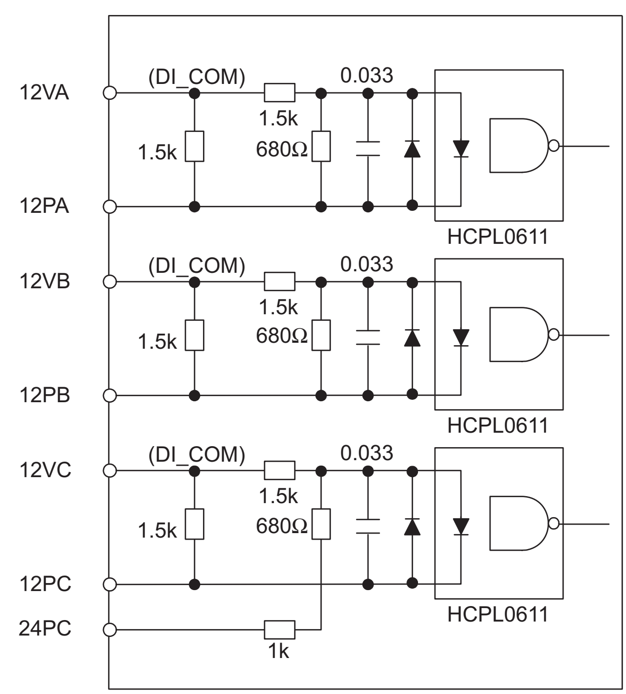
10.4 CNTR-01 Module I/O Circuits

This section explains the I/O circuits for the CNTR-01 Counter Module.

10.4.1 Pulse Input Specifications

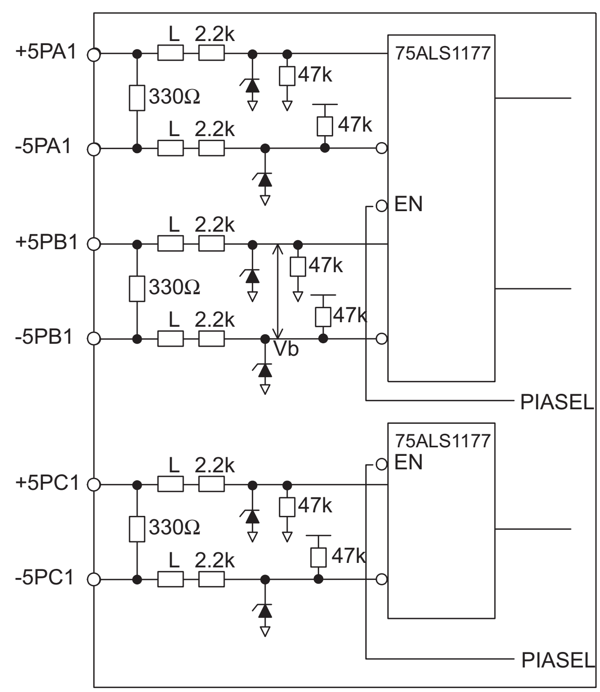
■ 12-V Voltage Input Specifications

The following table shows 12-V voltage pulse input specifications.

Item	Specification	Remarks
No. of input circuits	4	
Input Method	• Phase-A/B/C mode (×1, 2, or 4) • Up/Down mode (×1 or 2) • Sign mode (×1 or 2)	Selected via software
Counter Function	• Reversible counter • Interval counter • Frequency measurement	Selected via software
Response Frequency	120 kHz	
Others	12 V, 7 mA, current sourcing input, photocoupler isolation	
Pulse Input Circuits		

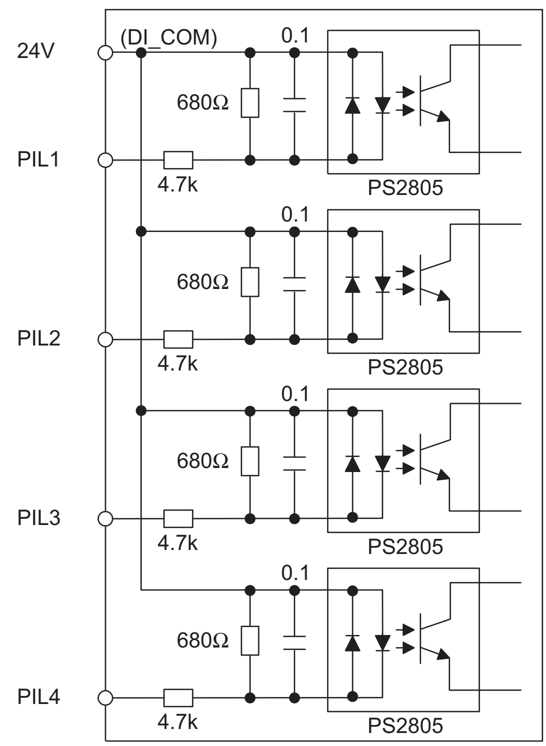
■ 5-V Differential Input Specifications

The following table shows 5-V differential pulse input specifications.

Item	Specification	Remarks
No. of Input Circuits	4	
Input Method	• Phase-A/B/C mode (×1, 2, or 4) • Up/Down mode (×1 or 2) • Sign mode (×1 or 2)	Selected via software
Counter Function	• Reversible counter • Interval counter • Frequency measurement	Selected via software
Response Frequency	2 MHz, RS-422	
Pulse Input Circuits		

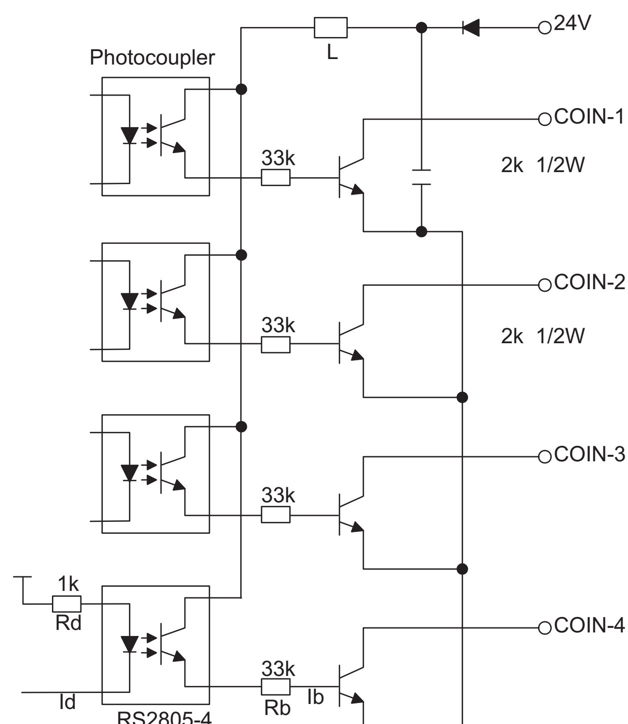
10.4.2 Latch Input Circuits

The following table shows the specifications for latch input circuits.

Item	Specifications
No. of Input Circuits	4
Input Type	Current sourcing input, photocoupler isolation
Input Voltage	24 VDC
Input Current	5 mA
Latch Input Circuits	

10.4.3 Coincidence Output Circuits

The following table shows the specifications for coincidence output circuits.

Item	Specifications
No. of Output Circuits	4
Output Circuit	Current sinking output, photocoupler isolation
Rated Voltage and Current	24 VDC, 50 mA max.
Coincidence Output Circuits	

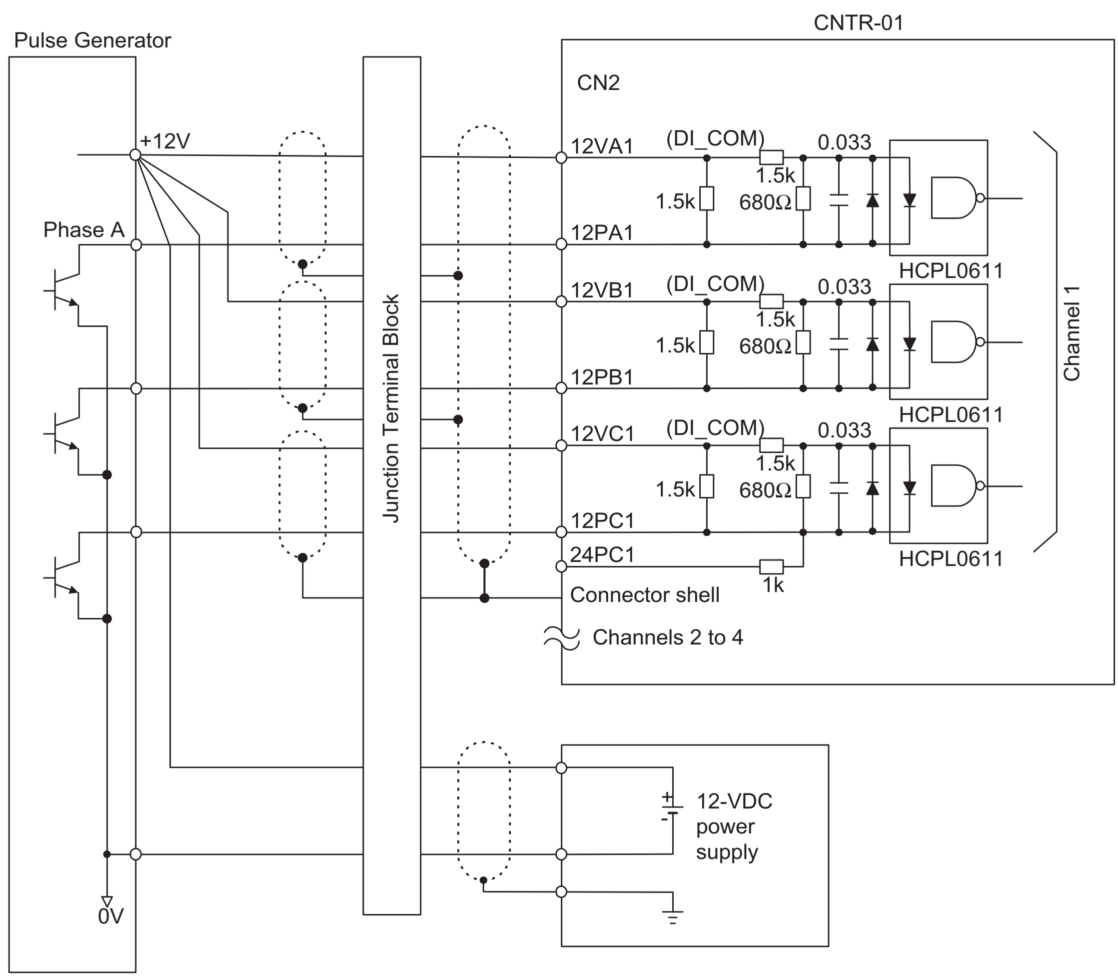
10.5 CNTR-01 Counter Module Connections

This section explains external I/O terminal connections.

10.5.1 Connections to Pulse Generators

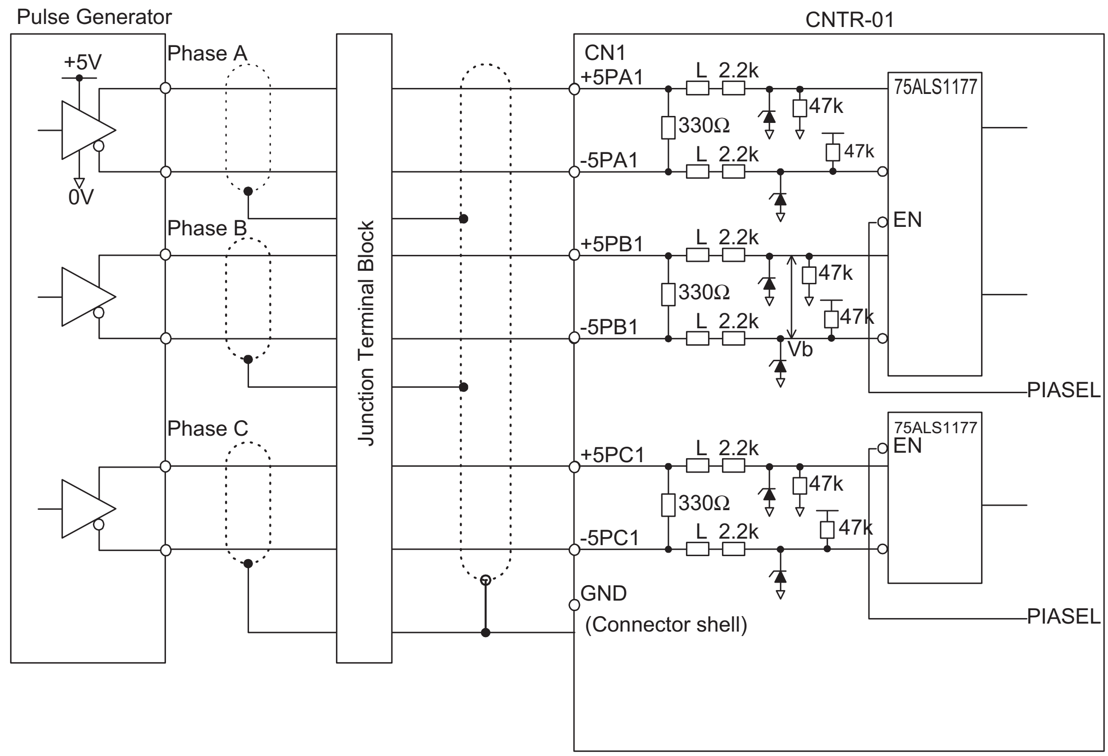
■ 12-VDC Open Collector Output

The connections to a 12-VDC open collector output pulse generator are shown in the following diagram.



■ 5-V Differential Pulse Generators

The connections to a 5-V differential pulse generator are shown in the following diagram.



INFO

- Use a standard JEPMC-W6060-□□ cable to connect the CNTR-01 Module and the Junction Terminal Block.
- Use shielded twisted-pair cable to connect the Junction Terminal Block and the Pulse Generator.
- Do not connect input terminals that will not be used.

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INFO

■ Combining Pulses A, B and C

The following two settings are possible for pulses A and B using fixed parameter 01 (Pulse-A/B Signal Type):

- 5-V differential
- 12-V collector

In addition, the following three settings are possible for pulse C using fixed parameter No. 02 (Pulse-C Signal Type):

- 5-V differential
- 12-V collector input
- 24-V input

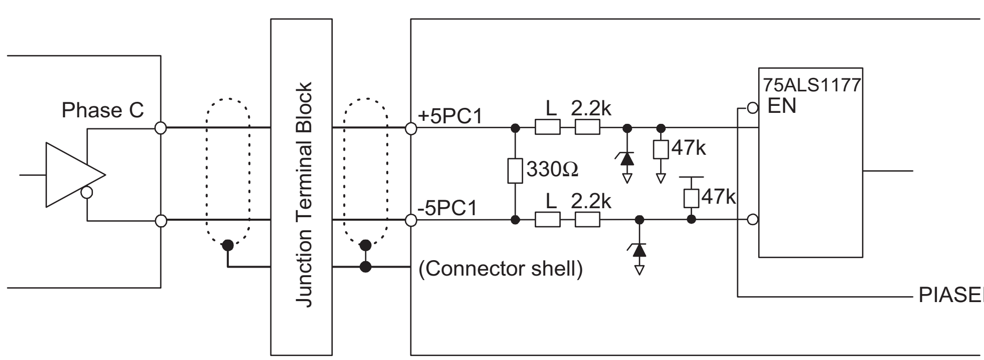
The following table shows the pulse A/B/C combinations that can be achieved by specifying fixed parameters 01 and 02.

No.	Pulse-A/B Signal Type (Fixed parameter 01)	Pulse-C Signal Type (Fixed parameter 02)
1	5-V differential	5-V differential
2	5-V differential	12-V input collector
3	5-V differential	24-V input
4	12-V input collector	5-V differential
5	12-V input collector	12-V input collector
6	12-V input collector	24-V input

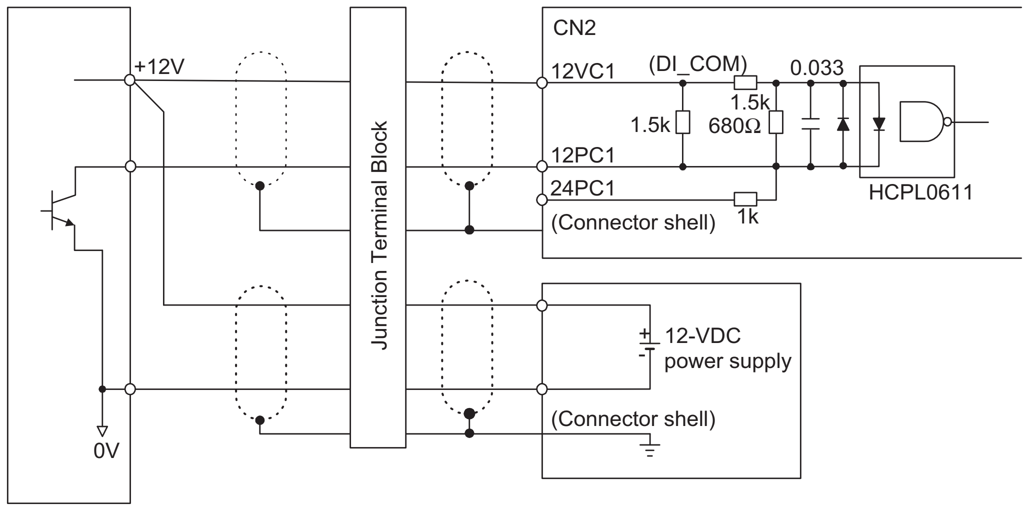
10.5.2 Pulse C Signals

Connections to the three types of pulse C signals are shown in the diagrams below.

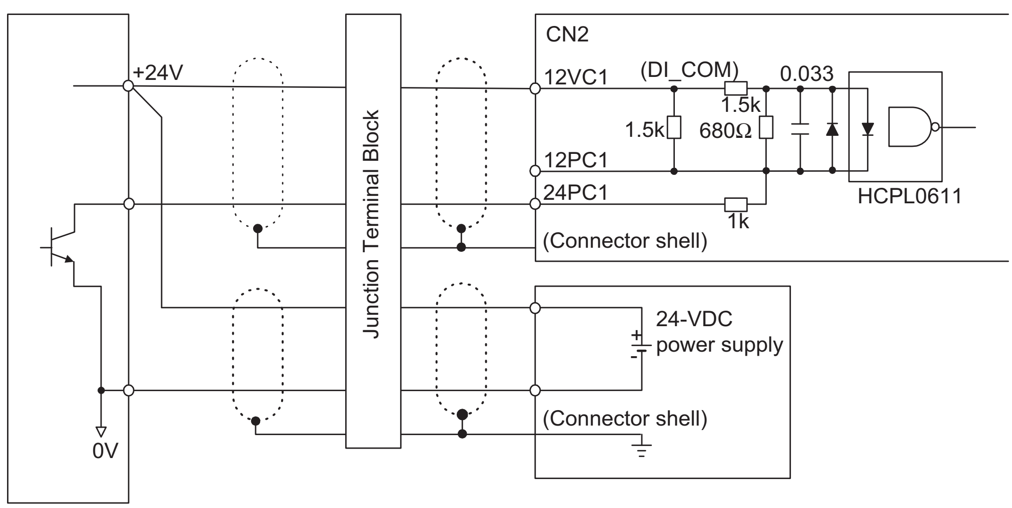
■ 5-V Differential Signals



■ 12-V Input Collector Signals



■ 24-V Input Signals



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Appendix A

A

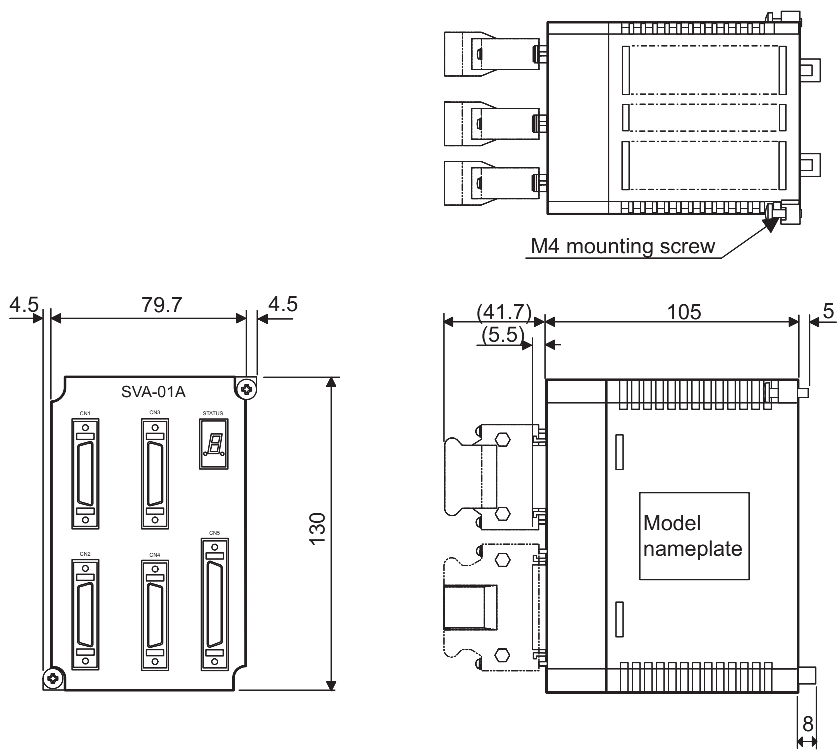
Module Appearance

This appendix shows the appearance of the Motion Modules used in the MP920 Machine Controller.

A.1 Motion Modules

■ 4-axis Servo Module

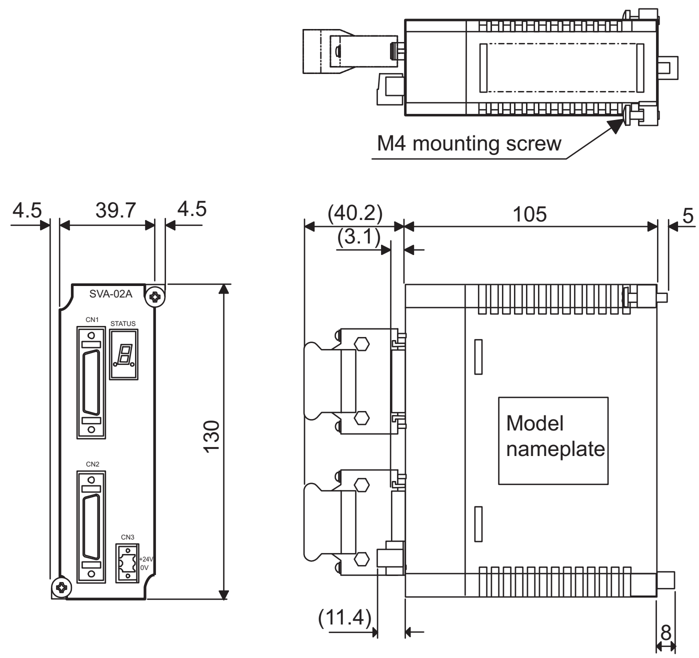
Description: SVA-01A
Model: JEPMC-MC200A



A

■ 2-axis Servo Module

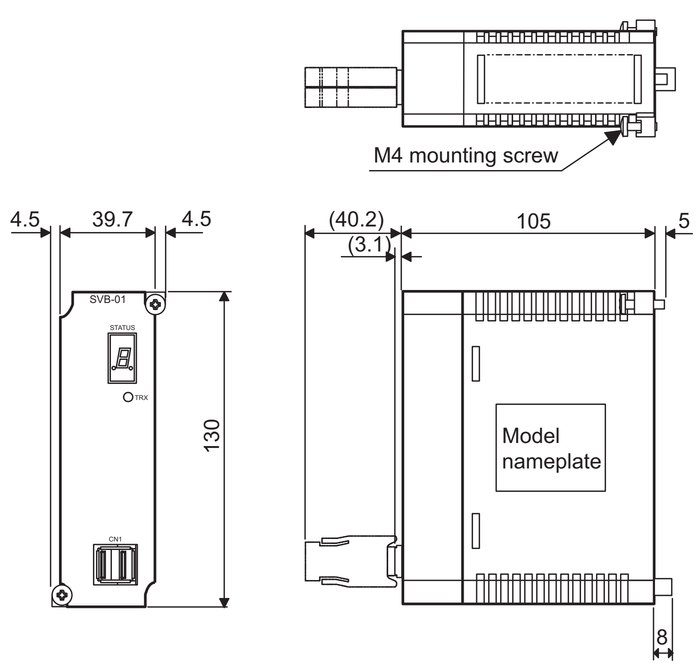
Description: SVA-02A
Model: JEPMC-MC220A



Units: mm

■ MECHATROLINK Interface Module

Description: SVB-01
Model: JEPMC-MC210

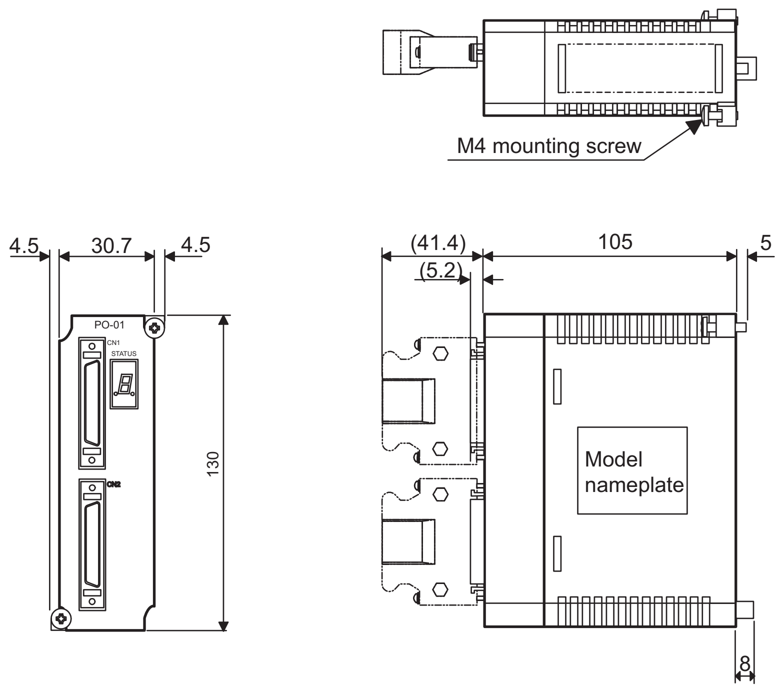


Units: mm

■ Pulse Output Module

Description: PO-01

Model: JEPMC-PL210

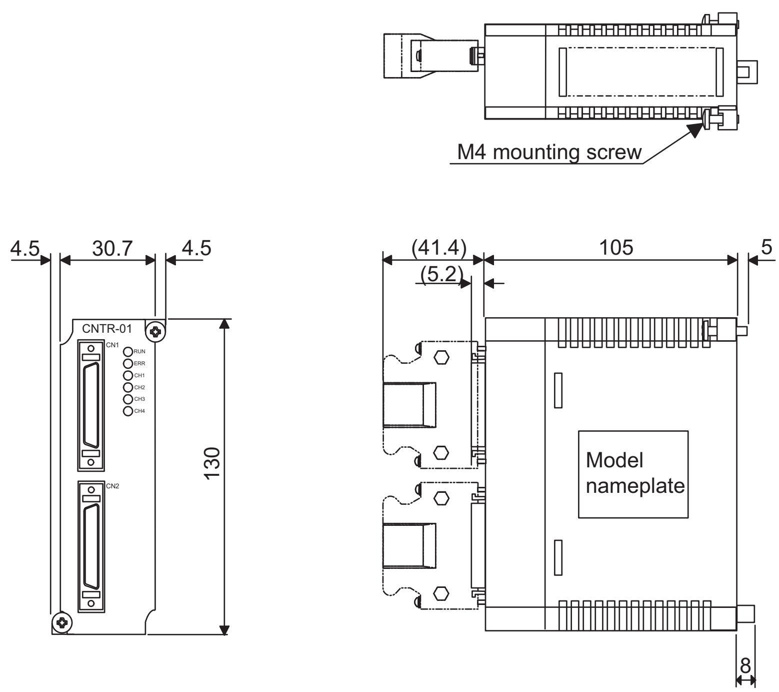


Units: mm

A.2 Counter Module

■ Counter Module

Description: CNTR-01
Model: JEPMC-PL200



Units: mm

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Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

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			5.4.2, 6.2.2	Addition: ■ Acceleration/Deceleration Type
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			All chapters	Slightly revised
			Back cover	Revision: Address
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			All chapters	Completely revised
			Back cover	Revision: Address
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Machine Controller MP920

Motion Module

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