YASKAWA

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MP2300 Machine Controller
Basic Module User’s Manual

Model Number: JEPMC-MP2300-Y□□

Using this Manual

The MP2300 is a compact Machine Controller that contains the power supply, the CPU, I/O, and the communication functions in one single unit.

Please read this manual to ensure correct usage of the MP2300 system. Keep this manual in a safe place for future reference.

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MP2300: MP2300 Machine Controller
- PC: Programmable Logic Controller
- PP: Programming Panel
- MPE720: The Programming Device Software or a Programming Device (i.e., a personal computer) running the Programming Device Software

■ Manual Configuration

Read the chapters of this manual as required by the purpose.

Chapter	Selecting Models and Peripheral Devices	Studying Specifications and Ratings	Designing the System	Installation and Wiring	Trial Operation	Maintenance and Inspection
Chapter 1 Overview of the MP2300	√	–	–	–	–	–
Chapter 2 System Startup and Sample Programs	√	–	–	–	–	–
Chapter 3 Module Specifications	–	–	–	–	√	–
Chapter 4 Mounting and Wiring	√	√	√	√	–	–
Chapter 5 Outline of Motion Control Systems	–	√	√	√	–	–
Chapter 6 Motion Parameters	–	–	√	–	√	–
Chapter 7 Motion Commands	–	–	√	–	√	–
Chapter 8 Control Block Diagrams	–	–	√	–	√	√
Chapter 9 Absolute Position Detection	–	–	√	–	√	√
Chapter 10 Utility Functions	–	–	–	–	–	√
Chapter 11 Precautions for Using the MP2300	–	–	–	–	√	√
Chapter 12 Maintenance and Inspection	√	–	√	–	√	√

■ Graphic Symbols Used in this Manual

The graphic symbols used in this manual indicate the following type of information.

- This symbol is used to indicate important information that should be memorized or minor precautions, such as precautions that will result in alarms if not heeded.

■ 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:

Notation Examples

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

■ Related Manuals

The following table lists the manuals relating to the MP2500(M). Refer to these manuals as required.

Manual Name	Manual Number	Contents
Machine Controller MP2300 Communication Module User's Manual	SIEP C880700 04□	Describes the functions, specifications, and application methods of the MP2300 Communication Modules (217IF, 218IF, 260IF, 261IF).
Machine Controller MP900/MP2000 Series User's Manual, Ladder Programming	SIEZ-C887-1.2□	Describes the instructions used in MP900/MP2000 ladder programming.
Machine Controller MP900/MP2000 Series User's Manual Motion Programming	SIEZ-C887-1.3□	Describes the instructions used in MP900/MP2000 motion programming.
Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual	SIEP C880700 05□	Describes how to install and operate the MP900/MP2000 Series programming system (MPE720).
Σ Series SGM□/SGD User's Manual	SIEZ-S800-26.3□	Describes the Σ Series SERVOPACK models, specifications, and capacity selection methods.
Σ Series SGM□/SGD User's Manual High-speed Field Network MECHATROLINK-compatible AC Servo Drivers	SIEZ-S800-26.4□	Describes the Σ Series SERVOPACK models, specifications, and capacity selection methods.
Σ-II Series SGM□H/SGDM User's Manual	SIEP S8000 05□	Describes the installation, wiring, trial operation, function applications methods, maintenance, and inspection of the Σ-II Series SERVOPACKs.
Σ-II Series SGM□H/SGDM User's Manual	SIEP S8000 15□	Describes the installation, wiring, trial operation, function applications methods, maintenance, and inspection of the Σ-II Series SERVOPACKs.
Σ-III Series SGM□H/SGDS User's Manual	SIEP S800000 00□	Describes the models, specifications, wiring, trial operation, adjustment, function application methods, maintenance, and inspection of the Σ-III Series SERVOPACKs and Servomotors.
Σ-III Series SGM□S/SGDS Digital Operator Operating Instructions	TOBEP S800000 01□	Describes the operating methods of the JUSP-OP05A Digital Operator.

Manual Name	Manual Number	Contents
Σ-III Series SGM□S/SGDS MECHATROLINK-II SERVOPACKs with Communication User’s Manual	SIEP S800000 11□	Describes the models, specifications, wiring, trial operation, adjustment, function application methods, maintenance, inspection, and MECHATROLINK communication of the Σ-III Series SERVOPACKs and Servomotors.
Machine Controller MP900/MP2000 Series Linear Servomotor Manual	SIEP C880700 06□	Describes the connection methods, setting methods, and other information for Linear Servomotors.
Machine Controller MP900/MP2000 Series New Ladder Editor User’s Manual Programming Manual	SIEZ-C887-13.1□	Describes the programming instructions of the New Ladder Editor, which assists MP900/ MP2000 Series design and maintenance.
Machine Controller MP900/MP2000 Series New Ladder Editor User’s Manual Operation	SIEZ-C887-13.2□	Describes the operating methods of the New Ladder Editor, which assists MP900/MP2000 Series design and maintenance.
Machine Controller MP900/MP2000 Series User’s Manual, MECHATROLINK System	SIEZ-C887-5.1□	Describes MECHATROLINK distributed I/O for MP900/MP2000 Series Machine Controllers.

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Safety Information

The following conventions are used to indicate precautions in this manual. These precautions are provided to ensure the safe operation of the MP2500(M) and connected devices. Information marked as shown below is important for the safety of the user. Always read this information and heed the precautions that are provided.
The conventions are as follows:

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

⚠ CAUTION Indicates precautions that, if not heeded, could result in relatively serious or minor injury, or property damage.

If not heeded, even precautions classified under ⚠ CAUTION can lead to serious results depending on circumstances.

PROHIBITED Indicates prohibited actions. Specific prohibitions are indicated inside ⃠.

For example, the open-flame symbol indicates prohibition of open flame.

MANDATORY Indicates mandatory actions. Specific actions are indicated inside ●.

For example, the grounding symbol indicates mandatory grounding.

Safety Precautions

The following precautions are for checking products on delivery, storage, transportation, installation, wiring, operation, application, inspection, and disposal. These precautions are important and must be observed.

■ General Precautions

⚠ WARNING

- Before connecting the machine and starting operation, ensure that an emergency stop procedure has been provided and is working correctly.

  There is a risk of injury.
- Do not touch anything inside the MP2300.

  There is a risk of electrical shock.
- Always keep the front cover attached when power is being supplied.

  There is a risk of electrical shock.
- Observe all procedures and precautions given in this manual for trial operation.

  Operating mistakes while the servomotor and machine are connected may damage the machine or even cause accidents resulting in injury or death.

  There is a risk of electrical shock.
- Do not remove the front cover, cables, connector, or options while power is being supplied.

  There is a risk of electrical shock.
- Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch cables.

  There is a risk of electrical shock, operational failure or burning of the MP2300.
- Do not attempt to modify the MP2300 in any way.

  There is a risk of injury or device damage.
- Do not approach the machine when there is a momentary interruption to the power supply. When power is restored, the MP2300 and the device connected to it may start operation suddenly. Provide safety measures in advance to ensure human safety in the event that operation restarts suddenly.

  There is a risk of injury.
- Do not allow installation, disassembly, or repairs to be performed by anyone other than specified personnel.

  There is a risk of electrical shock or injury.

■ Storage and Transportation

⚠ CAUTION

- Do not store or install the MP2300 in the following locations.

  There is a risk of fire, electrical shock, or device damage.
  - Direct sunlight
  - Ambient temperature exceeds the storage or operating conditions
  - Ambient humidity exceeds the storage or operating conditions
  - Rapid changes in temperature or locations subject to condensation
  - Corrosive or flammable gas
  - Excessive dust, dirt, salt, or metallic powder
  - Water, oil, or chemicals
  - Vibration or shock
- Do not overload the MP2300 during transportation.

  There is a risk of injury or an accident.

■ Installation

⚠ CAUTION

- Never use the MP2300 in locations subject to water, corrosive atmospheres, or flammable gas, or near burnable objects.

  There is a risk of electrical shock or fire.
- Do not step on the MP2300 or place heavy objects on the MP2300.

  There is a risk of injury.
- Do not block the air exhaust port or allow foreign objects to enter the MP2300.

  There is a risk of element deterioration inside, an accident, or fire.
- Always mount the MP2300 in the specified orientation.

  There is a risk of an accident.
- Do not subject the MP2300 to strong shock.

  There is a risk of an accident.

■ Wiring

⚠ CAUTION

- Check the wiring to be sure it has been performed correctly.

  There is a risk of motor run-away, injury, or an accident.
- Always use a power supply of the specified voltage.

  There is a risk of burning.
- In places with poor power supply conditions, take all steps necessary to ensure that the input power supply is within the specified voltage range.

  There is a risk of device damage.
- Install breakers and other safety measure to provide protection against shorts in external wiring.

  There is a risk of fire.
- Provide sufficient shielding when using the MP2300 in the following locations.

  There is a risk of device damage.
  - Noise, such as from static electricity
  - Strong electromagnetic or magnetic fields
  - Radiation
  - Near to power lines
- When connecting the battery, connect the polarity correctly.

  There is a risk of battery damage or explosion.

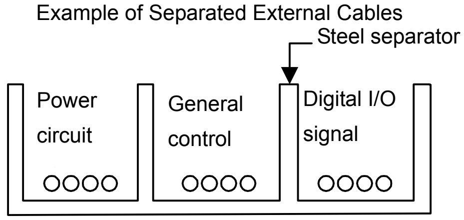
■ Selecting, Separating, and Laying External Cables

⚠ CAUTION

- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP2300 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 box 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



■ Maintenance and Inspection Precautions

⚠ CAUTION
• Do not attempt to disassemble the MP2300. There is a risk of electrical shock or injury. • Do not change wiring while power is being supplied. There is a risk of electrical shock or injury. • When replacing the MP2300, restart operation only after transferring the programs and parameters from the old Module to the new Module. There is a risk of device damage.

■ Disposal Precautions

⚠ CAUTION
• Dispose of the MP2300 as general industrial waste.

Variable Tables

■ System Variable Table (Tree View)

The following table lists details on the system variables provided by MPE720 version 6.

Variable Name			Register	Comments
OnCoil			SB000004	Always ON
Clock			-	Calendar
	DayOfWeek		SW00019	Calendar:Day of week
	HoursMinutes		SW00017	Calendar:Hours Minutes
	MonthDate		SW00016	Calendar:Month Day
	Second		SW00018	Calendar:Seconds
	Year		SW00015	Calendar:Year
CPU			-	Controller
	Error		-	CPU Error Status
		Exception	SB000413	Exception Error
		Failure	SB000410	Important Failure
		IOError	SB000419	I/O Error
		ProgramError	SB000418	User Calculation Error
	Info		-	CPU Information
		MemorySizeAvailable	SL00026	Available PRG Memory (BYTE)
		MemorySizeTotal	SL00028	All Module Memory (BYTE)
		SoftwareVersion	SW00020	System Program Software Number
	Status		-	CPU Status
		Alarm	SB000402	ALARM (1=Warning,0=Normal)
		BatteryAlarm	SB000487	Battery Alarm (1=Alarm)
		Error	SB000403	ERROR (1=Unusual,0=Normal)
		Ready	SB000400	READY (1=Normal,0=Converse/Own Diagnose Unusual)
		Running	SB000401	RUN (1=Driving,0=Driving Stop)
		RunSwitch	SB00040F	RUN switch status at power is on (1=RUN,0=STOP)
		Stopped	SB00040E	Running Stop Require (From EWS:1=STOP,0=RUN)
		WriteEnable	SB000407	WEN (Write:1=Possible,0=Impossible)
		WritingToFlash	SB000406	FLASH (1=FLASH Driving)
	Switches		-	CPU Switch
		Configure	SB000482	CNFG (0=ON,1=OFF)
		Initialize	SB000483	INIT (0=ON,1=OFF)
		Stop	SB000485	STOP (0=ON,1=OFF)
ErrorHigh			-	High-Speed Program Error
	Code		SW00085	High-Speed Program Error Code
	Count		SW00084	High-Speed Program Error Count
	ProgramNumber		SW00154	Error Program Number
	ReferProgramNumber		SW00155	Function Program Number
	ReferStep		SW00156	Function Program Step Number

(continued)

Variable Name			Register	Comments
ErrorInterrupt			-	Interrupt Program Error
	Code		SW00083	Interrupt Program Error Code
	Count		SW00082	Interrupt Program Error Count
	ProgramNumber		SW00138	Error Program Number
	ReferProgramNumber		SW00139	Function Program Number
	ReferStep		SW00140	Function Program Step Number
ErrorIO			-	I/O Error
	Count		SW00200	I/O Error Count
	InputAddress		SW00202	Input Error Address
	InputCount		SW00201	Input Error Times
	OutputAddress		SW00204	Output Error Address
	OutputCount		SW00203	Output Error Times
ErrorLow			-	Low-Speed Program Error
	Code		SW00089	Low-Speed Program Error Code
	Count		SW00088	Low-Speed Program Error Count
	ProgramNumber		SW00186	Error Program Number
	ReferProgramNumber		SW00187	Function Program Number
	ReferStep		SW00189	Function Program Step Number
ErrorStart			-	Start Program Error
	Code		SW00081	Start Program Error Code
	Count		SW00080	Start Program Error Count
	ProgramNumber		SW00122	Error Program Number
	ReferProgramNumber		SW00123	Function Program Number
	ReferStep		SW00124	Function Program Step Number
HighScan			-	High Scan Relay
	FirstScanRunning		SB000001	After High Scan Start,Only 1 Scan ON
	OnAfter		-	Start-up Relay
		FiveSecond	SB00001A	After 5.0s,Scan Start-up Relay
		OneSecond	SB000018	After 1.0s,Scan Start-up Relay
		TwoSecond	SB000019	After 2.0s,Scan Start-up Relay
	PulseEvery		-	Sampling Relay
		HalfSecond	SB000014	0.5s Sampling Relay
		OneMinute	SB000017	60.0s Sampling Relay
		OneSecond	SB000015	1.0s Sampling Relay
		TwoSecond	SB000016	2.0s Sampling Relay
	SquareWave		-	Flicker Relay
		HalfSecond	SB000011	0.5s Flicker Relay
		OneScan	SB000010	1 Scan Flicker Relay
		OneSecond	SB000012	1.0s Flicker Relay
		TwoSecond	SB000013	2.0s Flicker Relay

(continued)

Variable Name			Register	Comments
LowScan			-	Low Scan Relay
	FirstScanRunning		SB000003	After Low Scan Start,Only 1 Scan ON
	OnAfter		-	Start-up Relay
		FiveSecond	SB00003A	After 5.0s,Scan Start-up Relay
		OneSecond	SB000038	After 1.0s,Scan Start-up Relay
		TwoSecond	SB000039	After 2.0s,Scan Start-up Relay
	PulseEvery		-	Sampling Relay
		HalfSecond	SB000034	0.5s Sampling Relay
		OneMinute	SB000037	60.0s Sampling Relay
		OneSecond	SB000035	1.0s Sampling Relay
		TwoSecond	SB000036	2.0s Sampling Relay
	SquareWave		-	Flicker Relay
		HalfSecond	SB000031	0.5s Flicker Relay
		OneScan	SB000030	1 Scan Flicker Relay
		OneSecond	SB000032	1.0s Flicker Relay
		TwoSecond	SB000033	2.0s Flicker Relay
ScanTime			-	Scan Time
	ExecutionCurrentValue		SW00014	Execution Scan Current Value (0.1ms)
	High		-	High Scan
		CurrentValue	SW00005	High Scan Current Value (0.1ms)
		ExceededCount	SW00044	High Scan Over Counter
		MaximumValue	SW00006	High Scan Maximum Value (0.1ms)
		SetValue	SW00004	High Scan Set Value (0.1ms)
	Low		-	Low Scan
		CurrentValue	SW00011	Low Scan Current Value (0.1ms)
		MaximumValue	SW00012	Low Scan Maximum Value (0.1ms)
		SetValue	SW00010	Low Scan Set Value (0.1ms)
		ExceededCount	SW00046	Low Scan Over Counter

■ System Variables (Sorted by Register)

Register	Variable Name	Comments
SB000001	HighScan.FirstScanRunning	After High Scan Start,Only 1 Scan ON
SB000003	LowScan.FirstScanRunning	After Low Scan Start,Only 1 Scan ON
SB000004	OnCoil	Always ON
SB000010	HighScan.SquareWave.OneScan	1 Scan Flicker Relay
SB000011	HighScan.SquareWave.HalfSecond	0.5s Flicker Relay
SB000012	HighScan.SquareWave.OneSecond	1.0s Flicker Relay
SB000013	HighScan.SquareWave.TwoSecond	2.0s Flicker Relay
SB000014	HighScan.PulseEvery.HalfSecond	0.5s Sampling Relay
SB000015	HighScan.PulseEvery.OneSecond	1.0s Sampling Relay
SB000016	HighScan.PulseEvery.TwoSecond	2.0s Sampling Relay
SB000017	HighScan.PulseEvery.OneMinute	60.0s Sampling Relay
SB000018	HighScan.OnAfter.OneSecond	After 1.0s,Scan Start-up Relay
SB000019	HighScan.OnAfter.TwoSecond	After 2.0s,Scan Start-up Relay
SB00001A	HighScan.OnAfter.FiveSecond	After 5.0s,Scan Start-up Relay
SB000030	LowScan.SquareWave.OneScan	1 Scan Flicker Relay
SB000031	LowScan.SquareWave.HalfSecond	0.5s Flicker Relay
SB000032	LowScan.SquareWave.OneSecond	1.0s Flicker Relay
SB000033	LowScan.SquareWave.TwoSecond	2.0s Flicker Relay
SB000034	LowScan.PulseEvery.HalfSecond	0.5s Sampling Relay
SB000035	LowScan.PulseEvery.OneSecond	1.0s Sampling Relay
SB000036	LowScan.PulseEvery.TwoSecond	2.0s Sampling Relay
SB000037	LowScan.PulseEvery.OneMinute	60.0s Sampling Relay
SB000038	LowScan.OnAfter.OneSecond	After 1.0s,Scan Start-up Relay
SB000039	LowScan.OnAfter.TwoSecond	After 2.0s,Scan Start-up Relay
SB00003A	LowScan.OnAfter.FiveSecond	After 5.0s,Scan Start-up Relay
SW00004	ScanTime.High.SetValue	High Scan Set Value (0.1ms)
SW00005	ScanTime.High.CurrentValue	High Scan Current Value (0.1ms)
SW00006	ScanTime.High.MaximumValue	High Scan Maximum Value (0.1ms)
SW00010	ScanTime.Low.SetValue	Low Scan Set Value (0.1ms)
SW00011	ScanTime.Low.CurrentValue	Low Scan Current Value (0.1ms)
SW00012	ScanTime.Low.MaximumValue	Low Scan Maximum Value (0.1ms)
SW00014	ScanTime.ExecutionCurrentValue	Execution Scan Current Value (0.1ms)
SW00015	Clock.Year	Calendar:Year
SW00016	Clock.MonthDate	Calendar:Month Day
SW00017	Clock.HoursMinutes	Calendar:Hours Minutes
SW00018	Clock.Second	Calendar:Seconds
SW00019	Clock.DayOfWeek	Calendar:Day of week
SW00020	CPU.Info.SoftwareVersion	System Program Software Number
SL00026	CPU.Info.MemorySizeAvailable	Available PRG Memory (BYTE)
SL00028	CPU.Info.MemorySizeTotal	All Module Memory (BYTE)
SB000400	CPU.Status.Ready	READY (1=Normal,0=Converse/Own Diagnose Unusual)
SB000401	CPU.Status.Running	RUN (1=Driving,0=Driving Stop)
SB000402	CPU.Status.Alarm	ALARM (1=Warning,0=Normal)
SB000403	CPU.Status.Error	ERROR (1=Unusual,0=Normal)
SB000406	CPU.Status.WritingToFlash	FLASH (1=FLASH Driving)
SB000407	CPU.Status.WriteEnable	WEN (Write:1=Possible,0=Impossible)

(continued)

Register	Variable Name	Comments
SB00040E	CPU.Status.Stopped	Running Stop Require (From EWS:1=STOP,0=RUN)
SB00040F	CPU.Status.RunSwitch	RUN switch status at power is on (1=RUN,0=STOP)
SB000410	CPU.Error.Failure	Important Failure
SB000413	CPU.Error.Exception	Exception Error
SB000418	CPU.Error.ProgramError	User Calculation Error
SB000419	CPU.Error.IOError	I/O Error
SW00044	ScanTime.High.ExceededCount	High Scan Over Counter
SW00046	ScanTime.Low.ExceededCount	Low Scan Over Counter
SB000482	CPU.Switches.Configure	CNFG (0=ON,1=OFF)
SB000483	CPU.Switches.Initialize	INIT (0=ON,1=OFF)
SB000485	CPU.Switches.Stop	STOP (0=ON,1=OFF)
SB000487	CPU.Status.BatteryAlarm	Battery Alarm (1=Alarm)
SW00080	ErrorStart.Count	Start Program Error Count
SW00081	ErrorStart.Code	Start Program Error Code
SW00082	ErrorInterrupt.Count	Interrupt Program Error Count
SW00083	ErrorInterrupt.Code	Interrupt Program Error Code
SW00084	ErrorHigh.Count	High-Speed Program Error Count
SW00085	ErrorHigh.Code	High-Speed Program Error Code
SW00088	ErrorLow.Count	Low-Speed Program Error Count
SW00089	ErrorLow.Code	Low-Speed Program Error Code
SW00122	ErrorStart.ProgramNumber	Error Program Number
SW00123	ErrorStart.ReferProgramNumber	Function Program Number
SW00124	ErrorStart.ReferStep	Function Program Step Number
SW00138	ErrorInterrupt.ProgramNumber	Error Program Number
SW00139	ErrorInterrupt.ReferProgramNumber	Function Program Number
SW00140	ErrorInterrupt.ReferStep	Function Program Step Number
SW00154	ErrorHigh.ProgramNumber	Error Program Number
SW00155	ErrorHigh.ReferProgramNumber	Function Program Number
SW00156	ErrorHigh.ReferStep	Function Program Step Number
SW00186	ErrorLow.ProgramNumber	Error Program Number
SW00187	ErrorLow.ReferProgramNumber	Function Program Number
SW00189	ErrorLow.ReferStep	Function Program Step Number
SW00200	ErrorIO.Count	I/O Error Count
SW00201	ErrorIO.InputCount	Input Error Times
SW00202	ErrorIO.InputAddress	Input Error Address
SW00203	ErrorIO.OutputCount	Output Error Times
SW00204	ErrorIO.OutputAddress	Output Error Address

■ Axis Motion Parameters (Tree View)

The following table lists the axismotion parameters registered for each logical axis.

- Register address IW (IB/IL/IF/IA) xx00 indicates the leading input register address +00.
- Register address OW (OB/OL/OF/OA) xx00 indicates the leading output register address +00.

Variable Name		Register	Comments
Acceleration		OLxx36	Acceleration Value, units selected by UnitsWord (OWxx03)
Alarm		-	Alarm
	ABSEncoderOverrange	IBxx053	Absolute encoder number of rotations exceeded alarm
	Active	IBxx2C0	Servo status ALM
	Code	IWxx2D	Servo Alarm Code
	AllMask	ILxx04	Alarm mask
	Clear	OBxx00F	Clears servo alarms.
	FilterTimeChanged	IBxx04B	Filter time constant changed while in motion alarm
	FilterTypeChanged	IBxx04A	Filter type changed while in motion alarm
	FollowingError	IBxx049	Following error exceeded alarm
	HomingWhileMoving	IBxx04E	Zero point set while in motion alarm
	MonitorNumber	OWxx4F	This value determines which of the last 10 alarm codes are returned.
	NegativeOvertravel	IBxx041	Positive overtravel alarm
	NegativeSoftLimit	IBxx044	Negative software limit alarm
	NegativeSoftLimitN	IBxx2CD	Servo status N SOT
	NetworkServo	IBxx040	Servo alarm
	NotHomed	IBxx04D	Zero point not set alarm
	OutOfRangeParameter	IWxx01	Parameter number that is over range
	PositionCompletionTimeOut	IBxx046	Positioning timeout alarm
	PositionValueOutOfRange	IBxx047	Positioning out of range alarm
	PositiveOvertravel	IBxx042	Negative overtravel alarm
	PositiveSoftLimit	IBxx043	Positive software limit alarm
	PositiveSoftLimitN	IBxx2CC	Servo status P SOT
	ServoCommandTimeout	IBxx052	Servo command timeout alarm
	ServoCommunication	IBxx051	Servo communication alarm
	ServoCommunicationTimeout	IBxx050	Servo communication synchronization alarm
	ServoNotEnabled	IBxx045	Servo OFF alarm
	ServoParameterOutOfRange	IBxx04F	Servo parameter alarm
	SpeedOutOfRange	IBxx048	Speed out of range alarm

(continued)

Variable Name		Register	Comments
Command		-	Command
	Abort	OBxx091	Abort command
	Busy	IBxx090	Servo command busy
	Complete	IBxx098	Servo command complete
	Fail	IBxx093	Servo command failed
	GetValue	IWxx08	Servo command response
	Hold	IBxx091	Servo command holding
	JogRelativeMoveDirection	OBxx092	Selects Jog or Step direction.
	Pause	OBxx090	Pause command
	Ready	IBxx2C2	Servo status CMDRDY
	SetValue	OWxx08	SERVOPACK command
	StaticParameterNumber	OWxx5C	The number of the static parameter to be read when Command2=5
	StaticParameterValue	ILxx56	The value of the fixed parameter read by Command2=5.
	Status	IWxx09	Servo command status mask
Command2		-	Command2
	Busy	IBxx0B0	Servo Command2 busy
	Complete	IBxx0B8	Servo Command2 complete
	Fail	IBxx0B3	Servo Command2 Failed
	GetValue	IWxx0A	Servo Command2 response
	SetValue	OWxx0A	Additional servopack commands
	Status	IWxx0B	Servo Command2 status mask
CommandMask		OWxx09	Servo Command options
Deceleration		OLxx38	Deceleration value, units selected by UnitsWord (OWxx03)
Encoder		-	Encoder
	Get.AbsolutePositionLS	ILxx5E	Contains absolute position used in infinite length applications.
	Get.AbsolutePositionMS	ILxx60	Contains absolute position used in infinite length applications.
	Get.ModularPositionLS	ILxx62	Contains modularized position used in infinite length applications.
	Get.ModularPositionMS	ILxx64	Contains modularized position used in infinite length applications.
	Set.AbsolutePositionLS	OLxx5E	Used to set the absolute position used in infinite length applications.
	Set.AbsolutePositionMS	OLxx60	Used to set the absolute position used in infinite length applications.
	Set.ModularPositionLS	OLxx62	Used to set the modularized position used in infinite length applications.
	Set.ModularPositionMS	OLxx64	Used to set the modularized position used in infinite length applications.

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Variable Name		Register	Comments
Gain		-	Gain
	IntegralClear	OBxx00B	Resets position loop integral value.
	PhaseFeedForward	OWxx31	Add to the speed in 0.01%
	PositionFeedForward	OWxx30	Feed Forward adds to the position to increase response
	PositionIntegration	OWxx32	Time in ms used to integrate the position error
	PositionLoop	OWxx2E	Increase value for more rigid control.
	Select	OBxx014	Enables second set of servo gain parameters.
	SpeedIntegration	OWxx34	Time in ms used to integrate the speed error
	SpeedLoop	OWxx2F	Increases value for more rigid dampening.
	SpeedLoopType	OBxx013	Closes speed loop using Proportional and Integral control(0) or P control(1).
Home		-	Home
	ApproachSpeed	OLxx3E	Speed used in the first or second stage of homing depending on type
	AtHome	IBxx0C4	At home position (ZERO)
	AtHomeN	IBxx2C6	Servo status ZPOINT
	Complete	IBxx0C5	Home complete
	CompleteWindow	OWxx3D	The window used to set the home complete bit
	CreepSpeed	OLxx40	Speed used to locate the "c" channel or marker pulse
	DecelerationLS	OBxx058	Selects homing deceleration LS signal.
	Define	OLxx48	Redefine the coordinate system. In position mode, the servo will move when this variable is changed.
	Direction	OBxx093	Selects home direction.
	ForwardLimit	OBxx05A	Selects homing forward limit signal.
	InputSelect	OBxx05B	Selects homing input signal.
	Method	OWxx3C	The type of homing to perform
	Offset	OLxx42	Offset distance used at the end of homing
	ReverseLimit	OBxx059	Selects homing reverse limit signal.
IO		-	IO
	All	IWxx2E	Servo I_O mask
	Brake	IBxx2E9	Servo I_O BRK
	EXT1	IBxx2E6	Servo I_O EXT1
	EXT2	IBxx2E7	Servo I_O EXT2
	EXT3	IBxx2E8	Servo I_O EXT3
	Home	IBxx2E2	Servo I_O DEC
	IO12	IBxx2EC	Servo I_O IO12
	IO13	IBxx2ED	Servo I_O IO13
	IO14	IBxx2EE	Servo I_O IO14
	IO15	IBxx2EF	Servo I_O IO15
	NegativeOvertravel	IBxx2E1	Servo I_O N OT
	PhaseA	IBxx2E3	Servo I_O PA
	PhaseB	IBxx2E4	Servo I_O PB
	PhaseC	IBxx2E5	Servo I_O PC
	PositiveOvertravel	IBxx2E0	Servo I_O P OT

(continued)

Variable Name		Register	Comments
Latch			Latch
	Complete	IBxx0C2	Latch complete (LCOMP)
	CompleteN	IBxx2CA	Servo status L_CMP
	Enable	OBxx004	Sets bit to activate latch trigger.
	Value	ILxx18	Latch position (LPOS)
	WindowEnable	OBxx094	Enables the latch zone.
	WindowLowerLimit	OLxx2A	The lower limit of the latch window
	WindowUpperLimit	OLxx2C	The upper limit of the latch window
ModeMask		OWxx01	Various Servo bits packed into a word (mask)
Modulus		-	Modulus
	InitializeTurns	OBxx006	This will set the number of rotations for a modularized axis.
	SetTurns	OLxx4C	Value used to set the number of turns, or times the position has rolled over the maximum
	Turns	ILxx1E	POSMAX Number of turns
	TurnsInitialized	IBxx0C9	Number of turns initialized (TPRSE)
Monitor		-	Monitor
	Monitor2Enable	OBxx020	Enables second monitor.
	Monitor2Value	ILxx30	Monitor2
	Monitor3Value	ILxx32	Monitor3
	Monitor4Value	ILxx34	Monitor4
	PowerUp SeqDone	IBxx000	Motion controller ready
	ServoBusy	IBxx002	System is busy.
	ServoOn	IBxx001	Servo is energized.
	ServoOnN	IBxx2C3	Servo status SVON
	ServoReady	IBxx003	Servo is ready.
	ServoReadyN	IBxx2C4	Servo status PON
	Type	OWxx4E	Selects which value will be returned from the servopack. Bits 4 to 7 set monitor2and bits C to F set monitor4
	TypeResponse	IWxx2F	Servo monitor information
MonitorMask		IWxx00	Drive status mask
MotorType		IWxx3F	0=rotary, 1=linear

(continued)

Variable Name		Register	Comments
Position		-	Position
	AbsDataRestore	OBxx007	Loads current position with ABS encoder position at last power off.
	AbsDataRestored	IBxx0C8	Absolute data has been restored (ABSLDE).
	Actual	ILxx16	Actual (feedback) position (APOS)
	Commanded	OLxx1C	Commanded position, incremental or absolute based on MoveType
	CommandedPerScan	ILxx1C	Commanded position per each scan
	Error	ILxx1A	Position error (PERR)
	ErrorLimit	OLxx22	The value (in user units) that triggers a position error alarm or warning when exceeded
	ErrorType	OBxx010	Sets whether position error will trigger an alarm(0) or warning(1).
	IncTarget	ILxx0E	Commanded position (TPOS)
	IncTargetModularized	ILxx10	Modularized commanded position per scan (CPOS)
	IncTargetModularized2	ILxx12	Commanded position per scan (MPOS)
	InPosition	IBxx0C1	In position (POSCOMP)
	InPosition2	IBxx0C3	Second in position (NEAR)
	InPosition2N	IBxx2CB	Servo status NEAR
	InPosition2Window	OLxx20	Position window that determines when InPosition2 will be set (when Actual=Commanded ± Window2)
	InPositionN	IBxx2C7	Servo status PSET
	InPositionTimeOut	OWxx26	The value (in milliseconds) that triggers a position complete timeout alarm after the profilier is complete
	InPositionWindow	OLxx1E	Position window that determines when InPosition will be set (when Actual=Commanded ± Window)
	MoveType	OBxx95	Selects positioning. 0=incremental 1=absolete
	Offset	OLxx46	The offset distance that the motor will travel during the external positioning command if the external positioning signal is activated during the move
	PhaseCompensation	OLxx28	Position units added to the commanded position in phase control mode.
	PhasePositionLoopEnable	OBxx051	Closes position loop with OLxx16.
	ProfilerComplete	IBxx0C0	Profiler complete (DEN)
	ProfilerCompleteN	IBxx2C8	Servo status DEN
	Relative	OLxx44	Distance used in the step command
	WorkCoordinateOffset	OLxx4A	Offset for interpolation commands
S_CurveTime		OWxx3A	Softens acceleration or deceleration.
ServoOn		OBxx000	Sets bit to energize servo.
ServoParameter		-	ServoParameter
	GetNumber	IWxx36	Requested parameter number (Pn)
	GetValue	ILxx38	Requested parameter value
	SetNumber	OWxx50	The number of the amplifier parameter to be read or set
	SetSize	OWxx51	The size of the amplifier parameter data
	SetValue	OLxx52	The value to be set for the amplifier parameter

(continued)

Variable Name		Register	Comments
ServoParameter2		-	ServoParameter2
	GetNumber	IWxx37	Second requested parameter number (Pn)
	GetValue	ILxx3A	Second requested parameter value
	SetNumber	OWxx54	The number of the second amplifier parameter to be read or set
	SetSize	OWxx55	The size of the second amplifier parameter data
	SetValue	OLxx56	The value to be set for the second amplifier parameter
SettingsMask		OWxx00	Various Servo bits packed into a word (mask)
SignalSelectionWord		OWxx04	Selects latch input signal and offset input signal.
Simulate		OBxx001	In simulation mode, servo will not move.
SimulationActive		IBxx0C6	Simulation active or machine locked (MLKL)
SimulationActiveN		IBxx2C5	Servo status MLOCK
Speed		-	Speed
	Actual	ILxx40	Actual motor speed
	Commanded	OLxx10	Commanded speed in units based on UnitType
	CommandedResponse	ILxx20	Speed commanded response
	Override	OWxx18	The percentage of commanded speed actually achieved 100=1%
	TorqueLimit	OLxx14	Maximum torque allowed during speed control
StatusMask		IWxx0C	Status mask
StatusMaskN		IWxx2C	Servo status mask
Torque		-	Torque
	ActivateFwdLimit	OBxx008	Enables external forward torque limit set by servo parameter.
	ActivateRevLimit	OBxx009	Enables external reverse torque limit set by servo parameter.
	Actual	ILxx42	Actual motor torque
	Commanded	OLxx0C	The commanded motor torque in % of rated 100=1%
	Limited	IBxx2C9	Servo status T_LIM
	SpeedLimit	OWxx0E	Maximum speed allowed during torque control
UnitsWord		OWxx03	BITS 0 to 3, Set speed units 0=Ref/s 1=10^n ref/min 2=% BITS 4 to 7, Set acc/dec units 0=Ref/s^2 1=ms BITS 8 to 11, Set acc/dec filter 0=none 1=exponential 2=moving average
Warning		-	Warning
	Active	IBxx2C1	Servo status WARNING
	AllMask	ILxx02	Warning mask
	Communication	IBxx029	Servo communication warning
	DynamicParameterOutOfRange	IBxx021	Dynamic parameter out of range warning
	FollowingError	IBxx020	Following error warning
	InvalidCommand	IBxx024	Command Setting Error
	Mlink	IBxx023	Servo warning
	NegativeOvertravel	IBxx027	Negative overtravel warning
	PositiveOvertravel	IBxx026	Positive overtravel warning
	ServoNotEnabled	IBxx028	Servo not energized warning
	StaticParameterOutOfRange	IBxx022	Static parameter out of range warning

■ Axis Motion Parameters (Sorted by Register)

Register	Variable Name	Comments
IWxx00	MonitorMask	Drive status mask
IBxx000	Monitor.PowerUp SeqDone	Motion controller ready
IBxx001	Monitor.ServoOn	Servo is energized.
IBxx002	Monitor.ServoBusy	System is busy.
IBxx003	Monitor.ServoReady	Servo is ready.
IWxx01	Alarm.OutOfRangeParameter	Parameter number that is over range
ILxx02	Warning.AllMask	Warning mask
IBxx020	Warning.FollowingError	Following error warning
IBxx021	Warning.DynamicParameterOutOf-Range	Dynamic parameter out of range warning
IBxx022	Warning.StaticParameterOutOfRange	Static parameter out of range warning
IBxx023	Warning.Mlink	Servo warning
IBxx024	Warning.InvalidCommand	Command Setting Error
IBxx026	Warning.PositiveOvertravel	Positive overtravel warning
IBxx027	Warning.NegativeOvertravel	Negative overtravel warning
IBxx028	Warning.ServoNotEnabled	Servo not energized warning
IBxx029	Warning.Communication	Servo communication warning
ILxx04	Alarm.AllMask	Alarm mask
IBxx040	Alarm.NetworkServo	Servo alarm
IBxx041	Alarm.NegativeOvertravel	Positive overtravel alarm
IBxx042	Alarm.PositiveOvertravel	Negative overtravel alarm
IBxx043	Alarm.PositiveSoftLimit	Positive software limit alarm
IBxx044	Alarm.NegativeSoftLimit	Negative software limit alarm
IBxx045	Alarm.ServoNotEnabled	Servo OFF alarm
IBxx046	Alarm.PositionCompletionTimeOut	Positioning timeout alarm
IBxx047	Alarm.PositionValueOutOfRange	Positioning out of range alarm
IBxx048	Alarm.SpeedOutOfRange	Speed out of range alarm
IBxx049	Alarm.FollowingError	Following error exceeded alarm
IBxx04A	Alarm.FilterTypeChanged	Filter type changed while in motion alarm
IBxx04B	Alarm.FilterTimeChanged	Filter time constant changed while in motion alarm
IBxx04D	Alarm.NotHomed	Zero point not set alarm
IBxx04E	Alarm.HomingWhileMoving	Zero point set while in motion alarm
IBxx04F	Alarm.ServoParameterOutOfRange	Servo parameter alarm
IBxx050	Alarm.ServoCommunicationTimeout	Servo communication synchronization alarm
IBxx051	Alarm.ServoCommunication	Servo communication alarm
IBxx052	Alarm.ServoCommandTimeout	Servo command timeout alarm
IBxx053	Alarm.ABSEncoderOverrange	Absolute encoder number of rotations exceeded alarm
IWxx08	Command.GetValue	Servo command response
IWxx09	Command.Status	Servo command status mask
IBxx090	Command.Busy	Servo command busy
IBxx091	Command.Hold	Servo command holding
IBxx093	Command.Fail	Servo command failed
IBxx098	Command.Complete	Servo command complete
IWxx0A	Command2.GetValue	Servo Command2 response
IWxx0B	Command2.Status	Servo Command2 status mask
IBxx0B0	Command2.Busy	Servo Command2 busy
IBxx0B3	Command2.Fail	Servo Command2 Failed

(continued)

Register	Variable Name	Comments
IBxx0B8	Command2.Complete	Servo Command2 complete
IWxx0C	StatusMask	Status mask
IBxx0C0	Position.ProfilerComplete	Profiler complete (DEN)
IBxx0C1	Position.InPosition	In position (POSCOMP)
IBxx0C2	Latch.Complete	Latch complete (LCOMP)
IBxx0C3	Position.InPosition2	Second in position (NEAR)
IBxx0C4	Home.AtHome	At home position (ZERO)
IBxx0C5	Home.Complete	Home complete
IBxx0C6	SimulationActive	Simulation active or machine locked (MLKL)
IBxx0C8	Position.AbsDataRestored	Absolute data has been restored (ABSLDE).
IBxx0C9	Modulus.TurnsInitialized	Number of turns initialized (TPRSE)
ILxx0E	Position.IncTarget	Commanded position (TPOS)
ILxx10	Position.IncTargetModularized	Modularized commanded position per scan (CPOS)
ILxx12	Position.IncTargetModularized2	Commanded position per scan (MPOS)
ILxx16	Position.Actual	Actual (feedback) position (APOS)
ILxx18	Latch.Value	Latch position (LPOS)
ILxx1A	Position.Error	Position error (PERR)
ILxx1C	Position.CommandedPerScan	Commanded position per each scan
ILxx1E	Modulus.Turns	POSMAX Number of turns
ILxx20	Speed.CommandedResponse	Speed commanded response
IWxx2C	StatusMaskN	Servo status mask
IBxx2C0	Alarm.Active	Servo status ALM
IBxx2C1	Warning.Active	Servo status WARNING
IBxx2C2	Command.Ready	Servo status CMDRDY
IBxx2C3	Monitor.ServoOnN	Servo status SVON
IBxx2C4	Monitor.ServoReadyN	Servo status PON
IBxx2C5	SimulationActiveN	Servo status MLOCK
IBxx2C6	Home.AtHomeN	Servo status ZPOINT
IBxx2C7	Position.InPositionN	Servo status PSET
IBxx2C8	Position.ProfilerCompleteN	Servo status DEN
IBxx2C9	Torque.Limited	Servo status T_LIM
IBxx2CA	Latch.CompleteN	Servo status L_CMP
IBxx2CB	Position.InPosition2N	Servo status NEAR
IBxx2CC	Alarm.PositiveSoftLimitN	Servo status P SOT
IWxx2D	Alarm.Code	Servo Alarm Code
IBxx2CD	Alarm.NegativeSoftLimitN	Servo status N SOT
IWxx2E	IO.All	Servo I_O mask
IBxx2E0	IO.PositiveOvertravel	Servo I_O P OT
IBxx2E1	IO.NegativeOvertravel	Servo I_O N OT
IBxx2E2	IO.Home	Servo I_O DEC
IBxx2E3	IO.PhaseA	Servo I_O PA
IBxx2E4	IO.PhaseB	Servo I_O PB
IBxx2E5	IO.PhaseC	Servo I_O PC
IBxx2E6	IO.EXT1	Servo I_O EXT1
IBxx2E7	IO.EXT2	Servo I_O EXT2
IBxx2E8	IO.EXT3	Servo I_O EXT3
IBxx2E9	IO.Brake	Servo I_O BRK
IBxx2EC	IO.IO12	Servo I_O IO12
IBxx2ED	IO.IO13	Servo I_O IO13

(continued)

Register	Variable Name	Comments
IBxx2EE	IO.IO14	Servo I_O IO14
IBxx2EF	IO.IO15	Servo I_O IO15
IWxx2F	Monitor.TypeResponse	Servo monitor information
ILxx30	Monitor.Monitor2Value	Monitor2
ILxx32	Monitor.Monitor3Value	Monitor3
ILxx34	Monitor.Monitor4Value	Monitor4
ILxx38	ServoParameter.GetValue	Requested parameter value
IWxx36	ServoParameter.GetNumber	Requested parameter number (Pn)
IWxx37	ServoParameter2.GetNumber	Second requested parameter number (Pn)
ILxx3A	ServoParameter2.GetValue	Second requested parameter value
IWxx3F	MotorType	0=rotary, 1=linear
ILxx40	Speed.Actual	Actual motor speed
ILxx42	Torque.Actual	Actual motor torque
ILxx56	Command.StaticParameterValue	The value of the fixed parameter read by Command2=5.
ILxx5E	Encoder.Get.AbsolutePositionLS	Contains absolute position used in infinite length applications.
ILxx60	Encoder.Get.AbsolutePositionMS	Contains absolute position used in infinite length applications.
ILxx62	Encoder.Get.ModularPositionLS	Contains modularized position used in infinite length applications.
ILxx64	Encoder.Get.ModularPositionMS	Contains modularized position used in infinite length applications.
OWxx00	SettingsMask	Various Servo bits packed into a word (mask)
OBxx000	ServoOn	Sets bit to energize servo.
OBxx001	Simulate	In simulation mode, servo will not move.
OBxx004	Latch.Enable	Sets bit to activate latch trigger.
OBxx006	Modulus.InitializeTurns	This will set the number of rotations for a modularized axis.
OBxx007	Position.AbsDataRestore	Loads current position with ABS encoder position at last power off.
OBxx008	Torque.ActivateFwdLimit	Enables external forward torque limit set by servo parameter.
OBxx009	Torque.ActivateRevLimit	Enables external reverse torque limit set by servo parameter.
OBxx00B	Gain.IntegralClear	Resets position loop integral value.
OBxx00F	Alarm.Clear	Clears servo alarms.
OWxx01	ModeMask	Various Servo bits packed into a word (mask)
OBxx010	Position.ErrorType	Sets whether position error will trigger an alarm(0) or warning(1).
OBxx013	Gain.SpeedLoopType	Closes speed loop using Proportional and Integral control(0) or P control(1).
OBxx014	Gain.Select	Enables second set of servo gain parameters.
OBxx020	Monitor.Monitor2Enable	Enables second monitor.
OWxx03	UnitsWord	BITS 0 to 3, Set speed units 0=Ref/s 1=10^n ref/min 2=% BITS 4 to 7, Set acc/dec units 0=Ref/s^2 1=ms BITS 8 to 11, Set acc/dec filter 0=none 1=exponential 2=moving average
OWxx04	SignalSelectionWord	Selects latch input signal and offset input signal.
OBxx051	Position.PhasePositionLoopEnable	Closes position loop with OLxx16.
OBxx058	Home.DecelerationLS	Selects homing deceleration LS signal.
OBxx059	Home.ReverseLimit	Selects homing reverse limit signal.
OBxx05A	Home.ForwardLimit	Selects homing forward limit signal.
OBxx05B	InputSelect	Selects homing input signal.
OWxx08	Command.SetValue	SERVOPACK command

(continued)

Register	Variable Name	Comments
OWxx0E	Torque.SpeedLimit	Maximum speed allowed during torque control
OWxx09	CommandMask	Servo Command options
OBxx090	Command.Pause	Pause command
OBxx091	Command.Abort	Abort command
OBxx092	Command.JogRelativeMoveDirection	Selects Jog or Step direction.
OBxx093	Home.Direction	Selects home direction.
OBxx094	Latch.WindowEnable	Enables the latch zone.
OWxx0A	Command2.SetValue	Additional servopack commands
OLxx0C	Torque.Commanded	The commanded motor torque in % of rated 100=1%
OLxx10	Speed.Commanded	Commanded speed in units based on UnitType
OLxx14	Speed.TorqueLimit	Maximum torque allowed during speed control
OWxx18	Speed.Override	The percentage of commanded speed actually achieved 100=1%
OLxx1C	Position.Commanded	Commanded position, incremental or absolute based on MoveType
OLxx1E	Position.InPositionWindow	Position window that determines when InPosition will be set (when Actual=Commanded ± Window)
OLxx20	Position.InPosition2Window	Position window that determines when InPosition2 will be set (when Actual=Commanded ± Window2)
OLxx22	Position.ErrorLimit	The value (in user units) that triggers a position error alarm or warning when exceeded
OLxx28	Position.PhaseCompensation	Position units added to the commanded position in phase control mode.
OWxx26	Position.InPositionTimeOut	The value (in milliseconds) that triggers a position complete timeout alarm after the profilier is complete
OLxx2A	Latch.WindowLowerLimit	The lower limit of the latch window
OLxx2C	Latch.WindowUpperLimit	The upper limit of the latch window
OWxx2E	Gain.PositionLoop	Increase value for more rigid control.
OWxx2F	Gain.SpeedLoop	Increases value for more rigid dampening.
OWxx30	Gain.PositionFeedForward	Feed Forward adds to the position to increase response
OWxx31	Gain.PhaseFeedForward	Add to the speed in 0.01%
OWxx32	Gain.PositionIntegration	Time in ms used to integrate the position error
OWxx34	Gain.SpeedIntegration	Time in ms used to integrate the speed error
OLxx36	Acceleration	Acceleration Value, units selected by UnitsWord (OWxx03)
OLxx38	Deceleration	Deceleration value, units selected by UnitsWord (OWxx03)
OWxx3A	S_CurveTime	Softens acceleration or deceleration.
OWxx3C	Home.Method	The type of homing to perform
OWxx3D	Home.CompleteWindow	The window used to set the home complete bit
OLxx3E	Home.ApproachSpeed	Speed used in the first or second stage of homing depending on type
OLxx40	Home.CreepSpeed	Speed used to locate the "c" channel or marker pulse
OLxx42	Home.Offset	Offset distance used at the end of homing
OLxx44	Position.Relative	Distance used in the step command
OLxx46	Position.Offset	The offset distance that the motor will travel during the external positioning command if the external positioning signal is activated during the move
OLxx48	Home.Define	Redefine the coordinate system. In position mode, the servo will move when this variable is changed.
OLxx4A	Position.WorkCoordinateOffset	Offset for interpolation commands
OLxx4C	Modulus.SetTurns	Value used to set the number of turns, or times the position has rolled over the maximum

(continued)

Register	Variable Name	Comments
OWxx4E	Monitor.Type	Selects which value will be returned from the servopack. Bits 4 to 7 set monitor2and bits C to F set monitor4
OWxx4F	Alarm.MonitorNumber	This value determines which of the last 10 alarm codes are returned.
OWxx50	ServoParameter.SetNumber	The number of the amplifier parameter to be read or set
OWxx51	ServoParameter.SetSize	The size of the amplifier parameter data
OLxx52	ServoParameter.SetValue	The value to be set for the amplifier parameter
OWxx54	ServoParameter2.SetNumber	The number of the second amplifier parameter to be read or set
OWxx55	ServoParameter2.SetSize	The size of the second amplifier parameter data
OLxx56	ServoParameter2.SetValue	The value to be set for the second amplifier parameter
OWxx5C	Command.StaticParameterNumber	The number of the static parameter to be read when Command2=5
OLxx5E	Encoder.Set.AbsolutePositionLS	Used to set the absolute position used in infinite length applications.
OLxx60	Encoder.Set.AbsolutePositionMS	Used to set the absolute position used in infinite length applications.
OLxx62	Encoder.Set.ModularPositionLS	Used to set the modularized position used in infinite length applications.
OLxx64	Encoder.Set.ModularPositionMS	Used to set the modularized position used in infinite length applications.
OBxx95	Position.MoveType	Selects positioning. 0=incremental 1=absolete

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Revision History

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Overview of the MP2300

This chapter explains an overview and features of the MP2300 Machine Controller.

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1.1 Features

The MP2300 is an all-in-one, compact Machine Controller that combines power supply, CPU, SVB, I/O, and communication functions in one system. The MP2300 consists of a Basic Module that performs motion control and sequence control and Optional Modules that perform I/O and communication functions.
The MP2300 has the following features:

- Flexibility
- High performance, and
- Easy use

■ Flexibility

Optional Modules can be inserted into any of the three slots, so the optimum system can be built for your machine.

■ High Performance

- High control characteristics have been realized by increasing the CPU and Motion Network (MECHATROLINK-II) speed.
  - MECHATROLINK-II baud rate: 2.5 times faster
  - CPU processing speed: 1.4 times faster than MP930
- MECHATROLINK-II enables position control, speed control, and torque control and makes precise synchronous control possible. The control mode can also be changed while online, facilitating complicated machine operations.
- Select the appropriate Communication Module to use the following open networks.
  - Ethernet
  - DeviceNet
  - PROFIBUS

■ Easy to Use

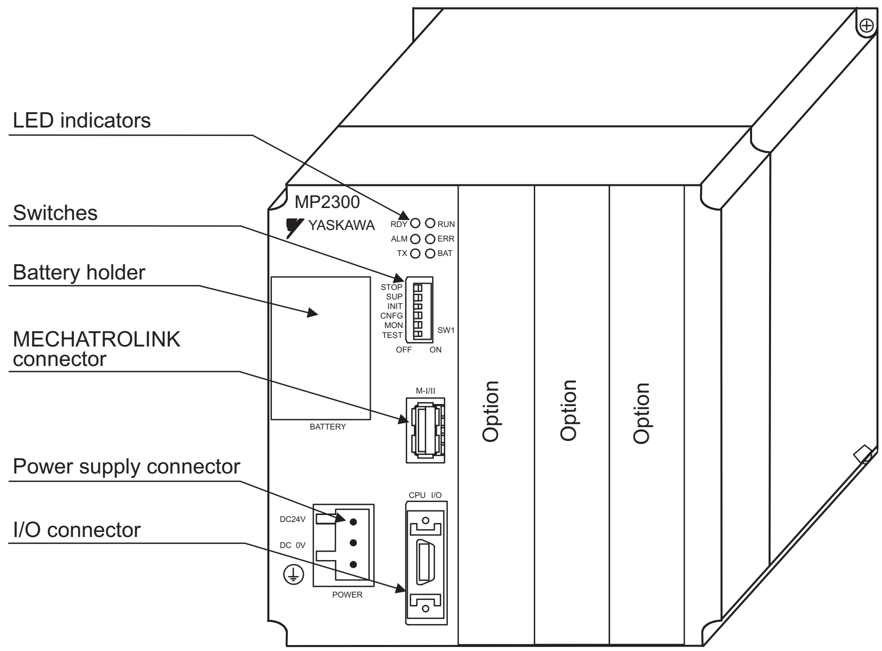
- The time of machine development can be greatly reduced by using the self-configuration function that automatically detects devices connected to MECHATROLINK and automatically sets the required parameters.
- The application program converter can utilize your previous software assets with their accumulated databanks of specific knowledge to improve the system further.

1.2 MP2300 Configuration

The MP2300 is configured with one Basic Module and up to three Optional Modules.

1.2.1 Basic Module Appearance

The following figure shows the external appearance of the Basic Module.



1.2.2 MP2300 Modules

The following table shows the names and descriptions of the Basic Module and Optional Modules.

Group		Name	Description	Model	Remarks
Basic Module		Basic Module	MP2300	JAPMC-MP2300	MECHATROLINK-I, MECHATROLINK-II 8 input, 4 outputs
Optional Modules	Motion Modules	MECHATROLINK-II Motion-control Module	SVB-01	JAPMC-MC2310	MECHATROLINK-I, -II, 16 axes maximum
		Analog Output Motion-control Module	SVA-01	JAPMC-MC2300	Analog output, 2 axes maximum
	I/O Modules	I/O Module	LIO-01	JAPMC-IO2300	16 inputs, 16 outputs (sink mode output) 1 pulse input
		I/O Module	LIO-02	JAPMC-IO2301	16 inputs, 16 outputs (source mode output) 1 pulse input
		I/O Module	LIO-04	JAPMC-IO2303	32 inputs, 32 outputs (sink mode output)
		I/O Module	LIO-05	JAPMC-IO2304	32 inputs, 32 outputs (source mode output)
		Analog Input Module	AI-01	JAPMC-AN2300	Analog input
		Output Module	DO-01	JAPMC-DO2300	64 outputs (sink mode output)
	Communication Modules	Ethernet Communication Module	218IF-01	JAPMC-CM2300	RS-232C and Ethernet communication
		General-purpose Serial Communication Module	217IF-01	JAPMC-CM2310	RS-232C and RS422/485 communication
		DeviceNet Communication Module	260IF-01	JAPMC-CM2320	RS-232C and DeviceNet communication
		PROFIBUS Communication Module	261IF-01	JAPMC-CM2330	RS-232C and PROFIBUS communication

1.2.3 MP2300 Series Models

The following table shows the possible combinations of the MP2300 Basic Module with the PS, the CPU, and the MB, and Optional Modules.

No.	Model	Combination of Modules
1	JEPMC-MP2300	Basic Module | (empty) | (empty) | (empty)
2	JEPMC-MP2300-Y1	Basic Module | 217 IF | 218 IF | LIO 01
3	JEPMC-MP2300-Y2	Basic Module | 218 IF | LIO 01 | LIO 01

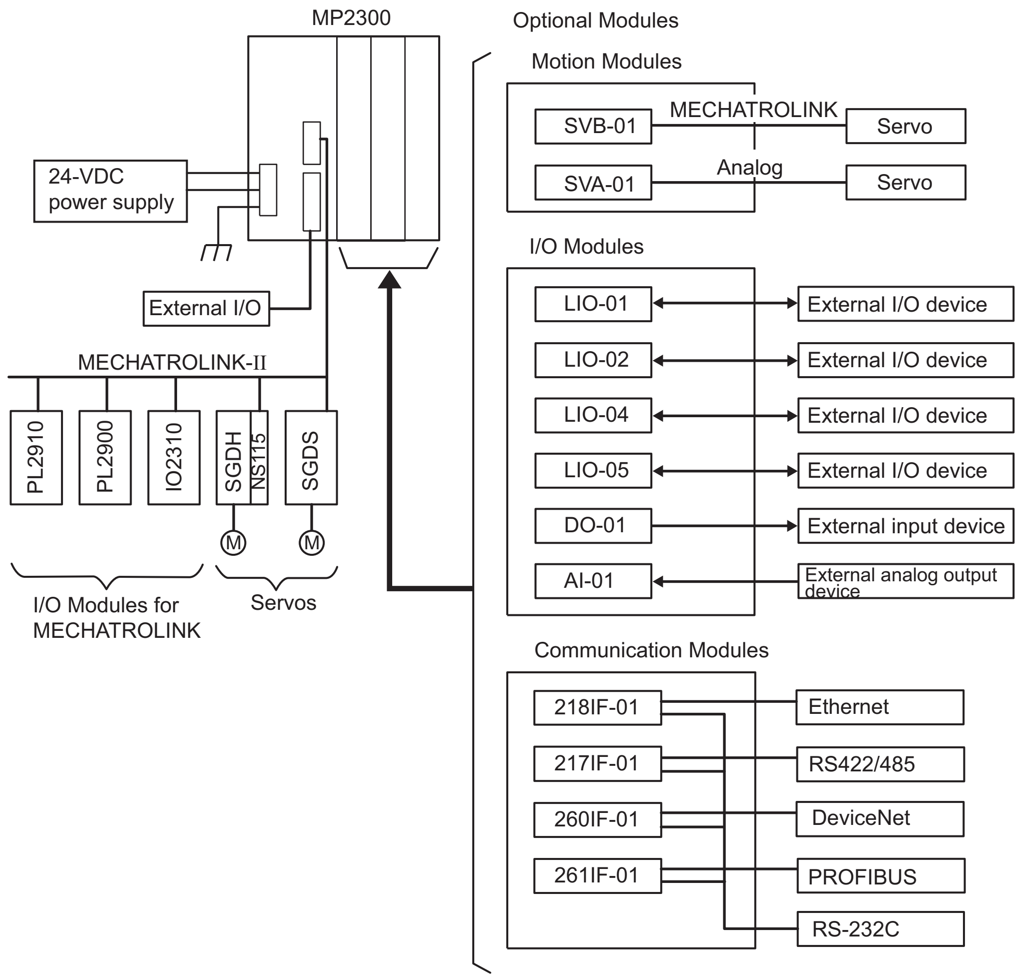
(cont'd)

No.	Model	Combination of Modules
4		**Reserved**
5	JEPMC-MP2300-Y4	Basic Module / 217 IF / 218 IF / LIO 02
6	JEPMC-MP2300-Y5	Basic Module / 218 IF / LIO 02 / LIO 02
7		**Reserved**
8	JEPMC-MP2300-Y7	Basic Module / 217 IF / 217 IF / LIO 01
9	JEPMC-MP2300-Y8	Basic Module / 217 IF / LIO 01 / LIO 01
10		**Reserved**
11	JEPMC-MP2300-Y10	Basic Module / 217 IF / 217 IF / LIO 02
12	JEPMC-MP2300-Y11	Basic Module / 217 IF / LIO 01 / LIO 02

1.3 System Configuration

1.3.1 Example

The following diagram shows an example of system configuration.



- For the details on the system configuration example, refer to *2.1.2 System Configuration* on page 2-3.
- Use the connecting cables and connectors recommended by Yaskawa. Always check the device to be used and select the correct cable for the device.
- Different SERVOPACKs are connected to MECHATROLINK-I (4 Mbps) and MECHATROLINK-II (10 Mbps). Refer to *1.4.1 SERVOPACKs* on page 1-7 and select the appropriate SERVOPACKs.
- If devices compatible with MECHATROLINK-I and MECHATROLINK-II are used together, make the settings for MECHATROLINK-I.
- The user must supply the 24-VDC power supply.
- When connecting SERVOPACKs via MECHATROLINK, connect the overtravel, zero point return deceleration limit switch, and external latch signals to the SERVOPACKs. For connection, refer to the SERVOPACK's manual.

1.4 Devices Connectable to MECHATROLINK

The devices that are compatible with MECHATROLINK and can be connected to the MP2300 and the SVB-01 Module are listed below.

1.4.1 SERVOPACKs

Model Number	Details	MECHATROLINK-I	MECHATROLINK-II
SGDS-□□□1□□	SGDS SERVOPACK	Yes	Yes
SGDH-□□□E JUSP-NS115	SGDH SERVOPACK NS115 MECHATROLINK-II Interface Unit	Yes	Yes
SGDH-□□□E JUSP-NS100	SGDH SERVOPACK NS110 MECHATROLINK-I Interface Units	Yes	No
SGD-□□□N SGDB-□□AN	MECHATROLINK compatible AC SERVO-PACKs	Yes	No

1.4.2 Modules

Model Number	Details	MECHATROLINK-I	MECHATROLINK-II
JEPMC-IO2310	64-point I/O Module 24 VDC, 64 inputs, 64 outputs (sink mode output)	Yes	Yes
JEPMC-IO2330	64-point I/O Module 24 VDC, 64 inputs, 64 outputs (source mode output)	Yes	Yes
JEPMC-PL2900	Counter Module Reversible counter, 2 channels	Yes	Yes
JEPMC-PL2910	Pulse Output Module Pulse output, 2 channels	Yes	Yes
JEPMC-AN2900	A/D Module Analog inputs, –10 to 10 V, 4 channels	Yes	Yes
JEPMC-AN2910	D/A Module Analog outputs, –10 to 10 V, 2 channels	Yes	Yes
JEPMC-IO350	64-point I/O Module 24 VDC, 64 inputs, 64 outputs	Yes	No
JAMSC-120DDI34330	DC Input Module 12/24 VDC, 16 inputs	Yes	No
JAMSC-120DDO34340	DC Output Module 12/24 VDC, 16 outputs	Yes	No
JAMSC-120DAI53330	AC Input Module 100 VAC, 8 inputs	Yes	No
JAMSC-120DAI73330	AC Input Module 200 VAC, 8 inputs	Yes	No
JAMSC-120DAO83330	AC Output Module 100/200 VAC, 8 outputs	Yes	No
JAMSC-120DRA83030	Relay Module Wide voltage range relay contacts, 8 contact outputs	Yes	No
JAMSC-120AVI02030	A/D Module Analog inputs, –10 to 10 V, 4 channels	Yes	No
JAMSC-120AVO01030	D/A Module Analog outputs, –10 to 10 V, 2 channels	Yes	No
JAMSC-120EHC21140	Counter Module Reversible counter, 2 channels	Yes	No
JAMSC-120MMB20230	Pulse Output Module Pulse output, 2 channels	Yes	No
JEPMC-REP2000	MECHATROLINK-II Repeater	No	Yes
JEVSA-YV250	MYVIS (image processing device)	Yes	Yes

1.5 Cables and Accessories

1.5.1 Cables

The following table shows the cables that can be connected to the MP2300 Basic Module and Optional Modules.

Module	Connector Name	Application	Model	Specifications
MP2300 Basic Module and SVB-01	CPU I/O	External I/O	JEPMC-W2060-□□	Used between CPU I/O and External I/O
	M-I/II	MECHATROLINK-I, MECHATROLINK-II cable	JEPMC-W6002-□□ *with MECHATROLINK connectors on both ends	Used between the devices listed below SVB-01 and I/O Unit, SVB-01 and SGDH-□□E+NS100 SVB-01 and SGDH-□□E+NS115 SVB-01 and SGDS-□□□1□□
			JEPMC-W6003-□□ *with MECHATROLINK connectors on both ends *with ferrite core	
			JEPMC-W6011-□□ *with a MECHATROLINK connector and loose wires	Used between the devices listed below SVB-01 and SGD-□□□N SVB-01 and SGDB-□□AN
			JEPMC-W6022	Terminator
SVA-01	CN/1 CN/2	Cable for analog reference input SERVOPACK	JEPMC-W2040-□□	Used between the devices listed below SVA-01 and SGDM/SGDH SVA-01 and SGDS-□□□01□ SVA-01 and SGDS-□□□02□
LIO-01 LIO-02	I/O	External I/O	JEPMC-W2061-□□ *Loose wires on one end	Used between LIO-01/02 and External I/O device
LIO-04 LIO-05	CN/1, CN/2	External I/O	JEPMC-W6060-□□ *Loose wires on one end	Used between LIO-04/05 and External I/O device
DO-01	CN/1, CN/2	External outputs	JEPMC-W6060-□□ *Loose wires on one end	Used between DO-01 and External I/O device
AI-01	CN/1, CN/2	Analog external outputs	JEPMC-W6080-□□ *Loose wires on one end	Used between AI-01 and Analog external output device
Communication Module	PORT (Common to all communication modules)	RS-232C communication cable	JEPMC-W5310-□□	Used between RS-232C port and 25-pin male D-sub connector
			JEPMC-W5311-□□	Used between RS-232C port and DOS/V
218IF-01	10Base-T	Ethernet communication cable	Use a commercially available cable.	Cross cable (Category 3 min.)
217IF-01	RS422/485	RS422/485 communication cable		Module-side connector: 1010214-52A2JL (manufactured by Sumitomo 3M)
				Cable-side connector: 10114-3000VE (manufactured by Sumitomo 3M)
				Shell: 10314-52A0-008 (manufactured by Sumitomo 3M)
260IF-01	DeviceNet	DeviceNet communication cable		Module-side connector: MSTB2-5/5-GF-5.08AM (manufactured by Phoenix Contact K.K.)
261IF-01	PROFIBUS	PROFIBUS communication cable		Module-side connector: 17LE-13090-27(D33C) (manufactured by DDK Ltd.)

1.5.2 Accessories and Options

Name	Accessory/Optional	Model	Remarks
Battery	Accessory	JZSP-BA01	ER3VC + exclusive use connector (BA000517)
Power Supply Connector	Accessory	721-203/026	Cable side
DIN Rail Mounting Parts	Optional	JEPMC-OP300	2 parts for 1 set
Option Slot Cover	Optional	JEPMC-OP2300	Front cover for empty slot

1.5.3 Software (Programming Tool (Optional))

The MPE720, programming tool for MP2300, is available.

Name	Model	Remarks
MPE720	CPMC-MPE720 (Ver. 4.41A or later)	CD-ROM (1 disk)

MEMO

2

System Startup and Sample Programs

This chapter describes the procedure for starting the MP2300 system and sample programs for typical operation and control.

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2.1 Model System Startup Procedure

This section describes the procedure for starting the Model System and using the sample programs of the MPE720 Programming Tool (on the MPE720 installation disk). The procedure for designing machine systems is omitted here.

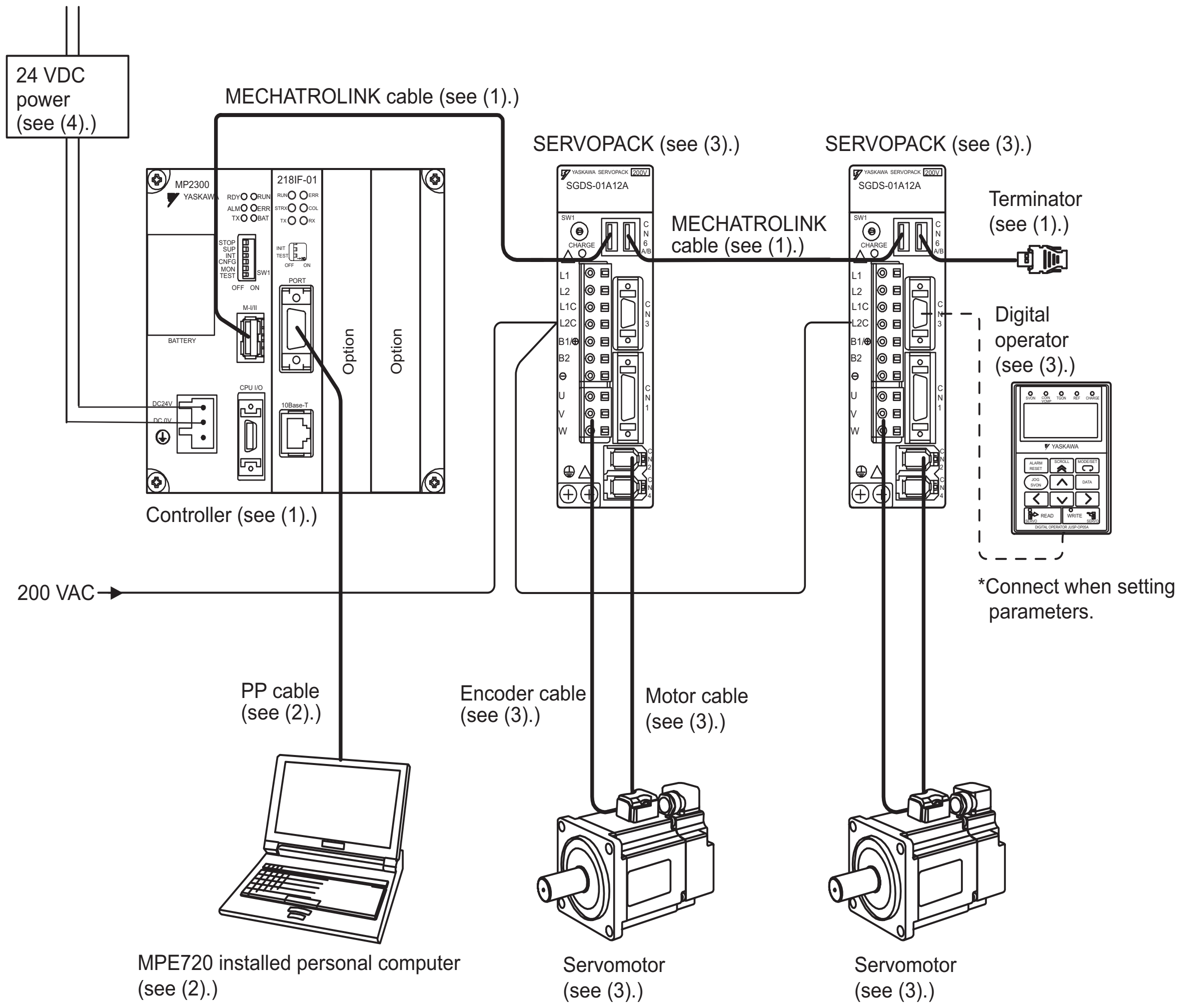
2.1.1 Flowchart for Model System Startup

An outline of the procedure for system startup is provided below.
Refer to the reference material for each procedure, indicated in the right-hand column.

1.	Preparation of Devices Prepare and connect the devices required for testing.	→ *2.1.2 System Configuration* on page 2-3
⇩		
2.	Mounting Modules Mount the 218IF-01 to the Basic Module.	→ *4.1.2 Replacing and Adding Optional Modules* on page 4-5
⇩		
3.	Connecting and Wiring the System Connect the MPE720 installed personal computer, and wire the Servomotors and SERVOPACKs.	→ *2.1.2 System Configuration* on page 2-3
⇩		
4.	Initializing the SERVOPACKs Initialize the SERVOPACKs.	→ *2.1.3 Initializing SERVOPACKs* on page 2-4
⇩		
5.	MP2300 Self-configuration The connected devices are automatically confirmed.	→ *2.1.4 MP2300 Self-configuration* on page 2-5
⇩		
6.	Starting and Preparing the MPE720 Start the MPE720 and create a folder for storing sample programs.	→ *2.1.5 Starting and Preparing MPE720*
⇩		
7.	Reading, Transferring, and Saving Sample Programs Read the sample program to the MPE720, transfer it to the MP2300. Then, set the parameters such as fixed parameters, and save the configuration definitions to flash memory.	→ *2.1.6 Reading Sample Programs and Setting and Saving Parameters* on page 2-19
⇩		
8.	Checking Operation Execute the program and check the test operation.	→ *2.2 Checking Sample Program Operation* on page 2-36

2.1.2 System Configuration

This section describes the system configuration shown in the following diagram. Prepare each devices and connect as diagram.



For details on equipment for the controller, programming device, servodrive, and the power supply, refer to the following descriptions.

(1) Controller-related Equipment

Name	Model	Quantity
MP2300	JEPMC-MP2300	1
218IF-01	JAPMC-CM2300	1
MECHATOROLINK Cables (1 m)	JEPMC-W6002-01	2
Terminator	JEPMC-W6022	1

- For mounting the 218IF-01 Module to the MP2300, refer to *4.1.2 Replacing and Adding Optional Modules* on page 4-5.

(2) Programming Device-related Equipment

Name	Model	Quantity
MPE720	CPMC-MPE720 version 4.41A or later	1
PP Cable (for RS-232C connection)	JEPMC-W5311-03	1
PP Cable (for Ethernet connection)	Commercially-available cross cable	1
Computer	Commercially-available product	1

- Above equipments can connect to the MP2300 with either RS-232C or Ethernet.

(3) Servodrive-related Equipment

Name	Model	Quantity
Σ-III SERVOPACKs	SGDS-01A12A	2
Σ-III Servomotors	SGMAS-01ACA21	2
Motor Cables (3 m)	JZSP-CSM01-03	2
Encoder Cables (3 m)	JZSP-CSP01-03	2
Digital Operator	JUSP-OP05A	1

- The sample program settings control operation for station 1 and 2 axes, so the MECHATROLINK station numbers must be set to 1 and 2 on the SERVOPACK rotary switches.
- Open the front cover of the SERVOPACK and set the DIP switch inside as follows: Pin 1: ON; Pin 2: ON; Pin 3: OFF; Pin 4: OFF.
- When making SERVOPACK settings, the Digital Operator is connected to the SERVOPACK for which settings are to be made.

(4) Other Required Equipment

Name	Specification	Quantity
24-VDC power supply	Current capacity of 2 A or larger	1

2.1.3 Initializing SERVOPACKs

This section describes the procedure for initializing Σ-III SERVOPACKs using the Digital Operator. Always initialize SERVOPACKs that have been transferred from other systems. SERVOPACKs that are being used for the first time do not need to be initialized.

1. Check that the SERVOPACK power is OFF and then insert the Digital Operation connection plug into the CN3 connector on the SERVOPACK.

2. Turn ON the SERVOPACK control power and main power.

3. Turn ON the Digital Operator power.

4. Press the MODE/SET Key on the Digital Operator to display the Auxiliary Function Mode main menu, and use the ∧ ∨ Keys to select Fn005.

```
BB        －FUNCTION－
Fn004
Fn005
Fn006
Fn007
```

5. Press the DATA Key to switch to the Fn005 parameter initialization execution display.

* If the display does not change and “NO-OP” is displayed on the status display, a Write Prohibited password has been set using Fn010 and the user settings cannot be initialized. Clear the write protection and execute the operation again.

6. Press the DATA Key again and execute Fn005.

“Parameter Init” will flash during initialization.

```
BB
 Parameter Init
  Start  :[DATA]
  Return:[SET]
```

The flashing will stop when initialization has been completed and the status display will change from BB to Done to A.941.

- To cancel initialization, press the MODE/SET Key before pressing the DATA Key. The display returns to the Auxiliary Function Mode main menu.

7. Turn the SERVOPACK control and main power supplies from OFF to ON to enable the initialization.

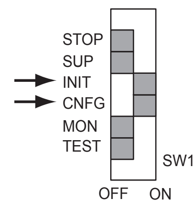
2.1.4 MP2300 Self-configuration

Execute self-configuration to automatically configure the Optional Modules mounted to the Basic Module and the devices connected to the MECHATROLINK.
This section explains the method for self-configuration.

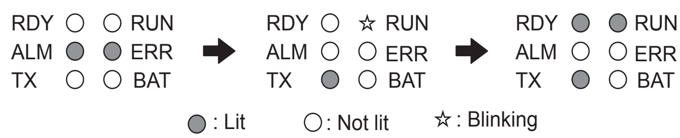
1. Check that the power supply of the Σ-III SERVOPACK is ON.

2. Turn OFF the 24-VDC power supply to the MP2300.

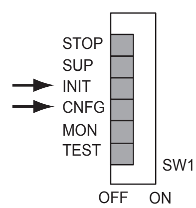
3. Turn ON the INIT and CNFG switches on the DIP switch (SW1) on the MP2300 Basic Module.



4. Turn ON the 24-VDC power supply to the MP2300.
Check that the LED indicators on the MP2300 Basic Module change as the following illustration.



5. Turn OFF the INIT and CNFG switches on the DIP switch (SW1) on the MP2300 Basic Module.



This completes the self-configuration, and the information of Optiotional Modules and MECHATROLINK slave devices are read in the definition information file.

■ INIT switch and RAM data

If the INIT switch on the DIP switch on the Basic Module is turned ON and the power is turned ON, RAM data will be cleared.
Flash memory data is read when the INIT switch is turned OFF and the power is turned ON. Therefore, always save data to the MP2300 flash memory before turning OFF the power when writing or editing programs.
For information on how to save data to flash memory, refer to *2.1.5 Starting and Preparing MPE720* on page 2-7.

■ Turning OFF Power after Executing Self-configuration

Do not turn OFF the 24-VDC power supply to the MP2300 after executing self-configuration until the definitions data has been saved to flash memory in the MP2300. If the power is turned OFF somehow before the data is saved to flash memory, execute self-configuration again.

2.1.5 Starting and Preparing MPE720

This section describes the preparation for connecting the MPE720 (motion programming software, optional) to the MP2300 and the method for installing the sample program for the MP2300.
The explanation is given assuming that the MPE720 has been installed on your personal computer.

- Refer to *Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (Manual No. SIEP C880700 05□)* for the installation method of MPE720.

The reference sections for the MPE720 startup procedure and each operation as follows.

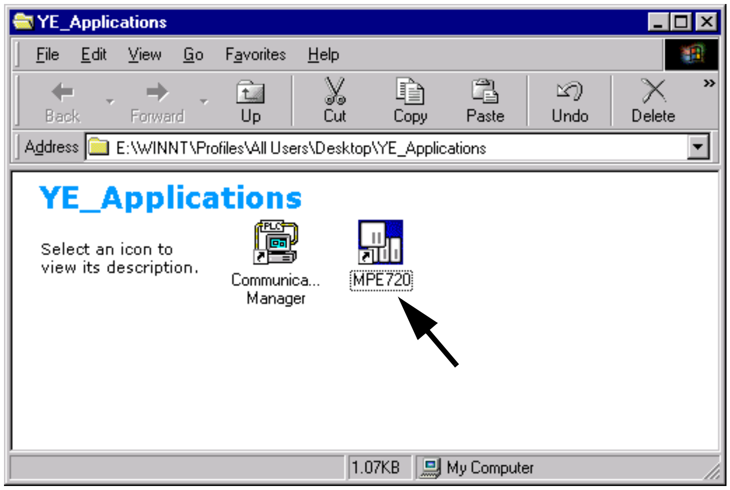
1.	Starting the MPE720	→ *2.1.5 (1) Starting the MPE720* on page 2-8
2.	Communication process settings Define the communication with MP2300.	→ *2.1.5 (2) Setting and Saving Communication Process* on page 2-9
3.	Create a group folder Create a Group Folder to save Order Folders.	→ *2.1.5 (3) Creating Group Folders (Option)* on page 2-15
4.	Create an order folder Create an Order Folder to save Controller Folders.	→ *2.1.5 (4) Creating Order Folders (Required)* on page 2-16
5.	Create a controller folder Create a Controller Folder to save programs.	→ *2.1.5 (5) Creating Controller Folders (Required)* on page 2-17

(1) Starting the MPE720

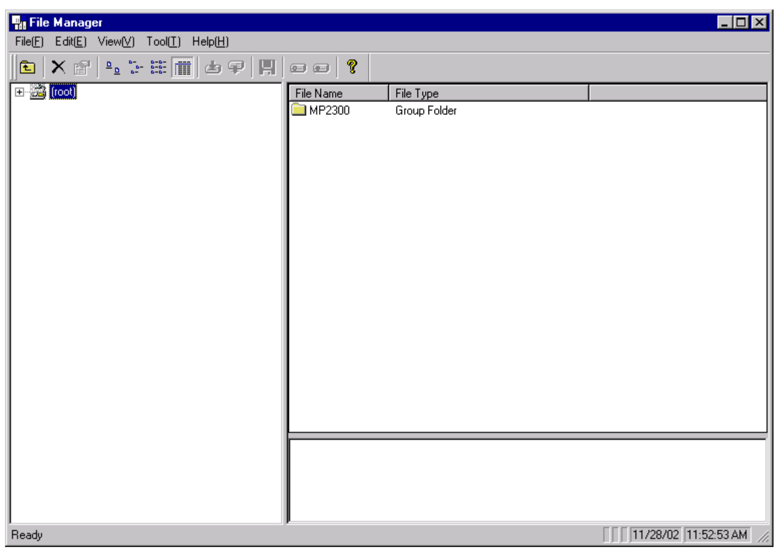
Start the MPE720 using the following procedure.

1. Open the YE_Applications Folder and double-click the **MPE720** icon.
Or, select ***Start - All Programs - YE_Application - MPE720.***

- The operation to start the MPE720 depends on the OS version number of the personal computer.



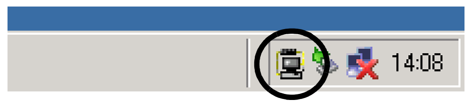
The MPE720 starts up and the File Manager Window appears.



(2) Setting and Saving Communication Process

Make communication settings for connecting the MPE720 and the MP2300 using the following procedure. These settings are not required if the communication settings have already been made.

1. When the MPE720 is started, the **Communication Process** icon will be displayed on the task tray at the right bottom of the screen. Click the **Communication Process** icon to open the **Communication Process** Window.

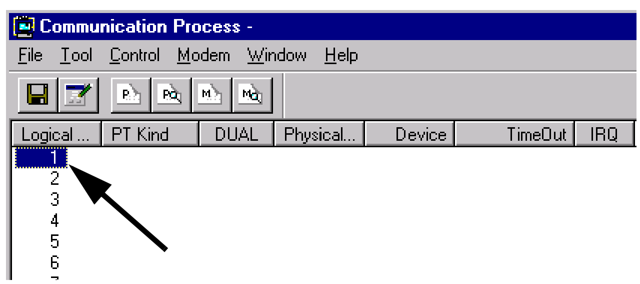


Communication Process icon

In this section, Logical PT number **1** is assigned for RS-232C connection and **2** for Ethernet connection in the **Communication Process** Window.

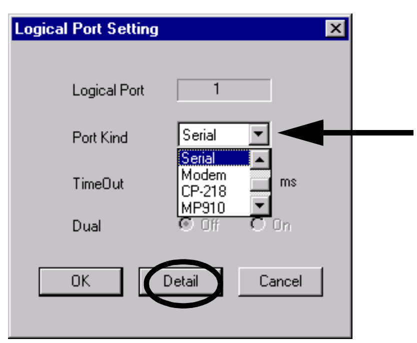
● Settings for RS-232C Connection

2. Double-click Logical PT number **1** in the **Communication Process** Window to display the Logical **Port Setting** Window.



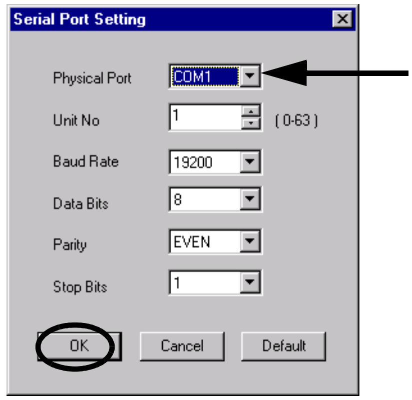
The **Logical Port Setting** Window appears.

3. For RS-232C connections, select **Serial** under Port Kind and then click **Detail** Button in the **Logical Port Setting** Dialog Box.

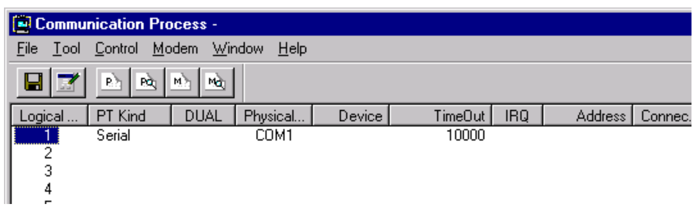


The **Serial Port Setting** Dialog Box appears.

4. Match the settings under Physical Port to the computer's serial communication port. Leave the other items on the default settings. Once the settings have been completed and checked, click the **OK** Button to close the **Logical Port Setting** Dialog Box.



5. The **Logical Port Setting** Window appears. Click the **OK** Button again. The screen will return to the **Communication Process** Window. Check that **Serial** has been allocated to Logical PT number **1**.



- Settings for Ethernet Connection

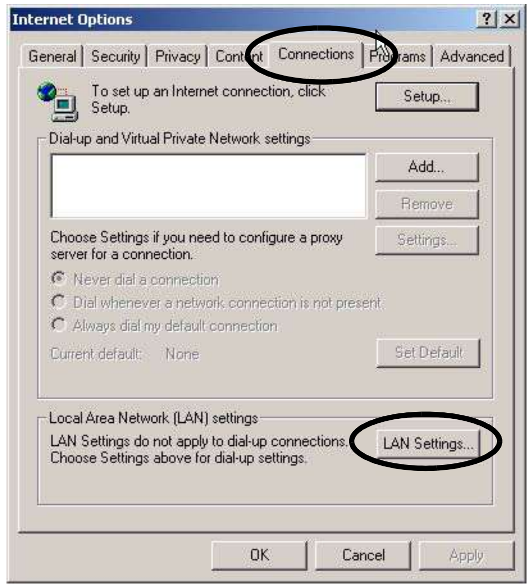
Prior to make settings for Ethernet connection, the IP address of the personal computer must be set. Use the following procedure to set the IP address and make settings for Ethernet connection.

- Make the following settings with the LAN cable connected.

6. Click ***Start - Settings - Control Panel - Internet***.

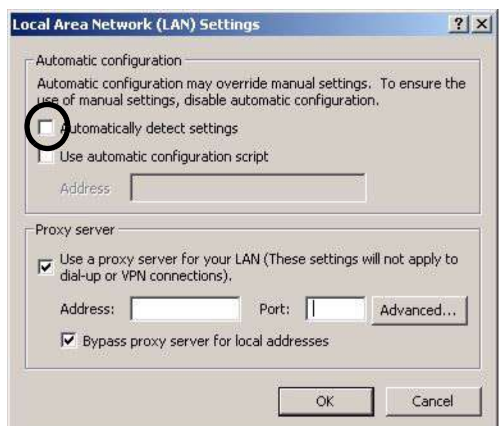
The **Internet Properties** Window appears.

7. Click **Connection** Tab to display the page. Click **LAN settings**.



The **Local Area Network (LAN) Settings** Dialog Box appears.

8. Check if the **Automatically detect the settings** check box is cleared and click the **OK** Button to close the dialog box.

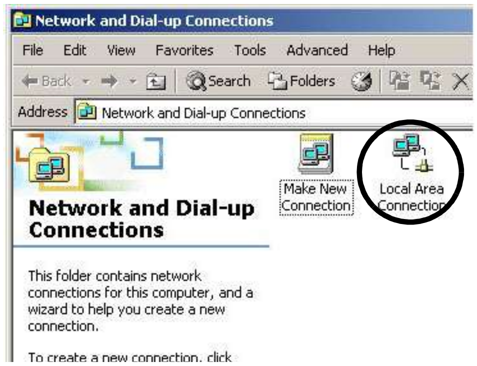


9. For a computer running Windows 2000 OS, click the **Start** Button and select ***Settings - Control Panel - Network and dial-up connection (N)***.
For a computer running Windows XP OS, click the **Start** Button and select ***Settings - Control Panel - Network connection (N)***.

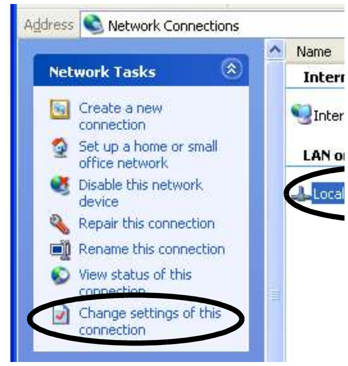
On the computer running Windows 2000 OS, the **Network and dial-up connection** Window will be displayed, and on the computer running Windows XP OS, the **Network connection** Window.

10. For the computer running Windows 2000 OS, double-click the **Local area connection** icon.
For the computer running Windows XP OS, select **Local area connection** and click **Change the settings of connection** in the Network Task field.

< Windows 2000 running computer >



< Windows XP running computer >

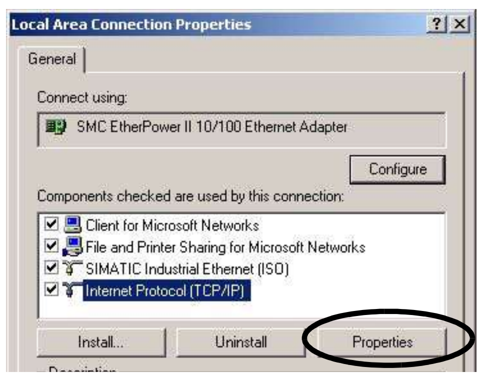


The **Property for Local area connection** Dialog Box appears.

11. Click the **Properties** Button.

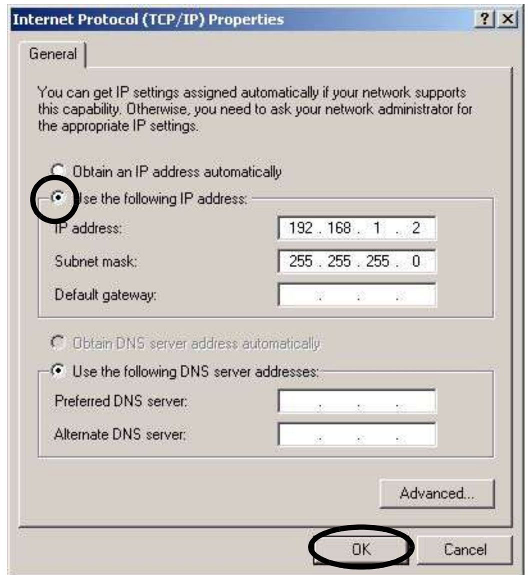
The **Local Area Connection Properties** Dialog Box appears.

12. Select Internet Protocol (TCP/IP) and click the **Properties** Button.

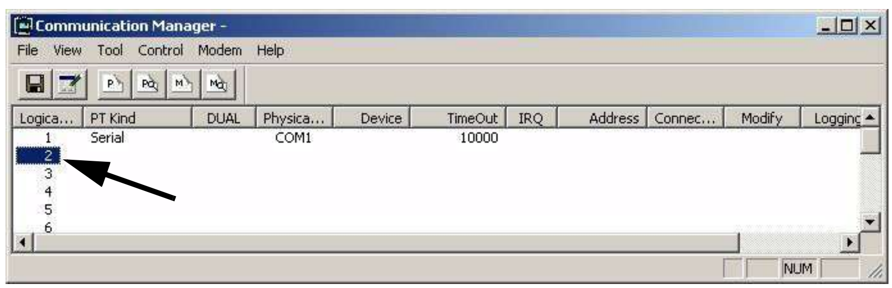


The **Property for Internet protocol (TCP/IP)** Dialog Box appears.

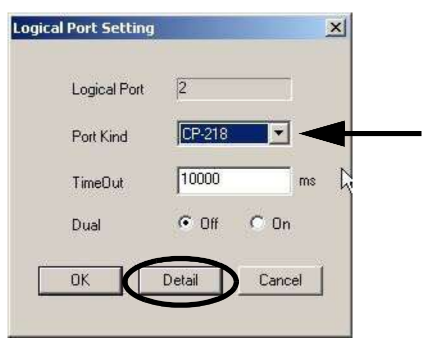
13. Click the **Using the following IP address** Option Button and enter 192 168 1 2 under IP Address and 255 255 255 0 under Subnet Mask. Click the **OK** Button to close the dialog box.



14. Double-click Logical Port No. **2** in the **Communication Process** Window to display the **Logical Port Setting** Dialog Box.

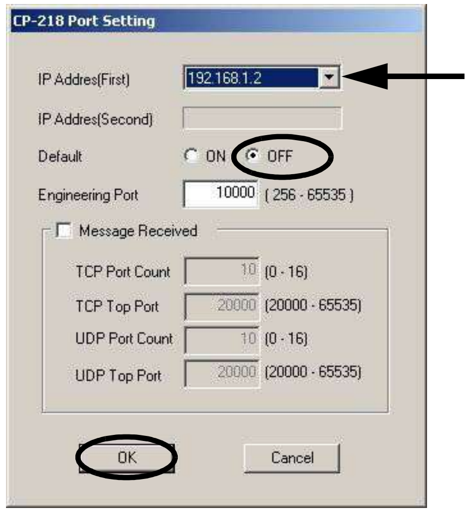


15. Select **CP-218** under Port Kind in the **Logical Port Setting** Dialog Box and click the **Detail** Button.

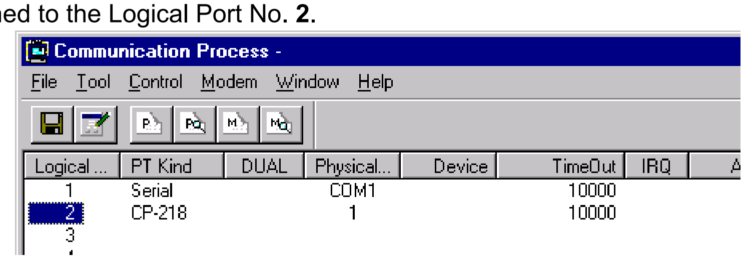


The **CP-218 Port Setting** Dialog Box appears.

16. Enter the IP address of computer and click **OFF** for Default. Leave the other items on their default settings. Click the **OK** Button to close the dialog box.



17. Click the **OK** Button in the Logical Port Setting Dialog Box to return to the **Communication Process** Window. Check to see if the **CP-218** (Ethernet connection) is assigned to the Logical Port No. **2**.



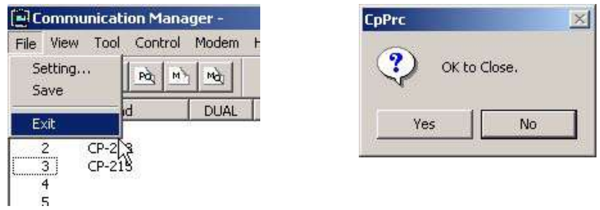
● Saving the Communication Port Settings and Restarting **Communication Process** Window

18. Click ***File - Save***. A save confirmation window will be displayed. Click the **Yes** Button to save the communication port settings.

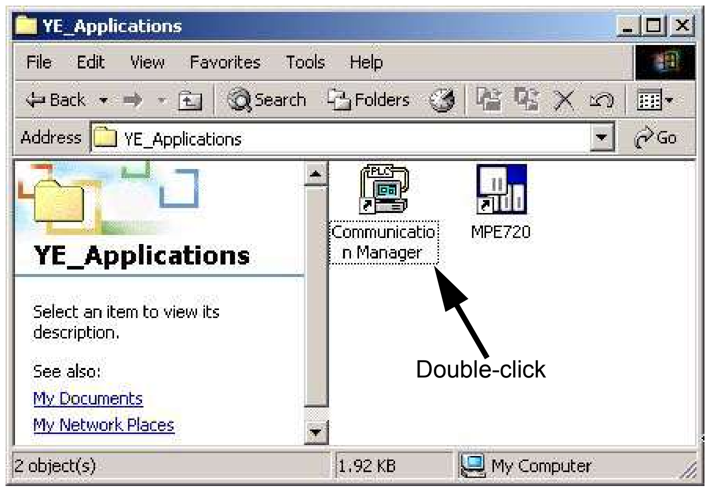
These settings will be used as the communication port information whenever the communication process is started.

19. Exit the **Communication Process** Window and restart to validate the settings. Select ***File - Exit*** to close the **Communication Process** Window. The confirmation message will be displayed. Click the **Yes** Button to close the **Communication Pro-**

cess Window.



20. Double-click the **Communication Manager** icon in the YE_Application Folder to reopen the **Communication Process** Window.

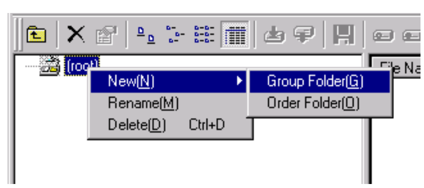


(3) Creating Group Folders (Option)

In the File Manager Window, create a group folder for storing order folders.

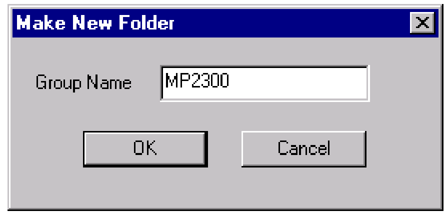
- Refer to ***Group Folders, Order Folders, Controller folders*** at the bottom of this page for more information about these folders.

1. Right-click **(root)** and select ***New - Group Folder*** from the pop-up menu.



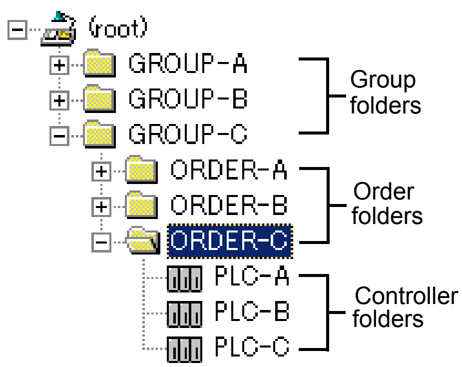
The **Make New Folder** Dialog Box will be displayed.

2. Enter a group folder name of up to 8 characters and click the **OK** Button.



A new group folder will be created. Double-click **(root)** or click ⊞ to display the entered group folder name.

■ Group, Order, and PLC folders

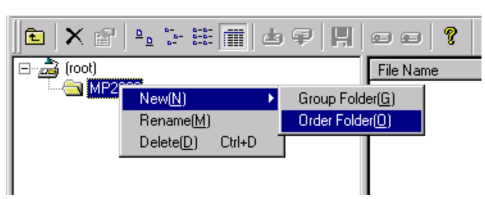


Group folders, order folders, and PLC folders form part of a directory tree, as shown in the figure to the left. Programs created using MPE720 are saved to PLC folders.
MPE720 cannot create programs if no PLC folder exists. PLC folders cannot be created if no order folder exists. For this reason, always create an order folder and PLC folder. Creating group folders is optional.

(4) Creating Order Folders (Required)

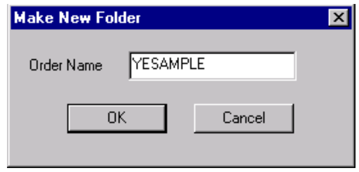
In the **File Manager** Window, create an Order Folder for storing Controller Folders.

1. Right-click **(root)** or the Group Folder in which the Order Folder is to be created and select ***New - Order Folder*** from the pop-up menu.



The **Make New Folder** Dialog Box will appear.

2. Enter an Order Folder name of up to 8 characters and click the **OK** Button.

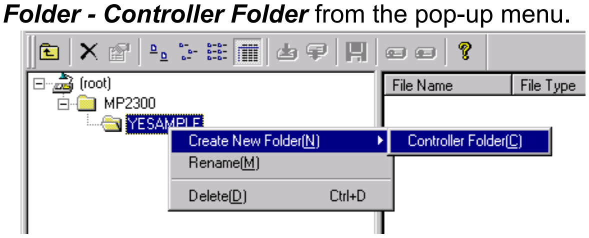


A new Order Folder will be created. Click the group folder or ⊞ to display the entered Order Folder name.

(5) Creating Controller Folders (Required)

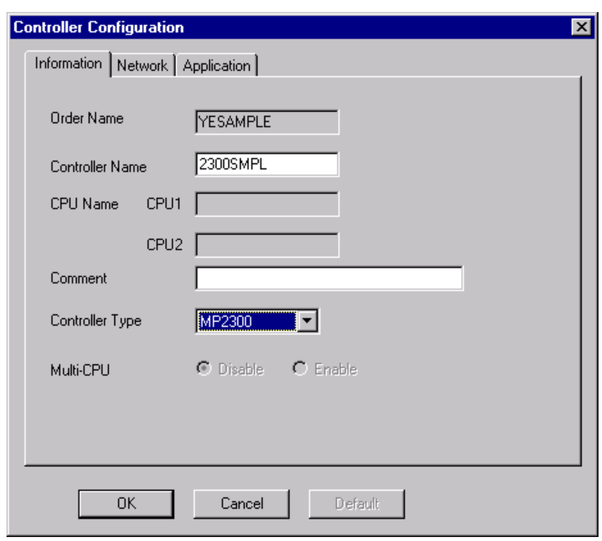
In the File Manager Window, create a Controller Folder for storing programs.

1. Right-click the Order Folder in which the Controller Folder is to be created and select ***Create New Folder - Controller Folder*** from the pop-up menu.



The **Controller Configuration** Dialog Box will be displayed.

2. Enter a Controller Folder name of up to 8 characters under *Controller Name*, select ***MP2300*** under *Controller Type*, and click the **OK** Button.



A new Controller Folder will be created. Click the Order Folder or ⊞ to display the entered Controller Folder name.


(root)
MP2300
YESAMPLE
File Name
File Type
Controller Ty...
2300SMPL
Controller Folder
MP2300

2.1.6 Reading Sample Programs and Setting and Saving Parameters

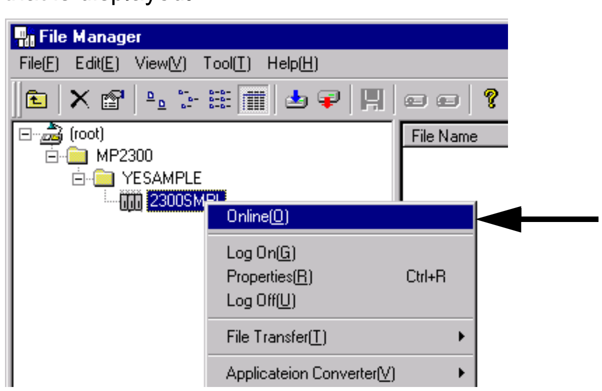
This section use sample programs to explain how to log on after being connected to the MP2300, transfer programs, set motion fixed parameters, and log off. The following flowchart outlines the order of the explanations.

1.	Log On Online Connect to MP2300 and log on to MPE720.	→ *2.1.6 (1) Logging On Online* on page 2-19
2.	Load Sample Programs Load sample programs from MPE720 system CD-ROM.	→ *2.1.6 (2) Loading the Sample Programs* on page 2-23
3.	Transfer Individual Sample Programs Select a sample program to be transferred and transfer to MP2300.	→ *2.1.6 (3) Transfer Individual Programs* on page 2-25
4.	Set the Motion Fixed Parameters Set the motion fixed parameters to match the sample program.	→ *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28
5.	Adjust the Servo and Save the SERVOPACK Parameters Make Servo adjustments and save the SERVOPACK parameters for each axis.	→ *2.1.6 (5) Making Servo Adjustments and Saving SERVOPACK Parameters* on page 2-30
6.	Save to Flash Memory Save the sample program to the MP2300 flash memory.	→ *2.1.6 (6) Saving to Flash Memory* on page 2-31
7.	Transfer All Files to Hard Disk Save the MP2300 data in the hard disk of the personal computer for backup.	→ *2.1.6 (7) Dumping All Data* on page 2-33

(1) Logging On Online

Use the following procedure to connect to the MP2300 and log on online to the MPE720 to transfer programs.

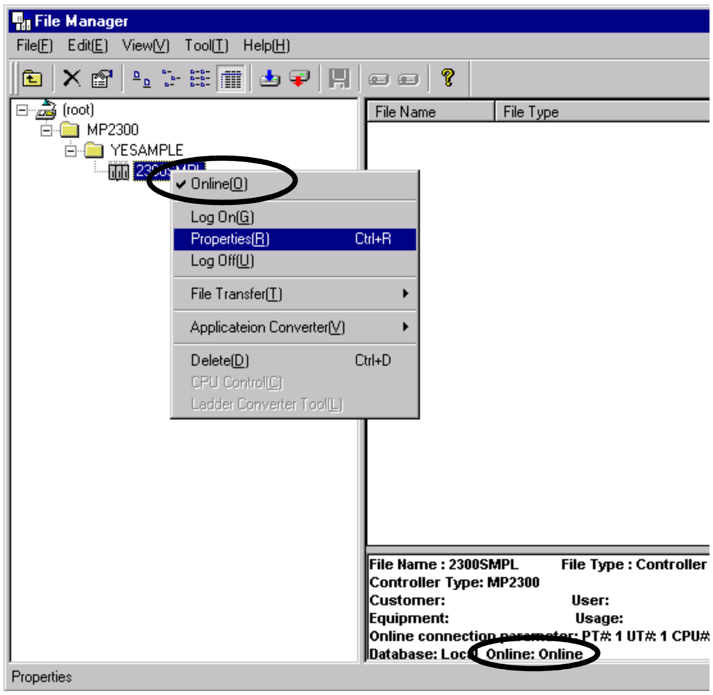
1. Right-click on the Controller Folder that has been created and select ***Online*** from the pop-up menu that is displayed.



A confirmation dialog box will be displayed. Click the **Yes** Button to switch to online mode.

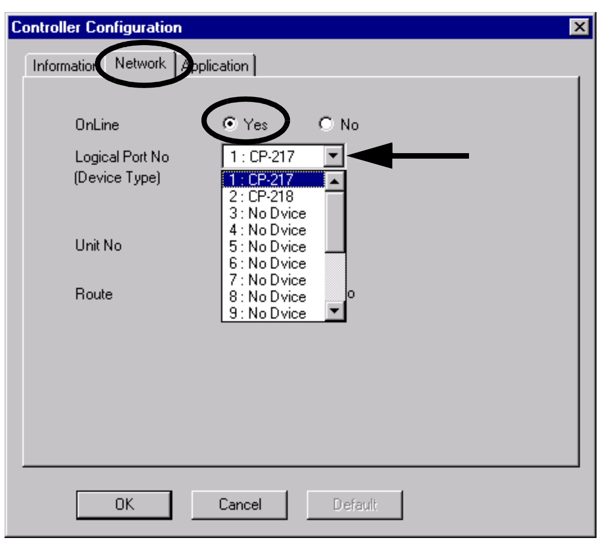
- The communication mode cannot be changed while logging on to the Controller folder is performed when using MPE720. If a *Cannot change to CPU while logged on* message is displayed when ***Online*** is selected, refer to *2.1.6 (9) Logging Off* on page 2-35 and log off from the Controller folder.

2. Right-click on the Controller Folder that was selected in step 1 and select ***Properties*** from the pop-up menu that is displayed. Check that a check mark appears to the left of *Online* and *Online* is displayed in the data area at the bottom right of the window.



The Controller Configuration Dialog Box will appear.

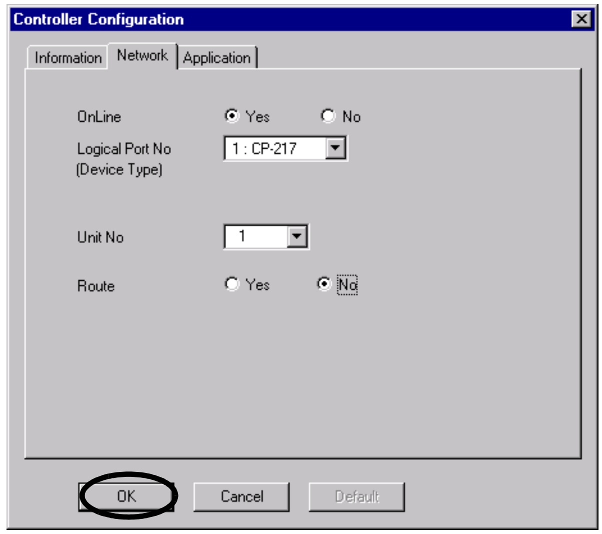
3. Select the **Network** Tab Page and check that *OnLine* is set to *Yes*. Under *Logical Port No. (Device Type)*, select the logical port number to be used, from the logical ports set using the communication process. The contents displayed on the tab page changes according to the selected port number.



- CP217 represents the RS-232C connection (serial port), and CP218 represents the Ethernet connection.

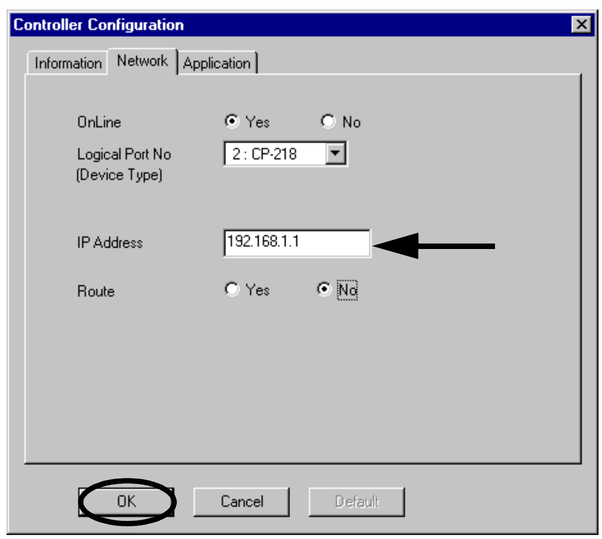
4. < For RS-232C Connection >

Leave the values other than the *Logical Port No* on their default settings, and click **OK** Button.

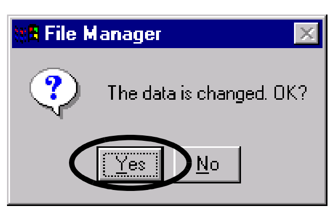


<For Ethernet Connection >

Enter the IP address of the personal computer, and click **OK** Button.



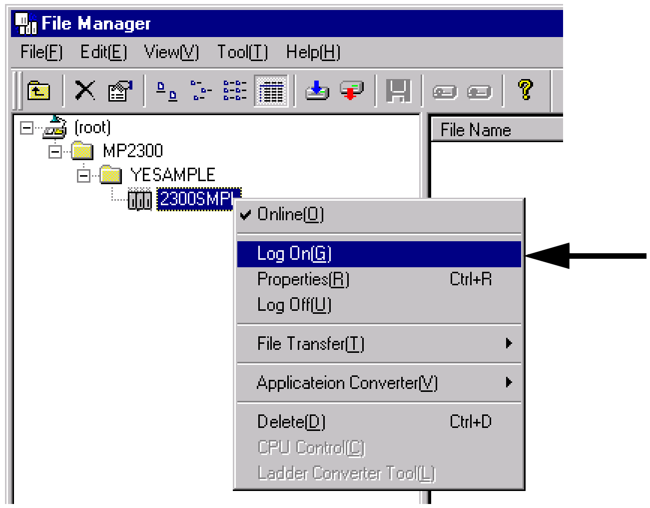
5. Click the **Yes** Button in the dialog box that is displayed next to complete selection of the logical port.



● Logging On Online

- When using MPE720, logging on is performed for each Controller Folder. Controller Folders that have not been logged onto cannot use the MPE720 functions.

6. Right-click on the Controller Folder that was selected in step 1 and select ***Log On*** from the pop-up menu that is displayed.



The **CPU Log On** Dialog Box will appear.

7. Enter *USER-A* (default) under *User Name* and *Password*, and click the **OK** Button.

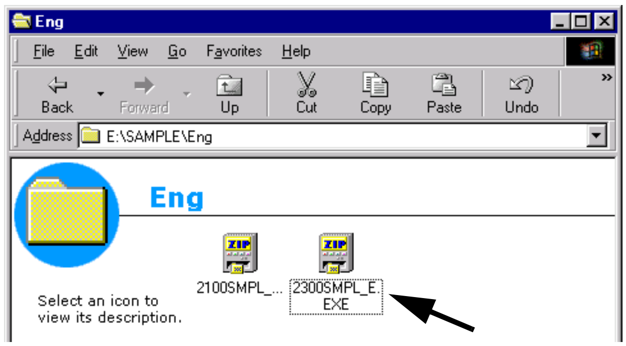
Logon will be executed for the selected Controller folder, and the dialog box will close.

- The user name and password may have already been changed. Ask the system administrator beforehand.
- The user name and password are changed from the *File* menu in the File Manager Window. Refer to *Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device* (Manual No. SIEPC8807005□) for details.

(2) Loading the Sample Programs

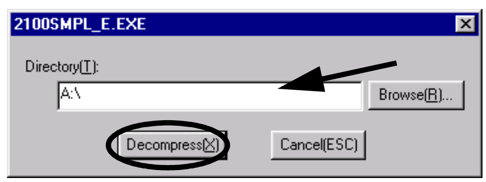
The sample programs on the MPE720 system CD-ROM will be decompressed on the personal computer and loaded to the Controller Folder. Set the MPE720 system CD-ROM in the CD-ROM drive of the personal computer.

1. Use Explorer to open the ***SAMPLE - Eng*** folders and double-click the **2300SMPL_E.EXE** icon.



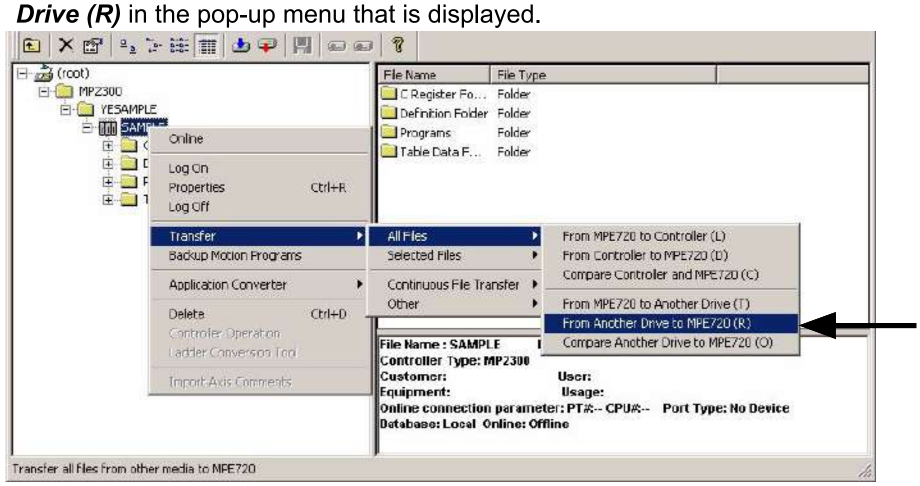
A dialog box for specifying where to unpack the file will appear.

2. Specify the destination path (a path other than File Manager) and click the **Decompress** Button.



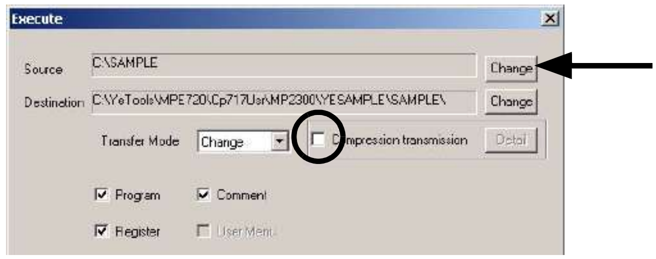
The sample program will be unpacked and saved to the specified path and a folder called 2300SMPL_E will be created.

3. Right-click on the Controller folder where the sample program is to be saved in File Manager Window and select ***Transfer (T) - All Files (A) - From MPE720 to Another Drive (R)*** in the pop-up menu that is displayed.

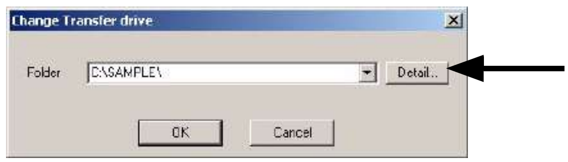


An execution confirmation dialog box will appear.

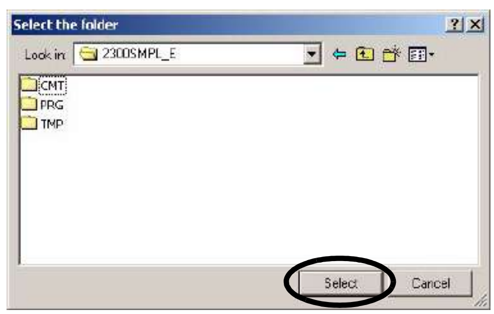
4. Deselect *Compression transmission*. Check the *Destination*. If the *Destination* is different to the unpack destination folder, click the **Change** Button and continue to step 5. If the *Destination* is correct, move to step 6.



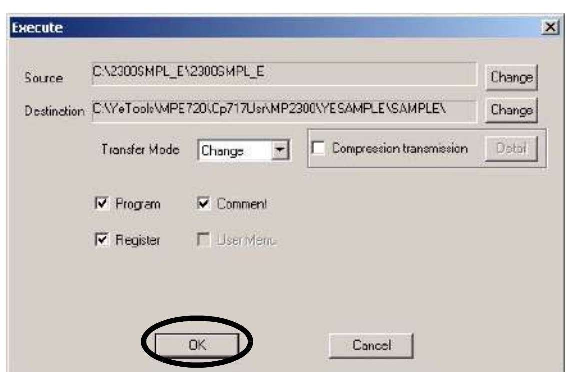
5. The Change Transfer Drive Dialog Box will be displayed. Click the **Detail** Button to open the Select the Folder Dialog Box.



6. Three sub-folders under the 2300SMPL_E folder will be displayed. Click the **Select** Button to close the dialog box.



7. The Execute Dialog Box will appear. Click the **OK** Button.



The **Execution Status** Dialog Box will appear. Once the transfer has been completed, a confirmation dialog box will be displayed. Click the **OK** Button.

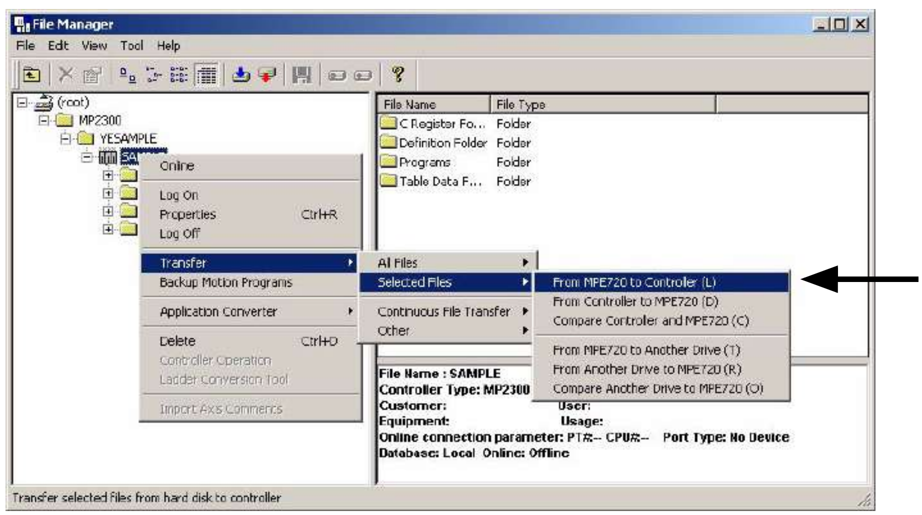
8. The All Media to

MPE720 Window will appear. Select ***File - Exit*** to end reading files to the MPE720.

(3) Transfer Individual Programs

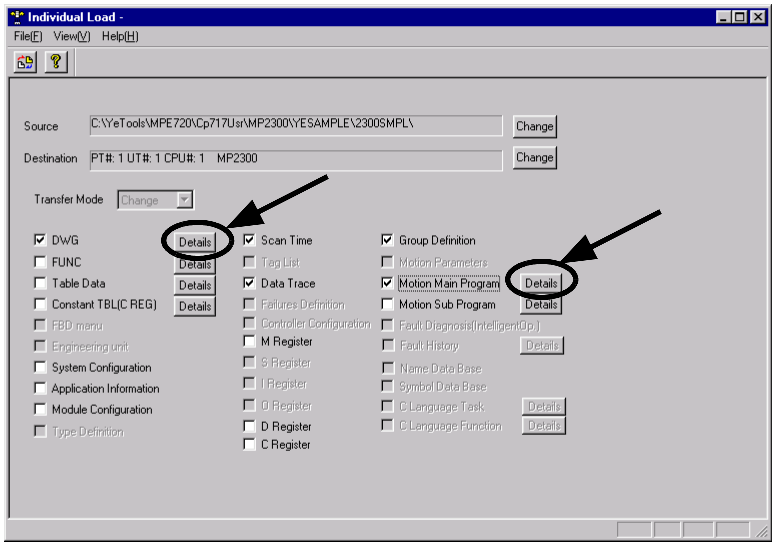
Transfer the programs that have been read to the MPE720 individually to the MP2300.

1. Right-click on the Controller Folder that has been logged onto online and select ***Transfer - Selected Files - From MPE720 to Controller*** from the pop-up menu that is displayed.



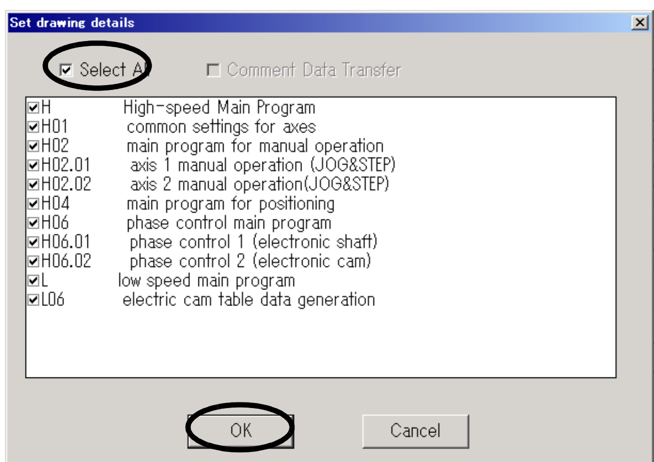
The Individual Load Window will appear.

2. Select the programs to be transferred. For programs with a **Details** Button next to them, click the **Details** Button and select the individual function programs for the program listed in the Set Details Dialog Box that is displayed.
In this example, *DWG*, *Scan Time*, *Data Trace*, *Group Definition*, and *Motion Main Program* are selected, and detailed settings are made for *DWG* and *Motion Main Program*.



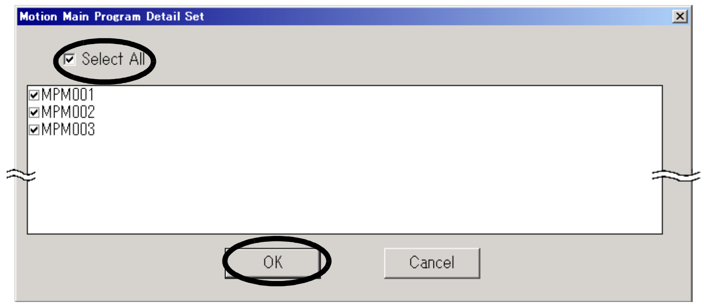
a) Set **Drawing Details** Dialog Box

The details for the DWG sample program are shown below. Select the programs to be transferred and click the **OK** Button. If *Select All* is selected, all programs for the DWG program will be selected. In this example, select *Select All* and click the **OK** Button to return to the Individual Load Window.

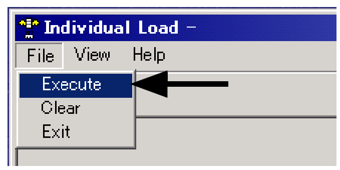


b) **Motion Main Program Detail Set** Dialog Box

The details for the Motion Main Program of sample program are shown below.
In this example, select *Select All* and click the **OK** Button to return to the **Individual Load** Window.

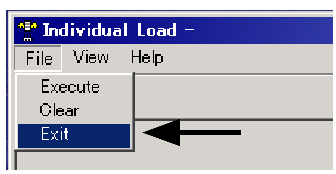


3. Select ***File (F) - Execute (S)***.



Click the **Yes** Button in the confirmation dialog box to start the file transfer. When the transfer has been completed, a confirmation dialog box will be displayed again. Click the **OK** Button.

4. Select ***File - Exit*** in the **Individual Load** Window to exit the transfer.

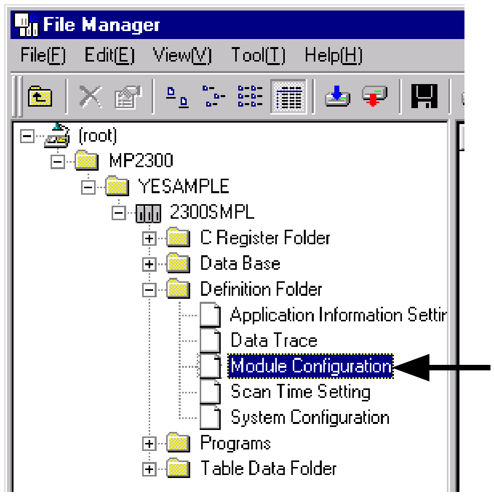


(4) Set and Save Motion Fixed Parameters

This section describes the procedure for setting motion fixed parameters for axes 1 and 2 to match the sample program .

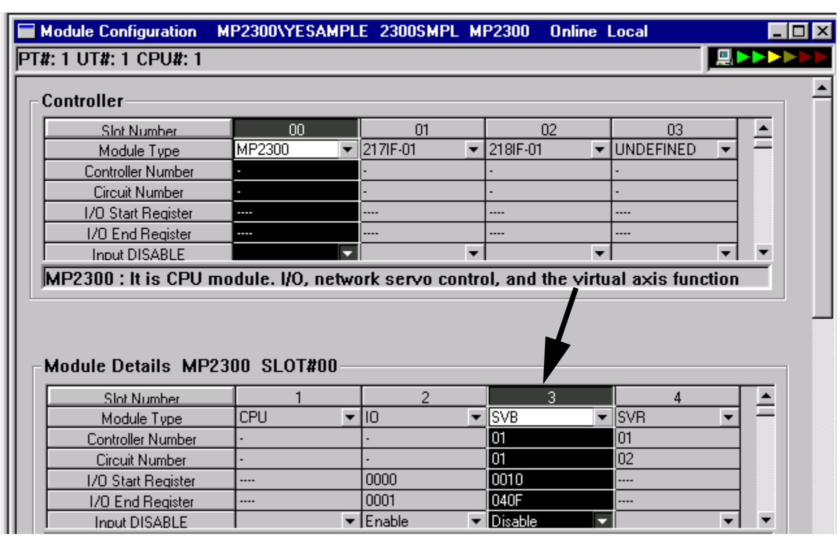
- When using a program, set the fixed parameters to match the devices being used. Refer to *6.4.1 Motion Fixed Parameter Details* on page 6-18.

1. Double-click the **2300SMPL** Controller Folder - **Definition Folder** in the **File Manager** Window to display the five folders contained within it. Double-click the **Module Configuration** Folder.



The **Engineering Manager** Window will open and the **Module Configuration** Window will appear.

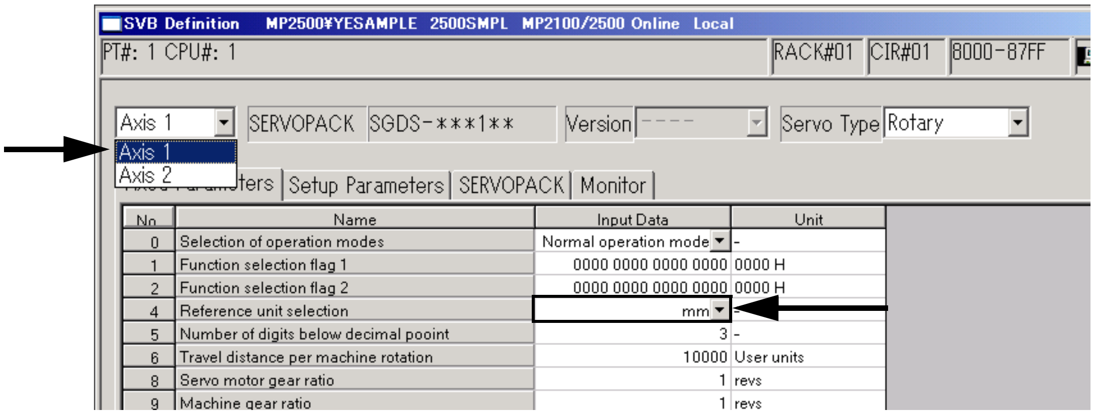
2. Point to ***00*** in the *Controller* area and double-click the ***3*** in the *Module Details* area in the **Module Configuration** Window.



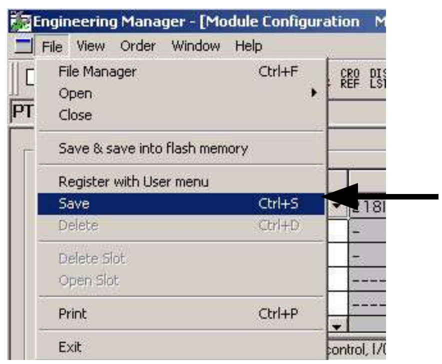
The **SVB Definition** Window with Fixed Parameter Tab Page will appear.

3. Set the fixed parameters for axis 1.

Select ***Axis 1*** from the axis selection box at the top-left of the window and select ***mm*** under *No. 4 Reference unit selection* on the Fixed Parameter Tab Page.



4. In the Engineering Manager Window, select ***File (F) - Save (S)*** to save the settings for axis 1 fixed parameters.



5. Refer to steps 3 and 4 to set and save the fixed parameters for axis 2 using the same procedure as for axis 1.

The process for saving fixed parameter settings has now been completed. Next, save the SERVO-PACK parameters.

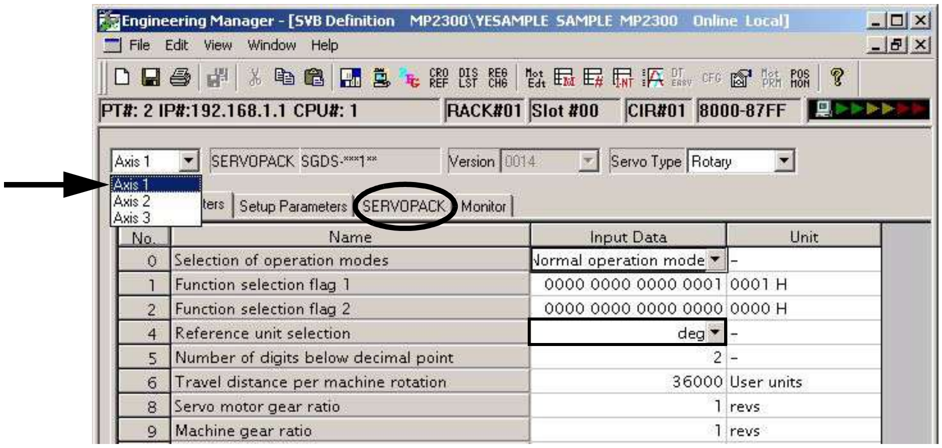
(5) Making Servo Adjustments and Saving SERVOPACK Parameters

This section describes how to make Servo adjustments and save the SERVOPACK parameters for each axis to the MP2300.

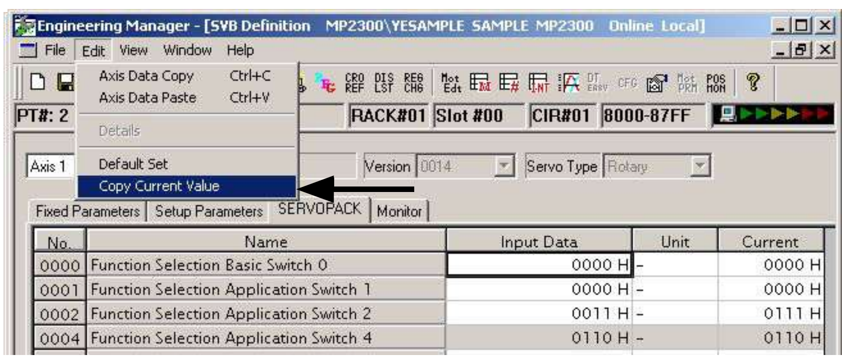
1. Execute servo gain and other adjustments for each Servo.

- Refer to each SERVOPACK manual for information on the Servo adjustments.

2. Select the axis in the SVB Definition Window, then click the **SERVOPACK** Tab to display the SERVOPACK Tab Page.



3. Select ***Edit - Copy Current Value***.

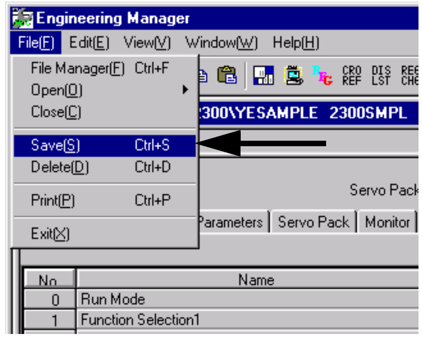


A confirmation dialog box will appear.

- The data in the *Input Data* column is the SERVOPACK data saved to the MP2300 and the data in the *Current Value* column is the data set to the SERVOPACK.
- Refer to *11.3 SERVOPACK Parameter Data Flow* on page 11-9 for information on the relationship between *Current Value* and *Unit*.

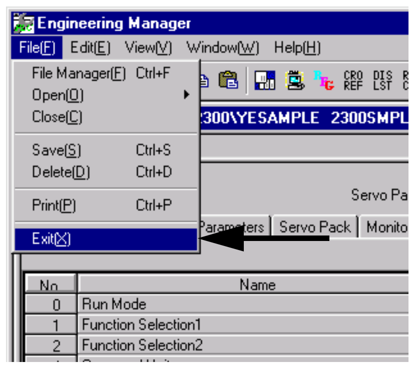
4. Click the **OK** Button in the confirmation dialog box to write the SERVOPACK data (current position) as the MP2300 settings data.

5. Select ***File (F) - Save (S)*** to save the SERVOPACK settings for axis 1 to the MP2300.



6. Refer to steps 2 to 5 to write and save the SERVOPACK current position for axis 2 as settings data, using the same procedure as for axis 1.

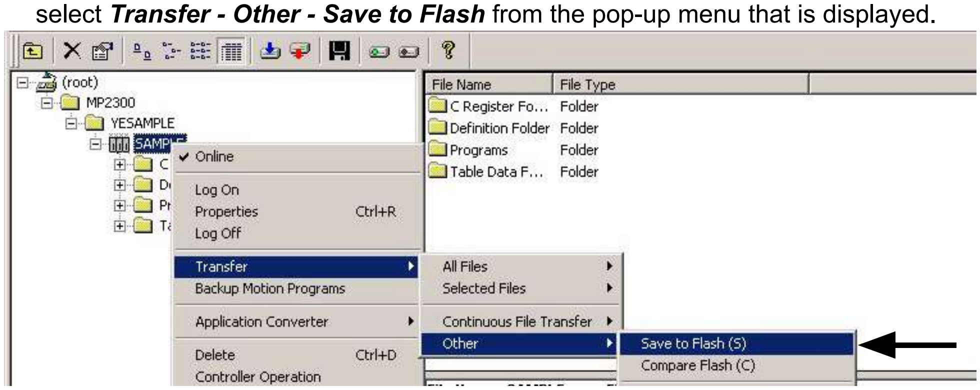
7. Select ***File - Exit*** to exit the setting and saving process in the **Engineering Manger** Window.



(6) Saving to Flash Memory

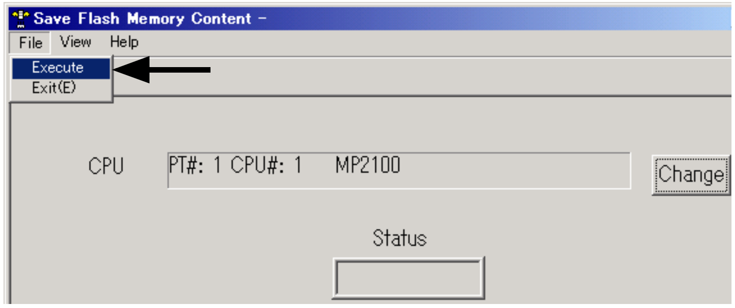
Save sample programs that have been transferred individually to the MP2300 to the MP2300 flash memory using the procedure below.

1. Right-click the Controller Folder in which the sample programs have been saved and select ***Transfer - Other - Save to Flash*** from the pop-up menu that is displayed.

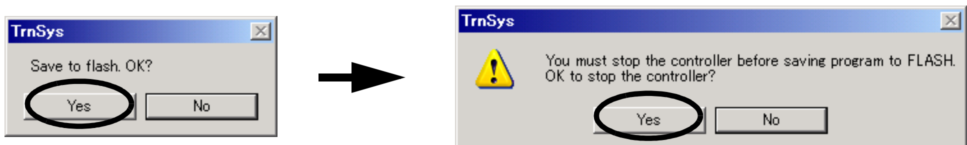


The Save Flash Memory Content Window will appear.

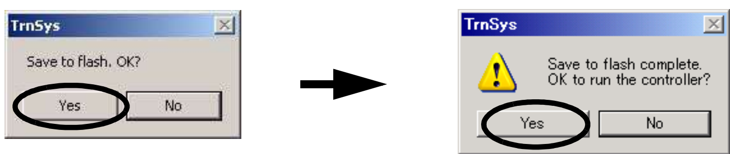
2. Select ***File - Execute***.



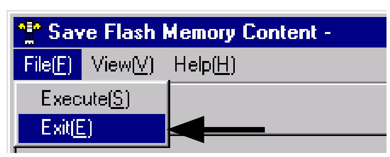
3. Click the **Yes** Button in the displayed confirmation dialog box, and then click the **Yes** Button in the **TrnSys** Dialog Box that is displayed.



4. Another confirmation dialog box will be displayed. Click the **Yes** Button. The data will be saved to flash memory. When saving to flash memory has been completed, a dialog box to confirm that the CPU is to be run will be displayed. Click the **Yes** Button. Then the display will automatically return to the **Save Flash Memory Content** Window.



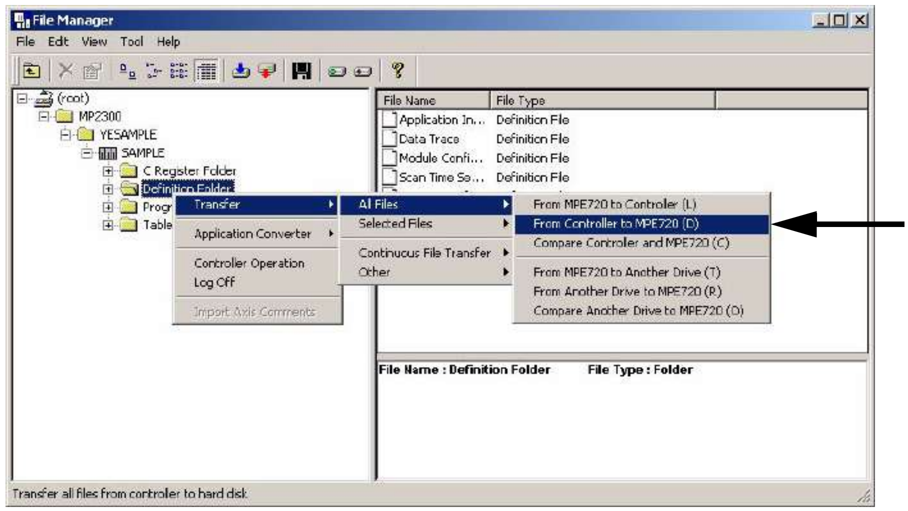
5. Select ***File - Exit*** to exit saving to flash memory.



(7) Dumping All Data

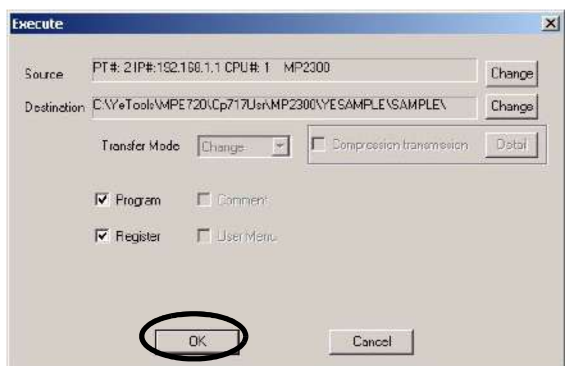
Execute All Program File Dump to back up to a personal computer the module configuration definitions automatically detected by the MP2300 during self-configuration and edited programs. The MP2300 program data and the program data in the personal computer hard disk are synchronized when all programs are dumped.

1. Right-click the Controller Folder in which the sample programs have been saved, and select ***Transfer - All File Transfer - All Program File Dump [CPU→MPE720 (D)]*** from the pop-up menu that is displayed.



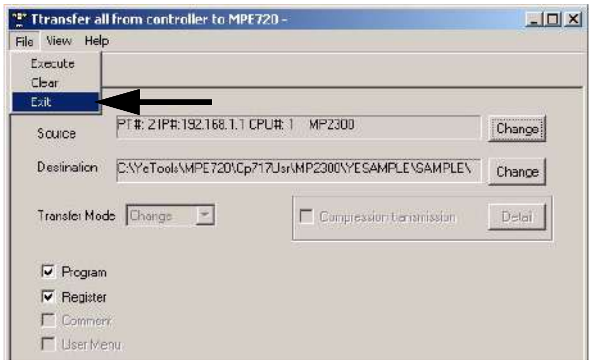
An execution confirmation dialog box will appear.

2. Check the details and click the **OK** Button.



The file transfer will start. A notification dialog box will be displayed when the transfer has been completed. Click the **OK** Button in the dialog box to display the **All Dump** Window.

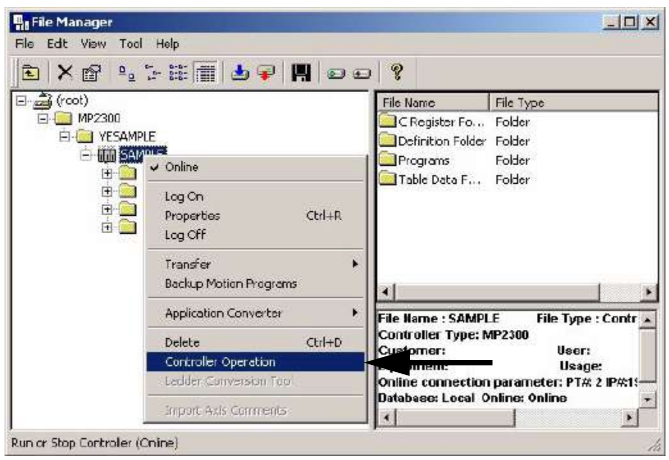
3. Select ***File - Exit*** to stop the dumping of all data.



(8) CPU RUN Settings

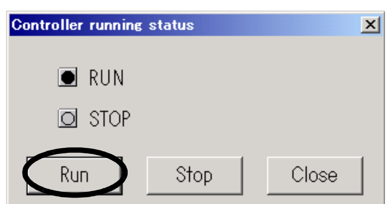
If the CPU STOP status is not cleared after executing processes such as saving to flash memory, use the following procedure to return to RUN status.

1. Right-click on the Controller Folder where sample programs are saved and select ***Controller Operation*** from the pop-up menu that is displayed.



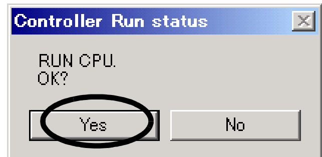
The Controller Running Status Dialog Box will appear.

2. Click the **Run** Button.

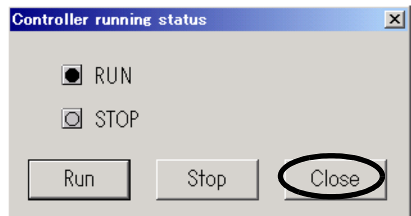


- To stop the CPU, for example to verify errors, click the **STOP** Button displayed here.

3. Change confirmation dialog box will be displayed. Click the **Yes** Button to return to the **Controller Running Status** Dialog Box. Check that the RUN LED indicator is lit.



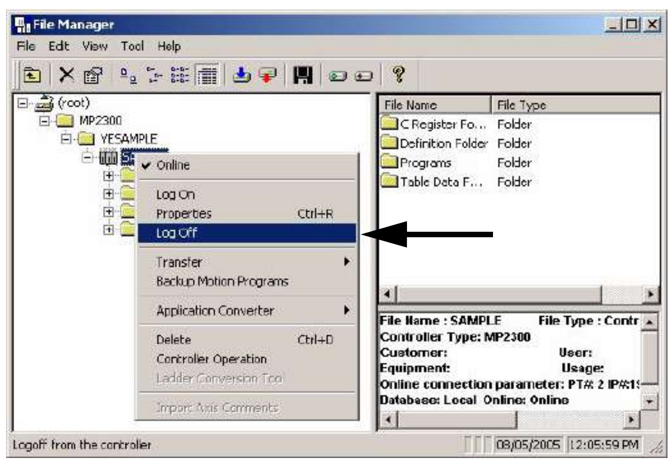
4. Click the **CLOSE** Button in the **Controller Running Status** Dialog Box to exit RUN settings.



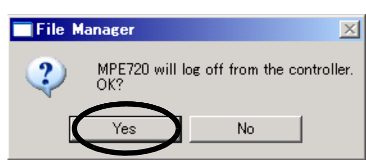
(9) Logging Off

Log off once the work using MPE720 (Embedded) has been completed.

1. Right-click on the Controller Folder where sample programs are saved and select ***Log Off*** from the pop-up menu that is displayed.



2. Click the **Yes** Button in the displayed dialog box to complete the logoff process.



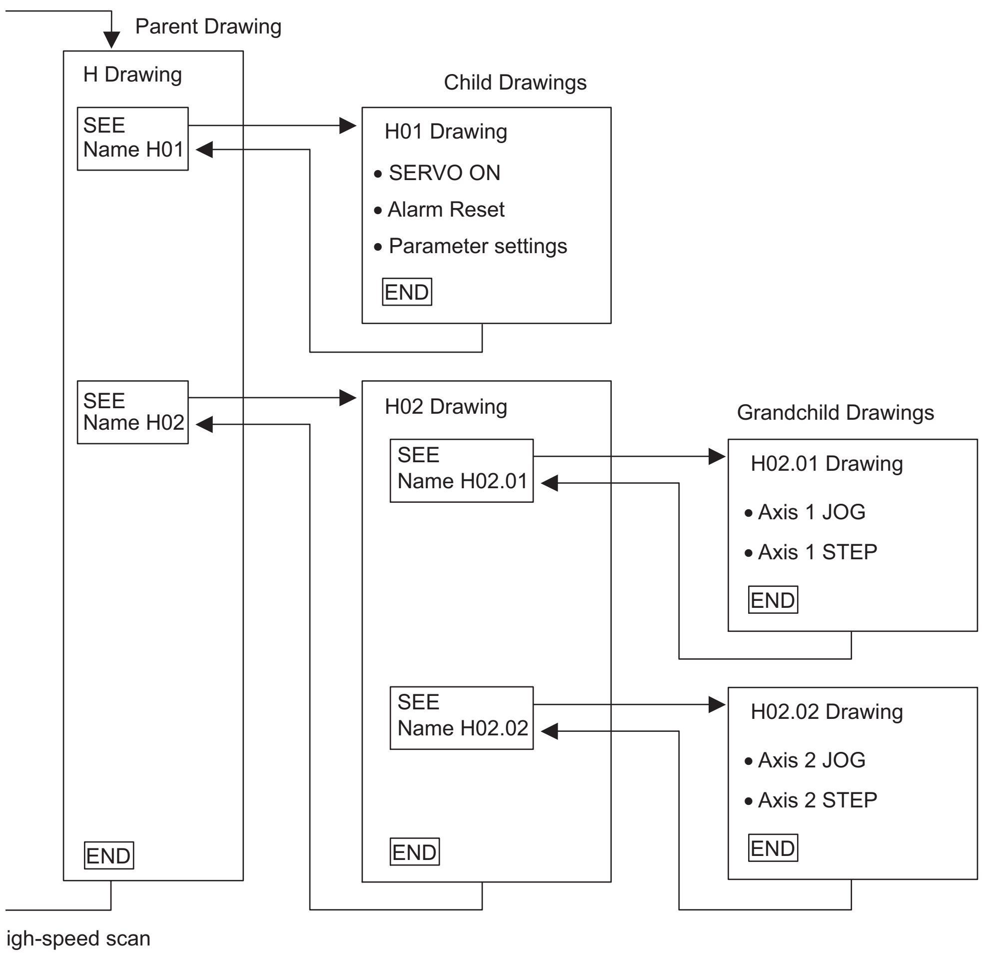
2.2 Checking Sample Program Operation

This section describes how to check three operations in the model system by using the Tuning Panel Window for sample programs.

2.2.1 Operation Check 1: Manual Operation

(1) Program Outline

This section describes how to execute JOG and STEP operations for Servomotor 1 or 2 (axis 1 or 2) using a ladder program such as the one shown below.



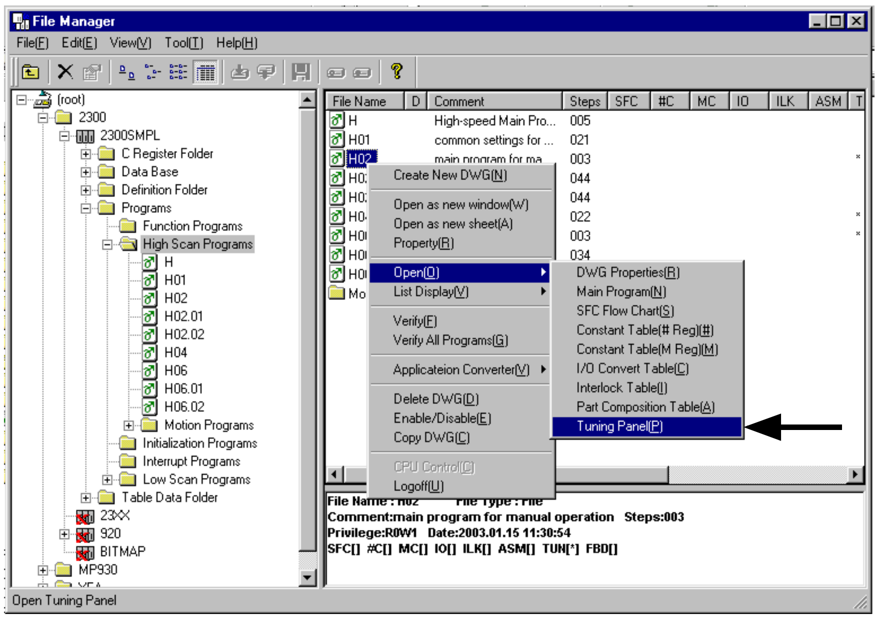
- Refer to *2.2.1 (4) Sample Program Details* on page 2-39 for details of each program (drawing).
- A simple device is used in this example to describe the MP2300 system startup.
- This device has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual devices.

(2) Displaying the H02 Drawing Tuning Panel

Use the following procedure to display the H02 Drawing Tuning Panel.

1. Log on online, open the ***Programs*** folder, and then open the ***High Scan Programs*** folder in the PLC folder where the sample programs are saved in the **File Manager** Window.

2. Right-click the **H02** Drawing in the ***High Scan Programs*** folder and select ***Open - Tuning Panel*** from the pop-up menu that is displayed.



Engineering Manager will start and the following Tuning Panel Window for the H02 Drawing will be displayed.

No	Data Name	S	Format	CurrentValue	Unit	Lower Limit	Upper Limit	REG-No.	DWG
1	**************** common monitor ****************		XXXXX	00000		00000	32767	DW00010	L
2	axis 1 operation ready		ON/OFF	OFF				IB80000	
3	axis 2 operation ready		ON/OFF	OFF				IB80800	
4	axis 1 current position		XXXXXXXXXX	0000000000		-0214783648	2147483647	IL8016	
5	axis 2 current position		XXXXXXXXXX	0000000000		-0214783648	2147483647	IL8096	
6	************* common operation *************		XXXXX	00000		00000	32767	DW00010	L
7	servo on PB	S	ON/OFF	ON				MB300000	
8	alarm reset PB	S	ON/OFF	OFF				MB300001	
9	******** manual operation and setting *******		XXXXX	00000		00000	32767	DW00010	L
10	axis 1 forward JOG	S	ON/OFF	OFF				DB000010	H02.01
11	axis 1 reverse JOG	S	ON/OFF	OFF				DB000011	H02.01
12	axis 2 forward JOG	S	ON/OFF	OFF				DB000010	H02.02
13	axis 2 reverse JOG	S	ON/OFF	OFF				DB000011	H02.02
14	axis 1 forward STEP	S	ON/OFF	OFF				DB000012	H02.01
15	axsi 1 reverse STEP	S	ON/OFF	OFF				DB000013	H02.01
16	axis 2 forward STEP	S	ON/OFF	OFF				DB000012	H02.02
17	axis 2 reverse STEP	S	ON/OFF	OFF				DB000013	H02.02
18	axis 1 STEP moving amount	S	XXXXXXXXXX	0000000000		-0214783648	2147483647	DL00010	H02.01
19	axis 2 STEP moving amount	S	XXXXXXXXXX	0000000000		-0214783648	2147483647	DL00010	H02.02

Model system operation can be controlled by writing the current values for *Common Operation* and *Manual Operation and Setting* from the Tuning Panel.

(3) Procedure

Use the following procedure to confirm operation.

Servo ON

↓

Start JOG or STEP operation.

↓

Confirm operation.

The following table gives an outline of the operation when the Tuning Panel window is used.

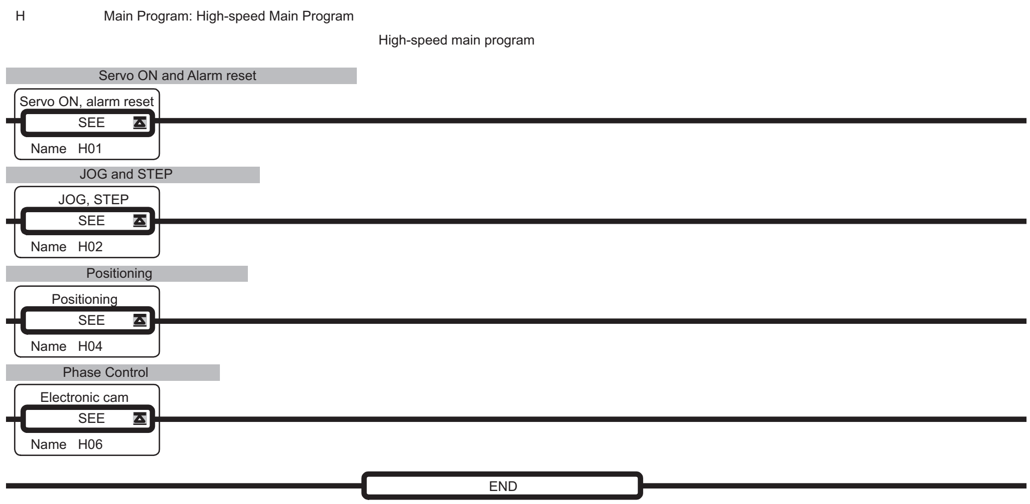
Data Name	Current Value Operation	Operation Outline
Servo ON PB	Current value OFF → ON	The Servomotor will turn ON and the Servo will be clamped.
	Current value ON → OFF	Servo turned OFF.
Axis 1 Forward Jog	Current value OFF → ON	Axis 1 rotates forward.
	Current value ON → OFF	Axis 1 stops.
Axis 1 Reverse Jog	Current value OFF → ON	Axis 1 rotates in reverse direction.
	Current value ON → OFF	Axis 1 stops.
Axis 2 Forward Jog	Current value OFF → ON	Axis 2 rotates forward.
	Current value ON → OFF	Axis 2 stops.
Axis 2 Reverse Jog	Current value OFF → ON	Axis 2 rotates in reverse direction.
	Current value ON → OFF	Axis 2 stops.
Axis 1 Forward Step	Current value OFF → ON	Axis 1 starts rotating forward for the moving amount set under Axis 1 STEP moving amount.
	Current value ON → OFF	STEP operation stops. Always stop after executing stepping.
Axis 1 Reverse Step	Current value OFF → ON	Axis 1 starts rotating in reverse for the moving amount set under Axis 1 STEP moving amount.
	Current value ON → OFF	STEP operation stops. Always stop after executing stepping.
Axis 2 Forward Step	Current value OFF → ON	Axis 2 starts rotating forward for the moving amount set under Axis 2 STEP moving amount.
	Current value ON → OFF	STEP operation stops. Always stop after executing stepping.
Axis 2 Reverse Step	Current value OFF → ON	Axis 2 starts rotating in reverse for the moving amount set under Axis 2 STEP moving amount.
	Current value ON → OFF	STEP operation stops. Always stop after executing stepping.
Axis 1 STEP Moving Amount	Enter any value.	Sets the STEP moving amount for axis 1.
Axis 2 STEP Moving Amount	Enter any value.	Sets the STEP moving amount for axis 2.

- It is necessary to create routines within the actual application program in order to monitor and control the registers corresponding to the signals and data listed in the table above.

(4) Sample Program Details

[a] H Drawing

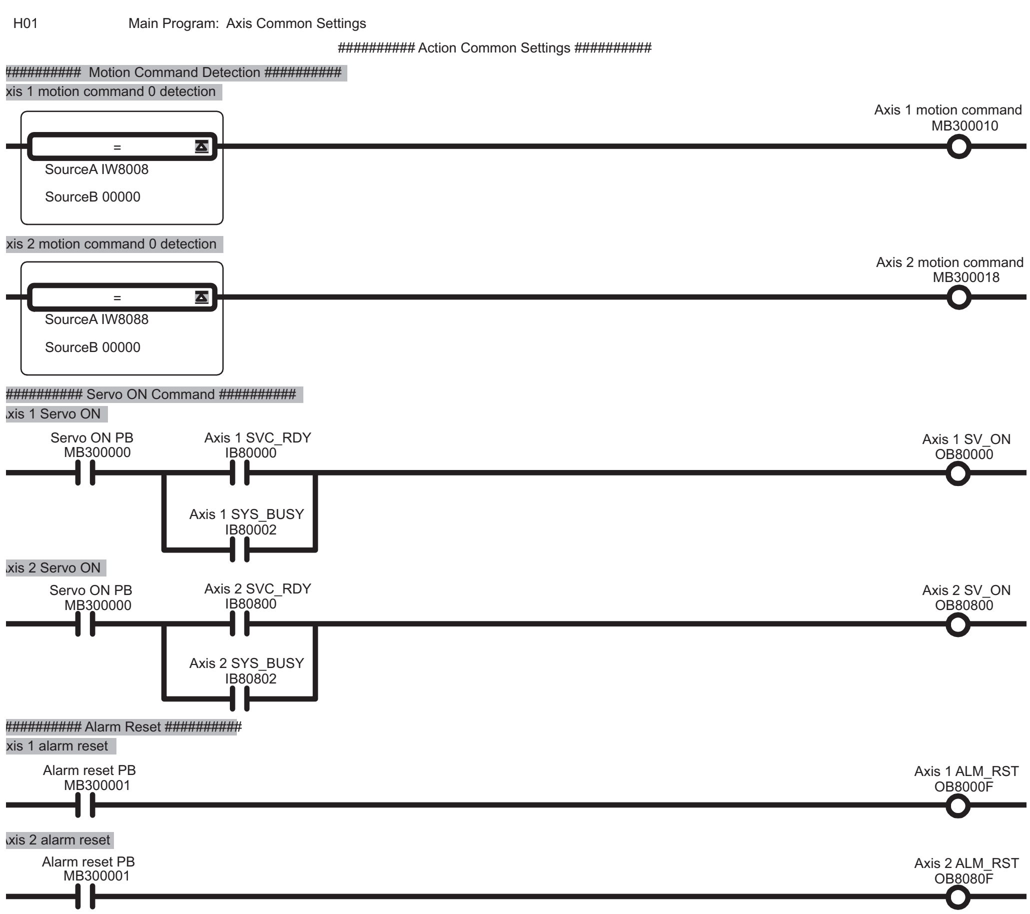
The H parent drawing controls the overall sample program.



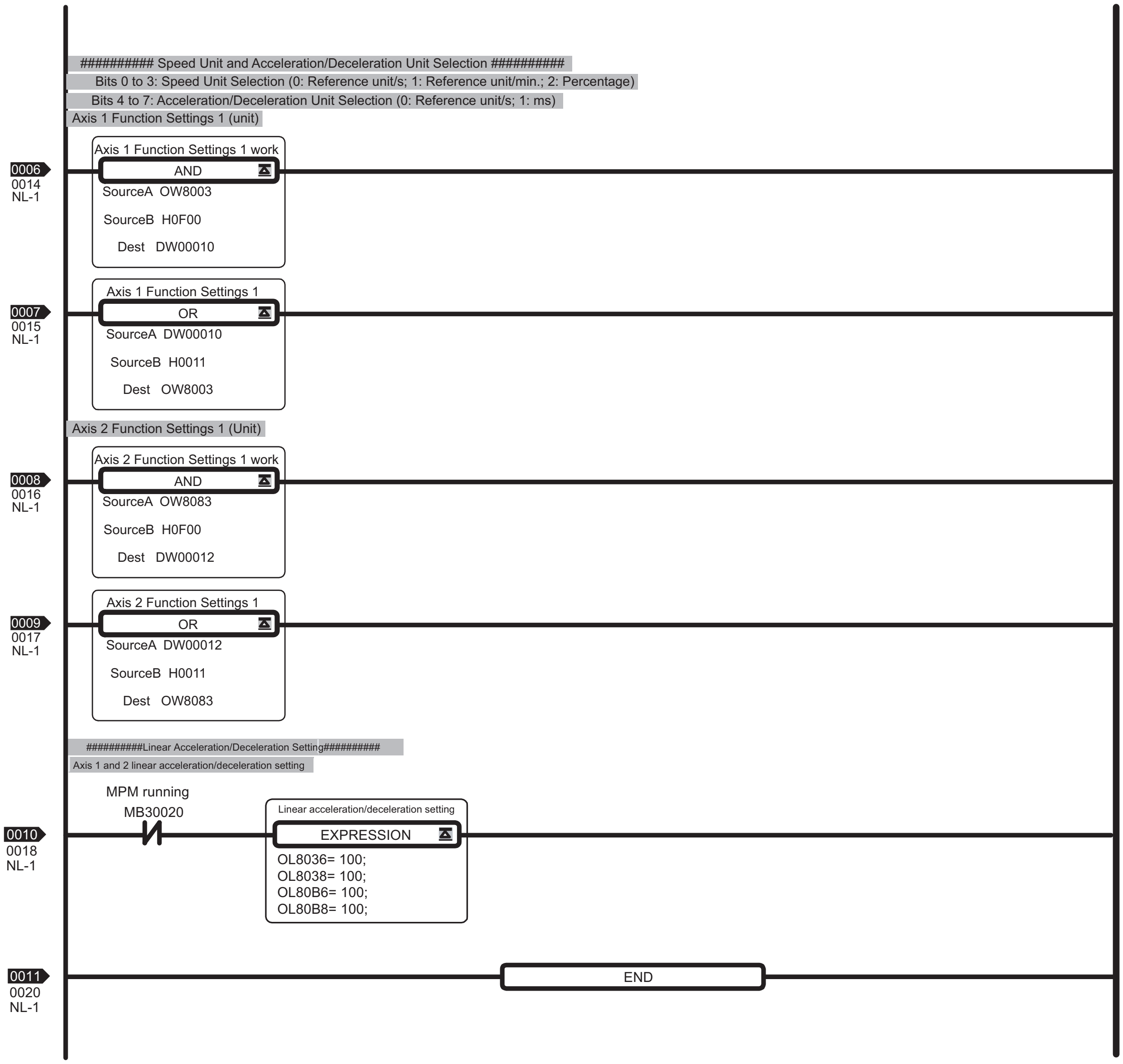
[b] H01 Drawing

The H01 child drawing turns ON the Servo, resets alarms, and sets common parameters.

'awing - (1)

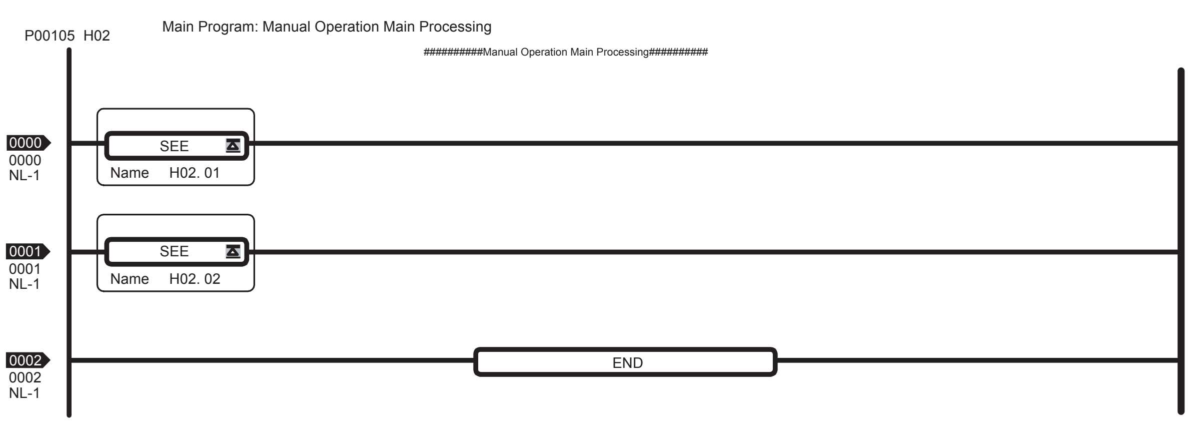


H01 Drawing - (2)



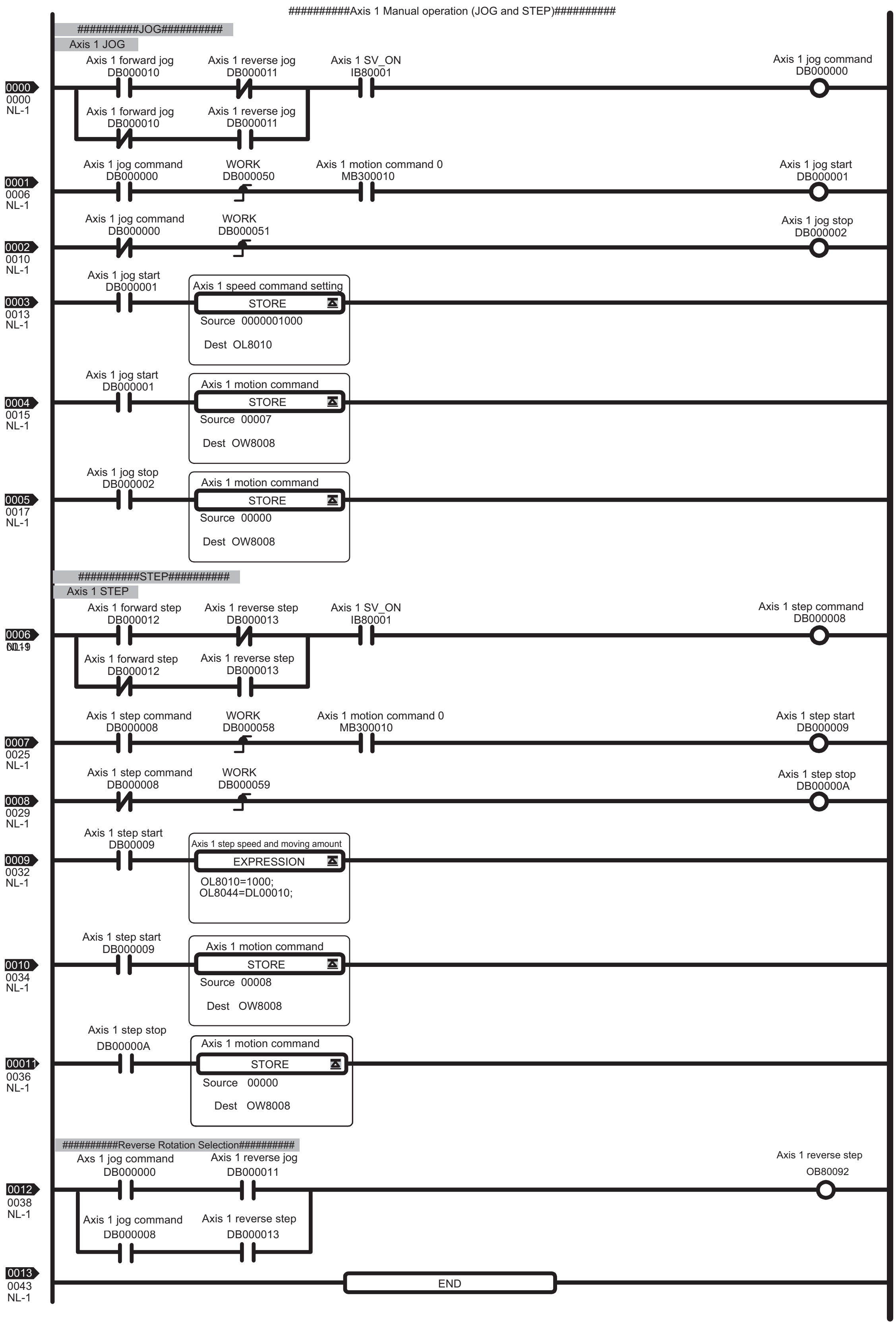
[c] H02 Drawing

The H02 child drawing controls JOG and STEP operation.



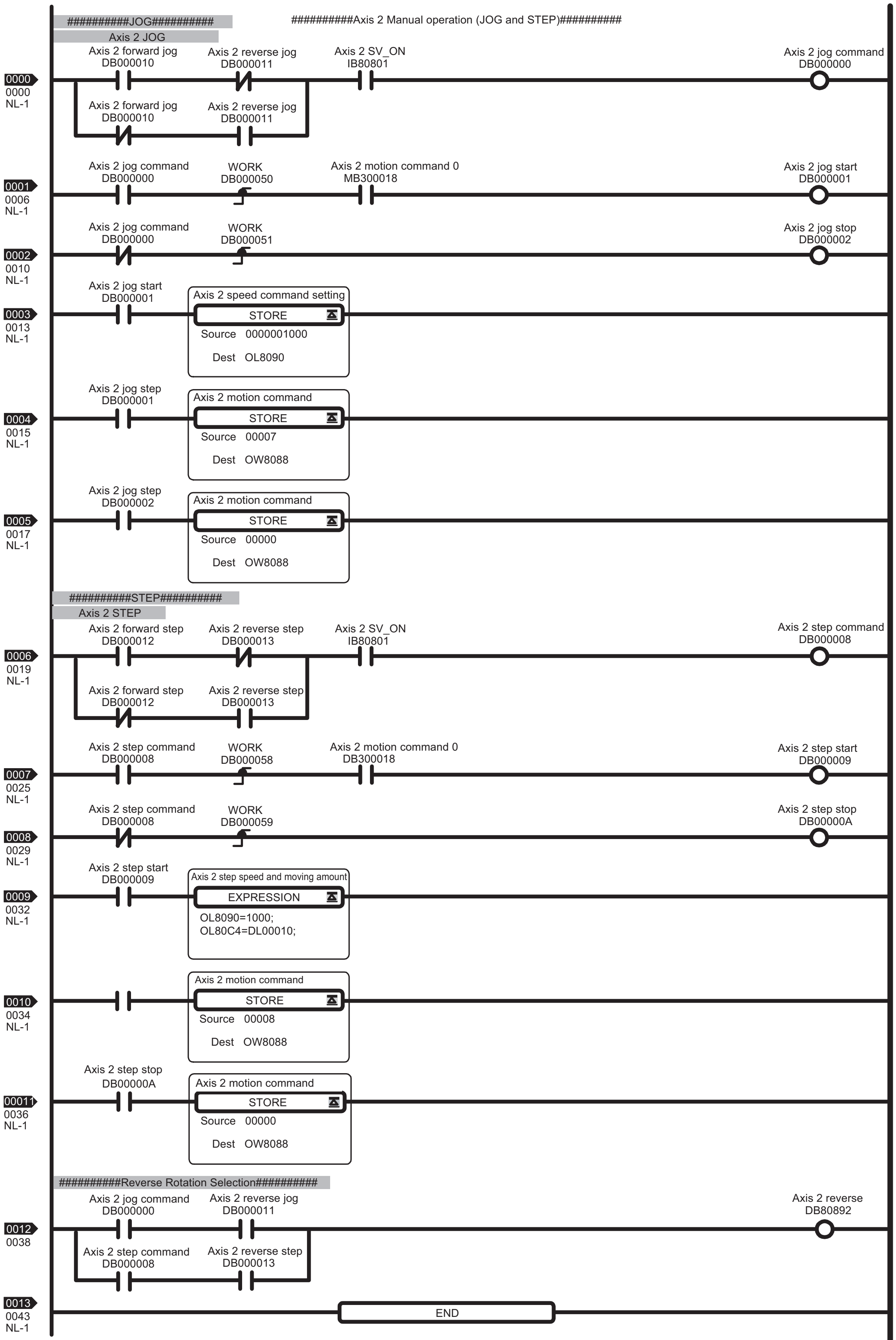
[d] H02.01 Drawing

The H02.01 grandchild drawing controls JOG and STEP operation for axis 1.



[e] H02.02 Drawing

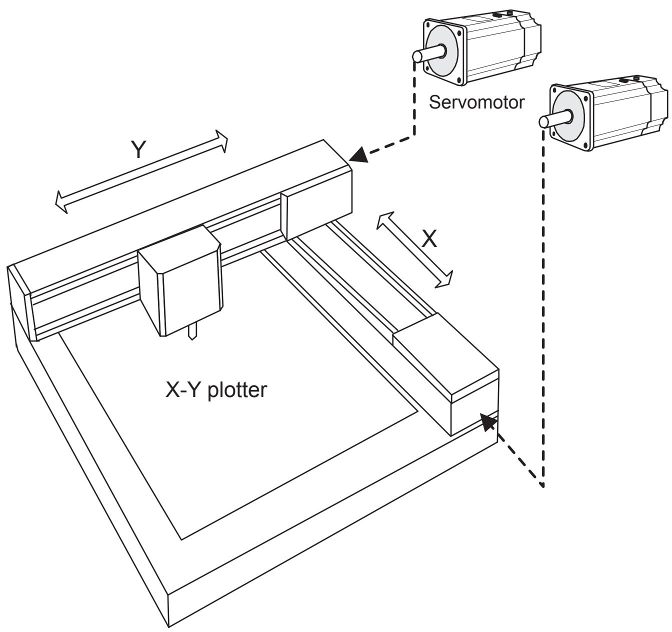
The H02.02 grandchild drawing controls JOG and STEP operation for axis 2.



2.2.2 Operation Check 2: Position Control

(1) Operation Outline

In this example, an X-Y plotter like the one shown in the figure is operated by ladder and motion programs.

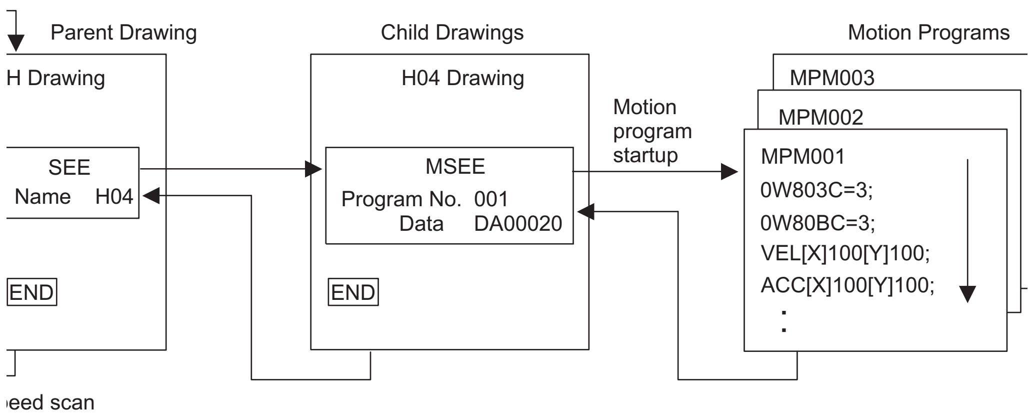


(2) Program Outline

A ladder program (H04 Drawing) and three prepared sample programs (MPM001, MPM002, and MPM003) are used to check the operation, as shown in the figure.
Programs MPM001 to MPM003 perform the following operations.

- MPM001: Zero point return using Servomotor phase-C
- MPM002: Axis 2 positioning and interpolation (with interval timer)
- MPM003: Axis 2 positioning and interpolation (without interval timer)

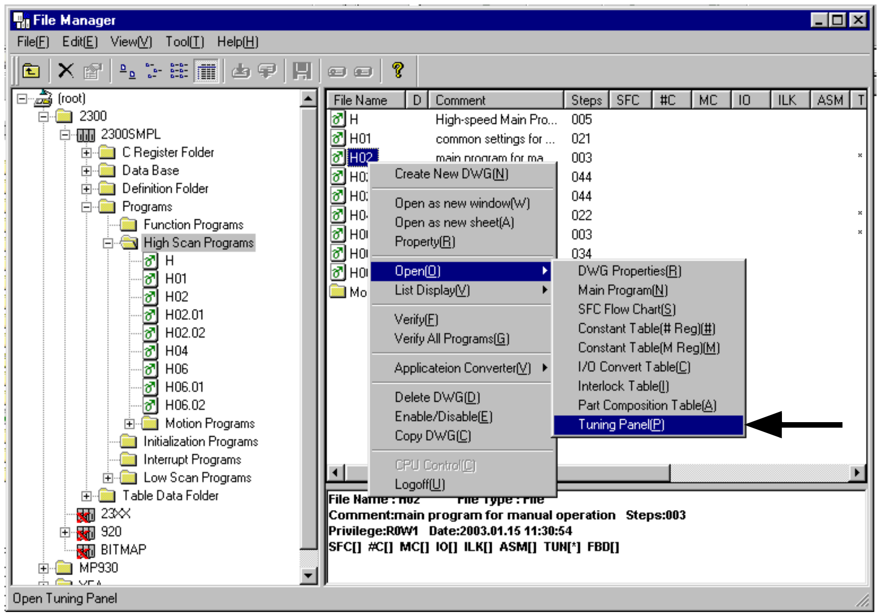
Motion programs are written in text format, and the listed commands and operations are executed in listed order.



- Refer to *2.2.2 (5) Sample Program Details* on page 2-46 for details of each program.
- A simple device is used in this example to describe the MP2300 system startup.
- This device has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual devices.

(3) Display Tuning Panel for H04 Drawing

1. Use the same procedure as 2.2.1 (2). Right-click the **H04** Drawing in the ***High Scan Programs*** folder in the **File Manager** Window and select ***Open - Tuning Panel*** from the pop-up menu that is displayed.



Engineering Manager will start and the following Tuning Panel Window for the H04 Drawing will be displayed.

Model system operation can be controlled by writing the current values for *Common Operation* and *Positioning Operation and Settings* from the Tuning Panel.

No	Data Name	S	Format	CurrentValue	Unit	Lower Limit	Upper Limit	REG-No.	DWG
1	********** Common monitor **********		XXXXX	00000		00000	32767	DL00010	L
2	Axis 1 operation ready		ON/OFF	OFF				IB80000	
3	Axis 2 operation ready		ON/OFF	OFF				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8096	
6	********** Common operation **********		XXXXX	00000		00000	32767	DL00010	L
7	Servo ON PB	S	ON/OFF	ON				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	**** Positioning operation and settings ****		XXXXX	00000		00000	32767	DL00010	L
10	Positioning, start	S	ON/OFF	OFF				DB000010	H04
11	Positioning, hold	S	ON/OFF	OFF				DB000011	H04
12	Positioning, abort	S	ON/OFF	OFF				DB000012	H04
13	Motion program No. setting	S	XXX	000		001	003	DW00030	H04
14	1st target position (x axis)	S	XXXXXXXXXX	0000000000		-2147483648	2147483647	DL00010	H04
15	1st target position (y axis)	S	XXXXXXXXXX	0000000000		-2147483648	2147483647	DL00012	H04
16	2nd target position (x axis)	S	XXXXXXXXXX	0000000000		-2147483648	2147483647	DL00014	H04
17	2nd target position (y axis)	S	XXXXXXXXXX	0000000000		-2147483648	2147483647	DL00016	H04
18	MPM running		ON/OFF	OFF				MB300020	
19	MPM alarm		ON/OFF	OFF				MB300028	

(4) Procedure

Use the following procedure to operate the Tuning Panel and check operation.

1. Servo ON

Change the *Servo ON PB* current value from *OFF* to *ON*.
The Servomotor will turn ON and the Servo will be clamped.

2. Motion program No. setting

Enter a value from *1* to *3* as the current value for the *Motion Program No. setting* to specify the motion program to be executed.

001 (=PMP001): Program for executing zero point return using Servomotor phase-C. When this program is executed, X axis (axis 1) and Y axis (axis 2) rotate a set distance once a phase-C pulse has been input, and then return home.

002 (= PMP002): Repeats the following two operations with an interval time.
1.) Moves to target position 1 in incremental mode, performs linear interpolation to target position 2, and then repeats this operation 5 times.
2.) In absolute mode, performs counterclockwise circular interpolation from current position to home (0,0) (once).

003 (= PMP003): Repeats the same operation as PMP002, but without an interval time.

- No programs have been created for numbers *004* and higher. An MPM alarm will occur if *004* or higher numbers are entered and operation is started.

3. Set Target Position 1 and Target Position 2

Enter any value for the following settings. These settings determine the target position for positioning when Motion Program No. 2 and No. 3 are executed.

1st target position (X axis)
1st target position (Y axis)
2nd target position (X axis)
2nd target position (Y axis)

4. Positioning, start

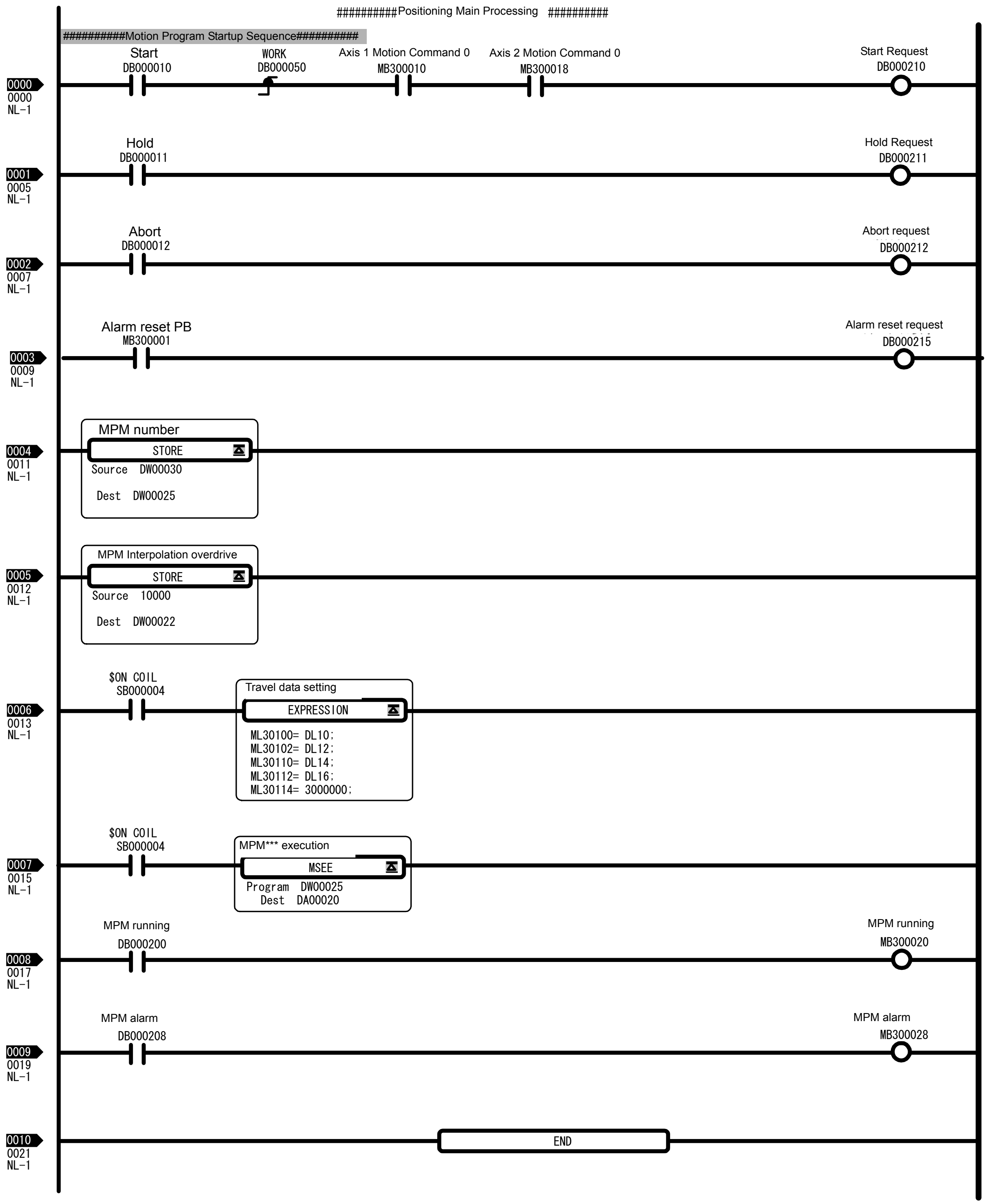
Change the current value for *Positioning, start* from *OFF* to *ON*.
The program will be executed and the model system will operate according to the motion program set in step 2. Once the operation has been checked, enter *OFF* and stop the system.
When a motion program starts, the current value for *MPM running* will change to *ON*. Also, when the Servo axis rotates, all *Current Values* will change.

- If an error occurs during motion program execution, the current value for *MPM alarm* in the Tuning Panel will change to *ON*. Use the following procedure to clear alarms.
- 1. Set the current value for *Positioning, abort* to *ON* then *OFF*.
- 2. Set the current value for *Alarm reset PB* to *ON* then *OFF*.
- It is necessary to create routines within the actual application program in order to monitor and control the registers corresponding to the signals and data listed in the table above.
- The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under *REG-No*. next to *DWG* at the right of the Tuning Panel window.

(5) Sample Program Details

[a] H04 Drawing

The H04 child drawing contains the ladder program for managing and controlling MPM motion programs.



[b] Motion Program MPM001

The MPM001 motion program uses the Servomotor phase-C pulse to perform home return.

```
"MPM001";
OW803C=3;               "X axis home return method selection (3: Phase C)"
OW80BC=3;               "Y axis home return type selection (3: Phase C)"
VEL [X]1000 [Y]1000;    "Travel speed setting for positioning command"
ACC[X]100[Y]100;        "Acceleration time setting"
DCC[X]100[Y]100;        "Deceleration time setting"
OW803E=100;             "X axis approach speed (mm/min)"
OW8040=50;              "X axis creep speed (mm/min)"
OL8042=10000;           "X axis final travel distance (0.001 mm)"
OW80BE=100;             "Y axis approach speed (mm/min)"
OW80C0=50;              "Y axis creep speed (mm/min)"
OL80C2=10000;           "Y axis final travel speed (0.001 mm)"
ZRN[X]00[Y]00;          "Home return command"
END;
```

[c] Motion Programs MPM002 and MPM003

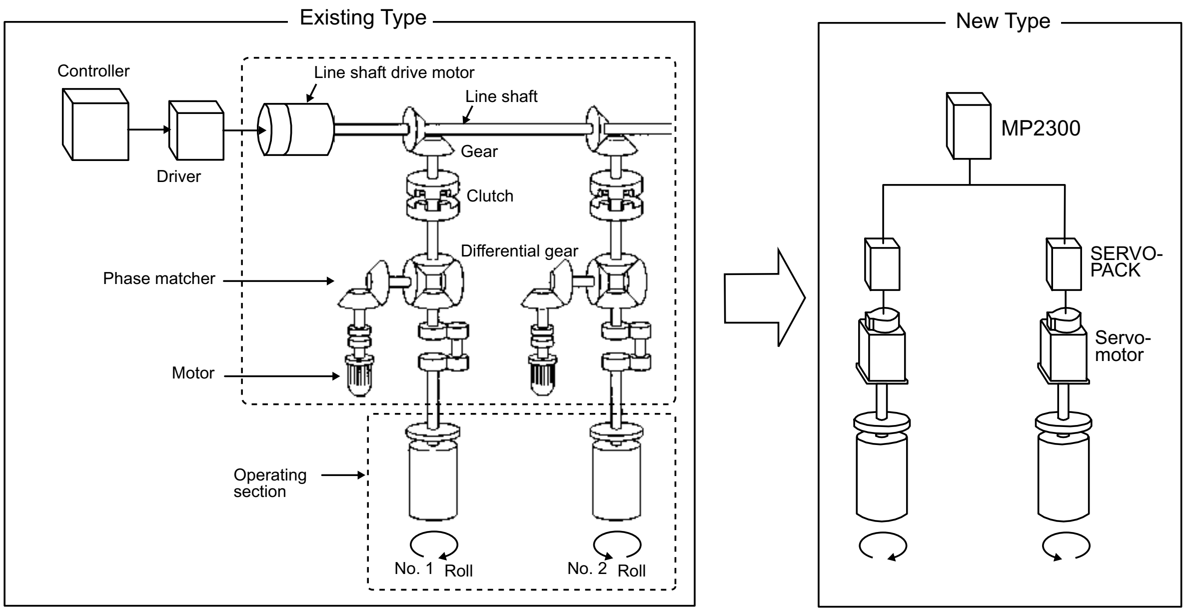
Motion programs MPM002 and MPM003 perform positioning, linear interpolation, and circular interpolation for axis 2.
MPM002 inserts a timer command between each travel command to indicate operation divisions.
MPM003 continuously executes travel commands, without the timer commands of MPM002, as shown in the following figure.

```
"MPM002";
"Data Setting";
VEL [X]1000 [Y]1000;      "Travel speed setting for positioning command"
FMX T50000000;            "Composite speed upper limit setting for interpolation command"
IAC T500;                 "Acceleration time setting for interpolation command"
IDC T500;                 "Deceleration time setting for interpolation command"
PLN [X][Y];               "Plane specification for circular interpolation command"
INC;                      "Increment position command setting"
TIM T100;
"Repeat Operation"
DW10 =0;
WHILE DW10 <5;            "No. repeats = 5"
MOV [X]ML30100 [Y]ML30102 ; "Positioning command"
TIM T100;
MVS [X]ML30110 [Y]ML30112 FML30114; "Linear interpolation command"
TIM T100;
ABS;                      "Absolute positioning command setting"
MCC [X]0 [Y]0 R1000.0 FML30114; "Circular interpolation command"
TIM T100;
DW10 =DW10 +1;
WEND;
"End Repeat Operation";
END;
```

2.2.3 Operation Check 3: Phase Control - Electronic Shaft

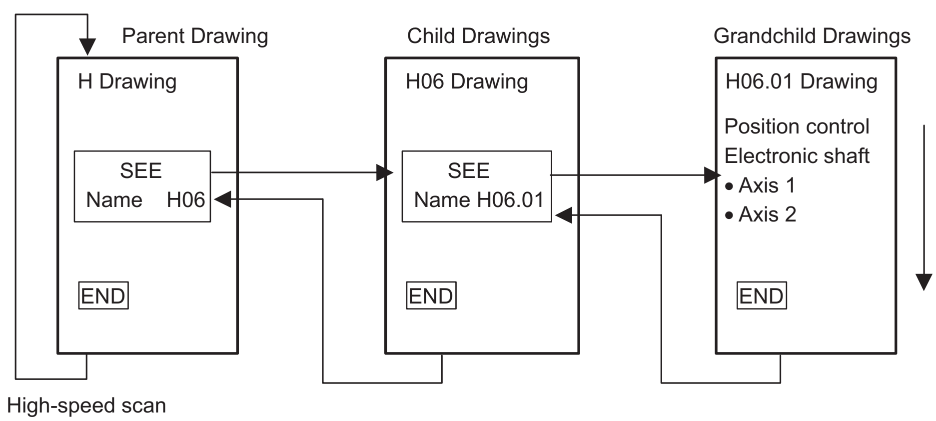
(1) Machine Outline

As shown in the following figure, the Servomotor performs the same operation as rolls No. 1 and No. 2 connected to the line shaft. No phase matching, however, is used.



(2) Program Overview

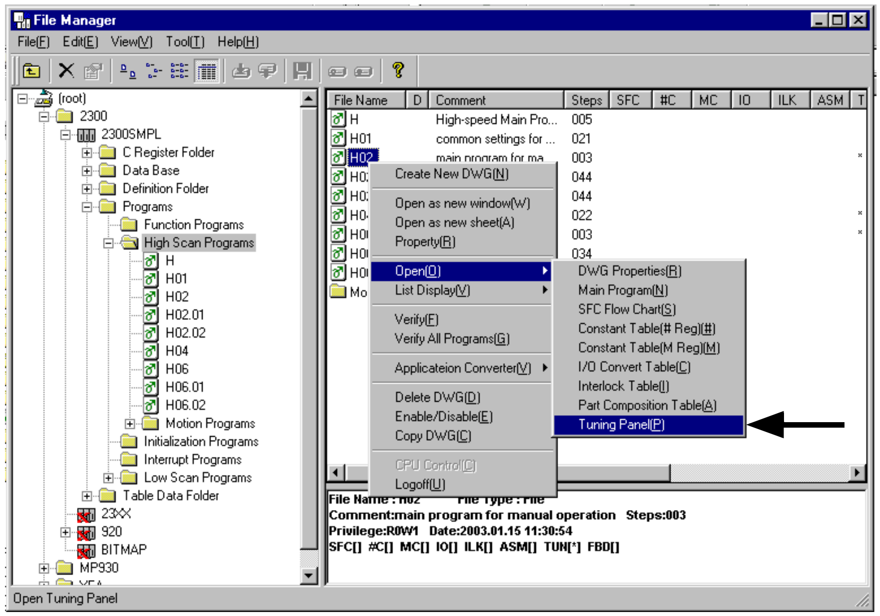
Use the ladder program (H06.01 Drawing) to check the above operation. The two axes synchronize to a virtual master axis according to the entered speed settings, and axis 1 and axis 2 rotate in exactly the same way.



- Refer to *2.2.3 (5) Sample Program Details* on page 2-50 for details of H06.01 Drawing.
- A simple device is used in this example to describe the MP2300 system startup.
- This device has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual devices.

(3) Display Tuning Panel for H06 Drawing

1. Use the same procedure as 2.2.1 (2). Right-click the **H06** Drawing in the ***High Scan Programs*** folder in the **File Manager** Window and select ***Open - Tuning Panel*** from the pop-up menu that is displayed.



Engineering Manager will start and the following Tuning Panel Window for the H06 Drawing will be displayed.

No	Data Name	S	Format	Current Value	Unit	Lower Limit	Upper Limit	REG-No.	DWG
1	********* Common monitor **********		XXXXX	00000		00000	32767	DW00010	L
2	Axis 1 operation ready		ON/OFF	OFF				IB80000	
3	Axis 2 operation ready		ON/OFF	OFF				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8096	
6	********** Common operation **********		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	ON				MB300000	
8	Alarm reset PB	S	ON/OFF	OFF				MB300001	
9	******* Phase control (electric shaft) ******		XXXXX	00000		00000	32767	DW00010	L
10	Electric shaft start	S	ON/OFF	OFF				DB000010	H06.01
11	Speed setting (motor rated speed 30000mm/min)	S	XXXXXX	000000	mm/min	000000	030000	DL00010	H06.01
12	******* Phase control (electric cam) *****		XXXXX	00000		00000	32767	DW00010	L
13	Electric cam start	S	ON/OFF	OFF				DB000010	H06.02
14	Main axis speed setting(30000mm/min)	S	XXXXXX	000000	mm/min	-030000	030000	DL00010	H06.02
15	Cam axis: amplitude setting(double amplitude)	S	XXX.XXX	*******	mm	000.000	999.999	ML30200	
16	Cam axis: main axis moving amount per a cycle	S	XXXXX.XXX	**********	mm	00000.000	50000.000	ML30202	

Model system operation can be controlled by writing the current values for *Common operation* and *Phase control (electric shaft)* from the Tuning Panel.

(4) Procedure

Use the following procedure to operate the Tuning Panel and check operation.

1. Servo ON

Change the *Servo ON PB* current value from *OFF* to *ON*.
The Servomotor will turn ON and the Servo will be clamped.

2. Electronic Shaft Start

Change the *Electric shaft start* current value from *OFF* to *ON*.
The mode will change to the phase control (electronic shaft) mode. Enter *OFF* to exit position control (electric shaft) mode.

3. Enter Speed Settings

Enter any value within the setting range (0 to 30000) as the current value of *Speed setting (motor rated speed 30,000 mm/min)*.
This operation synchronizes the speed for both axes to the speed of the virtual master axis and operation starts.
Change the *Electric shaft start* current value from *ON* to *OFF* when the check operation has been completed.

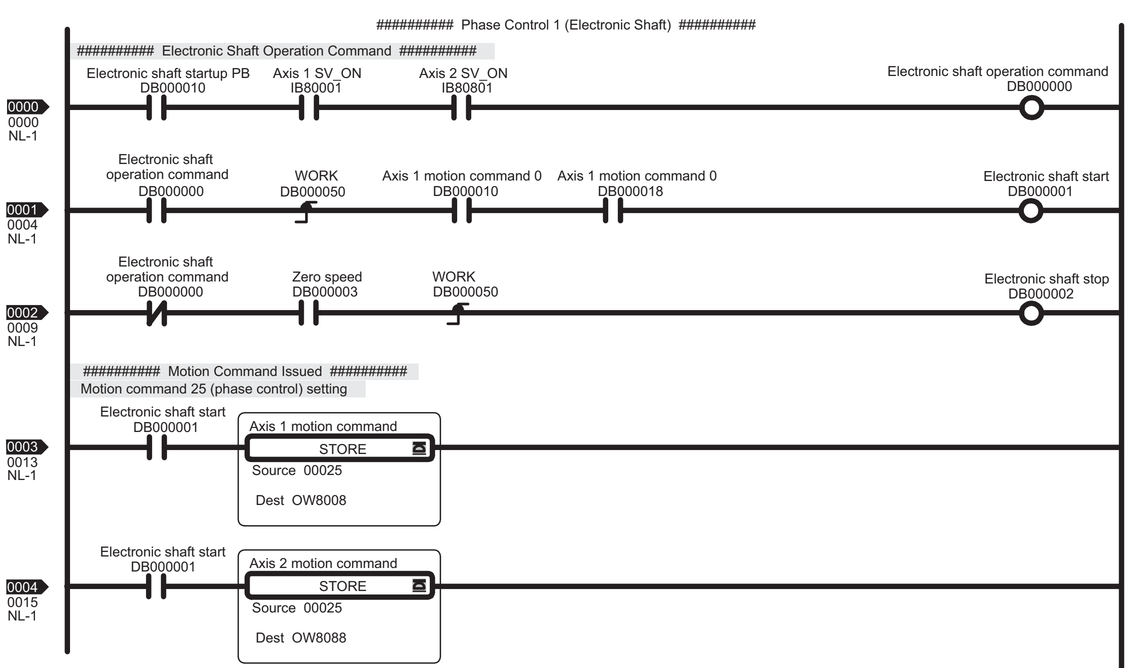
- It is necessary to create routines within the actual application program in order to monitor and control the registers corresponding to the signals and data listed in the table above.
- The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under *REG-No*. next to *DWG* at the right of the Tuning Panel window.

(5) Sample Program Details

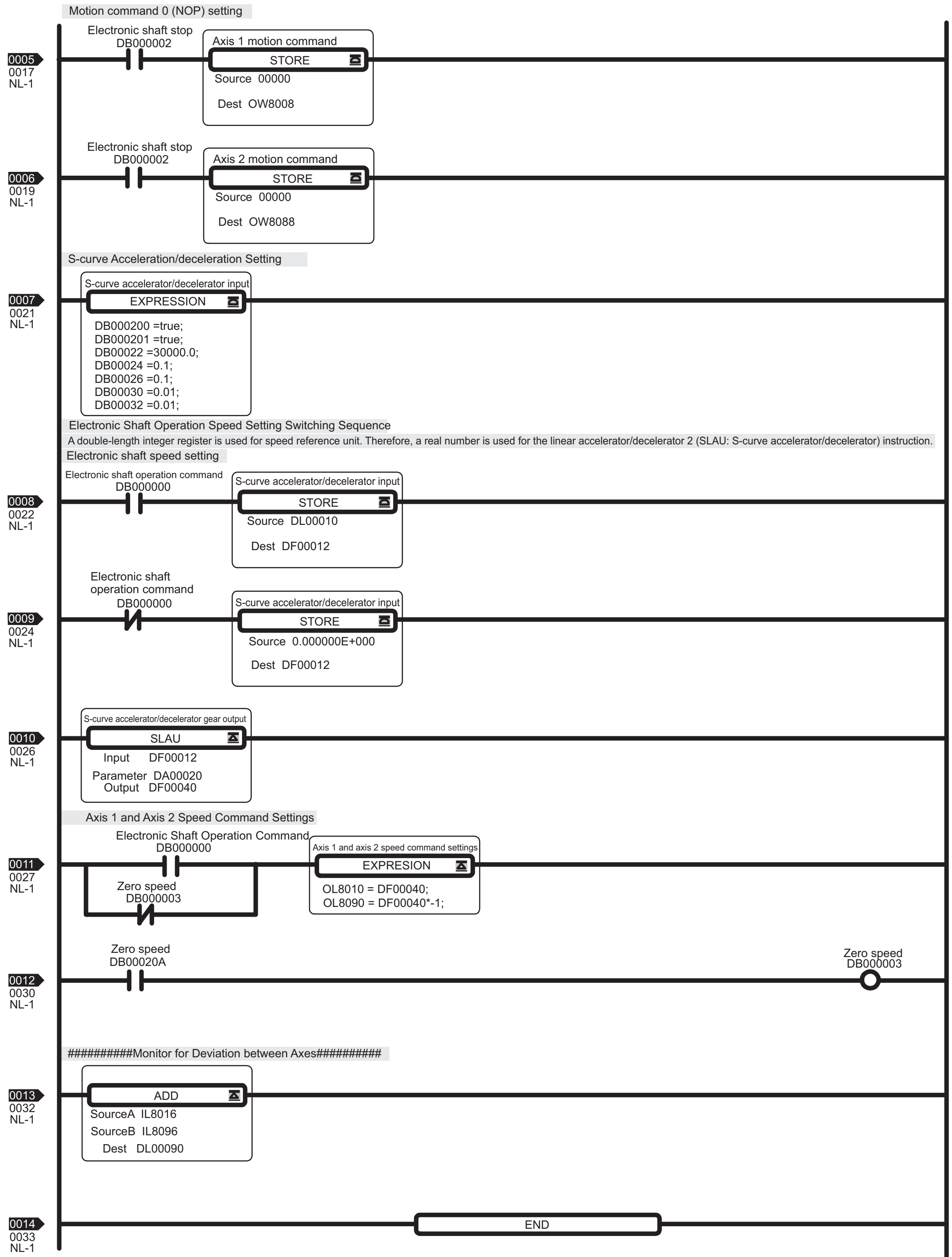
[a] H06.01 Drawing

The H6.01 grandchild drawing shows the ladder program for controlling phase control (electronic shaft) operation.

H06.01 Drawing - (1)



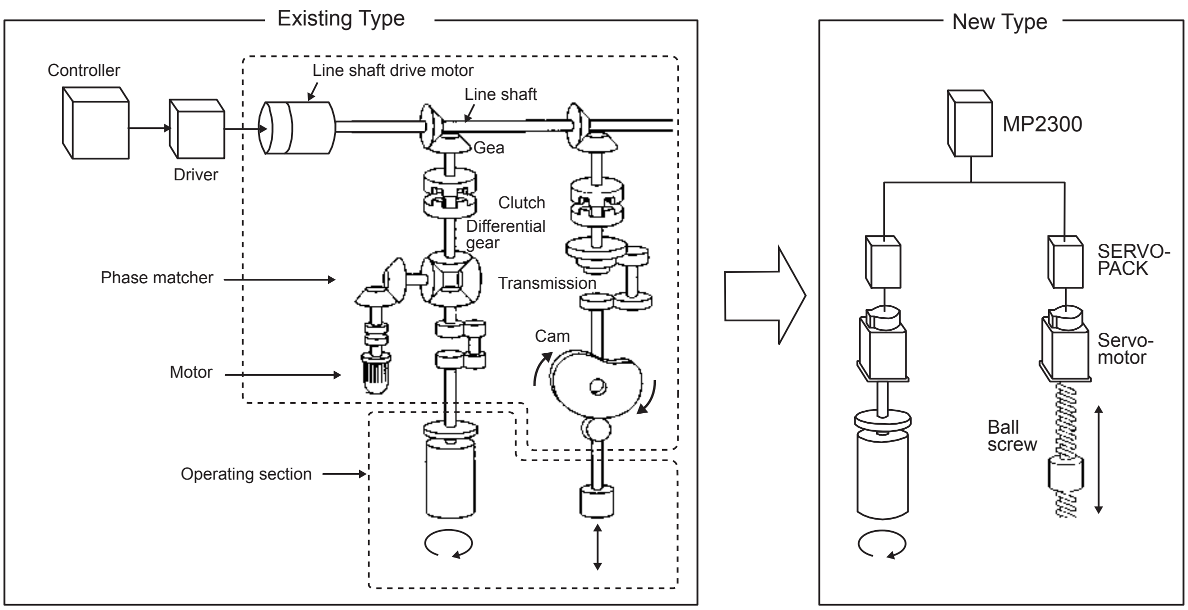
H06.01 Drawing - (2)



2.2.4 Operation Check 4: Phase Control - Electronic Cam

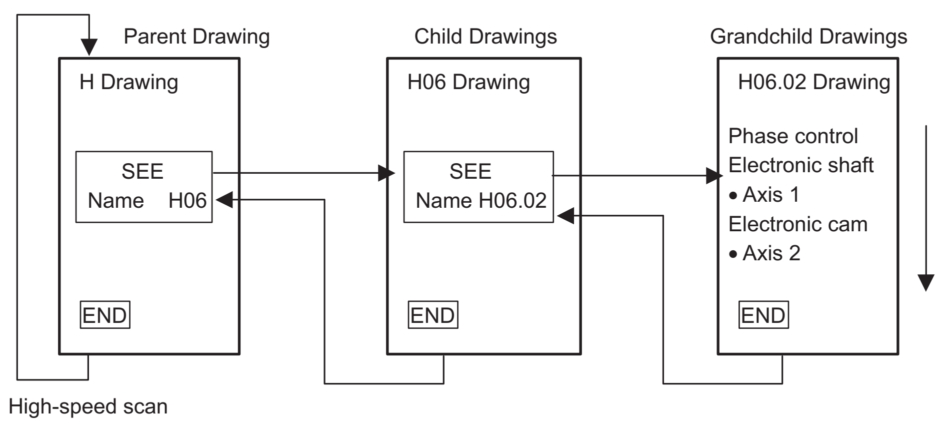
(1) Machine Outline

As shown in the following figure, the Servomotor performs the same operation as the mechanical cam synchronized to a roller connected to the line shaft. No phase matching is used.



(2) Program Overview

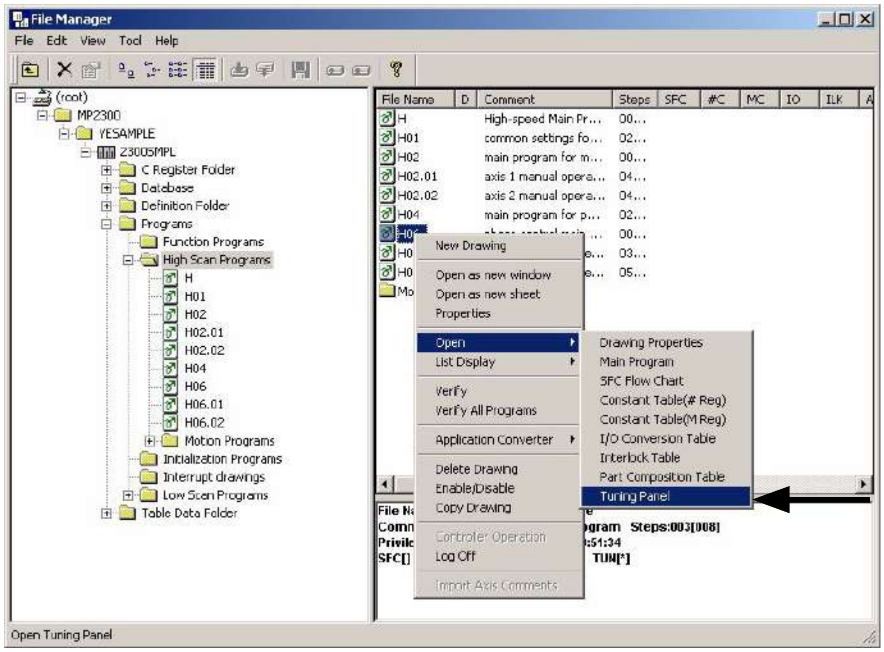
Use the ladder program (H06.02 Drawing) to check the above operation.
The two axes rotate synchronized with the input speed setting. Axis 1 is the roll axis (Master axis) and axis 2 is the cam axis (Slave axis, which moves in COS cam pattern against Master axis).
Cam pattern data is created using a ladder program (L06 Drawing).



- Refer to *2.2.4 (5) Sample Program Details* on page 2-55 for details of H06.01 Drawing.
- A simple device is used in this example to describe the MP2300 system startup. Caution is required because actual applications will be different.
- This device has no power OFF circuit for the SERVOPACK in the event of emergency stops or overtravel. Include a proper emergency stop circuit in actual applications.

(3) Display Tuning Panel for H06 Drawing

1. Use the same procedure as 2.2.1 (2). Right-click the **H06** Drawing in the ***High Scan Programs*** folder in the **File Manager** Window and select ***Open - Tuning Panel*** from the pop-up menu that is displayed.



Engineering Manager will start and the following Tuning Panel Window for the H06 Drawing will be displayed.

No	Data Name	S	Format	CurrentValue	Unit	Lower Limit	Upper Limit	REG-No.	DWG
1	********** Common monitor ***********		XXXXX	00000		00000	32767	DW00010	L
2	Axis 1 operation ready		ON/OFF	OFF				IB80000	
3	Axis 2 operation ready		ON/OFF	OFF				IB80800	
4	Axis 1 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8016	
5	Axis 2 current position		XXXXXXXXXX	0000000000		-2147483648	2147483647	IL8096	
6	*********** Common operation ***********		XXXXX	00000		00000	32767	DW00010	L
7	Servo ON PB	S	ON/OFF	OFF				MB30000	
8	Alarm reset PB	S	ON/OFF	OFF				MB30000	
9	******* Phase control (electric shaft) *******		XXXXX	00000		00000	32767	DW00010	L
10	Eectric shaft start	S	ON/OFF	OFF				DB00001	H06.01
11	Speed setting (motor rated speed 30000mm/min)	S	XXXXXX	000000	mm/min	000000	030000	DL00010	H06.01
12	******* Phase control (electric cam) ******		XXXXX	00000		00000	32767	DW00010	L
13	Electric cam start	S	ON/OFF	OFF				DB00001	H06.02
14	Main axis speed setting(30000mm/min)	S	XXXXXX	000000	mm/min	-030000	030000	DL00010	H06.02
15	Cam axis: amplitude setting(double amplitude)	S	XXX.XXX	000.000	mm	000.000	999.999	ML30200	
16	Cam axis: main axis moving amount per a cycle	S	XXXXX.XXX	00000.000	mm	00000.000	50000.000	ML30202	

Model system operation can be controlled by writing the current values for *Common operation* and *Phase control (electric shaft)* from the Tuning Panel.

(4) Procedure

1. Servo ON

Change the *Servo ON PB* current value from *OFF* to *ON*.
The Servomotor will turn ON and the Servo will be clamped.

2. Enter Cam Data

Enter any value within the setting range to *Cam axis: amplitude setting (double amplitude)* and *Cam axis: main axis moving amount per cycle*. These settings create the cam pattern.

- Cam axis: amplitude setting (double amplitude), Setting range: 0 to 999.999
- Cam axis: main axis moving per cycle, Setting range: 0 to 50000.000

Cam pattern data is not changed when *Electric cam start* is set to ON.

3. Start Electronic Cam Operation

Change the *Electric cam start* current value from *OFF* to *ON*.
Axis 2 will change to phase control (electric cam) mode. Enter OFF to exit phase control (electric cam) mode.

4. Enter Main Axis Speed Settings

Enter any value within the setting range (–30000 to 30000) as the current value for *Main axis speed setting*.
This operation sets the master axis speed and starts operation.
Change the *Electric cam start* current value from *ON* to *OFF* when the check operation has been completed.

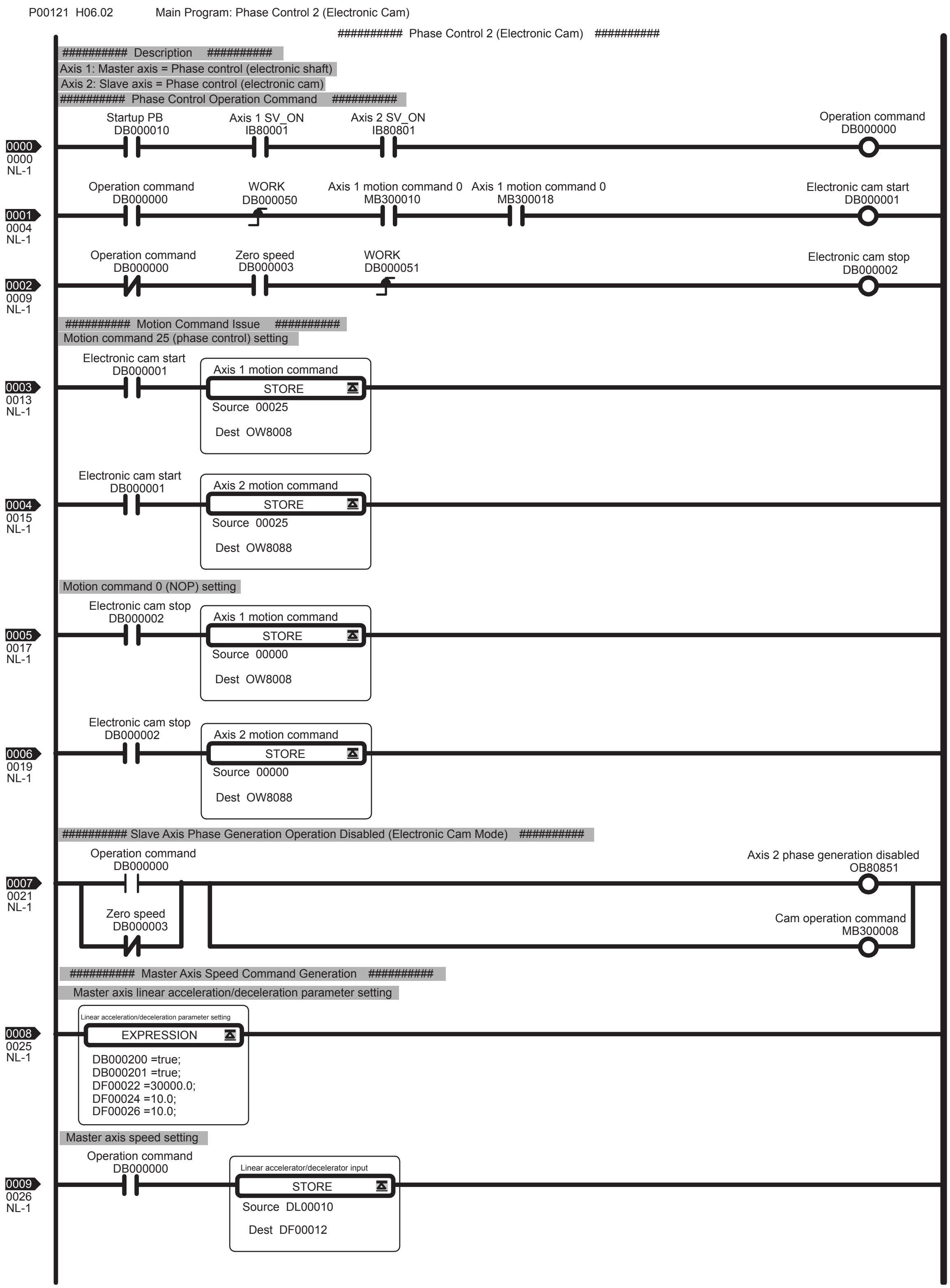
- It is necessary to create routines within the actual application program in order to monitor and control the registers corresponding to the signals and data listed in the table above.
- The register numbers that correspond to the signals used in this sample program will be the register numbers displayed under *REG-No*. next to *DWG* at the right of the Tuning Panel window.

(5) Sample Program Details

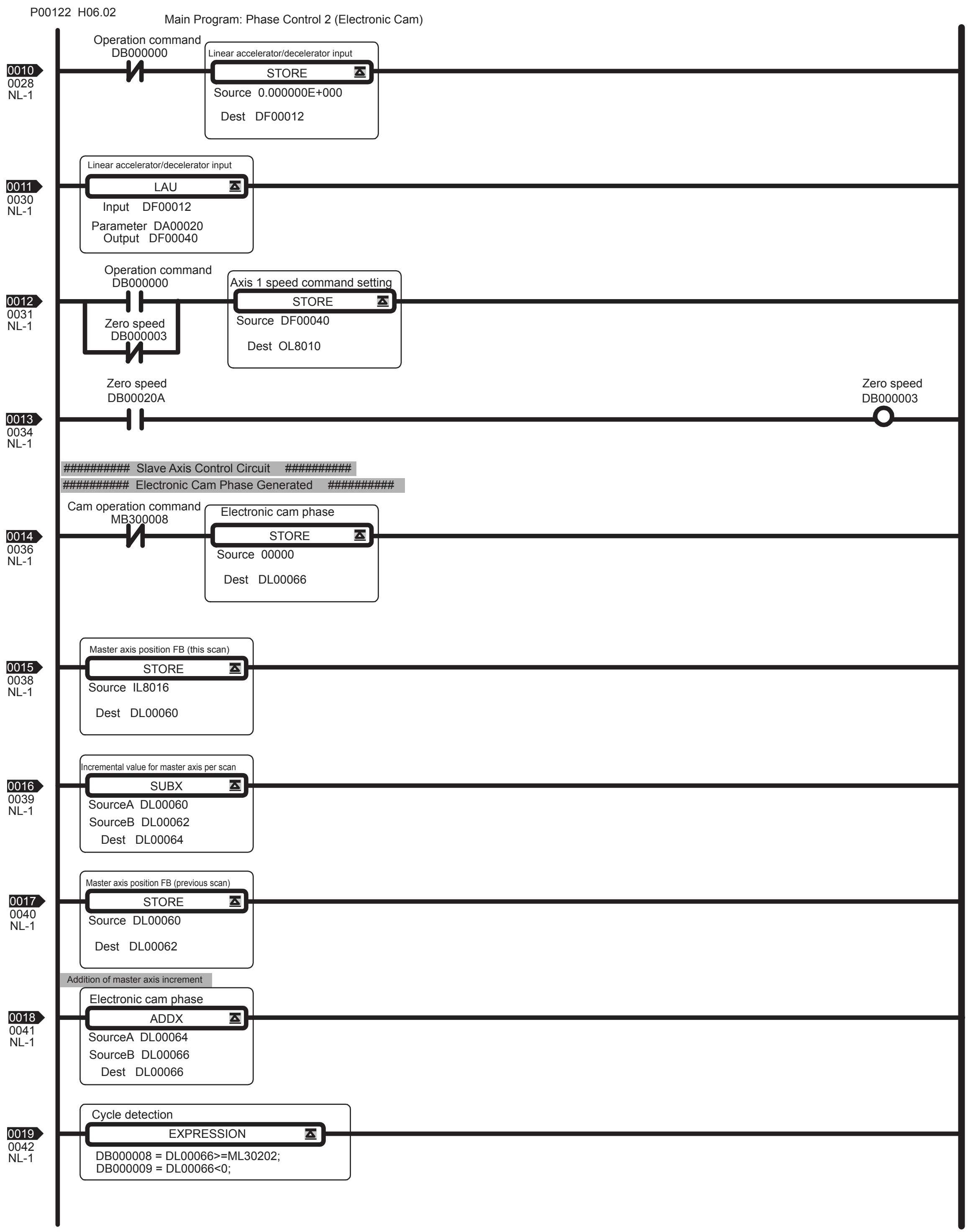
[a] H06.02 Drawing

The H06.02 grandchild drawing controls phase control (electronic cam) operation.

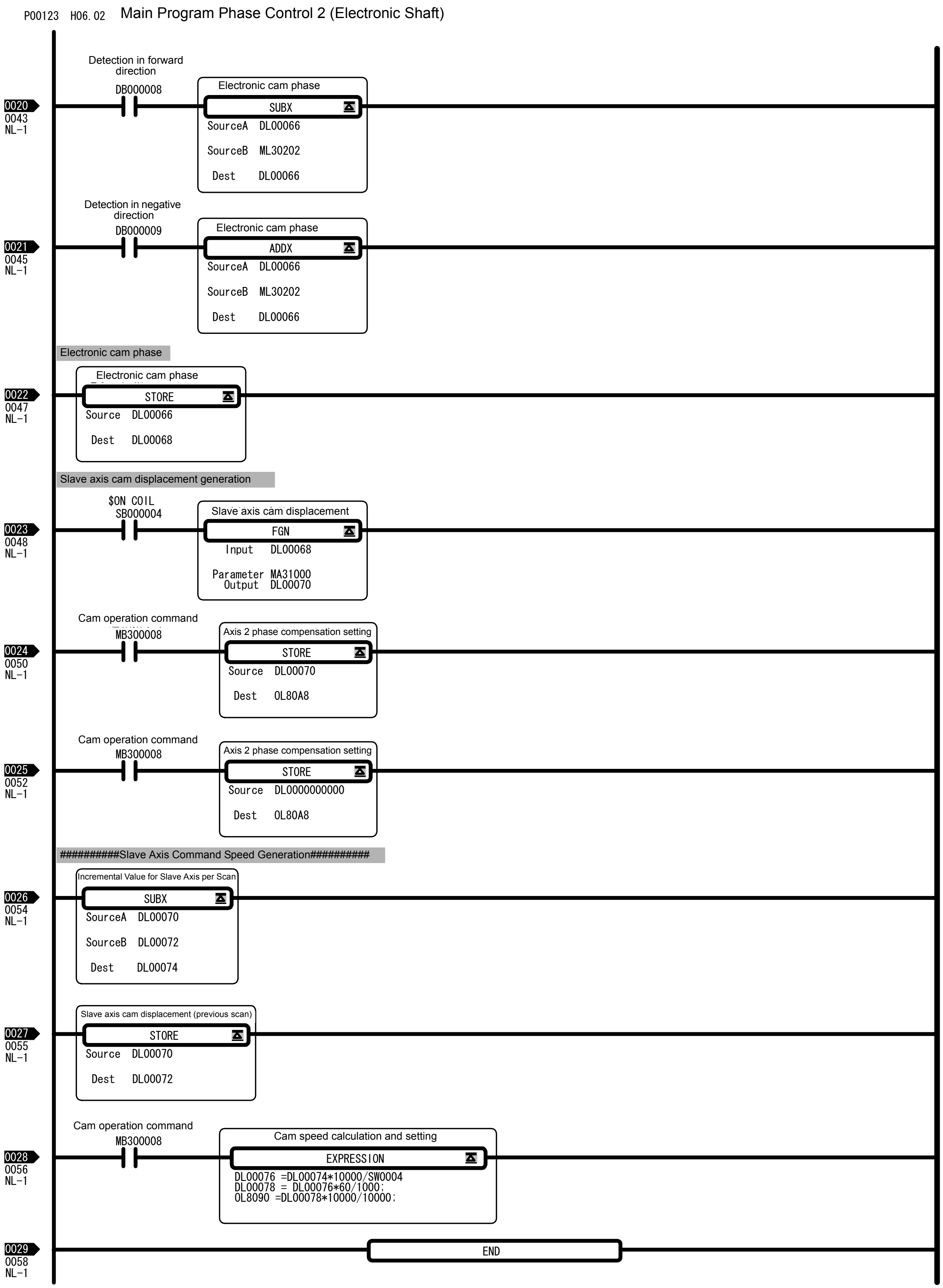
H06.02 Drawing - (1)



H06.02 Drawing - (2)

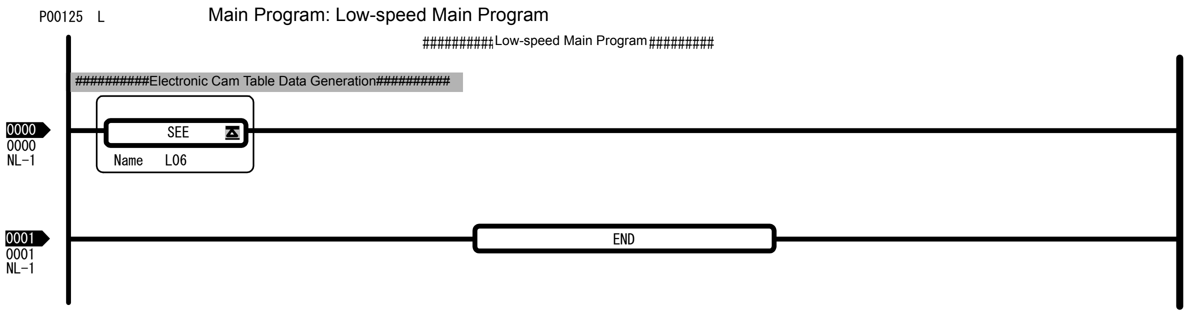


H06.02 Drawing - (3)



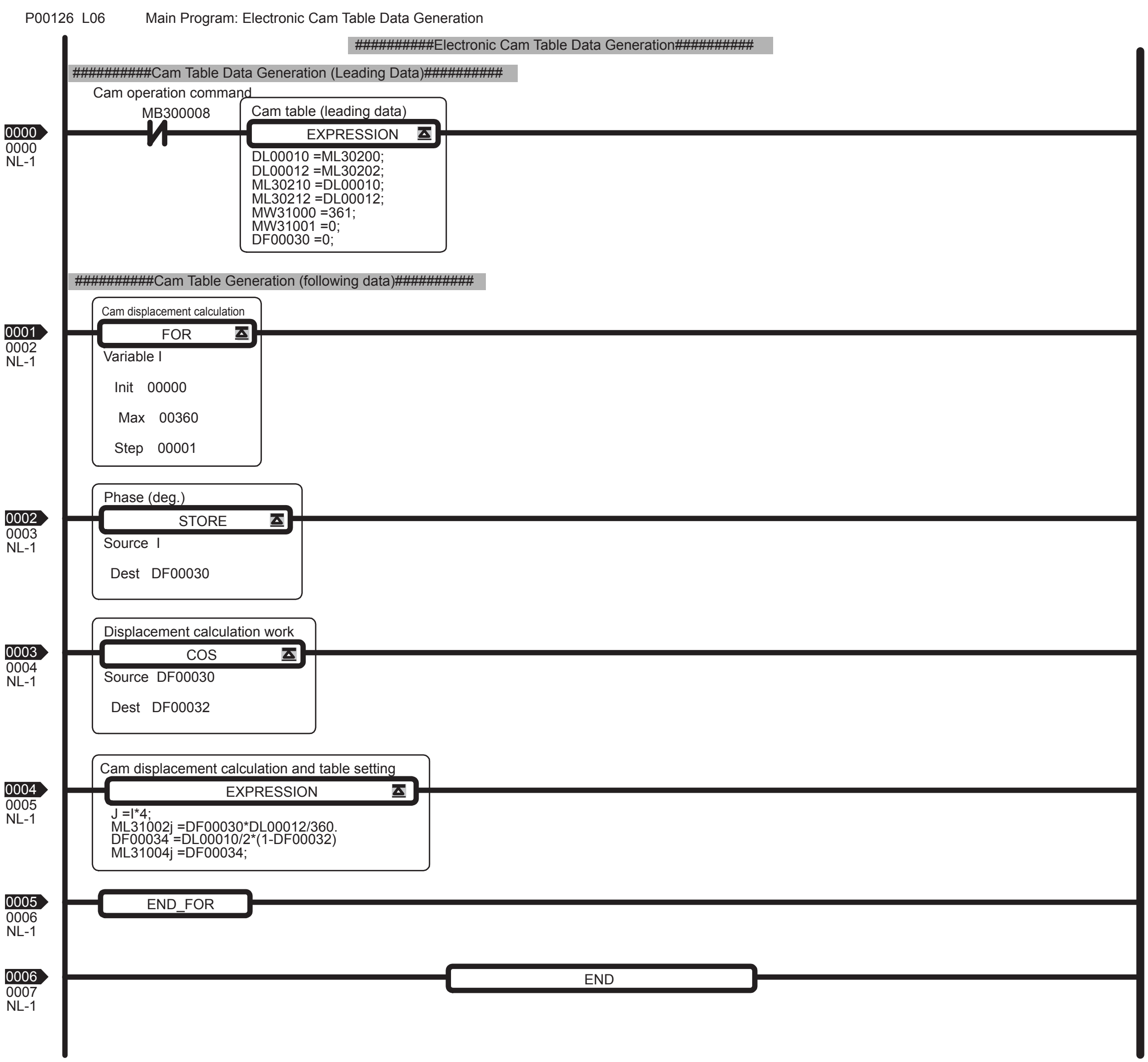
[b] L Drawing

The L parent drawing manages the low-speed scan that controls the overall sample program.



[c] L06 Drawing

The L06 child drawing creates cam pattern data for phase control (electronic cam).



2.3 System Startup Using Self-Configuration

System startup time can be reduced by using self-configuration.
This section describes system startup using self-configuration, in the following three circumstances.

- Starting the system for first time
- Adding an electronic device (e.g., SERVOPACK or Distributed I/O Module)
- Replacing electronic devices

2.3.1 Starting the System for First Time

Use the following procedure to startup a new system.

1. Wire and Connect Electronic Devices.

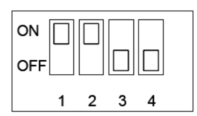
Correctly wire and connect all electronic devices to be used.

2. Make Switch Settings for MECHATROLINK Slaves.

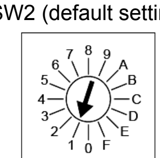
Set the MECHATROLINK communication specifications using the DIP switch and the station address on the rotary switch on each MECHATROLINK slaves.

Example SERVOPACK Settings (SGDS-□□□1□□)

SW1	Name	Setting	Contents	Default
Bit 1	Baud rate	OFF	4 Mbps	ON
		ON	10 Mbps	
Bit 2	No. of transmission bytes	OFF	17	ON
		ON	32	
Bit 3	Station address	OFF	Station address = 40H+SW1	OFF
		ON	Station address = 50H+SW1	
Bit 4	Reserved (Reserved by the system.)	OFF	—	OFF



SW2 (default setting)



SW1 (default setting)

- Refer to each slaves manual for information on the setting details.

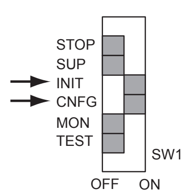
3. Start Up MECHATROLINK Slaves.

Turn ON the power to the MECHATROLINK slaves and check that the electronic devices start up normally.

- If using a new Absolute Encoder, the Absolute Encoder will need to be initialized. Refer to *9.2.2 Initializing the Absolute Encoder* on page 9-6 for details.
- The servo adjustment can be performed either in this step or after the self-configuration.

4. Set the Switches on MP2300/Optional Module

Set the switches of SW1 on MP2300 as shown below.



Make switch settings for communication and station address on each Optional Module mounted on the MP2300 as required.

5. Execute Self-configuration.

Check that all MECHATROLINK slaves have started up normally, then turn ON the power to the MP2300 to start self-configuration.
The LED indicators on the MP2300 Basic Module change as shown below.

When self-configuration is executed, the MP2300 will detect connected MECHATROLINK slaves, make I/O register allocations for them, and automatically set motion parameters to enable minimum operation.

- Refer to *6.1.1 Motion Parameter Register Numbers for MP2300* on page 6-2 for the I/O register number, circuit number, motion register number allocated to each Module by self-configuration.

- Self-configuration is designed to immediately enable operation to the Servo. Therefore, the SERVOPACK overtravel function (refer to *10.2 Overtravel Function* on page 10-8) is disabled. When actually operating machinery, overtravel must be enabled each SERVOPACK.

---

6. Make Parameter Settings to Match the Machinery.

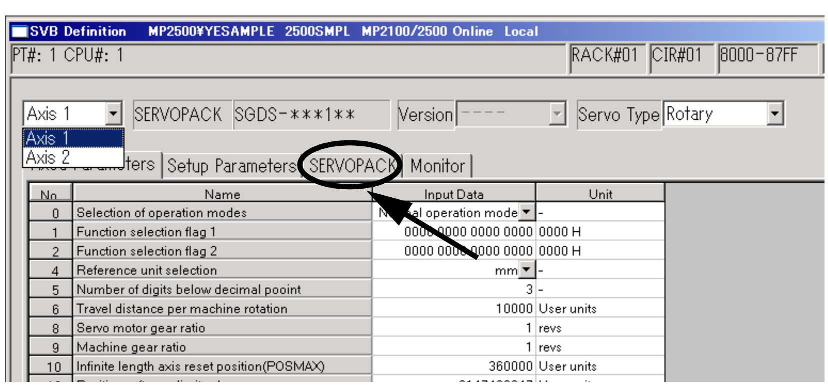
Start MPE720 and log on online, then set and save fixed parameters relating to reference units (fixed parameters 4, 5, 6, 8, and 9).

- Refer to *2.1.5 Starting and Preparing MPE720* on page 2-7 for the procedure to start MPE720 and *2.1.6 Reading Sample Programs and Setting and Saving Parameters* on page 2-19 for details on how to set and save fixed parameters.
- Refer to *6.3.1 Fixed Parameter List* on page 6-6 for details on fixed parameters, and *6.5 Example of Setting Motion Parameters for the Machine* on page 6-59 for information on setting parameters for machinery.
- Refer to each SERVOPACK manual for information on the Servo adjustment.

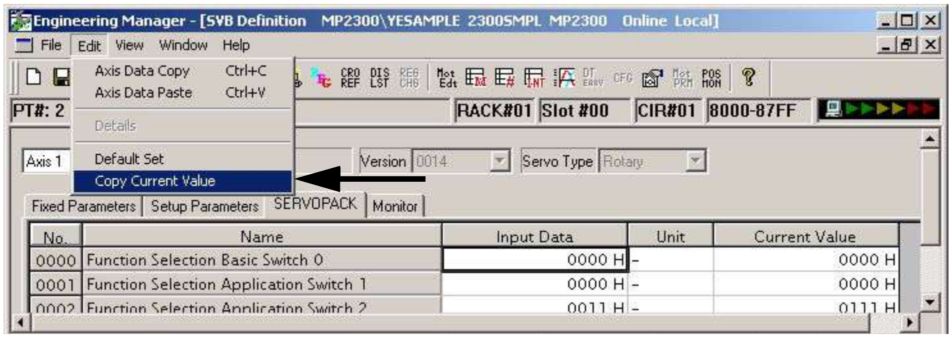
7. Make Servo Adjustment and Save SERVOPACK Parameters.

Adjust the SERVOPACK gain and other parameters for each SERVOPACK and save the SERVOPACK parameters for each axis to the MP2300.

a) Select the axis in the SVB Definition Window (refer to *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28) , then click the **SERVOPACK** Tab to display the SERVOPACK Tab Page.



b) Select ***Edit - Copy Current Value***.



- The data in the *Input Data* column in the SERVOPACK data saved to the MP2300 and the data in the *Current Value* column is the data set to the SERVOPACK.
- Refer to *11.3 SERVOPACK Parameter Data Flow* on page 11-9 for information on the relationship between *Current Value* and *Input Data*.

c) Select ***File - Save*** to save the SERVOPACK settings for the axis to the MP2300.

8. Save MP2300 Data to Flash Memory.

Return to the MPE720 File Manager Window and save to flash memory.

- Refer to *2.1.6 (6) Saving to Flash Memory* on page 2-31 page for information on how to save to flash memory.

9. Save Ladder Programs and Restart MP2300

Transfer the ladder program to the MP2300 and save to flash memory, and then turn the power from OFF to ON to restart the MP2300.

- Refer to *2.1.6 (3) Transfer Individual Programs* on page 2-25 for information on transferring ladder programs.

This completes the system startup procedure.

- Always save to flash memory when applications have been changed, e.g., the ladder program changed or parameters set. The added information will be lost if not saved to flash memory and the power is turned OFF. If the information is lost, load the application remaining on the hard disk of the personal computer to the MP2300 and save to flash memory.
- It is recommended that applications are backed up at appropriate times. Applications can be backed up by logging on online to the application using MPE720 and selecting ***Transfer - All Files - From Controller to MPE720***. Refer to *2.1.6 (7) Dumping All Data* on page 2-33 for information on how to dump all files.

2.3.2 System Startup when Adding Electronic Devices

Use the following procedure to start the system when adding SERVOPACKs, Optional Modules, and other electronic devices.

1. Back Up Applications.

Before adding the electronic devices, log on to the MP2300 online using MPE720 and select ***Transfer - All Files - From Controller to MPE720*** to create a backup of the application.

- For information on how to dump all files, refer to *2.1.6 (7) Dumping All Data* on page 2-33.

2. Turn OFF the MP2300.

Once the application has been backed up, log off from the MP2300 and turn OFF the MP2300 power.

3. Start the Electronic Device to Be Added.

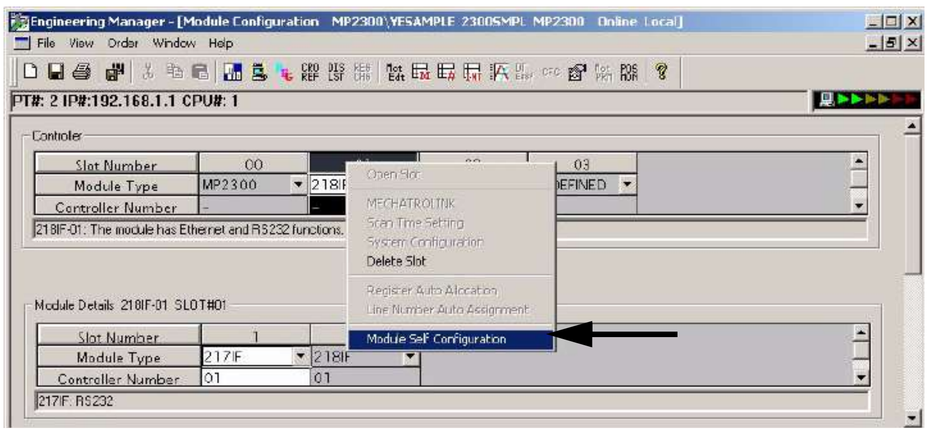
Make the DIP and rotary switch settings for the device to be added, then turn ON the power to that device only. Check that it starts up normally. Once normal startup has been confirmed, turn OFF the power supply.

4. Connect the Electronic Device.

Connect the electronic device to the MP2300 and turn ON the power to all the MECHATROLINK slaves.

5. Execute Self-configuration.

Turn ON the power to the MP2300, log on to the MP2300 using MPE720, then select ***Order - Self Configure All Modules*** to execute self-configuration for the added Optional Module or the SERVOPACK connected SVB Module.



- Refer to *5.4.3 (2) Self Configuration of Each Module* on page 5-33 for information on self-configuration of MP2300 Modules.
- If ***Self Configure All Modules*** is executed when *MP2300* is selected, all the modules will be self-configured.
- With the self-configuration function, existing definitions for SERVOPACKs are not refreshed and existing parameters are saved. However, SERVOPACKs need to be started up normally for self-configuration to be used..

- If I/O addresses are changed for an existing application using MPE720 after the initial self-configuration has been executed, the I/O addresses are updated when self-configuration is subsequently executed. If SVR is set to disabled, the setting will return to enabled. It is recommended that settings are checked again, including settings for existing electronic devices, after self-configuration has been executed.

Refer to steps 6 to 9 under *2.3.1 Starting the System for First Time* on page 2-59 for details of the rest of this procedure (steps 6 to 9).

6. Make Parameter Settings to Match Machinery.

7. Save SERVOPACK Parameters.

8. Save MP2300 Data to Flash Memory.

9. Save Ladder Programs and Restart MP2300.

This completes the system startup procedure when electronic devices have been added.

2.3.3 System Startup when Replacing Electronic Devices

Use the following procedure to start the system when replacing SERVOPACKs, Optional Modules, and other electronic devices due to malfunctions and other causes.

1. Back Up Applications.

Before replacing the electronic devices, log on to the MP2300 online using MPE720 and select ***Transfer - All Files - From Controller to MPE720*** to create a backup of the application.

- Refer to *2.1.6 (7) Dumping All Data* on page 2-33 for information on how to dump all files.

2. Turn OFF the MP2300.

Log off from the MP2300 and turn OFF the MP2300 power.

3. Start the Electronic Device to Be Added.

Make the DIP and rotary switch and other settings for the new electronic device.
For MECHATROLINK slaves, make the switch settings, turn ON the power to the slave, and check that it starts up normally. Once normal startup has been confirmed, turn OFF the power supply.

4. Replace the Electronic Device.

Remove the electronic device to be replaced, connect the new device to the MP2300, and turn ON the power to all MECHATROLINK slaves.

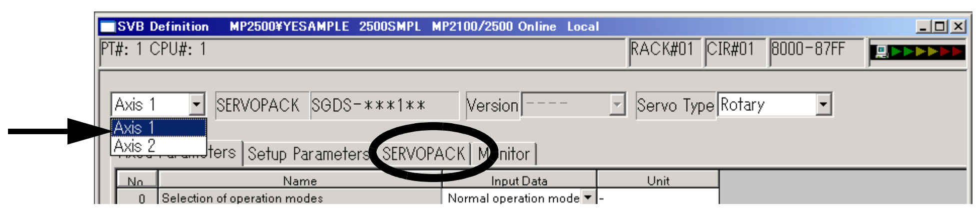
5. Turn ON the MP2300.

Turn ON the MP2300 power.

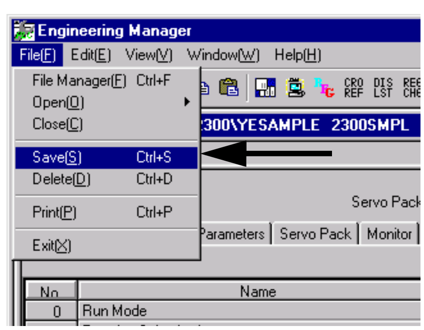
6. Save SERVOPACK Parameters.

If a SERVOPACK has been replaced, use the following procedure to write the SERVOPACK parameters saved to the MP2300 to the new SERVOPACK.

a) Select the axis, then select the SERVOPACK Tab Page on the SVB Definition Window (refer to *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28) to display the SERVOPACK Tab Page.



b) Click ***File - Save*** to write the SERVOPACK settings to the SERVOPACK.



- The MP2300 SERVOPACK settings data is written to all SERVOPACKs when ***Save*** is executed, and the settings data is also written in the MP2300 *Current Value* data column.

7. Turn ON the MP2300 and SERVOPACKs

Turn ON (OFF to ON) the power to the MP2300 and SERVOPACKs and then enable the parameters written to the SERVOPACKs.

This completes the system startup procedure when electric devices have been replaced.

3

Module Specifications

This chapter explains detailed specifications for the Basic Module and Optional Modules of the MP2300.

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3.1 General Specifications

This section describes the environmental conditions and functions of the MP2300.

3.1.1 Environmental Conditions

Item		Specifications
Environmental Conditions	Ambient Operating Temperature	0°C to 55°C
	Ambient Storage Temperature	-25°C to 85°C
	Ambient Operating Humidity	30% to 95% (with no condensation)
	Ambient Storage Humidity	5% to 95% (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
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 • 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 (15 G) twice for 11 ms each in the X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group 1, Class A) Power supply noise (FT noise): 2 Kv min., for one minute Radiation noise (FT noise): 1 Kv min., for one minute
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling

3.1.2 Function Lists

(1) PLC Function Specifications

The following table shows the PLC function specifications.

Item	Specifications
Control Method	Sequence: High-speed and low-speed scan methods
Programming Language	Ladder diagram: Relay circuit Text-type language:Numeric operations, logic operations, etc.
Scanning	Two scan levels: High-speed scan and low-speed scan High-speed scan time setting: 1 to 32 ms (Integral multiple of MECHATROLINK communication cycle) Low-speed scan time setting: 2 to 300 ms (Integral multiple of MECHATROLINK communication cycle)
User Drawings, Functions and Motion Programs	Startup drawings (DWG.A): 64 drawings max. Up to three hierarchical drawing levels Interrupt processing drawings (DWG.I): 64 drawings max. Up to three hierarchical drawing levels High-speed scan process drawings (DWG.H): 200 drawings max. Up to three hierarchical drawing levels Low-speed scan process drawings (DWG.L): 500 drawings max. Up to three hierarchical drawing levels Number of steps: Up to 1,000 steps per drawing User functions: Up to 500 functions Motion programs: Up to 256
	Revision history of drawings and motion programs Security function for drawings and motion programs
Data Memory	Common data (M) registers: 64 Kwords System (S) registers: 8 Kwords Drawing local (D) registers: Up to 16 Kwords per drawing Drawing constant (#) registers: Up to 16 Kwords per drawing Input (I) registers: 32 Kwords (including internal input registers) Output (O) registers: 32 Kwords (including internal output registers) Constant (C) registers: 16 Kwords
Trace Memory	Data trace: 128 Kwords (32 Kwords × 4 groups), 16 points defined
Memory Backup	Program memory: Flash memory: 8 MBytes (User area: 5.5 MBytes) definition files, ladder programs, motion programs, etc. Data other than battery backup data Data memory: Battery backup: 256 Kbytes, M registers, S registers, alarm history, trace data
Data Types	Bit (relay): ON/OFF Integer: –32768 to +32767 Double-length integer: –2147483648 to +2147483647 Real number: ± (1.175E-38 to 3.402E+38)
Register Designation Method	Register number: Direct designation of register number Symbolic designation: Up to 8 alphanumeric characters (up to 200 symbols per drawing) With automatic number or symbol assignment
Instructions	Program control instructions: 14 instructions Direct I/O instructions: 2 instructions Relay circuit instructions: 14 instructions (including set and reset coils) Logic operation instructions: 3 instructions Numeric operation instructions: 16 instructions Numeric conversion instructions: 9 instructions Numeric comparison instructions: 7 instructions Data manipulation instructions: 14 instructions Basic function instructions: 10 instructions Table data manipulation instructions: 11 instructions DDC instructions: 13 instructions System functions: 9 instructions

(2) Motion Control Function Specifications

The following table lists the motion control function specifications for the MP2300.

<table>
<tr><th colspan="3">Item</th><th>Specifications</th></tr>
<tr><td colspan="3">Interface</td><td>MECHATROLINK-I, MECHATROLINK-II</td></tr>
<tr><td colspan="3">Number of Controlled Axes/Module</td><td>Up to 16 axes (up to 48 axes when two SVB Modules are mounted)</td></tr>
<tr><td rowspan="13">Control Specifications</td><td colspan="2">PTP Control</td><td>Linear, rotary, and infinite-length</td></tr>
<tr><td colspan="2">Interpolation</td><td>Up to 16 linear axes, 2 circular axes, and 3 helical axes</td></tr>
<tr><td colspan="2">Speed Reference Output</td><td>Yes
(Only with MECHATROLINK-II)</td></tr>
<tr><td colspan="2">Torque Reference Output</td><td>Yes
(Only with MECHATROLINK-II)</td></tr>
<tr><td colspan="2">Phase Control</td><td>Yes
(Only with MECHATROLINK-II)</td></tr>
<tr><td rowspan="8">Position Control</td><td>Positioning</td><td>Yes</td></tr>
<tr><td>External positioning</td><td>Yes</td></tr>
<tr><td>Zero point return</td><td>Yes</td></tr>
<tr><td>Interpolation</td><td>Yes</td></tr>
<tr><td>Interpolation with position detection function</td><td>Yes</td></tr>
<tr><td>JOG operation</td><td>Yes</td></tr>
<tr><td>STEP operation</td><td>Yes</td></tr>
<tr><td>Parameter changes during motion command execution</td><td>Yes
(Only with MECHATROLINK-II in 32-byte mode)</td></tr>
<tr><td colspan="3">Reference Unit</td><td>mm, inch, deg, or pulse</td></tr>
<tr><td colspan="3">Reference Unit Minimum Setting</td><td>1, 0.1, 0.01, 0.001, 0.0001, 0.00001</td></tr>
<tr><td colspan="3">Maximum Programmable Value</td><td>–2147483648 to +2147483647 (signed 32-bit value)</td></tr>
<tr><td colspan="3">Speed Reference Unit</td><td>Reference unit/s designation: mm/s, inch/s, deg/s, pulse/s
Reference unit/min. designation: mm/min, inch/ min, deg/min, pulse/min
Percentage designation: Percentage of rated speed</td></tr>
</table>

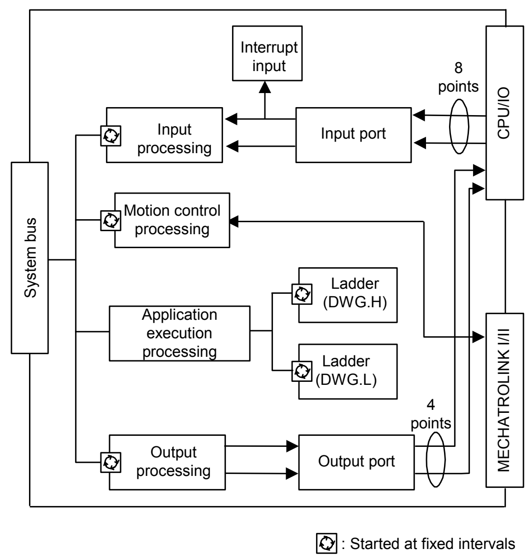
<table>
<tr><th colspan="2">Item</th><th colspan="2">Specifications</th></tr>
<tr><td colspan="2">Acceleration/Deceleration Type</td><td colspan="2">Linear, asymmetric, S-curve, exponent</td></tr>
<tr><td colspan="2">Acceleration/Deceleration Reference Unit</td><td colspan="2">Reference unit/s^2 designation: mm/s^2, inch/s^2, deg/s^2, pulse/s^2
Acceleration/deceleration time constant: Time from 0 to rated speed (ms)</td></tr>
<tr><td colspan="2">Override Function</td><td colspan="2">Positioning: 0.01% to 327.67% by axis</td></tr>
<tr><td colspan="2">Coordinate System</td><td colspan="2">Rectangular coordinates</td></tr>
<tr><td rowspan="13">Zero Point Return</td><td>DEC1+ Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>ZERO signal</td><td colspan="2">Yes</td></tr>
<tr><td>DEC1+ ZERO signal</td><td colspan="2">Yes</td></tr>
<tr><td>Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>Only Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>POT and Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>POT</td><td colspan="2">Yes</td></tr>
<tr><td>Home limit switch and Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>HOME</td><td colspan="2">Yes</td></tr>
<tr><td>NOT and Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>NOT</td><td colspan="2">Yes</td></tr>
<tr><td>INPUT and Phase-C pulse</td><td colspan="2">Yes</td></tr>
<tr><td>INPUT</td><td colspan="2">Yes</td></tr>
<tr><td colspan="2">Applicable SERVOPACKs</td><td>■ MECHATROLINK-I
• SERVOPACKs
SGD-□□□N
SGDB-□□AN
SGDH-□□□E ＋ NS100
SGDS-□□□1□□
• Inverter
VS-616G5 (216IF card is needed)</td><td>■ MECHATROLINK-II
• SERVOPACKs
SGDH-□□□E ＋ NS115
SGDS-□□□1□□</td></tr>
<tr><td colspan="2">Encoders</td><td colspan="2">• Incremental Encoder
• Yaskawa Absolute Encoder</td></tr>
</table>

3.2 Basic Module

This section describes the functions, the external appearance, the LED indicators, the setting switches, and the hardware specifications of the MP2300 Basic Module and also describes the virtual motion module SVR.

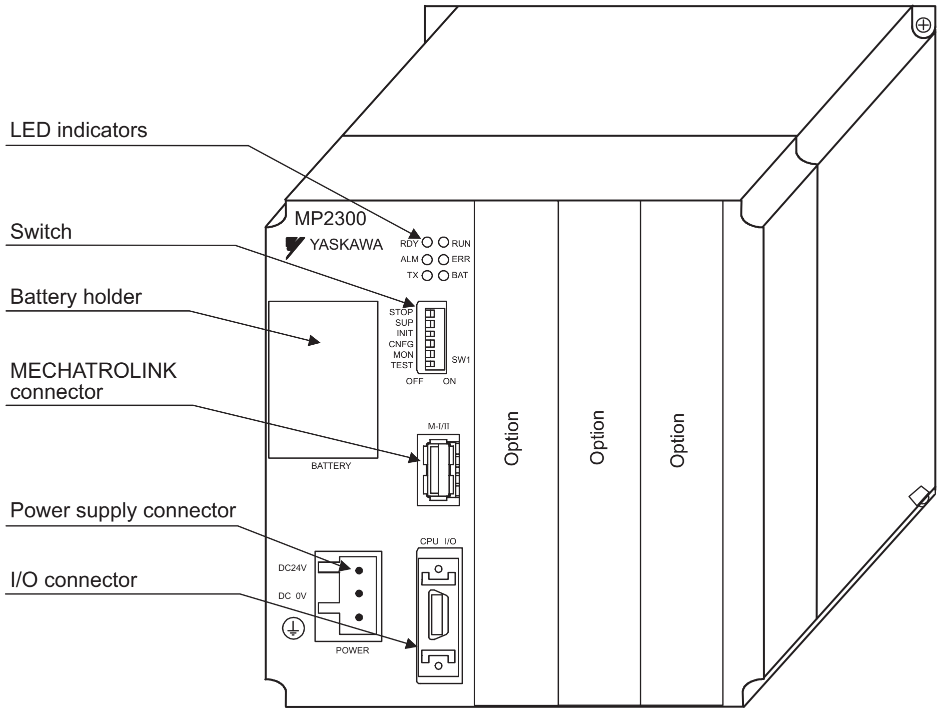
3.2.1 Outline of Functions

The Basic Module is an all-in-one, compact module that combines power supply, CPU, and I/O in one module. The Basic Module has both motion control and sequence control functions. With the 3-slot option slot configuration, Optional Modules can be selected freely and the optimum system can be built for your machine. An outline of the Basic Module functions is shown in the following diagram.



3.2.2 External Appearance, LED Indicators, and Switch Settings

(1) External Appearance



(2) Indicators

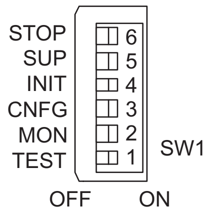
The following table shows the indicators that show the operating status of the Basic Module and error information.

	Indicator	Color	Status
RDY ○ ○ RUN ERR ○ ○ ALM TRX ○ ○ BAT	RDY	Green	Lit during normal operation.
	RUN	Green	Lit during execution of user program.
	ALM	Red	Lit/blinking when warning occurs.
	ERR	Red	Lit/blinking when malfunction occurs.
	TX	Green	Lit during transmission of MECHATROLINK I/II data.
	BAT	Red	Lit during battery alarm.

- For details on indicator meanings, refer to *12.3.3 (2) LED Indicator Meanings* on page 12-7.

(3) Switch Settings

The DIP switch sets the operating conditions for the Basic Module when the power is turned ON.



No.	Name	Setting	Operating Mode	Default Setting	Details
6	STOP	ON	User program stopped	OFF	Stops the user program execution. Enabled only when the power is turned ON.
		OFF	User program running		
5	SUP	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
4	INIT	ON	Memory clear	OFF	Set to ON to clear the memory. If this switch is set to OFF, the program stored in flash memory will be executed.
		OFF	Normal operation		
3	CNFG	ON	Configuration mode	OFF	Set to ON to execute self-configuration for connected devices.
		OFF	Normal operation		
2	MON	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
1	TEST	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		

3.2.3 Module Specifications

(1) Basic Module Hardware Specifications

The following table shows the hardware specifications of the Basic Module.

Item	Specifications
Classification	Basic Module
Name	MP2300
Model Number	JEPMC-MP2300
Flash Memory	8 MBytes (User area 5.5 MBytes)
SDRAM	16 MBytes
SRAM	256 kBytes: M registers, S registers, trace memory, alarm history (battery backup)
Motion Network MECHATROLINK	Motion network 1 channel SERVOPACK and I/O for up to 21 stations connectable (SERVOPACK for up to 16 axes) Baud rate: 4 Mbps (MECHATROLINK-I) or 10 Mbps (MECHATROLINK-II)
I/O Signal	8 digital inputs (1 input also used as an interrupt input) 24 VDC, 4.1 mA (TYP) source mode/sink mode inputs 4 digital outputs 24 VDC, 100 mA (TYP) open-collector sink mode outputs
Calendar	Seconds to year timer (Battery backup)
Connectors	POWER: Power supply connector M-I/II: MECHATROLINK connector CPU I/O: I/O connector
Indicators	RDY (green) RUN (green) ALM (red) ERR (red) TX (green) BAT (red)
Switches	STOP SUP INIT CNFG MON TEST
Current Consumption	1A max.
Dimensions (mm)	$120 \times 130 \times 105$ ($W \times H \times D$)
Mass	450 g

(2) Basic Module Functional Specifications (Built-in SVB)

The SVB is a MECHATROLINK interface built in the MP2300 Basic Module.
The specifications of the built-in SVB are as follows.

[a] MECHATROLINK Communication Specifications

Item	MECHATROLINK-I	MECHATROLINK-II
Topology	Bus	Bus
Transmission Path	Electric bus	Electric bus
Transmission Distance	50 m (Can be extended up to 100m by connecting repeaters*.)	50 m (Can be extended up to 100m by connecting repeaters*)
Baud Rate	4 Mbps	10 Mbps
Communication Cycle	2 ms	1 ms, 2 ms
Maximum Number of Connectable Stations	14	21
Communication Control Method	Cyclic	Cyclic
Media Access Control Method	1:N	1:N (2:N when using SigmaWin+)
Communication Mode	Control communication	Control communication
Error Detection Control	CRC check	CRC check

* Applicable repeater model: JEPMC-REP2000

[b] MECHATROLINK Communication Settings and Max. Number of Slaves

MECHATROLINK Communication Settings			Max. Number of Slaves
Communication Method	Baud Rate	Communication Cycle	
MECHATROLINK-I	4Mbps	2 ms	14
MECHATROLINK-II (17-byte mode)	10Mbps	1 ms	15
MECHATROLINK-II (32-byte mode)	10Mbps	1 ms	9
		1.5 ms	15
		2 ms	21 (16 axes max. for Servos)

- Refer to *8.8.6 MECHATROLINK Definition* of *Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (Manual No. SIEP C880700 05□)* for information on MECHATROLINK commnication settings.

[c] Transmission Distance and Max. Number of Slaves

Communication Method	Transmission Distance (Total Network Length)	Max. Number of Slaves
MECHATROLINK-I	50 m	14
MECHATROLINK-II	30 m (Can be extended up to 100m by connecting repeaters)	16 (21)*
	50 m (Can be extended up to 100m by connecting repeaters)	15 (21)*

* The max. number of slaves in parentheses are when repeaters (JEPMC-REP2000) are used. For MECHATROLINK-II communication, repeaters (JEPMC-REP2000) are required to connect more than 16 slave stations.

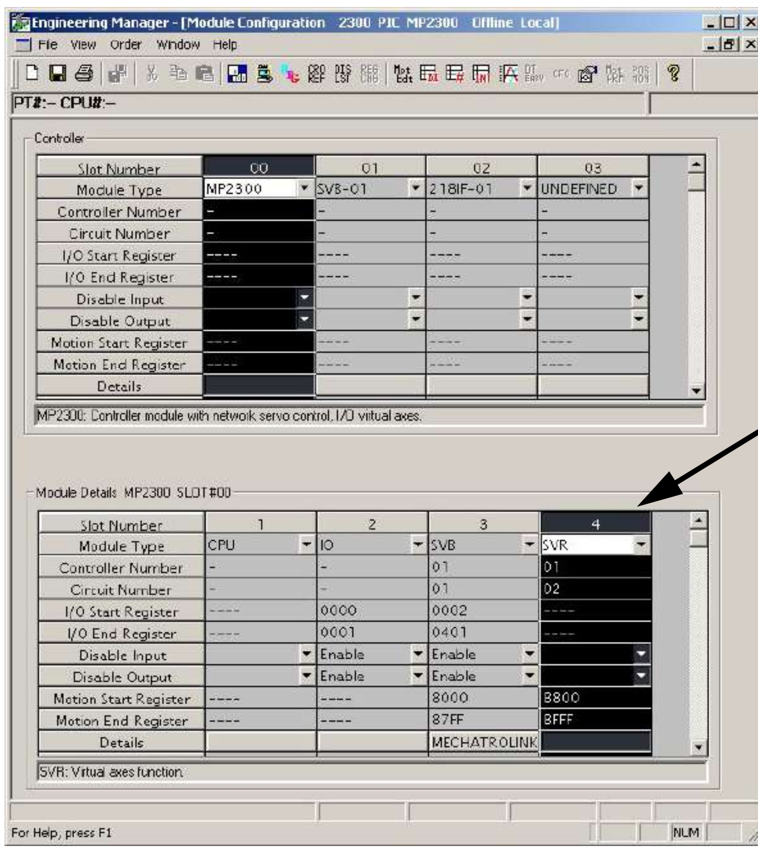
3.2.4 SVR Virtual Motion Module

(1) Outline

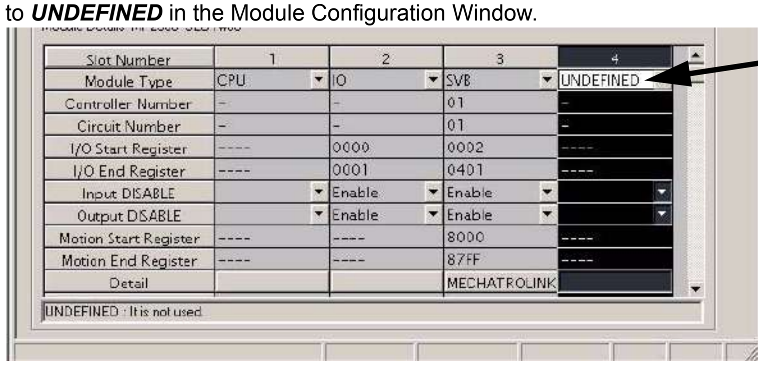
The Virtual Motion Module is a software module provided as a standard feature with the MP2300. It is not connected to a motor, but provides a virtual axis interface.
The SVR is configured in the same way as the MP2300 built-in SVB with fixed parameters, setting parameters, and monitoring parameters, and can be accessed from application programs using I/O registers.

- Refer to items marked with R in *Chapter 6 Motion Parameters* for information on SVR motion parameters.
- Refer to *Chapter 7 Motion Commands* for information on how to use SVR motion commands.

The SVR can be used to control up to 16 virtual axes in the high-speed scan control cycle.
In the MP2300 Basic Module, slot 4 in the default Module Configuration Window is for SVR.



- If the SVR is not used, MP2300 processing time can be reduced by setting the *Module Type* for SVR to ***UNDEFINED*** in the Module Configuration Window.



(2) Example SVR Usage

The SVR is used in the following two applications.

- **Program testing**: Results are easily obtained without mounting a motor.
- **Generating commands**: If the SVR is used in applications where motion modules are required only for generating commands, such as master axis for phase control or multi-axis synchronous control, then Motion Modules on real axes are no longer required.

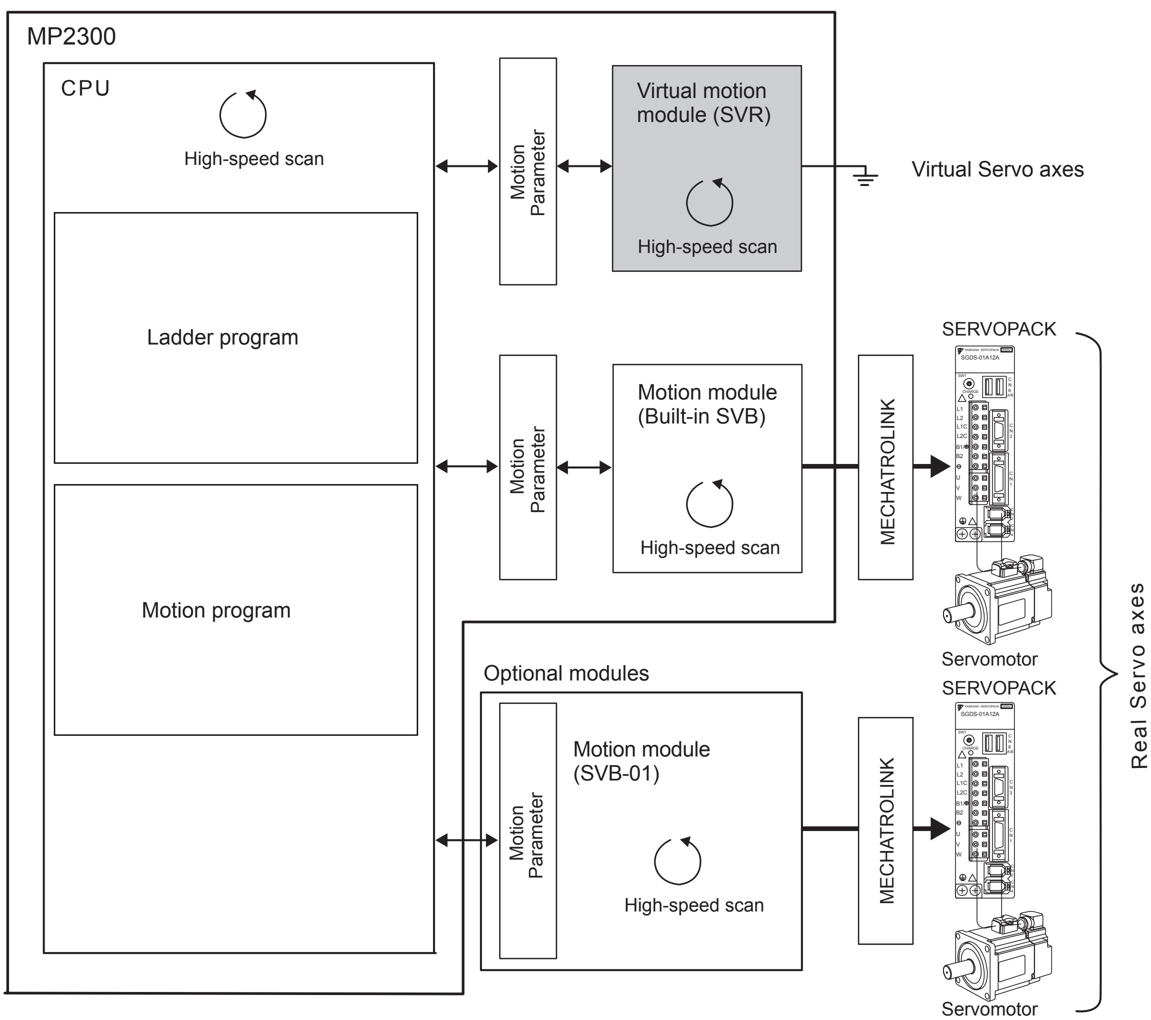
The following table lists application examples of the SVR.

Slot Number	Application Example	Application Method
1	Master axis for phase control	Electronic cam or shaft operation can be achieved by using the SVR for the virtual master axis.
2	Multi-axis synchronous control	Multi-axis synchronous control can be achieved by controlling the SVR from a motion program and then using the ladder program to copy position commands of the SVR to other axes.
3	Sine curve commands	If the motion program is used to perform circular interpolation with the SVR, the axis will operate with a sine curve command.

- The software limit function and machine lock function cannot be used with the SVR. The position error will always be 0.

(3) System Configuration Example

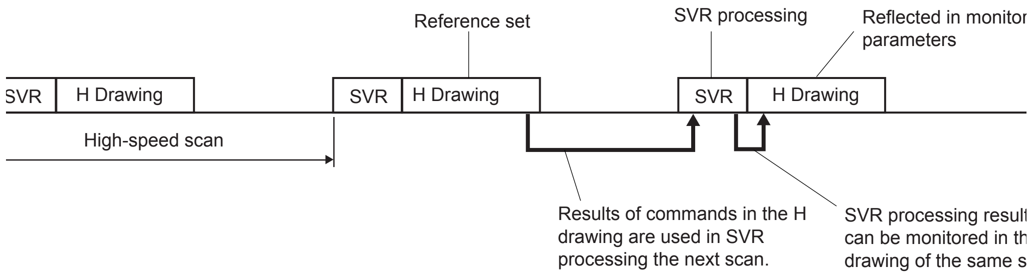
The following figure shows an example system configuration using SVR.



(4) SVR Operation

[a] SVR Execution Timing

The SVR is processed at the beginning of the high-speed scan. SVR processing is performed in the next scan after specifying and the processing results are reflected in the monitoring parameters.



[b] Processing Time

When fixed parameter 0 (Run Mode) is set to 0 (Normal Running), services are started for each of the 16 SVR module virtual axes.

- The default for the Run Mode parameter is 1 (Axis Unused).

The following table gives guidelines for the processing time required for each SVR axis.

Command	MP2300
NOP	35 +14 × Number of axes (μs)
POSING	35 +36 × Number of axes (μs)

- Number of axes: The number of axes (1 to 16) when Run Mode (fixed parameter 0) is set to Normal Running (0). The formula listed above do not apply when the number of axes is 0.

■ Differences from SVB Simulation Mode

Simulation mode does not have a positioning function, so the position data is refreshed in one scan to the final target position. The SVR has its own positioning function that performs distribution, so like a real module, position data is refreshed each scan for the final target position.

3.3 Motion Modules (Optional)

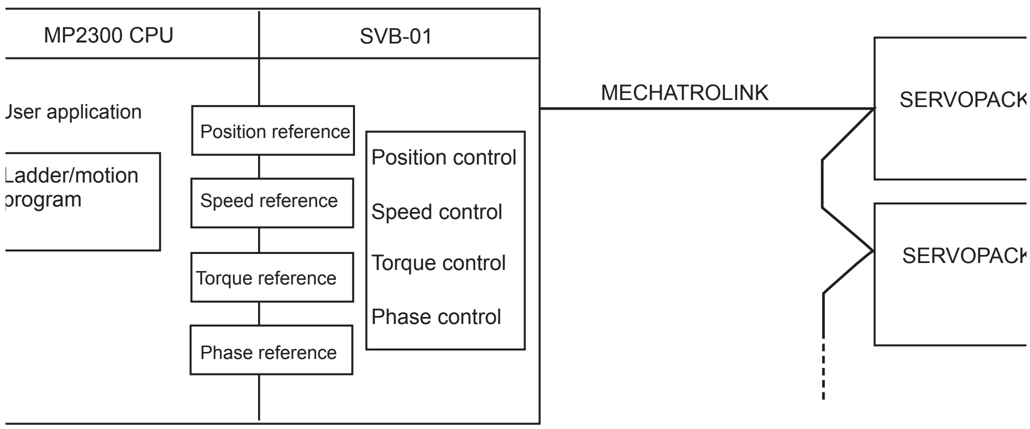
This section describes two models of Motion Module that can be mounted to MP2300 as Optional Module:
SVB-01 Module and SBA-01 Module.

3.3.1 SVB-01 Module

(1) Overview and Features

The SVB-01 Module is a Motion Module with a MECHATROLINK-II-compatible interface.

The use of MECHATROLINK enables control of multiple axes with reduced wiring. MECHATROLINK-II compatibility also enables position control, speed control, torque control, and phase control, and makes precise synchronous control possible. The control mode can also be changed during axis operation, facilitating complicated machine operations.



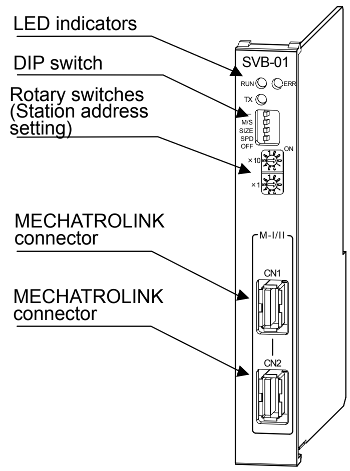
< Features >

- Up to 21 slave stations can be connected to a single Module (the SERVOPACKs can be connected up to 16 axes).
- Synchronization between Modules is also supported, making it suitable for both synchronous control and interpolation across Modules.
- An SVB-01 Module used as a slave can be connected to a host controller equipped with MECHATROLINK communication functions.
- Self-configuration enables automatic allocation of setting data for the slave device that is connected to MECHATROLINK.
- SERVOPACK parameters can be managed over networks.
    - For information on MECHATROLINK devices that can be connected, refer to *1.4 Devices Connectable to MECHATROLINK* on page 1-7.

(2) External Appearance, LED Indicators, and Switch Settings

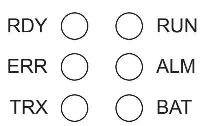
[a] External Appearance

The following figure shows the SVB-01 Module external appearance.



[b] LED Indicators

The following table shows the SVB-01 Module status when each LED indicator is lit or unlit.



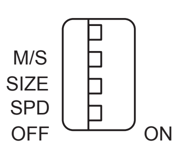
Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
ERR	Red	Failure (lights/blinks)	Normal operation
TX	Green	MECHATROLINK transmission in progress	No data being transmitted

[c] Switch Settings

Both the DIP switch and rotary switches set the operating conditions for the SVB-01 Module. Use the default settings when using the Module in Master Mode.

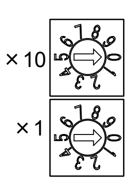
■ DIP Switch

SIZE and SPD are valid only in Slave Mode. They will be ignored in Master Mode.



Name	Status	Operating Mode	Default Setting	Details
–	ON	Reserved.	OFF	Keep turned OFF.
	OFF	Reserved.		
M/S	ON	Slave Mode	OFF	Select Master or Slave Mode.
	OFF	Master Mode		
SIZE	ON	17 bytes	OFF	Select the number of send bytes.
	OFF	32 bytes		
SPD	ON	4 Mbps	OFF	Select the baud rate.
	OFF	10 Mbps		

■ Rotary Switches



Name	Status	Operating Mode	Default Setting	Details
×10	0 to 9	Local station address when in Slave Mode (10s digit)	0	Sets the 10s digit of the local slave address.
×1	0 to 9	Local station address when in Slave Mode (1s digit)	1	Sets the 1s digit of the local slave address.

(3) Specifications

The specifications of SVB-01 Module are as follows.

[a] Hardware Specifications

Item	Specifications
Classification	Motion Module
Name	SVB-01
Model Number	JAPMC-MC2310
MECHATROLINK Motion Network	Motion network: 1 channel Communication ports: 2 ports SERVOPACK and I/O: Up to 21 stations connectable (SERVOPACK for up to 16 axes) Baud rate: 4 Mbps (MECHATROLINK-I) or 10 Mbps (MECHATROLINK-II)
LED Indicators	RUN (green) ERR (red) TX (green)
Connectors	CN1: MECHATROLINK connector CN2: MECHATROLINK connector
Switches	– M/S (Master/Slave) SIZE (Number of transfer bytes) SPD (Baud rate) ×1 (slave address) ×10 (slave address)
Current Consumption	1 A max.
Dimensions (mm)	125 × 95 (H×D)
Mass	80 g

[b] Motion Control Function Specifications

Item			Specifications	
MECHATROLINK Communication		Number of Communication Lines	1 line	
		Number of Communication Ports (Connectors)	2 ports	
		Terminator	JEPMC-W6022 Terminator must be purchased separately.	
		Transmission Distance	• MECHATROLINK-II Minimum distance between stations: 0.5 m Total Network length: 50 m (can be extended up to 100 m by connecting repeaters) • MECHATROLINK-I Minimum distance between stations: 0.3 m Total Network length: 50 m (can be extended up to 100 m by connecting repeaters)	
	Master Functions	Communication Interface	MECHATROLINK-II (2:N synchronous)	MECHATROLINK-I (1:N synchronous)
		Baud Rate	10 Mbps	4 Mbps
		Transmission Cycle	0.5 ms, 1 ms, 1.5 ms, 2 ms	2 ms
		Number of Link Communication Bytes	17 bytes or 32 bytes	17 bytes
		Number of Connectable Stations	Up to 21 stations (SERVOPACKs for up to 16 axes)	Up to 14 stations
		C1 Messaging (Master Function)	Provided (selectable)	Not provided
		C2 Messaging (Allocations)	Provided (selectable)	Not provided
		Retry Function	Provided (selectable)	Not provided
		Supported Slave Devices	Refer to *1.4 Devices Connectable to MECHATROLINK* on page 1-7.	

Item			Specifications	
MECHATROLINK Communication (continued)	Slave Functions	Communication Interface	MECHATROLINK-II	MECHATROLINK-I
		Baud Rate	10 Mbps	4 Mbps
		Transmission Cycle	0.5 ms, 1 ms, 1.5 ms, 2 ms	2 ms
		Number of Link Communication Bytes	17 bytes or 32 bytes	17 bytes
		Messaging (Slave Function)	Provided	Not provided
	Communication Method		Single-send (communication cycle = transmission cycle) synchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection (software) provided. Automatic recovery function not provided (recovery when alarm cleared).	
	I/O Registers		Input/output using motion registers (synchronized on high-speed scan)	
	Command Mode		Motion Command Mode/MECHATROLINK Transparent Command Mode	
	Applicable Servomotors		Standard rotary motors, linear motors, and direct drive motors	
	Control Types		Position control, speed control, torque control, and phase control	
	Motion Commands		Positioning, external positioning, zero point return, interpolation, interpolation with position detection function, JOG feed, STEP feed, speed reference*, torque reference*, and phase reference*, etc.	
	Acceleration/Deceleration Method		One-step asymmetric trapezoidal acceleration/deceleration, exponential acceleration/ deceleration filter, moving average filter	
	Position Unit		pulse, mm, inch, degree	
	Speed Unit		Reference units/s, 10^n reference units/min, percentage of rated speed	
	Acceleration Unit		Reference units/s^2, ms (acceleration time from 0 to rated speed)	
	Torque Unit		Percentage of rated torque	
	Electronic Gear		Provided	
	Position Control Methods		Finite length position control, infinite length position control, absolute system infinite length position control, and simple absolute system infinite length position control	
	Software Limit		Positive/negative direction for each point	
	Zero Point Return Methods		13 types	
	SERVOPACK Parameter Management		Parameters can be managed in the MPE720's SERVOPACK Parameter Window.	
Inverter Control	Communication Method		Single-send (communication cycle = transmission cycle) asynchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection (software) not provided. Automatic recovery function not provided (recovery by clearing alarm).	
	I/O Registers		Input/output using motion registers (synchronized on high-speed scan)	
	Command Mode		Motion Command Mode/MECHATROLINK Transparent Command Mode	
	Control Type		Speed control only (V/f, vector control and other control methods use interter settings.)	
	Motion Commands		Inverter I/O control, etc.	
	Speed Unit		The speed unit depends on the inverter settings.	
I/O Control	Communication Method		Single-send (communication cycle = transmission cycle) asynchronous communication Transmission/communication error detection (hardware) provided. Synchronous communication error detection not provided. Automatic recovery function not provided.	
	I/O Registers		Input/output using I/O registers and synchronized on the high-speed scan or low-speed scan (selectable).	
Self-configuration Function			Module and slave devices can be automatically allocated.	
Synchronization between Modules			Synchronization supported (enabled when power is cycled) when high-speed scan cycle = communication cycle times n .	

* Only with MECHATROLINK-II

[c] MECHATROLINK Communication Specifications

Item	MECHATROLINK-I	MECHATROLINK-II
Topology	Bus	Bus
Transmission Media	Twisted-pair cable	Twisted-pair cable
Transmission Distance	50 m max.	50 m max.
Minimum Distance between Stations	0.3 m	0.5 m
Baud Rate	4 Mbps	10 Mbps
Communication Cycle	2 ms	0.5 ms, 1 ms, 1.5 ms, or 2 ms
Number of Connectable Stations	Up to 14 stations	Up to 21 stations * (SERVOPACK for up to 16 axes)
Communication Control Method	Cyclic	Cyclic
Media Access Control Method	1:N	1:N (2:N when using SigmaWin+)
Communication Mode	Control communication	Control communication
Error Control	CRC check	CRC check

* Up to 16 stations can be connected if a JEPMC-REP2000 MECHATROLINK-II Repeater is not used. Refer to *Chapter 8 MECHATROLINK-II Repeater* of the *Machine Controller MP900/MP2000 Series User's Manual MECHATROLINK System (Manual No. SIEZ-887-5.1□)* for details.

[d] Maximum Number of Slave Stations

The maximum numbers of slave stations that can be connected to a SVB-01 Module SVB-01 are listed below.

• MECHATROLINK Communication Setting and Maximum No. of Slave Stations

MECHATROLINK Communication Setting			Maximum Number of Slave Stations
Communication Method	Baud Rate	Communication Cycle	
MECHATROLINK-I	4 Mbps	2 ms	14
MECHATROLINK-II (17-byte Mode)	10 Mbps	0.5 ms	6
		1 ms	15
MECHATROLINK-II (32-byte Mode)	10 Mbps	0.5 ms	4
		1 ms	9
		1.5 ms	15
		2 ms	21 (SERVOPACK for up to 16 axes)

- Refer to *Section 8.8 MECHATROLINK Definition* of *Machine Controller MP900/MP2000 Series MPE720 Software for Programming User’s Manual (Manual No. SIEPC88070005□)* for information on MECHATROLINC communication settings.

■ Transmission Distance and Maximum No. of Slave Stations

Communication Method	Transmission Distance (Total Network Length)	Maximum No. of Slave Stations
MECHATROLINK-I	50 m (Can be extended up to 100 m by connecting repeaters.)	14
MECHATROLINK-II	30 m (Can be extended up to 100 m by connecting repeaters.)	16 (21)*
	50 m (Can be extended up to 100 m by connecting repeaters.)	15 (21)*

* The values in parentheses apply when a JEPMC-REP2000 Repeater is used.
A JEPMC-REP2000 Repeater must be used if 17 or more slave stations are connected when using MECHATROLINK-II communication.

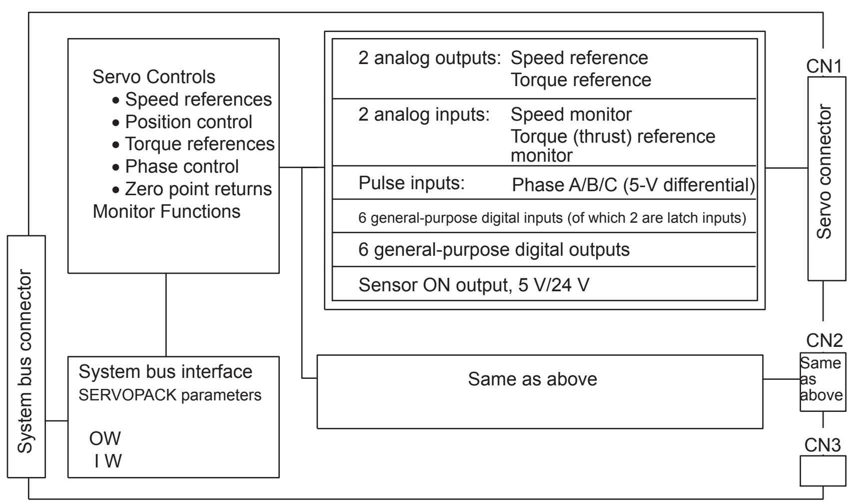
3.3.2 SVA-01 Module

(1) Overview and Features

The SVA-01 Module is a motion control module with analog outputs. Each Module can control Servos or Inverters for up to 2 axes.

The Module has two connectors (CN1 and CN2) for connecting SERVOPACKs and external I/O. Each connector provides analog outputs for speed references and torque references, analog inputs for feedback speed monitoring and torque monitoring, pulse input phases A, B, and C (5-V differential), and general-purpose digital I/O.

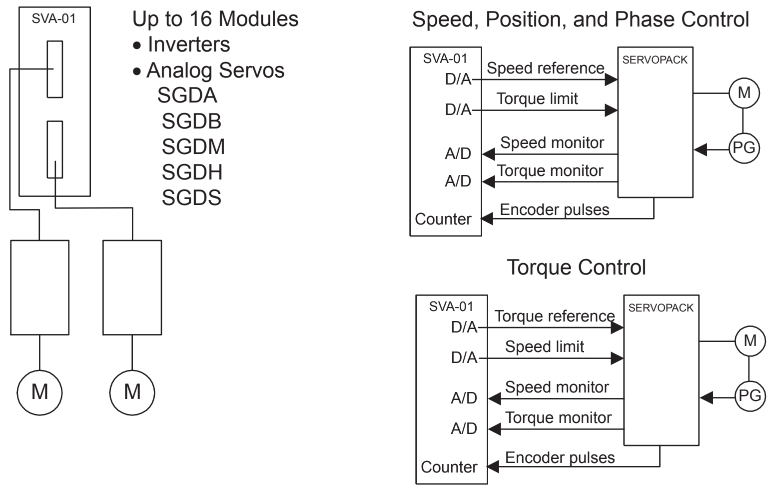
The control cycle is fixed at 500 µs, enabling high-precision control without being affected by the high-speed scan cycle.



< Features >

- Two analog outputs for Servos for 2 axes
- Position control, speed reference outputs, torque reference outputs, or phase control can be performed independently for each axis.

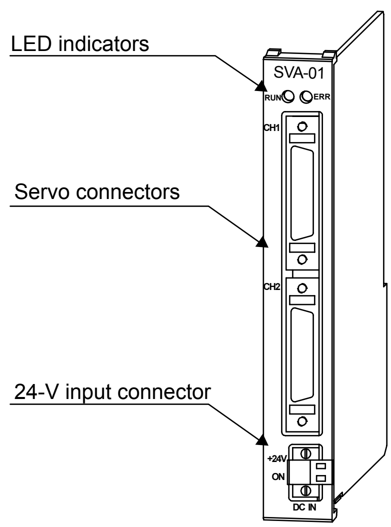
• Self-configuration enables automatic allocation for the Module.



3.3.3 External Appearance and LED Indicators

[a] External Appearance

The following figure shows the SVA-01 Module external appearance.



[b] LED Indicators

The following table shows the SVA-01 Module status when each LED indicator is lit or unlit.

RUN ◯ ◯ ERR

Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
ERR	Red	Failure (lights/blinks)	Normal operation

(1) Specifications

The specifications of SVA-01 Module are as follows.

[a] Hardware Specifications

Item		Specifications
Classification		Motion Module
Name		SVA-01
Model Number		JAPMC-MC2300
Servo Interface	Digital Inputs	6 inputs × 2 channels (source mode/sink mode inputs, 24 V/4.3 mA) DI_0: General-purpose input (ALM) DI_1: General-purpose input (RDY) DI_2: General-purpose input (ZERO: External latch signal input) DI_3: General-purpose input DI_4: General-purpose input DI_5: General-purpose input (EXT: External latch signal input)
	Digital Outputs	6 outputs × 2 channels (sink mode outputs, 24 V/100 mA) DO_0: General-purpose output (SV_ON) DO_1: General-purpose output (ALM_RST) DO_2: General-purpose output (PCON): Used as the C-SEL (control mode select) signal. DO_3: General-purpose output DO_4: General-purpose output DO_5:General-purpose output (SEN signal): 5-V and 24-V outputs
	Pulse Inputs	1 input × 2 channels, phases A/B/C, 5-V differential input, pulse rate: 4 Mpps (16 Mpps for × 4)
	Analog Outputs	2 outputs × 2 channels, –10 V to 10 V, D/A 16 bits
	Analog Inputs	2 inputs × 2 channels, –10 V to 10 V (applicable: –9.9 V to 9.9 V), A/D 16 bits
Connectors		CN1: Servo connector CN2: Servo connector CN3: 24-V input
Indicators		RUN (green) ERR (red)
Current Consumption		1 A max.
Dimensions (mm)		125 × 95 (H × D)
Mass		80 g

[b] Motion Control Function Specifications.

Item		Details	
Control functions	Torque Reference (Open Loop)	Torque Reference	According to the torque unit selection parameter.
		Speed Limit at Torque Reference	Rated speed percentage designation [0.01%]
	Speed Reference (Open Loop)	Speed Reference	According to the speed unit selection parameter.
		Acceleration	According to the acceleration unit selection parameter.
		Deceleration	According to the acceleration unit selection parameter.
		Moving Average Filter Time Constant Setting	ms
		Torque Limits	According to the torque unit selection parameter.
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]
	Position Control	Position References	mm, inch, deg, pulse
		Speed References	According to the speed unit selection parameter.
		Acceleration	According to the acceleration unit selection parameter.
		Deceleration	According to the acceleration unit selection parameter.
		Filter Type	Moving average or exponential acceleration/deceleration
		Filter Time Constant	ms
		Position Compensation	mm, inch, deg, pulse
		Speed Compensation	According to the speed unit selection parameter.
		Position Loop Gain	1/s
		Position Loop Integration Time Constant	ms
		Speed Feed Forward Gain	Position derivative percentage designation [0.01%]
		Primary Delay Time Constant	ms
		Torque Limit	Rated torque percentage designation [0.01%]
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]
	Phase Control	Speed References	According to the speed unit selection parameter.
		Speed Compensation	According to the speed unit selection parameter.
		Phase Compensation	mm, inch, deg, pulse
		Phase Control Proportional Gain	Same as position loop gain parameter.
		Phase Control Integral Time Constant	Same as position loop integral time constant parameter.
		Torque Limit	Rated torque percentage designation [0.01%]
		Positive Speed Limit	Rated speed percentage designation [0.01%]
		Negative Speed Limit	Rated speed percentage designation [0.01%]

Item		Details
Motion Functions	Motion Commands	Positioning, external positioning, zero point return, interpolation, interpolation with position detection function, JOG operation, STEP operation, speed references, torque references, phase control, etc.
	Acceleration/ Deceleration Method	1-step asymmetrical trapezoidal acceleration/deceleration, exponential acceleration/ deceleration filter, moving average filter
	Position Units	pulse, mm, inch, degree
	Speed Units	Reference unit/s, 10^n reference unit/min, rated speed percentage designation
	Acceleration Units	Reference unit/s^2, ms (acceleration time from 0 to rated speed)
	Torque Units	Rated torque percentage designation
	Electronic Gear	Supported
	Position Control Methods	Finite length position control, infinite length position control, absolute infinite length position control, simple absolute infinite length position control
	Software Limits	1 each in forward and reverse directions
	Zero Point Return Types	17
	Latch Function	Phase-C latch, external signal input latch
Self-configuration Function		Automatic allocation by Module is supported.

[c] Performance Specifications

Item		Contents	Remarks
Control Cycle		500 µs	
D/A	Resolution	16 bits	PWM output
	Output Delay	1 ms (*)	* When changing full-scale from −10 V to 10 V
	Accuracy	100 mV max.	
	Temperature Drift	100 µV/°C max.	
A/D	Resolution	16 bits	
	Input Delay	250 µs	
	Accuracy	100 mV max.	
	Temperature Drift	100 µV/°C max.	
DO	OFF→ON	1 µs	
	ON→OFF	1 µs	
DI	OFF→ON	30 µs	
	ON→OFF	600 µs	
Pulse Input Rate		4 Mpps	16 Mpps for input pulse multiplier of 4

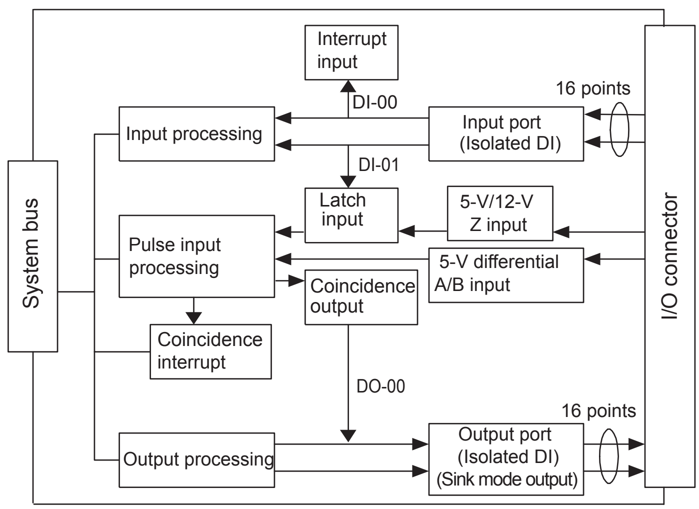
3.4 I/O Modules (Optional)

The I/O Modules that can be mounted to the MP2300 are LIO-01, LIO-02, LIO-04, LIO-05, DO-01 and AI-01 Modules.

3.4.1 LIO-01/LIO-02 Modules

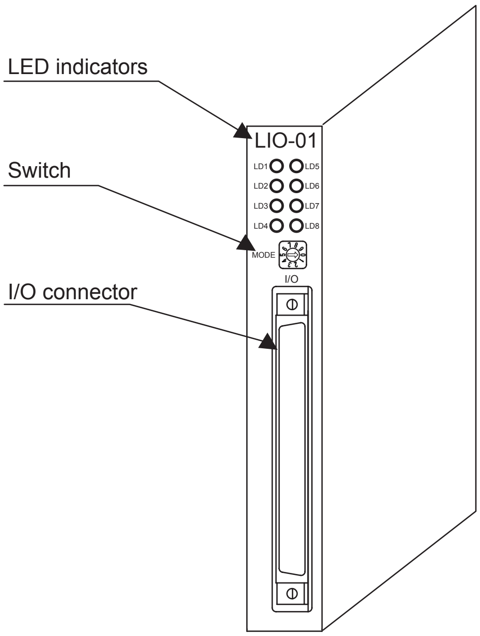
(1) Outline of Functions

The LIO-01 and LIO-02 Modules have digital I/O and pulse counter functions. There are 16 digital inputs (DI) and 16 digital outputs (DO) (LIO-01: sink mode outputs, LIO-02: source mode outputs) for the digital I/O function. There is also 1 pulse input (PI) channel for the pulse counter function. I/O is refreshed on a fixed cycle for the digital I/O and pulse counter functions, occurring every MP2300 high-speed and low-speed scan. The following diagram gives an outline of the LIO-01 and LIO-02 Module functions.

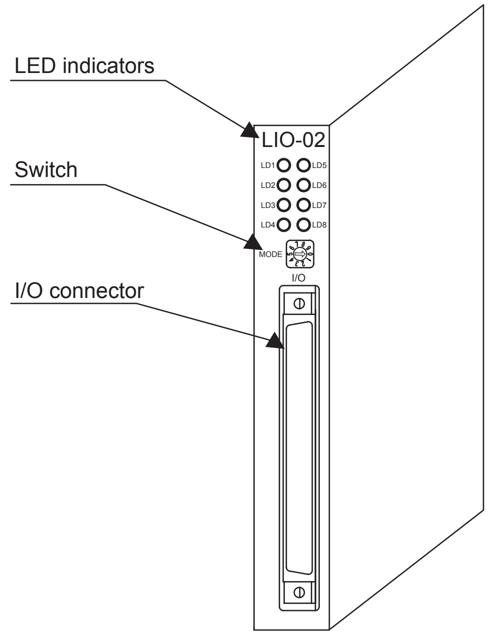


(2) External Appearance

[a] LIO-01 Module



[b] LIO-02 Module

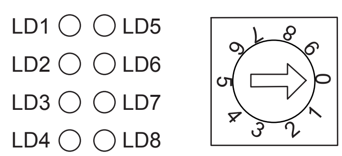


[c] LED Indicators and Switch Settings

The LIO-01 and LIO-02 Module status display LED indicators (LD1 to LD8) change based on the SW1 rotary switch settings (setting range: 0 to 5). The following table shows the indicator display for DI and DO status according to the SW1 setting.

SW1	LED No.	Status When Lit	LED No.	Status When Lit
0 (Board Status Indicator)	LD1	Normal (Error when not lit)	LD5	Normal (Error when not lit)
	LD2	One of the inputs D1_00 to DI_07 is ON.	LD6	One of the inputs DI_08 to DI_15 is ON.
	LD3	One of the outputs DO_00 to DO_07 is ON.	LD7	One of the outputs DO_08 to DO_15 is ON.
	LD4	Pulse A/B input. The Phase A/B is ON.	LD8	Pulse Z input. The Phase Z is ON.
1 (DI Input Indicator 1)	LD1	DI_00 is ON.	LD5	DI_04 is ON.
	LD2	DI_01 is ON.	LD6	DI_05 is ON.
	LD3	DI_02 is ON.	LD7	DI_06 is ON.
	LD4	DI_03 is ON.	LD8	DI_07 is ON.
2 (DI Input Indicator 2)	LD1	DI_08 is ON.	LD5	DI_12 is ON.
	LD2	DI_09 is ON.	LD6	DI_13 is ON.
	LD3	DI_10 is ON.	LD7	DI_14 is ON.
	LD4	DI_11 is ON.	LD8	DI_15 is ON.
3 (DO Output Indicator 1)	LD1	DO_00 is ON.	LD5	DO_04 is ON.
	LD2	DO_01 is ON.	LD6	DO_05 is ON.
	LD3	DO_02 is ON.	LD7	DO_06 is ON.
	LD4	DO_03 is ON.	LD8	DO_07 is ON.
4 (DO Output Indicator 2)	LD1	DO_08 is ON.	LD5	DO_12 is ON.
	LD2	DO_09 is ON.	LD6	DO_13 is ON.
	LD3	DO_10 is ON.	LD7	DO_14 is ON.
	LD4	DO_11 is ON.	LD8	DO_15 is ON.
5 (PI Input Indicator)	LD1	Pulse A input	LD5	Coincidence detection
	LD2	Pulse B input	LD6	Phase-Z latch
	LD3	Pulse Z input	LD7	DI latch
	LD4	—	LD8	—

.



Indicators SW1

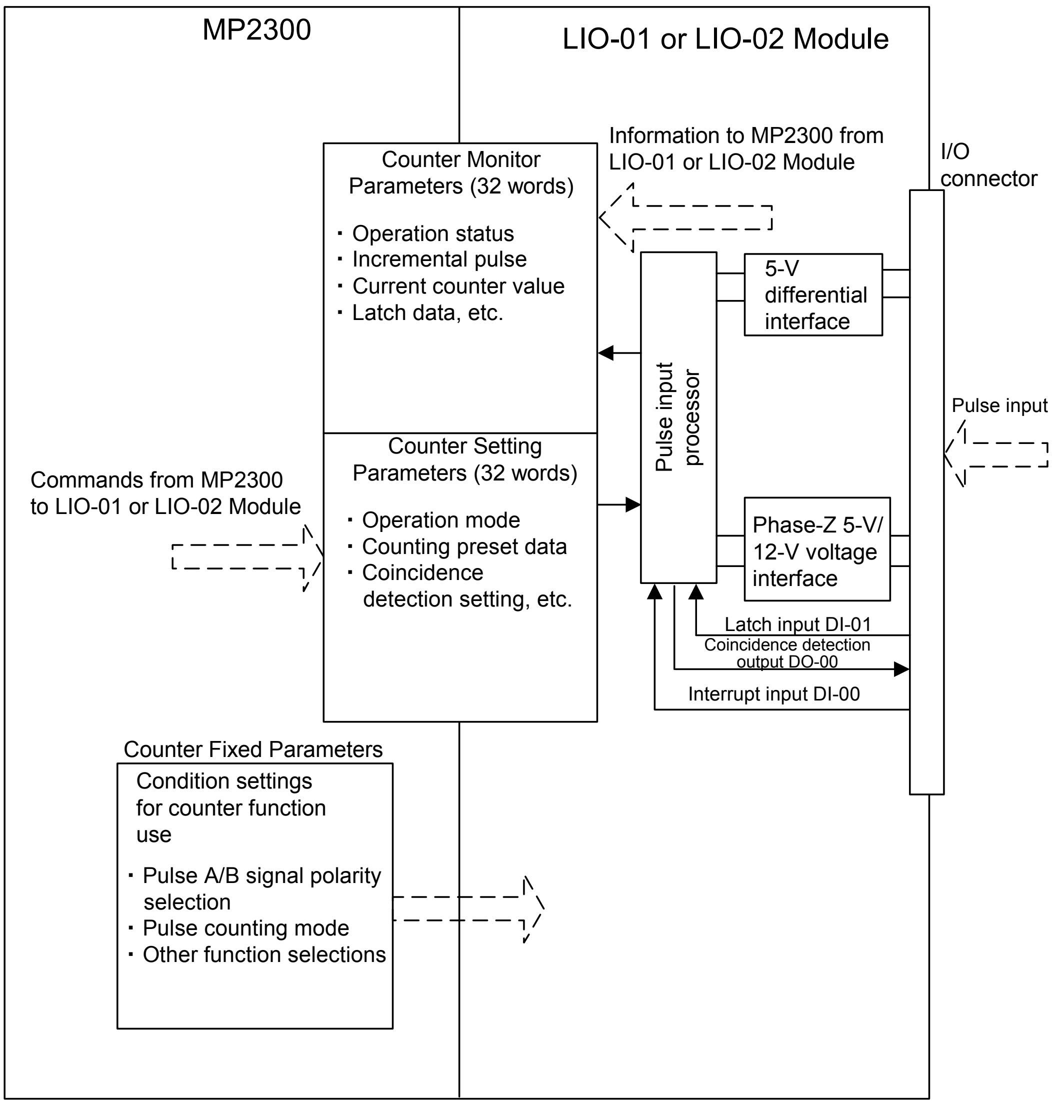
(3) Hardware Specifications

Item	Specifications	
Classification	I/O Module	
Name	LIO-01	LIO-02
Model	JAPMC-IO2300	JAPMC-IO2301
Digital Input	16 inputs 24 VDC, 4.1 mA, combined sink mode/source mode inputs (DI-00 also used for interrupts, DI-01 also used for pulse latch inputs)	
Digital Output	16 outputs 24 VDC transistor open-collector outputs, sink mode outputs (DO-00 also used for coincidence outputs)	16 outputs 24 VDC transistor open-collector outputs, source mode outputs (DO-00 also used for coincidence outputs)
Pulse Input	Phase A/B/Z inputs Phase AB: 5-V differential input, not isolated, max. frequency: 4 MHz Phase Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz Latch input Pulse latch for phase Z or DI-01.	
Connector	I/O: I/O connector	
Indicators	LD1 (green) LD2 (green) LD3 (green) LD4 (green) LD5 (green) LD6 (green) LD7 (green) LD8 (green)	
Switch	Rotary switch (SW1)	
Current Consumption	500mA max.	
Dimensions (mm)	125 × 95 (H × D)	
Mass	80 g	

3.4.2 Counter Functions and Settings of LIO-01/LIO-02 Modules

(1) Outline of Counter Functions

For the counter function, the command is selected in the counter fixed parameters and counter setting parameters, and the status and counter value are stored in counter monitor parameters.
The following diagram shows the data flow for the counter function.



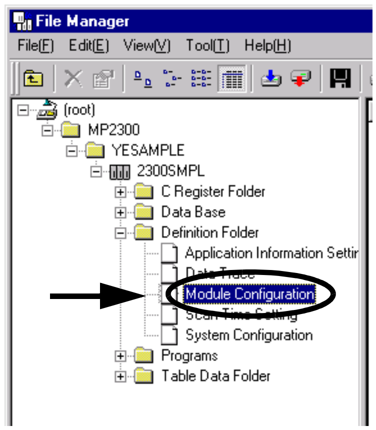
- In this section, the *fixed parameters* mean the *counter fixed parameters* if not otherwise mentioned.

(2) Setting Counter Fixed Parameters

[a] Opening the Fixed Parameter Setting Tab Page

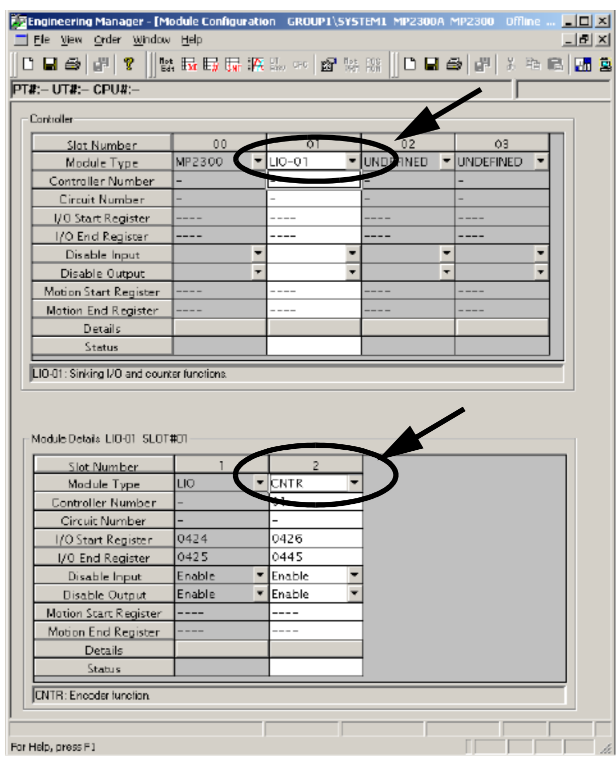
Set the fixed parameters for the counter function in the Fixed Parameter Tab Page in the Counter Module Window. Use the following procedure to open the Counter Module Window.

1. Double-click the **Module Configuration** Folder under the **Definition** Folder in the **File Manager** Window.



The Engineering Manager will start and the Module Configuration Window will appear.

2. Select **LIO-01** or **LIO-02** in the Module Type column of the Controller section.
Select **CNTR** in the Module Type column of the Module Details section, and then double-click the number cell of the slot where CNTR is assigned.



The **Counter Module** Window will appear.

- When the counter function of LIO-01 or LIO-02 Module is not used, select **UNDEFINED** in place of **CNTR**.

3. Select the **Fix Parameter Set** Tab.

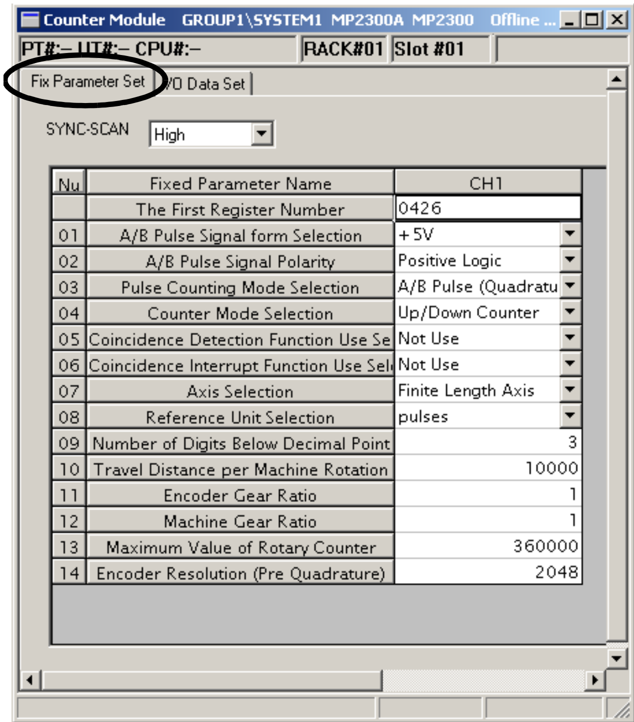


Fig. 3.1 Fixed Parameter Tab Page in Counter Module Window

Set the fixed parameters in the above **Fix Parameter Set** Tab Page.

[b] Counter Fixed Parameters

No.	Name	Description	Size	Default
	Synchronous Scan Selection	Select an MP2300 scan cycle to update the I/O data of counter function: High-speed scan or Low-speed scan		High
	Leading Register Number	Displays the leading register number that corresponds to the parameter.	1 word	
01	Pulse A/B Signal Form Selection	Set the signal form of phases A and B. For the MP2300, the signal form is fixed and to a +5V differential input.	1 word	Fixed to +5V (differential input)
02	Pulse A/B Signal Polarity Selection *1	Select either positive set or negative logic for the signal polarity of phases A and B.	1 words	Positive logic
03	Pulse Counting Mode Selection*1	Specify the pulse count mode*1. ・0: Sign mode × 1 ・1: Sign mode × 2 ・2: Up/Down mode × 1 ・3: Up/Down mode × 2 ・4: Pulse A/B mode × 1 ・5: Pulse A/B mode × 2 ・6: Pulse A/B mode × 4	1 word	6 (Pulse A/B mode × 4)
04	Counter Mode Selection	Set the counter mode. For the MP2300, the counter mode is fixed and set to Reversible Counter.	1 word	Fixed to Reversible Counter
05	Coincidence Detection Function Selection	Set whether or not the coincidence detection *2 is to be used.	1 word	Not use

No.	Name	Description	Size	Default
06	Coincidence Interrupt Function Selection	Set whether or not the coincidence interrupt function*2 is to be used. (Valid only when the coincidence detection function is set.)	1 word	Not use
07	Axis Type Selection	Set the axis type*3: Finite or infinite length axis.	1 word	Finite length axis
08	Reference Unit Selection	Specify the reference unit. If pulse is selected, an electronic gear is not to be used; If a unit other than pulse is selected, an electronic gear is to be used. ・pulse ・mm ・deg ・inch	1 word	pulse
09	Number of Digits Below Decimal Point	Set the number of digits 0 to 5 below the decimal point *4 for the minimum reference unit. *Example*: If the minimum reference unit is 1 μm (10^{-3}mm): Reference unit selection : mm, and Number of digits below decimal point: 3	1 word	3
10	Moving Amount Per Machine Rotation*4, *5	Set the load moving amount per load axis rotation. Setting range: 1 to 2147483647 (reference unit)	2 words	10000
11	Encoder Gear Ratio*4, *5	Set the value m so that the encoder axis rotates m times when the load axis rotates n times. Setting range: 1 to 65535	1 word	1
12	Machine Gear Ratio*4, *5	Set the value n so that the encoder axis rotates m times when the load axis rotates n times. Setting range: 1 to 65535	1 word	1
13	Infinite Length Axis Reset Position (POSMAX)*3	If the infinite Length Axis was selected for fixed parameter No.7, specify the number of rotations (1 to 2147483647) after which the axis will be reset.	2 words	360000
14	Number of Pulses Per Encoder Rotation (before Multiplication)	Set the number of input pulses per encoder rotation/ Setting range: 1 to 2147483647 (pulse/rev)	2 words	2048

* 1. For details, refer to *3.4.2*「*[a] Counter Function Details*」*(4) [a] Pulse Counting Modes* on page 3-35.

* 2. For details, refer to *3.4.2 (4) [c] Coincidence Output and Coincidence Interrupt Functions* on page 3-38.

* 3. For details, refer to *3.4.2 (4) [e] Axis Type Selection* on page 3-40.

* 4. For details, refer to *3.4.2 (5) Electronic Gear Function* on page 3-40.

* 5. If pulse is selected for the parameter No. 08, parameters No. 10 to 13 are ignored.

(3) I/O Data Settings

[a] Opening the I/O Data Setting Tag Page

Set the I/O data in the I/O Data Tab Page in the **Counter Module** Window.

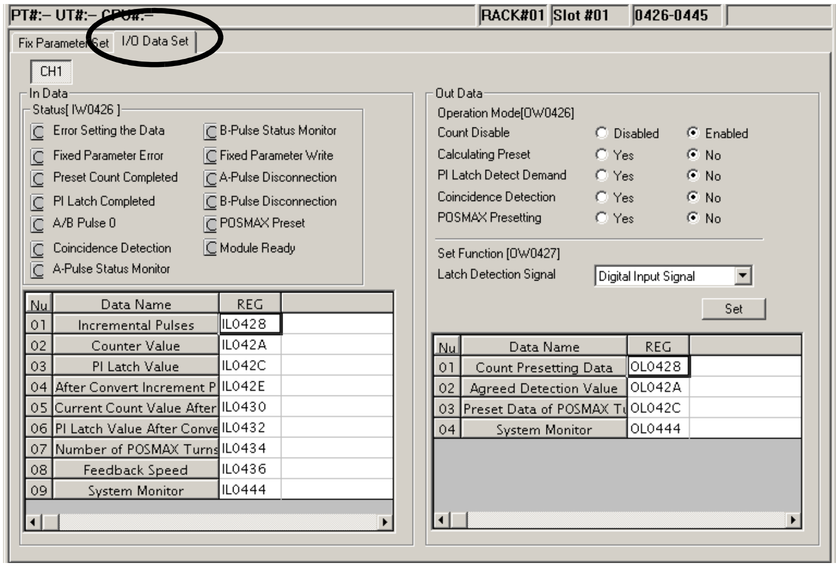


Fig. 3.2 I/O Data Tab Page in Counter Module Window

- The channel number is fixed to CH1.

The details on the status and I/O data that can be monitored in the I/O Data Tab Page are described below.

[b] In (Input) Data Details

■ Status Details

The status of each bit of the register is indicated: ● : ON, ○ : OFF. In offline, this area is displayed in gray.

Name	Bit No.	Meaning	Remarks
Error Setting the Data	0	1 (ON): Data setting error	–
Fixed Parameter Error	1	1 (ON): Fixed parameter setting error	–
Preset Count Completed	2	1 (ON): Count value preset completed	–
PI Latch Completed	3	1 (ON): PI latch completed	–
A/B Pulse 0	4	1 (ON): Feedback pulse is ±1 or less	–
Coincidence Detection	5	1 (ON): Coincidence detection ON (in pulse units)	Detected in pulse units.
A-Pulse Status Monitor	6	1 (ON): High	–
B-Pulse Status Monitor	7	1 (ON): High	–
Fixed Parameter Write	9	1 (ON): Writing parameter online	ON only during write.
A-Pulse Disconnection	A	1 (ON): Phase A disconnected	–
B-Pulse Disconnection	B	1 (ON): Phase B disconnected	–
POSMAX Preset	C	1 (ON): Completed	–
Module Ready	F	1 (ON): Counter processing being executed	–

■ Input Data Details

The following table shows the contents displayed in the Input Data area.

No.	Name	Register No.	Range	Remarks
00	Status (RUNSTS)	IL□□□□*1+0□00	Bit settings	Refer to the previous section ■ *Status Details*.
01	Incremental Pulses (PDV)	IL□□□□+0□02	–2147483648 to 2147483647 (pulse)	Indicates the difference between the pulse count value at previous scan and that at present scan.
02	Counter Value (PFB)	IL□□□□+0□04	–2147483648 to 2147483647 (pulse)	Indicates the pulse count value of each scan.
03	PI Latch Value (FREQ)	IL□□□□+0□06	–2147483648 to 2147483647 (pulse)	Indicates the current value of the counter when an external signal is input.
04	After Convert Increment Pulse (PDVG)	IL□□□□+0□08	–2147483648 to 2147483647 (reference unit)	Indicates the number of incremental pulses converted to a value in the reference unit. Indicates the same value as the number of incremental pulses if pulse is selected for the fixed parameter No. 08 “Reference Unit Selection.”
05	Current Count Value After Converts (PFBG)	IL□□□□+0□0A	–2147483648 to 2147483647 (reference unit)	Indicates the current value of the counter converted to a value in the reference unit. Indicates the same value as the counter current value when pulse is selected for the fixed parameter No. 08 “Reference Unit Selection.”
06	PI Latch Value After Converts (FREQG)	IL□□□□+0□0C	–2147483648 to 2147483647 (reference unit)	Indicates the PI latch data converted to a value in the reference unit. Shows the same value as the PI latch data when pulse is selected for the fixed parameter No. 08 “Reference Unit Selection.”
07	Number of POSMAX Turns	IL□□□□+0□0E	–2147483648 to 2147483647 (rotation)	Indicates the number of rotations that have been made when Infinite Length Axis is selected as the Axis Type.
08	Feedback Speed*2	IL□□□□+0□10	–2147483648 to 2147483647 (reference unit/s)	If the electronic gear*3 is not used, the unit is pulse/sec.
09	System Monitor	IL□□□□+0□1E	–2147483648 to 2147483647 (reference unit)	For system use

* 1. □□□□ indicates a register number. Refer to *5.3 Registers* on page 5-21 for information on register numbers.

* 2. The Feedback Speed is the moving average of the results of the following calculation for 32 scans.

- Without Electronic Gear (Reference unit: pulse)
  Feedback Speed (pulse/s) = No. of incremental pulses × 1000)/Ts
- With Electronic Gear (Reference unit: unit other than pulse)
  Feedback Speed (reference unit/s) = No. of incremental pulses after conversion × 1000)/Ts
  TS: Scan time (ms) for counter synchronized scan.

* 3. Refer to *3.4.2 (5) Electronic Gear Function* on page 3-40.

[c] Out (Output) Data Details

■ Operation Mode Details

Name	Bit No.	Meaning	Default
Count Disable	0	1: Count prohibited Prevents counting.	0 (permitted)
Calculating Preset	1	1: Preset request Resets the count to its preset value	0 (Not preset)
PI Latch Detect Demand	2	1: Latch detection request *1 Stores the counter value at the moment an external signal is input.	0 (Not detect)
Coincidence Detection	3	1: Coincidence detection request*2 Sends a coincidence signal if the values of the counter and the coincidence detection setting match.	0 (Not detect)
POSMAX Presetting	4	1: Preset request Resets the number of POSMAX turns to its preset value.	0 (Not preset)

* 1. Refer to *3.4.2 (4) [d] PI Latch Function* on page 3-39.
* 2. Refer to *3.4.2 (4) [c] Coincidence Output and Coincidence Interrupt Functions* on page 3-38.

■ Set Function Details

Name	Register No.	Description
Latch Detection Signal	OW□□□□+0□01	Select the external signal to be used for the PI latch signal. ・0000H: DI latch (Discrete input) ・0002H: Z latch (Phase-Z input)

■ Output Data Details

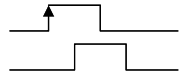
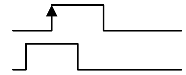
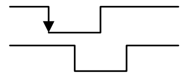
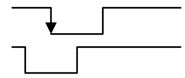
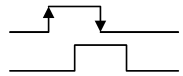
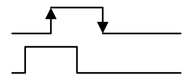
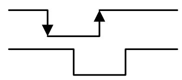
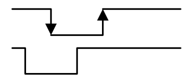
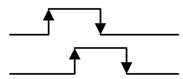
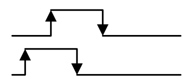
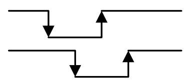
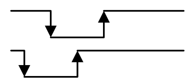
Name	Register No.	Size	Setting Range	Remarks
Command Setting (RUNMOD)	OW□□□□+0□00	1 word	Bit settings	Refer to ■ *Operation Mode Details*.
Set Function	OW□□□□+0□01	1 word	Bit settings	Refer to ■ *Set Function Details*.
Count Presetting Data (PRSDAT)	OL□□□□+0□02	2 words	–2147483648 to 2147483647 (reference unit)	Resets the present value of the counter to this value after a Count Preset Request is received.
Agreed Detection Value （COINDAT）	OL□□□□+0□04	2 words	–2147483648 to 2147483647 (reference unit)	Sends a coincidence detection signal if the current value of the counter is the value set in this parameter at the moment that the Coincidence Detection Request is sent, and sends an interrupt signal to the MP2300.
Preset Data of POSMAX Turns	OL□□□□+0□06	2 words	–2147483648 to 2147483647 (rotation)	Resets the number of POSMAX turns to this value after a POSMAX Turn Number Presetting Demand is received.
System Monitor	OL□□□□+0□1E	–	–2147483648 to 2147483647	For system use.

(4) Counter Function Details

[a] Pulse Counting Modes

The following pulse counting modes can be selected by setting the counter fixed parameter No.2 “Pulse A/B Signal Polarity Selection” and No. 3 “ Pulse Counting Mode Selection”.

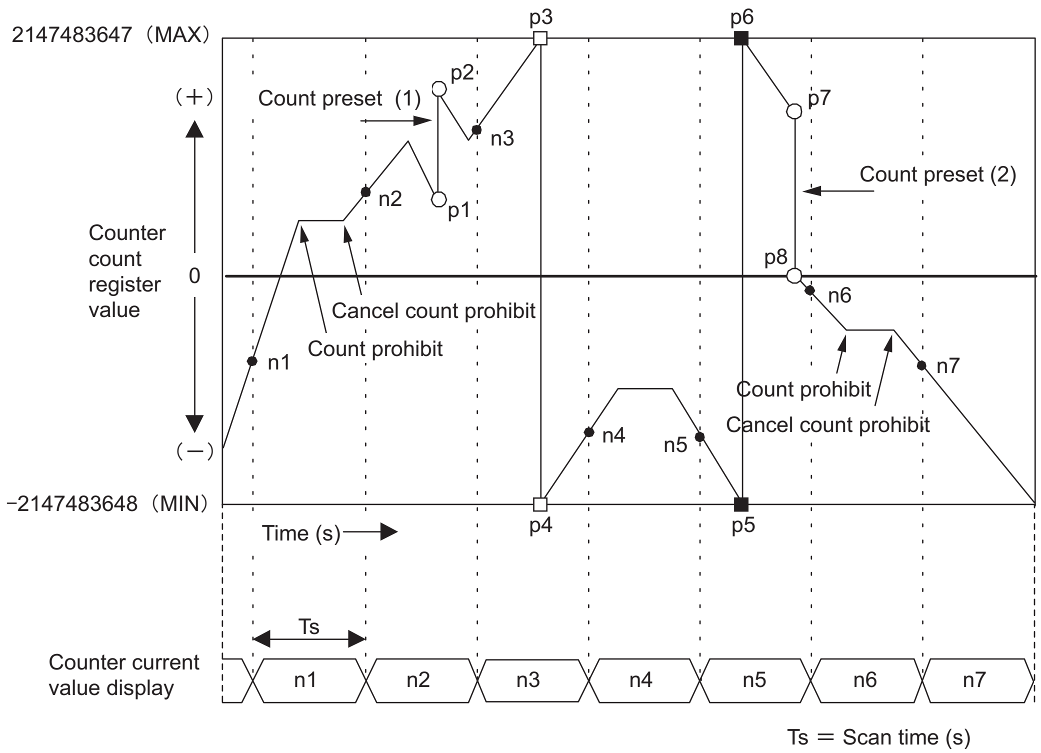
Pulse Counting Mode		Polarity	Up Count (Forward)	Down Count (Reverse)
Sign	× 1	Positive logic	Pulse A Pulse B LOW	Pulse A Pulse B HIGH
		Negative logic	Pulse A Pulse B HIGH	Pulse A Pulse B LOW
	× 2	Positive logic	Pulse A Pulse B LOW	Pulse A Pulse B HIGH
		Negative logic	Pulse A Pulse B LOW	Pulse A Pulse B LOW
UP/DOWN	× 1	Positive logic	Pulse A Pulse B Fixed at low or high	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 Pulse B Fixed at low or high	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

Pulse Counting Mode		Polarity	Up Count (Forward)	Down Count (Reverse)
A/B	× 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 

[b] Pulse Count Function

The Pulse Count Function reads A/B pulse input signals to increment (forward run) or decrement (reverse run) the count.

The following graph shows changes in the pulse count for each run mode.



<Explanation>

Counter current value

The values of n1 to n7 (counter value at each scan) is displayed sequentially in Counter Current Value (IL□□□□+4).

Count preset (1)

Executing the Count preset at the position p1 forces the counter value to change to the preset value (p2 value).

MAX overflow

When the counter value increases to the value MAX (p3), the counter value will be automatically reset to the value MIN (p4).

MIN overflow

When the counter value decreases to the value MIN (p5), the counter value will be automatically reset to the value MAX (p6).

Count preset (2)

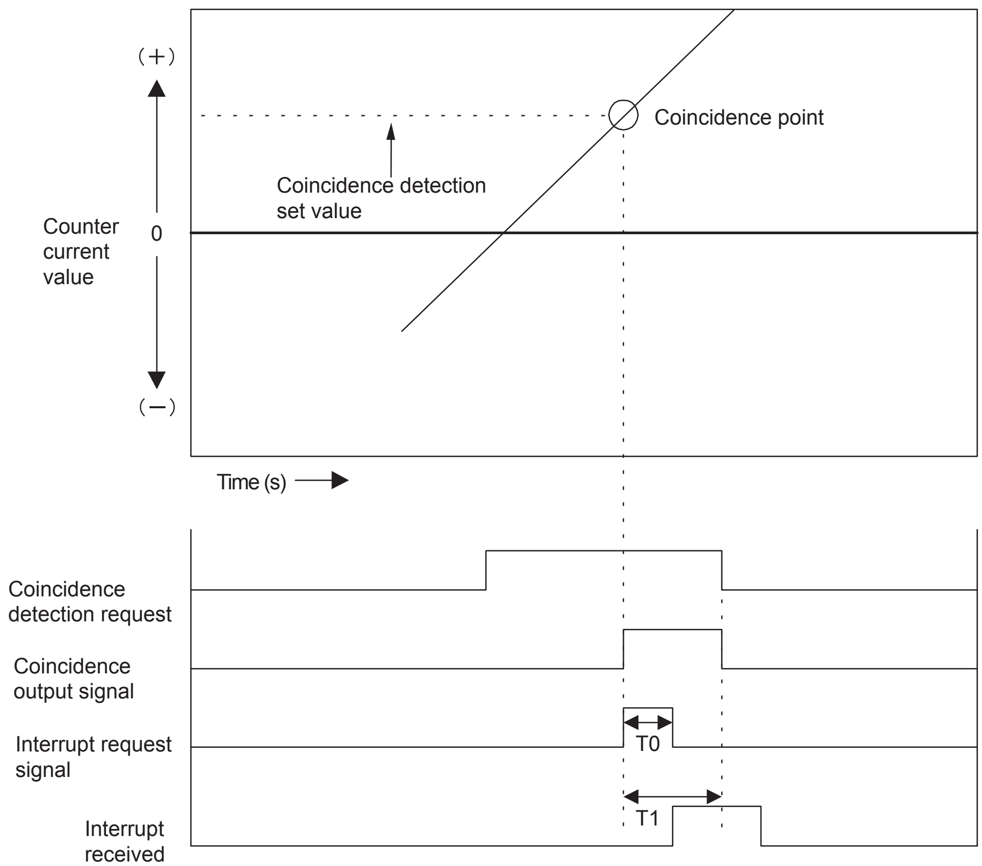
Executing the Count preset at the position p7 forces the counter value to change to the preset value (p8 value).

[c] Coincidence Output and Coincidence Interrupt Functions

The Coincidence Output and Coincidence Interrupt Functions output an external output signal (coincidence detection signal) and output an interrupt signal to the MP2300 when the current counter value and a preset counter setting parameter (Coincidence Detection Setting: OL□□□□+4) match.

The Coincidence Output Request is enabled when “Use” is set to the counter fixed parameter No. 5 (Coincidence Detection Function Selection).

The Coincidence Interrupt Request is enabled if “Use” is set to the counter fixed parameter No. 6 (Coincidence Interrupt Function Selection).
The following graph shows the changes.



- T0: Maximum time from when the MP2300 receives the interrupt request signal to when interrupt processing is started (70 to 120 μs).
- TI: Time from when interrupt request signal is received until DWG.I (interrupt process drawing) execution starts.

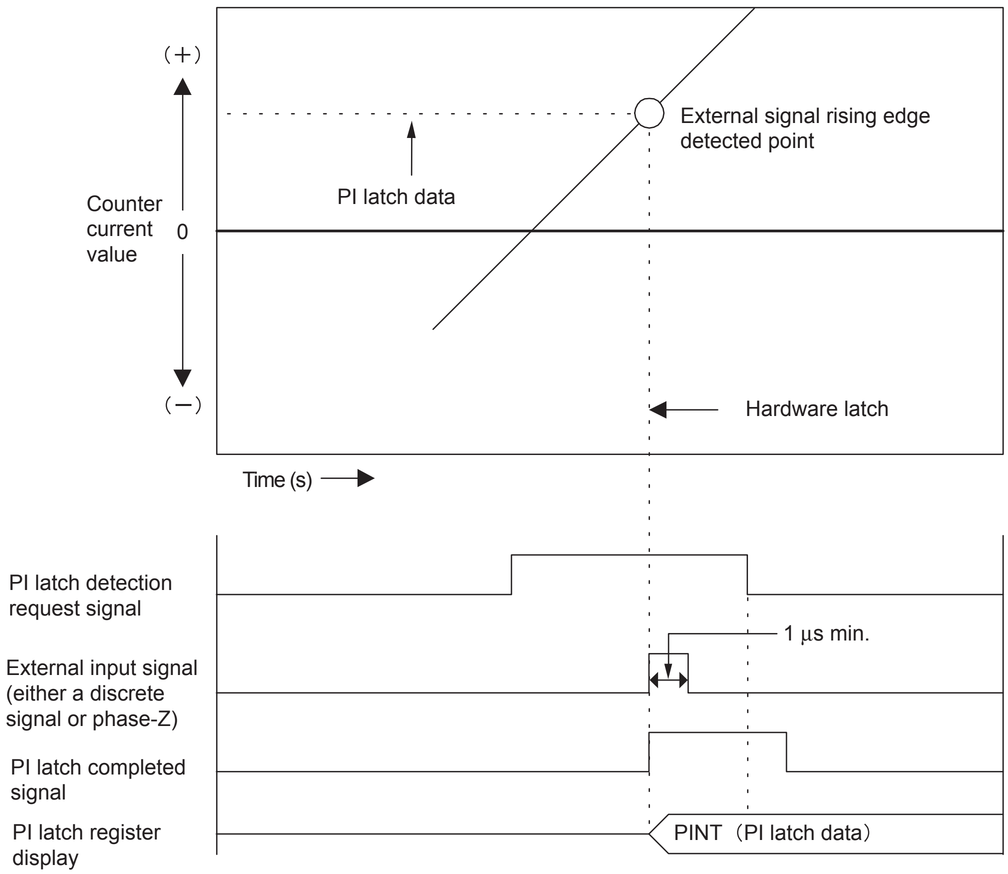
Normal program execution:	Approx. 90 to 170 μs
I/O command executed directly:	Approx. 90 to (1,460 + 40 + N) μs
	N = No. of direct I/O words (Max. 8)

- DO-00 is used as a coincidence output signal.
  When the counter fixed parameter No. 05 (Coincidence Detection Function Selection) is set to “Use”, DO-00 will be masked. So, when setting a register, which is allocated to DO-00, using a ladder program to ON or OFF, the setting of this register will not be valid because the other setting has priority.
- To monitor the coincidence detection signal, use Coincidence Detection in the Status of In Data.

[d] PI Latch Function

The PI latch function saves (latches) the current value to a memory register (IL□□□□ +06) on the rising edge of an external signal.
Select either phase-Z or a discrete input as the external signal.

The following graph shows the number of occurrences from when PI latch signal is output to when PI latch data is displayed.



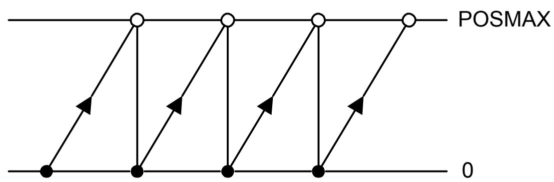
- When using a discrete input signal (DI latch), set the signal so that the signal remains ON for 5 to 60 μs.

[e] Axis Type Selection

There are two types of axis: An infinite length axis that resets the current value with a specified value, and a finite length axis that does not reset the current value.
The finite length axis is used for rotation in one direction only, where the current value data is not reset after rotation, and for return and other operations are performed only within a specified range.

The infinite length axis is used for applications such as resetting the current value data for a conveyor belt or other device to 0 after one rotation.

If infinite length axis is set, the counter current value after conversion and the PI latch data after conversion is stored in the range 0 to infinite length axis reset position – 1.
Set the reset position in the counter fixed parameter No. 13 (Infinite Length Axis Reset Position (POSMAX)).



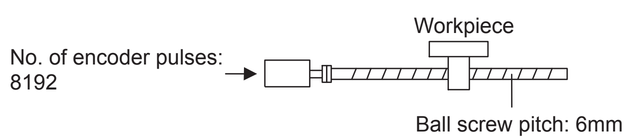
(5) Electronic Gear Function

The Electronic Gear Function can be used when other than 0 (pulse) is set to the counter fixed parameter No. 08 (Reference Unit Selection).

[a] Outline

The Electronic Gear Function is used to set the workpiece travel distance per pulse input to the LIO Module counter to any value.

The following example describes differences in operations to move a workpiece 10mm using the equipment shown below with and without electronic gear function. When using the electronic gear function, simply input the reference value calculated for the travel distance regardless of the number of pulses to move a workpiece for a specified travel distance.



When the Electronic Gear is Not Used

To move a workpiece 10mm:
1 revolution is 6 mm. Therefore,
$10 \div 6 = 1.666$ revolutions
2048×4 pulses is 1 revolution. Therefore,
$1.666 \times 8092 = 13653$ pulses
13653 pulses are input as reference pulses. The equation must be calculated at the host controller.

When the Electronic Gear is Used

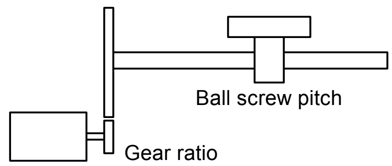
To move a workpiece 10mm:
Mechanical conditions and minimum reference unit are defined with electronic gear.
To move a workpiece 10mm, the minimum reference unit is set to $1\,\mu$m. Therefore,
$10(\text{mm}) \div 1(\mu\text{m}) = 10000$
10000 is input as reference value.

[b] Settings

Use steps 1 to 5 in the following procedure to make the settings.

1. Confirm the machine specifications.

Elements relating to the Electronic Gear
- Gear ratio
- Ball screw pitch
- Pulley diameter, etc.

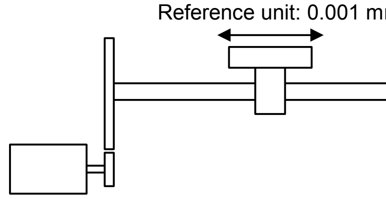


2. Check the number of encoder pulses displayed in Counter Current Value, and set this value to the counter fixed parameter No. 14 (Number of Pulses Per Encoder Rotation)

3. Set the reference unit (the smallest reference unit for the reference data to move a load) according to the settings in the counter fixed parameter No. 08 (Reference Unit Selection) and No. 09 (Number of Digits Below Decimal Point).

Reference to move a table in units of 0.001 mm.

Reference unit: 0.001 mm



Consider the machine specifications and positioning precision when setting the reference unit.

- When reference unit is 1 μm:
  When 50,000 reference pulses are input, the workpiece will be moved by 50,000 × 1 μm = 50 mm.

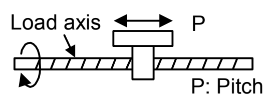
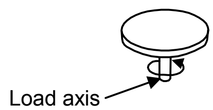
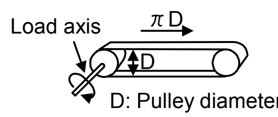
4. Find the load travel distance for each rotation of the load axis using the reference unit and set this distance to the counter fixed parameter No. 18 (Moving Amount Per Machine Rotation).

$$\text{Load travel distance per rotation of load axis (reference unit)} = \frac{\text{Load travel distance per load axis rotation reference unit}}{\text{Reference unit}}$$

◀ EXAMPLE ▶ Calculation Examples

- For a ball screw pitch of 5 mm and a reference unit of 0.001 mm:

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

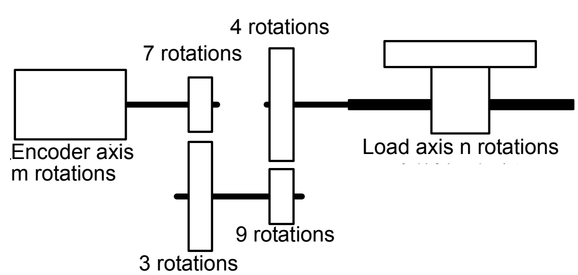
Ball screw	Round table	Belt + pulley
 $\text{One rotation} = \frac{P}{\text{Reference unit}}$	 $\text{One rotation} = \frac{360^\circ}{\text{Reference unit}}$	 $\text{One rotation} = \frac{\pi D}{\text{Reference unit}}$

5. Set the Encoder Gear Ratio and the Machine Gear Ratio in the counter fixed parameters No. 11 and No.12.

When the encoder axis has rotated m times and the mechanical configuration allows the load axis to rotate n times, set the following values:

No. 11 (Encoder Gear Ratio) = m rotations
No. 12 (Machine Gear Ratio) = n rotations
Setting range: 1 to 65,535 [rotations]

<Setting Example>
For the configuration shown in the diagram:

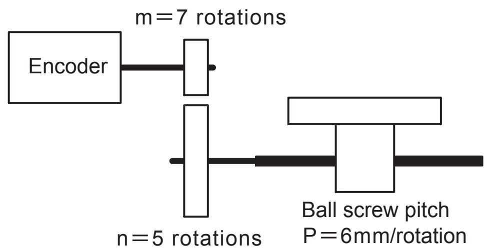


Gear ratio = n/m = (3/7) × (4/9) = 4/21
Therefore, set the following values:
No.11 (Encoder Gear Ratio) = 4 (rotations)
No. 12 (Machine Gear Ratio) = 21 (rotations)

(6) Electronic Gear Setting Examples

The following are setting examples for each kind of load mechanical configuration.

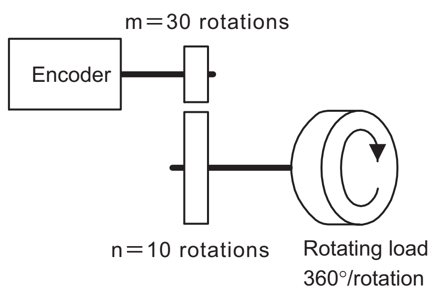
[a] Example A: Ball Screw



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

- Moving Amount Per Machine Rotation = 6 mm/0.001 mm = 6000
- Counter fixed parameter No. 11 (Encoder Gear Ratio) = 7 (rotations)
- Counter fixed parameter No. 12 (Machine Gear Ratio) = 5 (rotations)

[b] Example B: Rotating Load



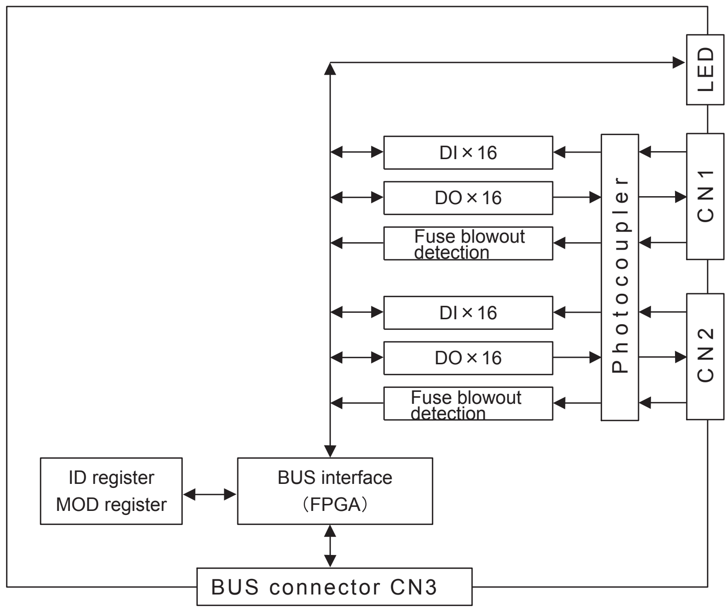
In the above machine system, if the reference unit = 0.1°, the setting of each parameter will be as follows:

- Moving Amount Per Machine Rotation = 360°/0.1° = 3600
- Counter fixed parameter No. 11 (Encoder Gear Ratio) = 3 (rotations)
- Counter fixed parameter No. 12 (Machine Gear Ratio) = 1 (rotation)

3.4.3 LIO-04/LIO-05 Modules

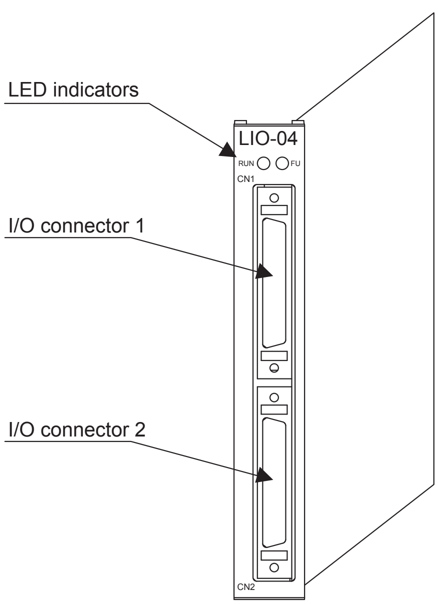
(1) Outline of Functions

The LIO-04/LIO-05 Module is equipped with the following digital I/O functions.
LIO-04: 32 digital inputs (DI) and 32 digital outputs (DO) (sink mode output)
LIO-05: 32 digital inputs (DI) and 32 digital outputs (DO) (source mode output)
The following diagram outlines the functions of LIO-04/LIO-05 Module.

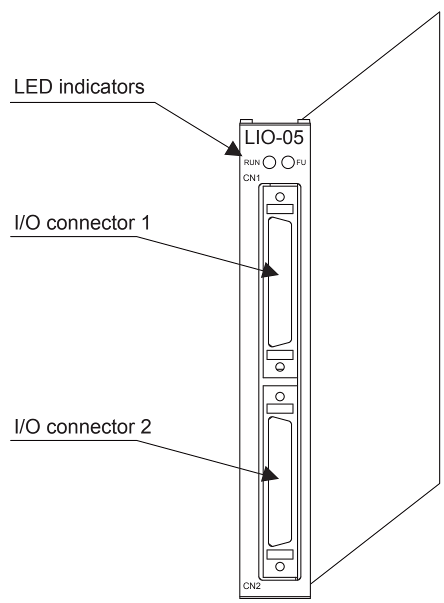


(2) External Appearance and LED Indicators

[a] LIO-04 Module External Appearance



[b] LIO-05 Module External Appearance



[c] LED Indicators

The following table shows the LIO-04/LIO-05 status when the each indicator lamp is lit or unlit.

Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
FUSE	Red	One or some of the output protection fuses is blown out.	All the output protection fuses are normal.

(3) Specifications

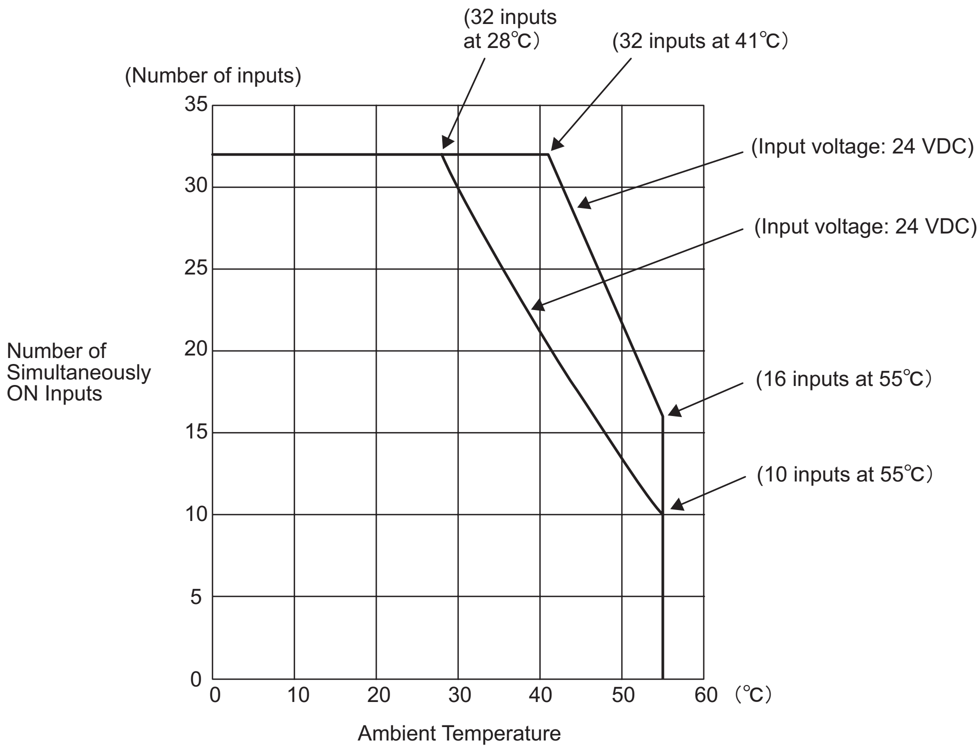
The hardware specifications and temperature characteristics of LIO-04/LIO-05 Module are as follows.

[a] Hardware Specifications

Item	Specifications	
Classification	I/O Module	
Name	LIO-04	LIO-05
Model	JAPMC-IO2303	JAPMC-IO2304
Digital Input	32 inputs 24-VDC±20% (+19.2V to +28.8V), 4.1 mA (TYP), combined sink mode/source mode inputs (DI-00, -01, -16, and -17 also used for interrupts) Number of simultaneously ON inputs: 16 (8/connector with 24 VDC), 10 (5/connector with 28.8 VDC) *For details, refer to *[b] Number of Simultaneously ON Inputs - Ambient Temperature Characteristics*.	
Digital Output	32 outputs 24-VDC±20% (+19.2V to +28.8V), 100 mA max., transistor outputs, sink mode outputs	32 outputs 24-VDC±20% (+19.2V to +28.8V), 100 mA max., transistor outputs, source mode outputs
LED Indicators	RUN (green) FUSE (red)	
Connectors	CN1: I/O connector CN2: I/O connector	
Current Consumption	500mA max.	
Dimensions (mm)	125 × 95 (H× D)	
Mass	80 g	

[b] Number of Simultaneously ON Inputs - Ambient Temperature Characteristics

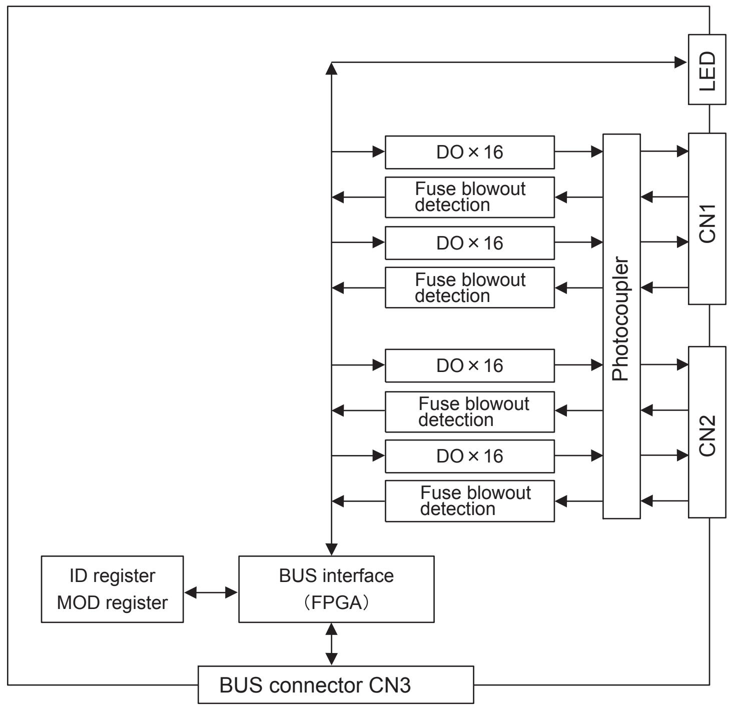
The following graph shows the number of inputs that can be simultaneously ON depending on the ambient temperature.



3.4.4 DO-01 Module

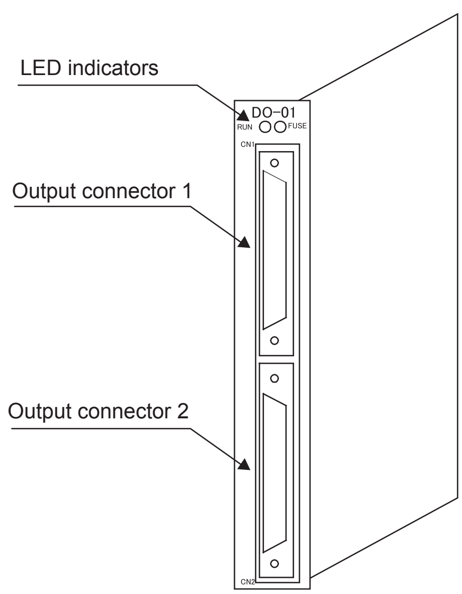
(1) Outline of Functions

The DO-01 Module is equipped with the following digital output functions:
64 digital outputs (DO) (sink mode output)
The following diagram outlines the DO-01 Module functions.



(2) External Appearance and LED Indicators

[a] External Appearance



[a] LED Indicators

The following table shows the DO-01 status when the each indicator lamp is lit or unlit.

Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
FUSE	Red	One or some of the output protection fuses is blown out.	All the output protection fuses are normal.

(3) Hardware Specifications

The following table shows the DO-01 Module hardware specifications.

Item	Specifications
Classification	I/O Module
Name	DO-01
Model	JAPMC-DO2300
Digital Output	64 outputs External power supply voltage: 24-VDC±20% (+19.2V to +28.8V) Output current: 100 mA max.
Connectors	CN1: Output connector CN2: Output connector
Indicators	RUN (green) FUSE (red)
Current Consumption	500mA max.
Dimensions (mm)	125 × 95 (H× D)
Mass	80 g

3.4.5 AI-01 Module

(1) Outline of Functions

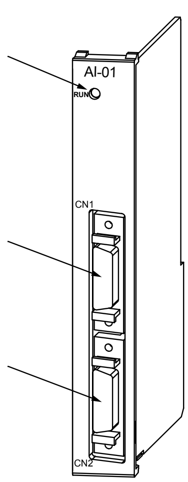
The AI-01 Module is a analog input module with 8 channels. The following three analog input range can be selected:

–10 to +10V voltage mode, 0 to +10V voltage mode, 0 to 20 mA current mode

Up to two AI-01 Modules can be mounted in MP2300 optional slots.

(2) External Appearance and LED Indicators

■ External Appearance



■ LED Indicators

Indicator	Color	AI-01 Status When Lit	AI-01 Status When Unlit
RUN	Green	Normal operation	Being stopped

(3) Hardware Specifications

The following table shows the AI-01 Module hardware specifications.

Item			Specifications		
Classification			I/O Module		
Name			AI-01		
Model			JAPMC-AN2300		
Analog Input	Analog Input Range		−10 to +10 V	0 to +10 V	0 to 20 mA
	Number of Channels		8 ((4/ connector) × 2)		
	Number of Channels to be Used		Any number from 1 to 8		
	Insulation		Between channels: Not insulated Between input connector and system power supply: Photocoupler insulation		
	Max. Rated Input		±15 V		±30 mA
	Input Impedance		20 kΩ		250 kΩ
	Resolution		16-bit (−31276 to +31276)	15-bit (0 to +31276)	
	Absolute Accuracy		100 mV max.*1		0.3 mA max.
	Accuracy	25 ℃ *2	±0.1% (±10 mV)		±0.1%(±0.02 mA)
		0 to 55 ℃	±0.3% (±30 mV)		±0.3% (±0.06 mA)
	Input Conversion Time *3		1.4 msec max.		
Connectors			CN1: Input connector CN2: Input connector		
LED Indicator			RUN (green)		
Current Consumption			500 mA max.		
Dimensions			125 × 95 (H× D)		
Mass			100 g		

* 1. Before the offset and gain adjustment using MPE720
* 2. After the offset and gain adjustment using MPE720
* 3. Input Conversion Time = Delay time caused by input filter (1 ms max.)** + (50 µs × Number of channels in use)
  **: The delay time when using an input filter becomes its maximum value 1 ms when –10V → +10V.

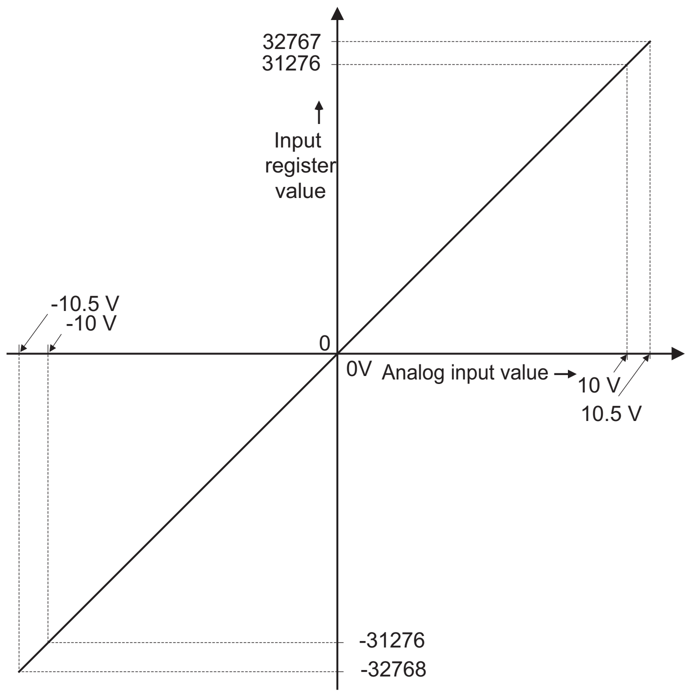
(4) Input Characteristics

Input characteristics of AI-01 Module are described below.

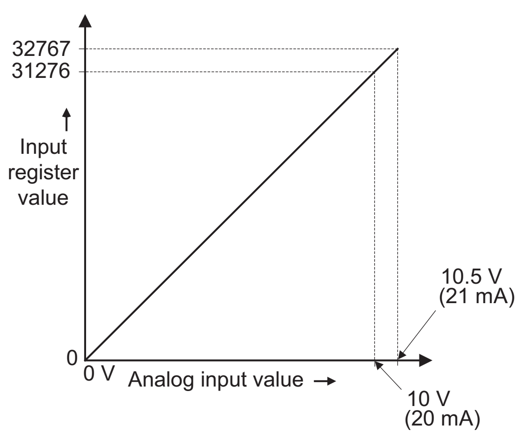
[a] Analog Input Characteristics in Each Input Mode

Analog Input Value	Voltage Mode 1	Voltage Mode 2	Current Mode
	–10 to +10 V	0 to +10 V	0 to 20 mA
–10.5V	–32768	—	—
–10.0V	–31276	—	—
–5.0V	–15638	—	—
0.0V (0.0mA)	0	0	0
+5.0V (10mA)	15638	15638	15638
+10.0V (20mA)	31276	31276	31276
+10.5V (21mA)	32767	32767	32767

[b] Analog Input Characteristics in –10 V to +10 V Voltage Mode 1



[c] Analog Input Characteristics in –10 V to +10 V Voltage Mode 2 and 0 mA to 20 mA Current Input Mode

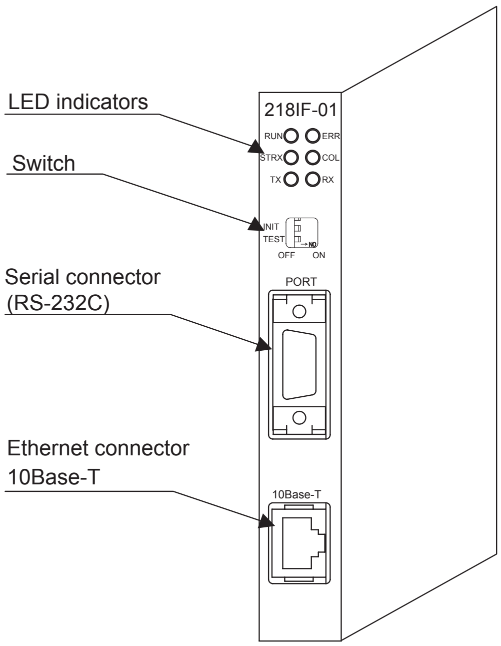


3.5 Communication Modules (Optional)

The following Communication Modules can be mounted to the MP2300: the 218IF-01, the 217IF-01, the 260IF-01, and the 261IF-01 Modules.

3.5.1 218IF-01 Module

(1) External Appearance and Outline of Functions

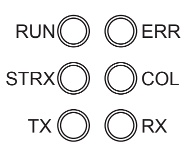


The 218IF-01 Module has an RS-232C serial interface and an Ethernet interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 218IF-01 Module via the PORT or 10Base-T connectors.
For details, refer to the *MP2300 Machine Controller Communication Module User's Manual (Manual No. SIEPC8807004□).*

(2) LED Indicators and Switch Settings

[a] LED Indicators

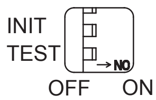
The following table shows the 218IF-01 Module status when each LED indicator is lit or unlit.



Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
ERR	Red	Malfunction (lights/blinks)	Normal operation
STRX	Green	Transmitting or receiving RS-232C data	No data being transmitted or received
COL	Red	Ethernet collision status : Collision	Ethernet collision status : No collision
TX	Green	Transmitting Ethernet transmission status	No data being transmitted
RX	Green	Receiving Ethernet receiving status	No data being received

[b] Switch Settings

The following table shows the 218IF-01 Module switch settings.



Switch	Name	Setting	Function	Factory Setting
INIT	Initial Startup	ON	For engineering communications. Starts the Module using the default parameters except setting of automatic reception functions. Given higher priority than the Basic Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for Basic Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation (Always leave set to OFF.)	

[c] Offline Self-diagnostic Test

Turn the TEST switch ON and the INIT switch OFF, and then turn ON the power supply to execute the Offline Self-diagnostic Test. The following table shows the status of the LED indicators when the 218IF-01 Module detects a malfunction.

Item	Details	LED Indicators			
		RUN	ERR	TX	RX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (twice)*	Not lit	Not lit
SRAM Error	A SRAM hardware error has been detected.		Blinking (3 times)*		
CPU Interface Error	A CPU data transmission error has been detected.		Blinking (5 times)*		
Communication Error	A communication error has been detected.		Blinking (4 times)*	Depends on status.	
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)*	Depends on status.	

* Indicates the number of blinking.

(3) Specifications

The specifications of 218IF-01 Module are as follows.

[a] Hardware Specifications.

Item	Specifications
Classification	Communication Module
Name	218IF-01
Model	JAPMC-CM2300
Communication Ports	RS-232C 1 port（PORT）
	Ethernet 1 port（10Base-T）
Indicators	Module status LED indicators RUN (green) ERR (red) STRX (green) COL (red) TX (green) RX (green)

Item	Specifications
Switches	INIT TEST
Current Consumption	500 mA
Dimensions (mm)	125×95 (H × D)
Mass	85 g

[b] Communication Specifications

■ RS-232C Communication Specifications.

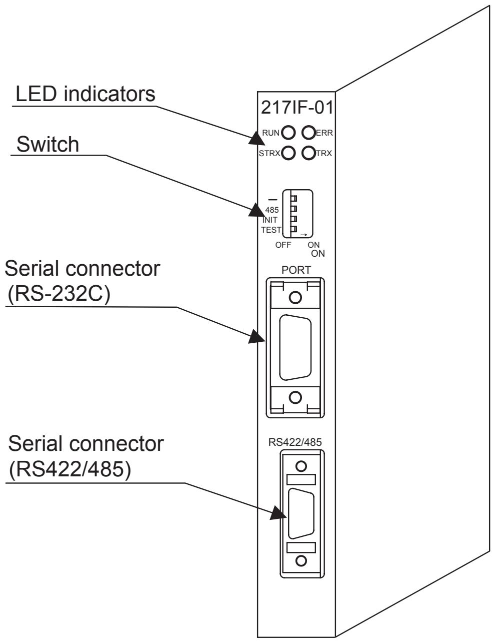
Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9,600 or 19,200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Modes	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, OMRON, Non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

■ Ethernet Communication Specifications

Item	Specifications
Interface	10Base-T: RJ-45
Insulation Method	Transformer coupled
Transmission Distance	100 m/segment Total length: 500 m (when 4 repeaters are connected)
Baud Rate	10 Mbps
Access Mode	IEEE802.3 CSMA/CD
Frames	Ethernet, Ver.2 (DIX specifications)
Connections	TCP/UDP/IP/ARP
Max. Number of Nodes	10Base-T: 2/segment
Communication Modes	Message communication, engineering communication
Max. Number of Transmission Words	512 words (1,024 Bytes)
Communication Protocols	MEMOBUS (slave), Extended MEMOBUS, MELSEC, MODBUS/TCP, Non-procedure, MODBUS/TCP
Max. Number of Segments	5

3.5.2 217IF-01 Module

(1) External Appearance and Outline of Functions



The 217IF-01 Module has RS-232C and RS422/485 serial interfaces mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 217IF-01 Module via the PORT or RS422/485 connectors. For details, refer to the *MP2300 Machine Controller Communication Module User's Manual (Manual No. SIEPC8807004□)*.

(2) LED Indicators and Switch Settings

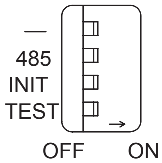
[a] Indicators

The following table shows the 217IF-01 Module status when each LED indicator is lit or unlit.

Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
ERR	Red	Malfunction (lights/blinks)	Normal operation
STRX	Green	Transmitting or receiving RS-232C (PORT) data	No data being transmitted or received
TRX	Green	Transmitting RS-422/485 (RS422/485) data	No data being transmitted

[b] Switch Settings

The following table shows the 217IF-01 Module switch settings.



Switch	Name	Setting	Function	Factory Setting
–	Reserved	–	Always leave set to OFF.	OFF
485	485 Mode	ON	Uses the RS422/485 port as an RS485.	OFF
		OFF	Uses the RS422/485 port as an RS422.	
INIT	Initial Startup	ON	For engineering communications. Starts the RS-232C (PORT) using default parameters except setting of automatic reception functions. The RS422/485 port is disabled. Given higher priority than CPU Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for CPU Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation (Always leave set to OFF.)	

[c] Offline Self-diagnostic Test

Turn the TEST switch ON and the INIT switch OFF, and then turn ON the power supply to execute the Offline Self-diagnostic Test. The following table shows the status of the LED indicators when the 217IF-01 Module detects a malfunction.

Item	Details	LED Indicators			
		RUN	ERR	STRX	TRX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (once)*	Not lit	Depends on status.
SRAM Error	An SRAM hardware error has been detected.		Blinking (twice)*		
DPRAM Error	A DPRAM hardware error has been detected.		Blinking (3 times)*		
Communication Error	A communication error has been detected.		Blinking (4 times)*		
RS-232C Error	An RS-232C loopback error has been detected.		Blinking (5 times)*		
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)*		

* Indicates the number of blinking.

(3) Specifications

The specifications of 217IF-01 Module are as follows.

[a] Hardware Specifications

Item	Specifications
Classification	Communication Module
Name	217IF-01
Model	JAPMC-CM2310
Communication Ports	RS-232C 1 port (PORT)
	RS422/485 1 port (RS422/485)
Indicators	Module status LED indicators RUN (green) ERR (red) STRX (green) TRX (green)
Setting Switches	– 485 INIT TEST
Current Consumption	500 mA max.
Dimensions (mm)	125 × 95 (H × D)
Mass	90 g

[b] Communication Specifications

■ RS-232C Communication Specifications

Item	Specifications
Interface	1 port (PORT)
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate*	9.6/14.4/19.2/28.8/38.4/48.0/57.6/76.8 Kbps
Access Mode	Asynchronous (start-stop synchronization)
Communication Modes	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, OMRON, Non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

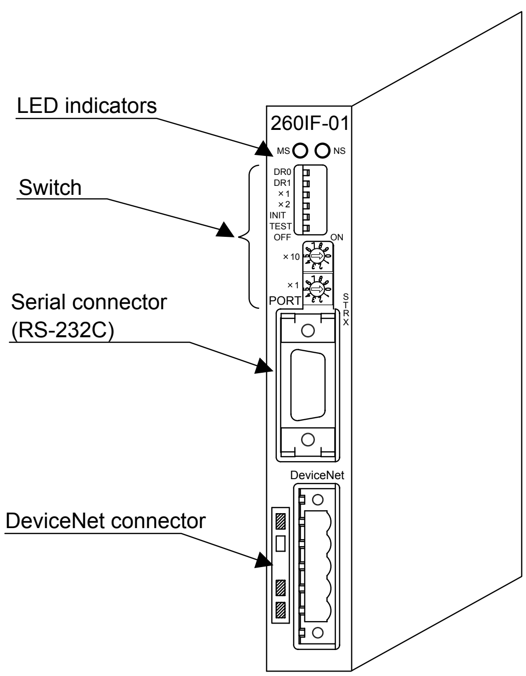
* The baud rate depends on the connected devices.

■ RS422/485 Communication Specifications

Item	Specifications
Interface	1 port (RS422/485)
Connectors	MDR14 pin (female)
Transmission Distance	300 m max.
Baud Rate	9.6/14.4/19.2/28.8/38.4/48.0/57.6/76.8 Kbps
Synchronization Mode	Asynchronous (start-stop synchronization)
Communication Protocols	MEMOBUS, MELSEC, OMRON, Non-procedure
Media Access Control Method	1:1 (RS422) 1:N (RS485)
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

3.5.3 260IF-01 Module

(1) External Appearance and Outline of Functions

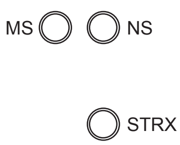


The 260IF-01 Module has an RS-232C serial interface and a DeviceNet interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 260IF-01 Module via the PORT or DeviceNet connectors.
For details, refer to the *MP2300 Machine Controller Communication Module User's Manual* (Manual No. SIEPC8807004□).

(2) LED Indicators and Switch Settings

[a] Indicators

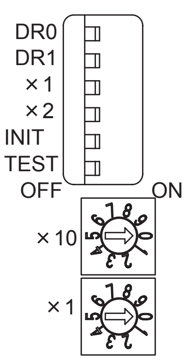
The following table shows the status of the 260IF-01 Module LED indicators.



Indicator	Display	Status
MS (2-color LED)	Green	Normal operation
	Red	Module error
	Not lit	Module power supply disconnected
NS (2-color LED)	Green	Normal operation
	Green blinking	No I/O allocation, connection being established
	Red	Error (Bus OFF, duplicated MAC ID)
	Red blinking	Communication error
	Not lit	Communication power supply disconnected, checking for duplicated MAC ID
STRX (mounted on PCB)	Green lit/blinking	Transmitting or receiving RS-232C data
	Not lit	No RS-232C data transmission or reception

[b] Switch Settings

The following table shows the 260IF-01 Module switch settings.



Switch	Name	Status/Setting Range	Function	Default
DR0	Baud Rate Setting 0	The following baud rates can be selected by the combination of ON/OFF settings of DR0 and DR1.		OFF
DR1	Baud Rate Setting 1			OFF

DR0	OFF	OFF	ON	ON
DR1	OFF	ON	OFF	ON
Baud Rate	125 kbps	250 kbps	500 kbps	Communication not possible

Switch	Name	Status/Setting Range	Function	Default
×1	Master/Slave Mode	ON	Used in master mode.	OFF
		OFF	Used in slave mode.	
×2	Self-diagnosis (DeviceNet)	ON	Executes DeviceNet self-diagnosis when turned ON the power supply.	OFF
		OFF	Does not execute self-diagnosis. Normally, always leave turned OFF.	
INIT	Initial Startup	ON	For engineering communications. Starts RS-232C (PORT) using default parameters except setting of automatic reception functions. Given higher priority than Basic Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for Basic Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation (Always leave set to OFF.)	
×10	Node Address 10s Digit Setting	0 to 6	Set the node address in the range from 1 to 64. (Rotary decimal switch)	0
×1	Node Address 1s Digit Setting	0 to 9		1

(3) Specifications

The specifications of 260IF-01 Module are as follows.

[a] Hardware Specifications

Item	Specifications
Classification	Communication Module
Name	260IF-01
Model	JAPMC-CM2320
Communication Ports	RS-232C 1 port (PORT)
	DeviceNet 1 port (DeviceNet)
Indicators	Module status LED indicators MS (green, red) NS (green, red)
Setting Switches	DR0 DR1 ×1 ×2 INIT TEST ×10 ×1
Current Consumption	500 mA max.
Dimensions (mm)	125 × 95 (H × D)
Mass	85 g

[b] Communication Specifications

■ RS-232C Communication Specifications

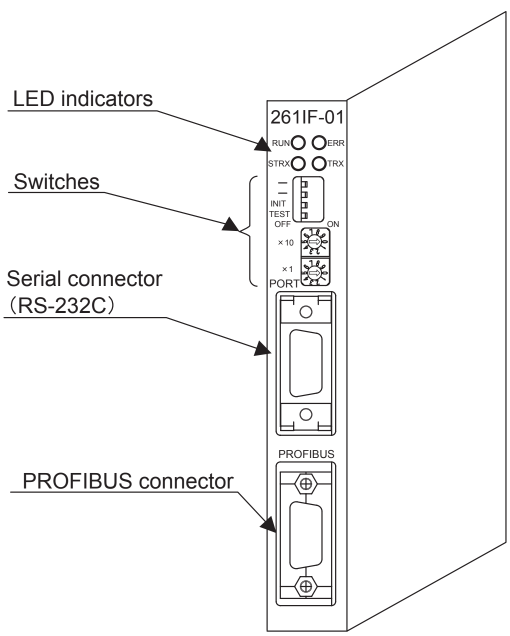
Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9,600 or 19,200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Modes	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, OMRON, Non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

■ DeviceNet Communication Specifications

Item		Specifications
Number of Lines		1
Supported Communication Methods		• I/O communication functions (Polled, Bit Strobed) • Explicit messages (Support only for master function)
I/O Communication	Max. Number of Slaves	63
	Max. Number of I/O Bytes	2,048 bytes, 256 bytes/node for max. number of I/O bytes.
Message Communication (Only for Masters)	Max. Number of Nodes for Message Communication	63 nodes Max. number of nodes for simultaneous communication: 8
	Max. Message Length	256 bytes
	Function for Execution	MSG-SND function
Settings		2 rotary switches on front panel: Node address
		DIP switch on front panel: Band rate Master/Slave mode
Indicators		2 LEDs: MS, NS
Power Supply Voltage for Communication		24 VDC±10% (supplied by special cable)
Current Consumption		Communication power supply: 45 mA max. (supplied from communication connector). Internal circuit power supply (supplied from Basic Module).

3.5.4 261IF-01 Module

(1) External Appearance and Outline of Functions



The 261IF-01 Module has an RS-232C serial interface and a PROFIBUS interface mounted in it. Personal computers, HMI devices, and controllers manufactured by other companies can be connected to the 261IF-01 Module via the PORT or PROFIBUS connectors.
For details, refer to the *MP2300 Machine Controller Communication Module User's Manual (Manual No. SIEPC8807004□).*

(2) LED Indicators and Switch Settings

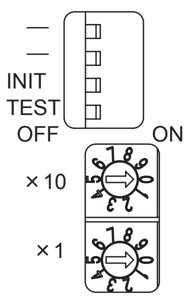
[a] Indicators

The following table shows the 261IF-01 Module status when each LED indicator is lit or unlit.

Indicator	Color	Status When Lit	Status When Unlit
RUN	Green	Normal operation	Error occurrence
ERR	Red	Malfunction (lights/blinks)	Normal operation
STRX	Green	Transmitting or receiving RS-232C (PORT) data	No data being transmitted or received
TRX	Green	Transmitting or receiving PROFIBUS data	No data being transmitted or received

[b] Switch Settings

The following table shows the 261IF-01 Module switch settings.



Switch	Name	Status/ Setting Range	Function	Factory Setting
–	Reserved	–	Always leave set to OFF.	OFF
–	Reserved	–		
INIT	Initial Startup	ON	For engineering communications. Starts the serial communication using the default parameters except setting of automatic reception functions. Given higher priority than the Basic Module Flash Startup and Self-configuration Startup.	OFF
		OFF	Set to OFF for Basic Module Flash Startup and Self-configuration Startup.	
TEST	TEST	ON	System use	OFF
		OFF	Normal operation. (Always leave turned OFF.)	
× 10	Node Address 10s Digit Setting	0 to 6	Sets the node address in the range from 1 to 64. (Rotary decimal switch).	0
× 1	Node Address 1s Digit Setting	0 to 9		1

[c] Offline Self-diagnostic Test

Turn the TEST switch ON and the INIT switch OFF, and then turn ON the power supply to execute the Offline Self-diagnostic Test. The following table shows the status of the LED indicators when the 261IF-01 Module detects a malfunction.

Item	Details	LED Indicators			
		RUN	ERR	STRX	TRX
Flash Checksum Error	A flash memory checksum error has been detected.	Not lit	Blinking (once)	Not lit	Depends on status.
SRAM Error	An SRAM hardware error has been detected.		Blinking (twice)		
DPRAM Error	A DPRAM hardware error has been detected.		Blinking (3 times)		
RS-232C Error	An RS-232C loopback error has been detected.		Blinking (5 times)		
Station Number Error	A PROFIBUS station number error has been detected.		Blinking (6 times)		
Watchdog Error	A watchdog timeout error has been detected.		Blinking (15 times)		

* Indicates the number of blinking.

(3) Specifications

The specifications of 261IF-01 Module are as follows.

[a] Hardware Specifications

Item	Specifications
Classification	Communication Module
Name	261IF-01
Model	JAPMC-CM2330
Communication Ports	RS-232C 1 port (PORT)
	PROFIBUS 1 port (PROFIBUS)
Indicators	Module status LED indicators RUN (green) ERR (red) STRX (green) TRX (green) BAT (red)
Setting Switches	INIT TEST ×10 ×1
Current Consumption	500 mA max.
Dimensions (mm)	125 × 95 (H × D)
Mass	90 g

[b] Communication Specifications

■ RS-232C Communication Specifications.

Item	Specifications
Connectors	9-pin D-sub (female)
Transmission Distance	15 m max.
Baud Rate	9,600 or 19,200 bps
Access Mode	Asynchronous (start-stop synchronization)
Communication Modes	Message communication, engineering communication
Communication Protocols	MEMOBUS, MELSEC, OMRON, Non-procedure
Media Access Control Method	1:1
Transmission Format (Can be set)	Data length: 7 or 8 bits Stop bits: 1 or 2 bits Parity: Odd, even, or none

■ PROFIBUS Communication Specifications

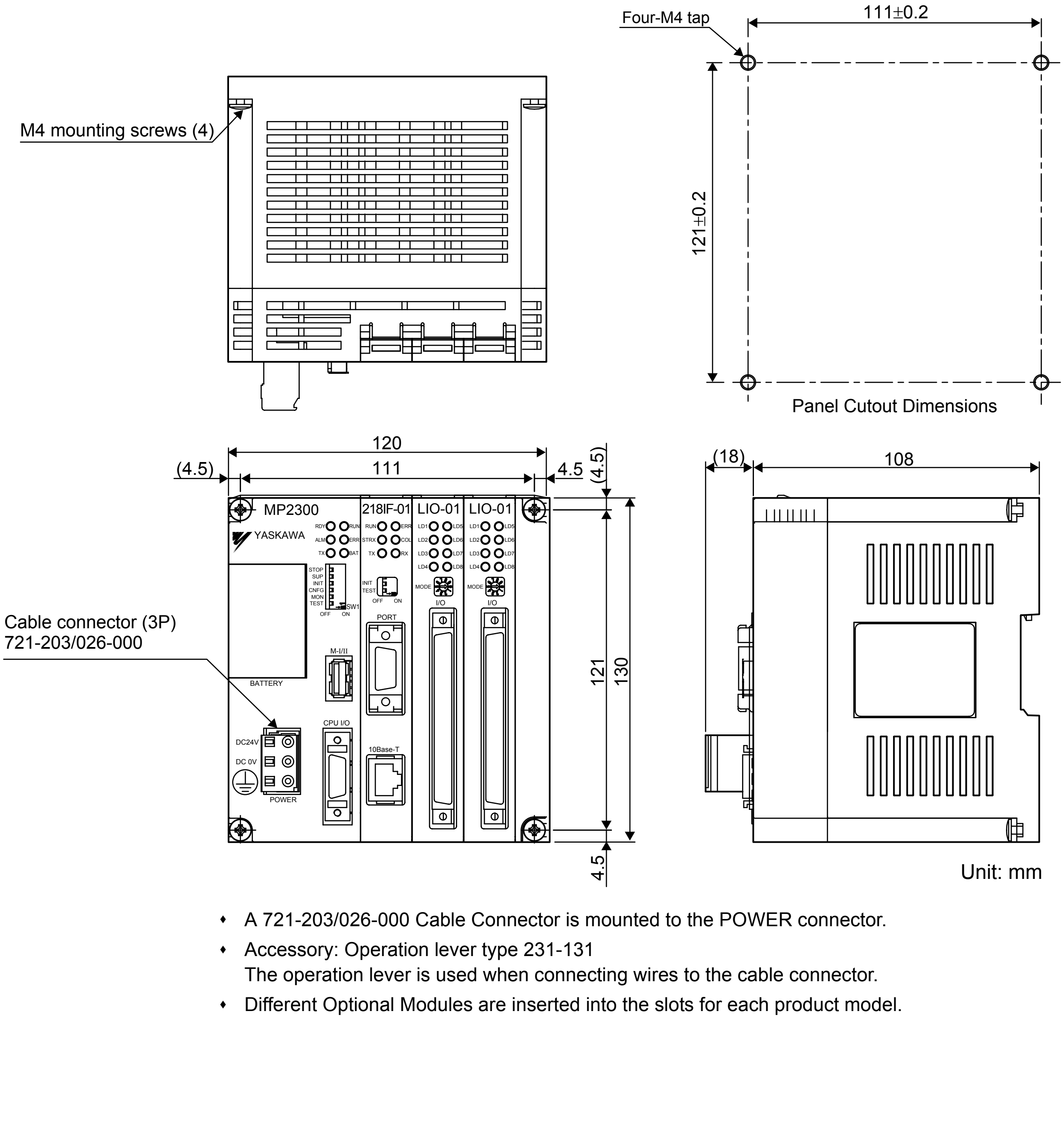
Item	Specifications
Mounted Functions	DP slave function • Cyclic communication (DP standard function)
Baud Rate	12 M/6 M/4 M/3 M/1.5 M/750 k/500 k/187.5 k/93.75 k/19.2 k/9.6 kbps (Auto detect)
Configuration	Implemented by the PROFIBUS Master *1
Slave Address	1 to 64 *2
I/O Processing	• Total I/O register area: Max. 122 words • I/O allocations: Max. 61 words each
Diagnostic Functions	• Status and slave status display using MPE720 • I/O error display using system register

* 1. The PROFIBUS ID is 05C1.
  The GSD file YASK05C1.GSD is provided for master configuration.
  GSD file: Defines slave information.
* 2. The PROFIBUS ID can be set between 0 and 125 but the 261IF-01 Module can be set between 1 and 64.

3.6 Dimensional Drawings

This section shows the dimensional drawings of the Basic Module and Optional Modules.

3.6.1 Basic Module



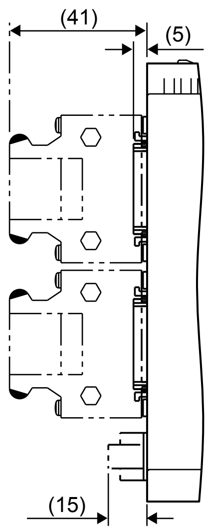
- A 721-203/026-000 Cable Connector is mounted to the POWER connector.
- Accessory: Operation lever type 231-131
  The operation lever is used when connecting wires to the cable connector.
- Different Optional Modules are inserted into the slots for each product model.

3.6.2 Optional Modules

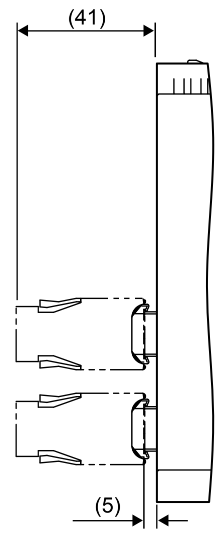
The Optional Modules have the following dimensions. Height: 125 mm; Depth: 95 mm
The following figures show the dimensions of the connector.

Unit: mm

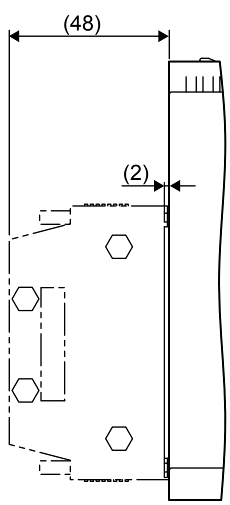
SVA-01



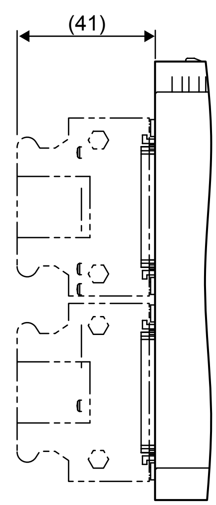
SVB-01



LIO-01 / LIO-02

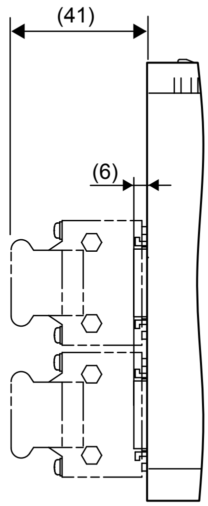


LIO-04 / LIO-05 / DO-01

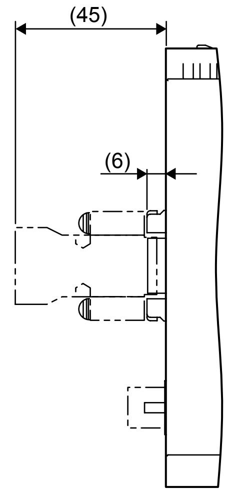


Unit: mm

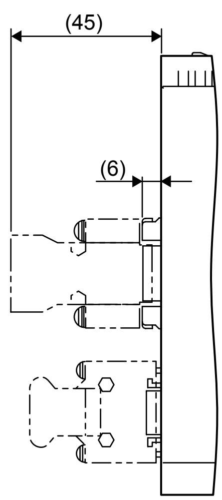
AI-01



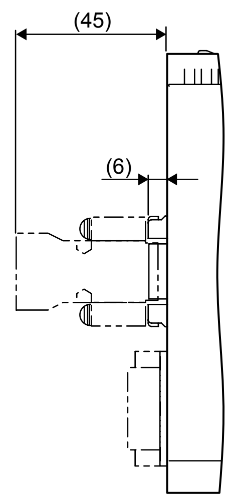
218IF-01



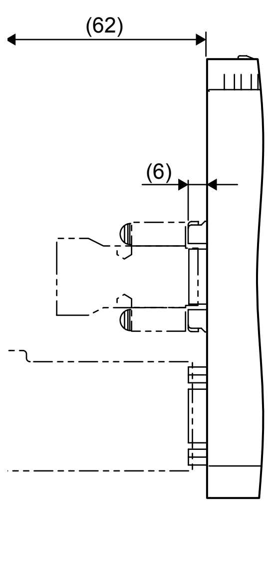
217IF-01



260IF-01



261IF-01



4

Mounting and Wiring

This chapter explains how to handle MP2300 and the connection methods for each Module.

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4.1 Handling MP2300

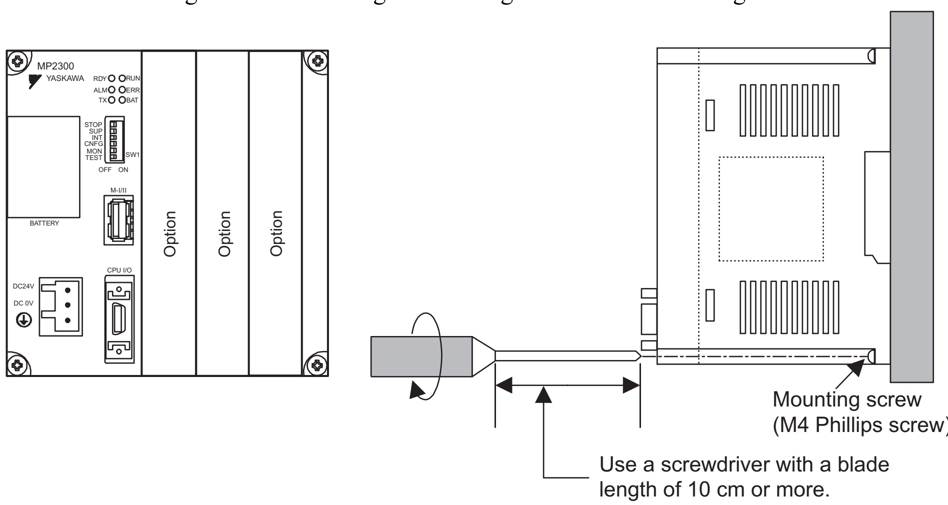
4.1.1 Mounting MP2300

There are two methods for mounting MP2300.

- Using screws
- Using DIN rail

(1) Screw Mounting

Place the MP2300 against the mounting base and tighten the four mounting screws.

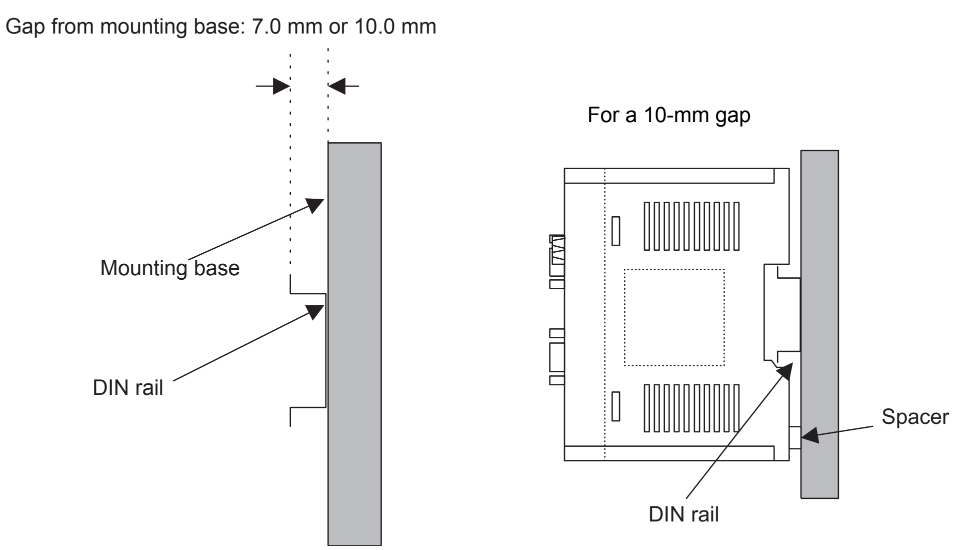


Note: Mount the MP2300 vertically on the wall, as shown in the above diagram.

(2) DIN Rail Mounting

[a] DIN Rails and Spacer

Two types of DIN rails are available: with 7-mm or 10-mm gap from the mounting base as shown in the following diagram. If mounting a MP2300 using DIN rail with 10 mm gap, install a spacer on the rear of the MP2300 near the bottom to protect the MP2300 from vibration and shock.



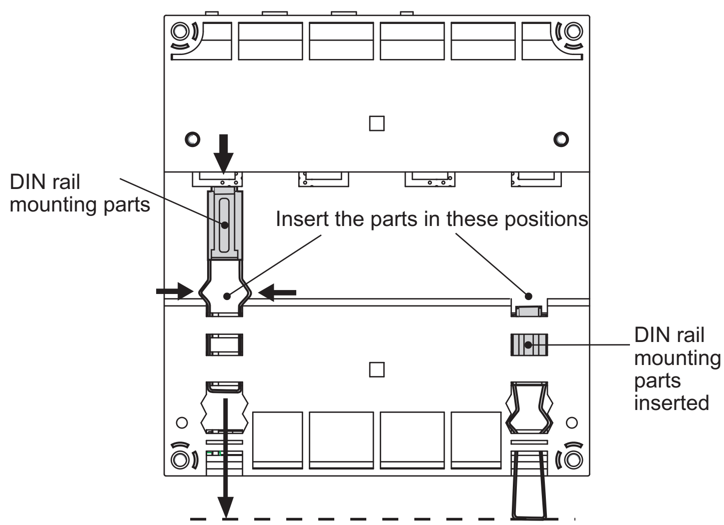
- The parts for mounting the MP2300 to the DIN rail are sold separately. Purchase the following product when using DIN rail.
  Product name: DIN Rail Mounting Parts
  Model No.: JEPMC-OP300

[b] Procedure for Mounting to DIN Rail

Use the following procedure to attach the DIN rail mounting parts to the MP2300 and then mount the MP2300 to the DIN rail.

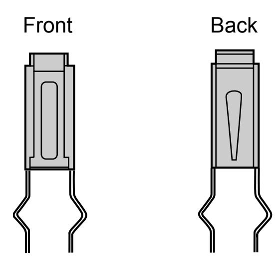
1. Insert the DIN rails in the two slots on the rear of the MP2300 as shown in the following figure.

MP2300 Rear Side

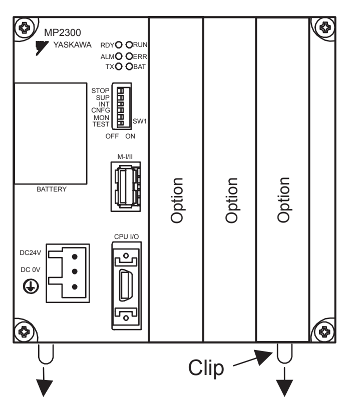


Insert the mounting clips so that they are in the positions shown with a dotted line in the previous figure.

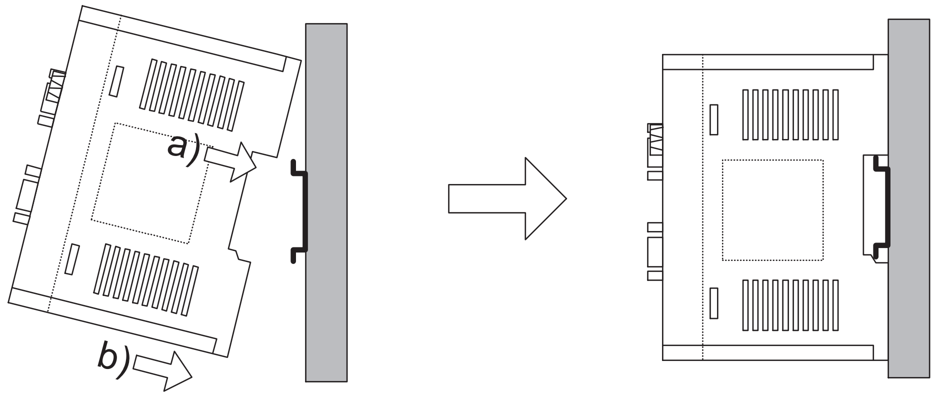
- The figure below shows the front and back of a mounting clip. Insert each clip so that its front faces outward.



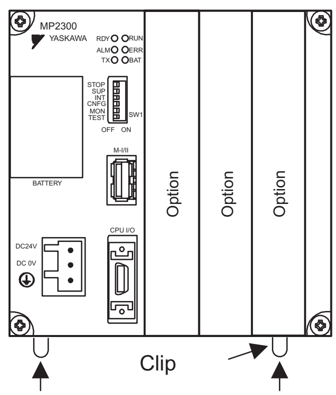
2. Pull the DIN rail mounting clips down to release them.



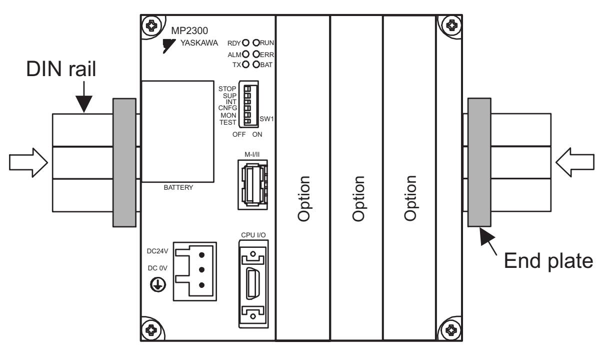
3. Hook the MP2300 to the top of the DIN rail (a), and then push the MP2300 towards the mounting base to secure it in place (b).



4. Push the DIN rail mounting clips to lock them in place.



5. Place end plates on either side of the MP2300 to secure it to the DIN rail.



This completes the installation procedure.

4.1.2 Replacing and Adding Optional Modules

Use the following procedures to replace and add Optional Modules.

(1) Preparations

1. Create a backup data file.

Use the MPE720 to save the MP2300 program on a computer (right-click the **PLC**, and select ***Transfer - All Files - From Controller to MPE720***.)

2. Remove the MP2300.

Turn OFF the power supply and disconnect all cables from the MP2300. Then remove the MP2300 from the panel or rack and place on a workbench or other area with sufficient space.

(2) Removing Optional Modules

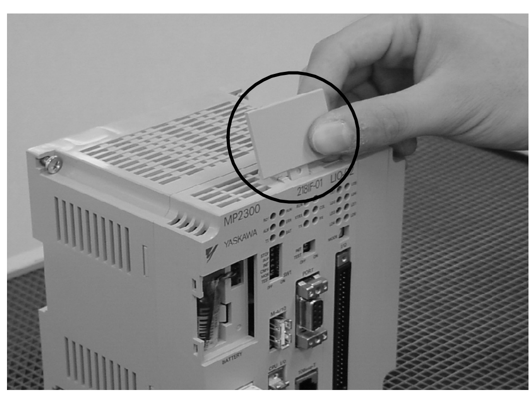
1. Remove the battery cover.

Pull the notch on the side of the MP2300 towards you to remove the battery cover.

2. Remove the panel of Optional Module.

Insert the protruding part of the battery cover into the slot on top of the panel of Optional Module to unhook, as shown in the diagram. Face the front of the battery cover towards you for this operation.

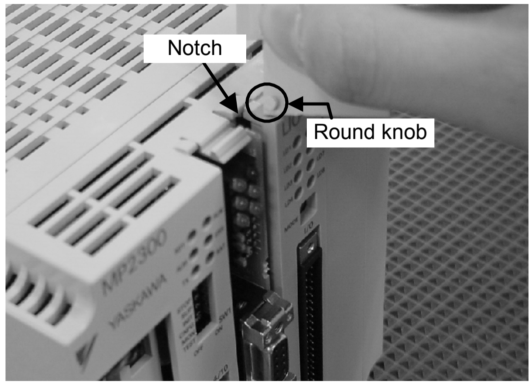
- Remove the front cover (optional) from the empty slot before mounting an Optional Module in an empty slot.



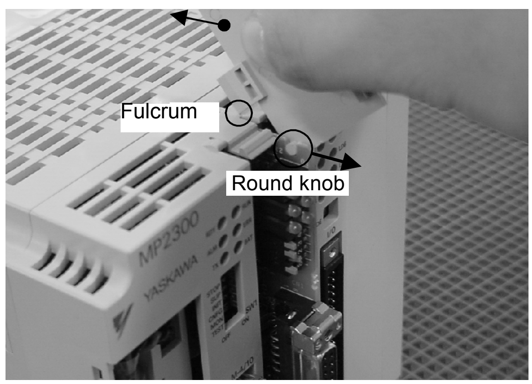
Unhook the bottom in the same way.

3. Remove the Optional Module from the mounting base.

Pull the top of the panel of the Optional Module towards you to remove it. A notch on the Optional Module will be visible from the gap in the cover. Hook the round knob on the battery cover, shown in the diagram, into the notch in the Optional Module.

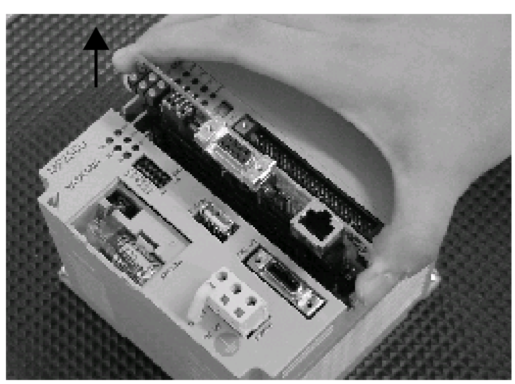


Hold the center of the battery cover as shown in the following diagram. Push the battery cover down and out, rotating from the round knob to disconnect the Module and mounting base connectors, and then pull the Optional Module forward.



4. Pull out the Optional Module.

Hold the Module on the top and bottom and pull it out straight. Hold the edges of the Module and avoid touching the parts on the Module.



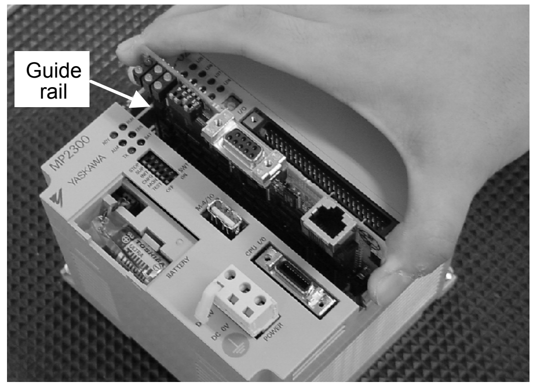
Put the removed Module into the bag that was supplied with and store the Module in this bag.

(3) Installing Optional Modules

1. Insert Optional Modules.

Hold the top and bottom of the Module to be installed, line up the Module on the left-side guide rail inside the Option Slot, and then insert it straight.

- The FG bar on the inside bottom of the Unit Case may be damaged if the Module is not inserted straight.

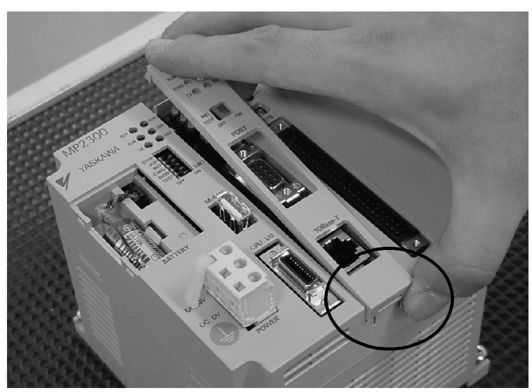


2. Mount on to the mounting base.

Once the Optional Module has been completely inserted, place your hand on the front face of the Optional Module and push hard until the Optional Module has been inserted into the mounting base connectors. The front face of the Optional Module and the hook will be aligned when the Optional Module has been installed properly.

3. Install the panel of the Optional Module.

Place the hole on the bottom of the panel of the Optional Module onto the hook on the bottom of the MP2300. Next, hook the hole at the top of the panel of the Optional Module onto the hook at the top of the MP2300.



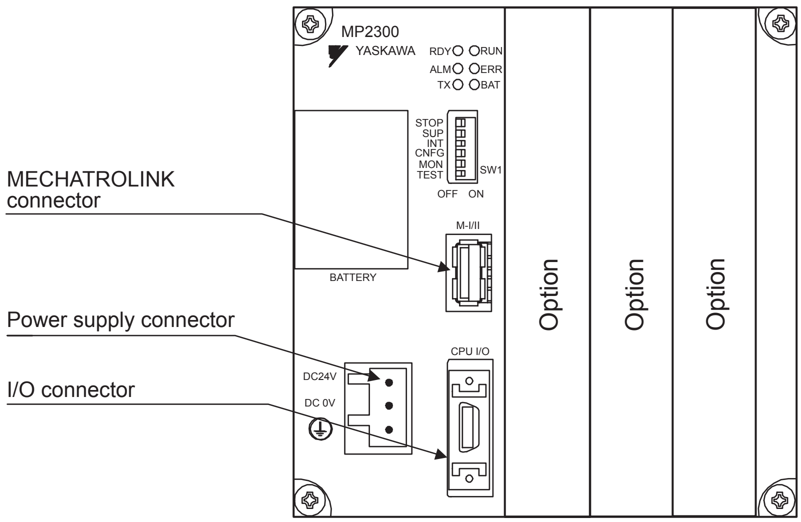
This completes the Optional Module mounting procedure.

- Always cover the empty slots with covers (Option: JEPMC-OP2300).

4.2 Basic Module Connections

4.2.1 Connectors

The following diagram shows the connectors for the Basic Module.

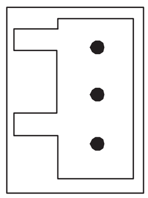


4.2.2 Power Supply Connector

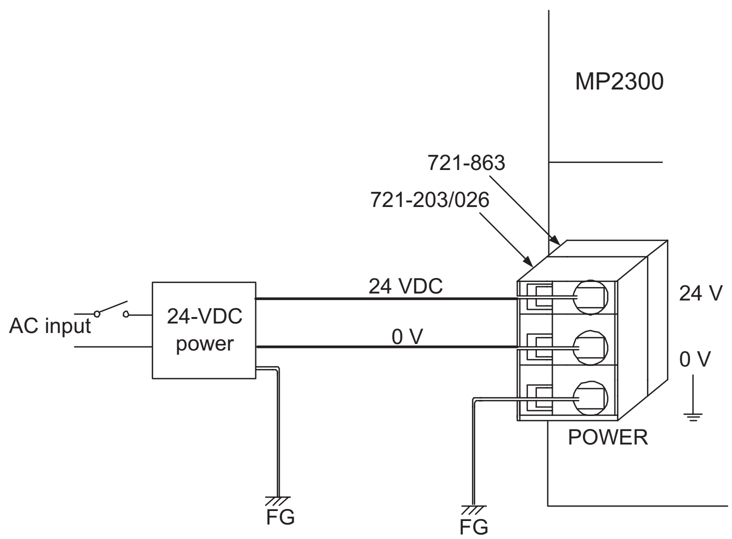
(1) Specifications, Pin Arrangement, and Connection Procedure

Supply a 24-VDC to the MP2300. Connect the power supply connector as shown in the diagram below.

Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
Power Supply Connector	POWER	3	721-863	721-203/026	WAGO



Symbol	Signal Name	Description
24VDC	24V	24 VDC input
0 VDC	0V	0 V input
	FG	Frame ground (Ground to 100 Ω or less.)

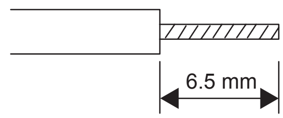


- Use an insulated 24-VDC power supply. Attach the power supply switch on the AC side. If the switch is attached on the 24-VDC side, there will be an inrush current of approximately 40 A when the power is turned ON.

(2) Connection Procedure

The power supply terminal has a removable connector. Use the following procedure to wire the terminal to the power supply connector. Use 0.2 mm^2 to 0.51 mm^2 (AWG24 to AWG20) twisted-pair cable.

1. Strip approx.6.5 mm the end of the wire.



2. Open the wire insert opening on the terminal with the tool shown in Fig. A or Fig. B.

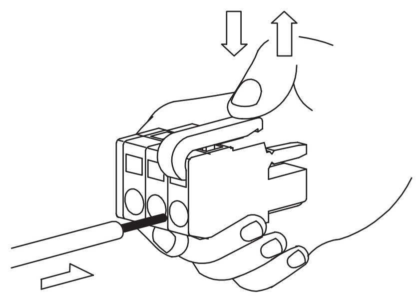


Fig. A (with lever)

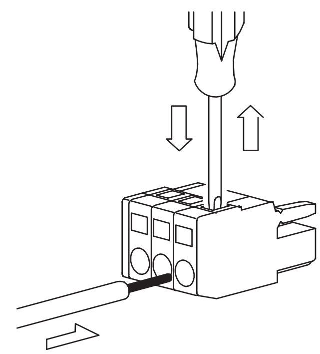


Fig. B (with screwdriver)

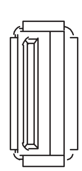
3. Insert the wire into the opening and then close the opening by releasing the lever or removing the screwdriver.

4.2.3 MECHATROLINK Connectors

MECHATROLINK connector is used to connect the MP2300 and the SERVOPACKs and distributed I/O via MECHATROLINK cables.

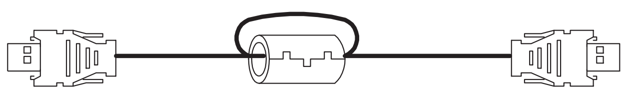
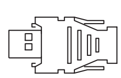
(1) Specifications and Pin Arrangement

Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
MECHATROLINK Connector	M-I/II	4	USB-AR41-T11	DUSB-APA41B1-C50	DDK Ltd.



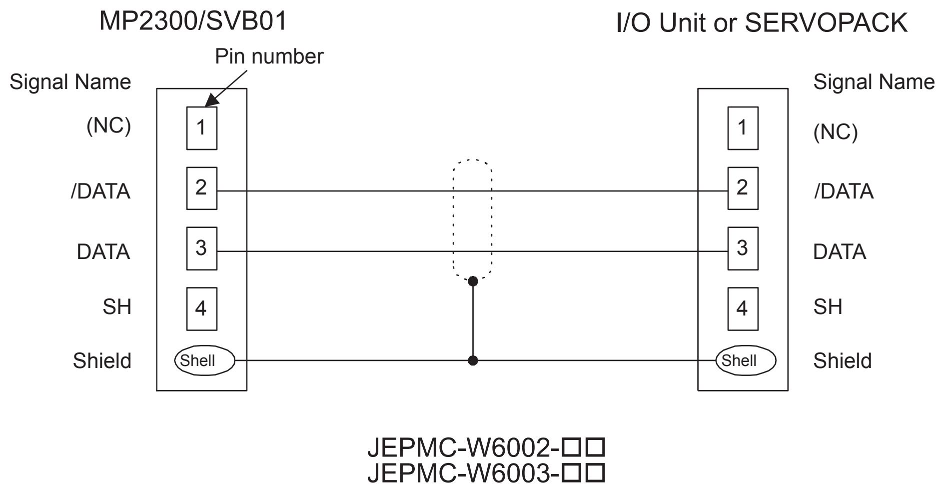
Pin Number	Signal Name	Description
1	(NC)	Not used.
2	/DATA	Signal –
3	DATA	Signal +
4	SH	Not used.
Shell	Shield	Connects the shield wire.

(2) Cables

Name and Specification	Model Number	Length
MECHATROLINK Cable MECHATROLINK Connector – MECHATROLINK Connector 	JEPMC-W6002-A5	0.5 m
	JEPMC-W6002-01	1 m
	JEPMC-W6002-03	3 m
	JEPMC-W6002-05	5 m
	JEPMC-W6002-10	10 m
	JEPMC-W6002-20	20 m
	JEPMC-W6002-30	30 m
	JEPMC-W6002-40	40 m
	JEPMC-W6002-50	50 m
MECHATROLINKCable MECHATROLINK Connector – MECHATROLINK Connector (with Ferrite Core) 	JEPMC-W6003-A5	0.5 m
	JEPMC-W6003-01	1 m
	JEPMC-W6003-03	3 m
	JEPMC-W6003-05	5 m
	JEPMC-W6003-10	10 m
	JEPMC-W6003-20	20 m
	JEPMC-W6003-30	30 m
	JEPMC-W6003-40	40 m
	JEPMC-W6002-50	50 m
MECHATROLINK Cable MECHATROLINK Connector – Loose Wire 	JEPMC-W6011-A5	0.5m
	JEPMC-W6011-01	1 m
	JEPMC-W6011-03	3 m
	JEPMC-W6011-05	5 m
	JEPMC-W6011-10	10 m
	JEPMC-W6011-20	20 m
	JEPMC-W6011-30	30 m
	JEPMC-W6011-40	40 m
	JEPMC-W6011-50	50 m
Terminator 	JEPMC-W6022	–

(3) Cable Connections between the MP2300 and I/O Units and the MP2300 and SERVOPACKs

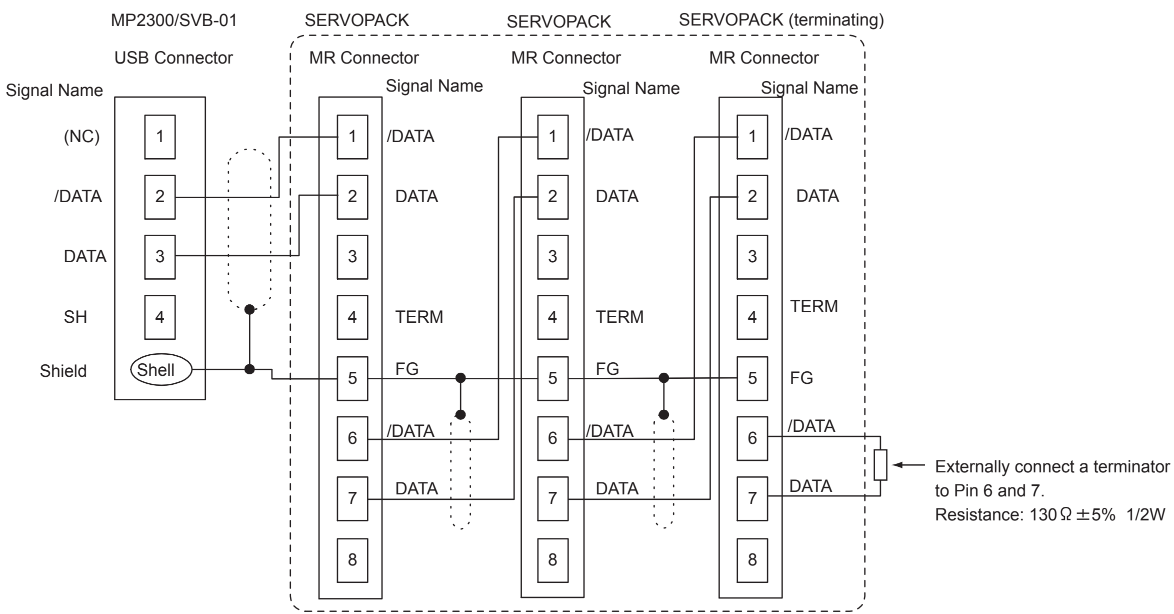
Use the MECHATROLINK cable JEPMC-W6002-□□ or JEPMC-W6003-□□ for connection between the MP2300 and I/O units or SERVOPACKs*1.
The connection diagram using MECHATROLINK cable JEPMC-W6002-□□ or JEPMC-W6003-□□*2 is shown below.



- Use MECHATROLINK cable JEPMC-W6011-□□ when connecting SERVOPACK SGD-□□□N or SGDB-□□AN. (Refer to *(4) Cable Connections between the MP2300 and SGD-□□□N and SGDB-□□AN SERVOPACKs*).
- The JEPMC-W6003- □□ cable has a ferrite core.

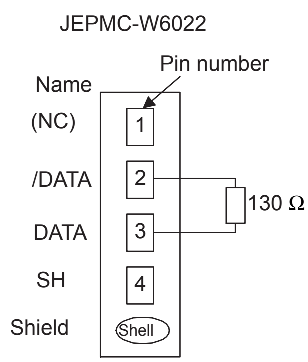
(4) Cable Connections between the MP2300 and SGD-☐☐☐N and SGDB-☐☐AN SERVOPACKs

Use the MECHATORLINK cable JEPMC-W611-☐☐ for the connections between the MP2300 and SGD-☐☐☐N or SGDB-☐☐AN SERVOPACK and between these SERVOPACKs.
The following diagram shows the connections between the MP2300 (or SVB-01) ←→ SERVOPACK ←→ SERVOPACK ←→ SERVOPACK using the MECHATROLINK cables JEPMC-W611-☐☐.

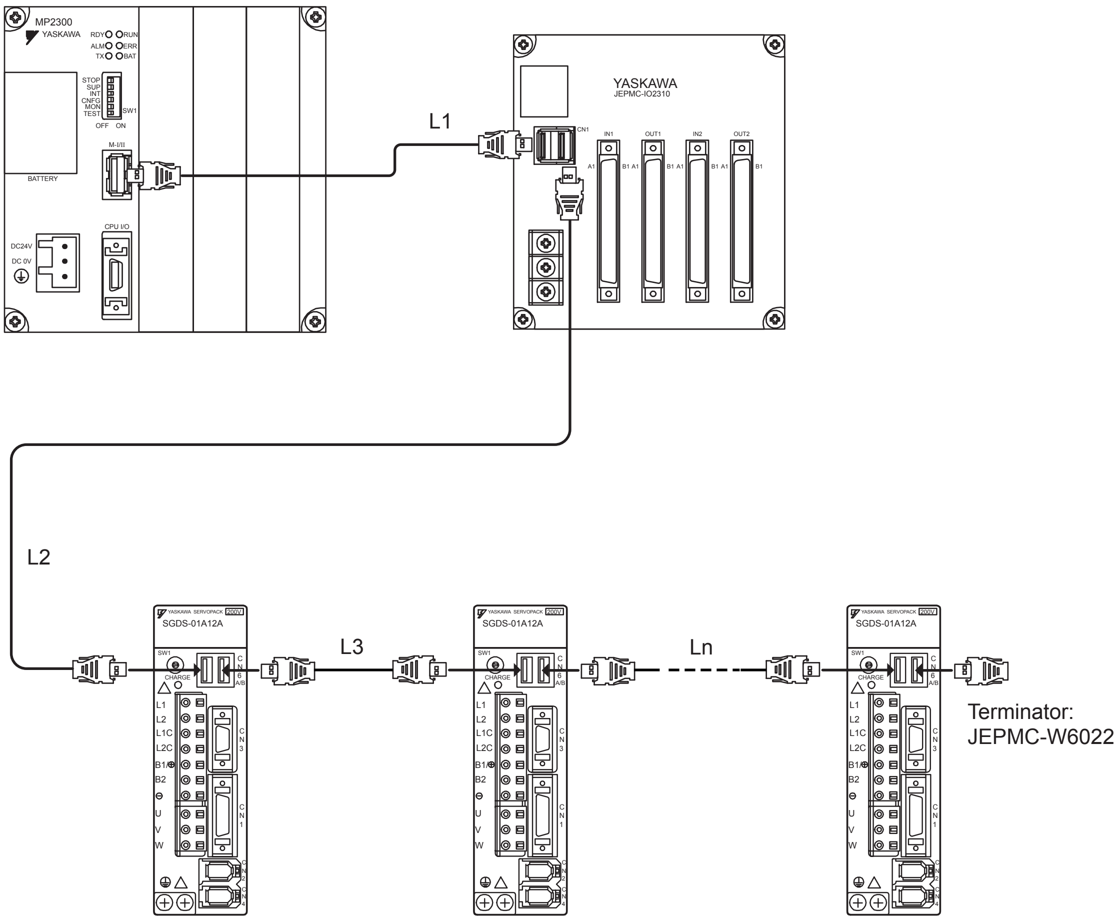


- The JEPMC-6011-☐☐ has a USB connector on one end and loose wires on the other end. Use an MR connector and wiring material to create a 1:N cable.
- The terminator must be provided by the user.
- The shield wire can be connected as instructed in the SERVOPACK's manual. However, the connections shown in the above diagram is recommended when using the MP2300 in combination with a SVB-01 Module.
- Prepare the cables according to MECHATROLINK-I specifications. Connections that do not meet the specifications will prevent normal communication due to the influence of reflected waves or other factors.
  MECHATROLINK-I Specifications
  - Total network length: 50 m max.
  - Maximum number of slave stations: 14 stations max.
  - Minimum distance between stations: 0.3 m min.

(5) Terminator Connections



(6) Connection Example between MP2300, SERVOPACK, and IO2310



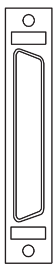
- Use MECHATROLINK cables between modules.
- Use under the conditions that L1 + L2 + L3 + . . . + Ln $\leq$ 50 m
- The MP2300 has a built-in terminator.

4.2.4 CPU I/O Connectors

CPU I/O connector is used to connect the MP2300 and external I/O signals.

(1) Specifications

External input: 8 points; External output: 4 points



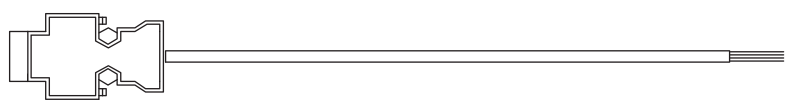
Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
I/O Connector	CPU I/O	20	10220-52A2JL	• 1020-3000VE Connector • 10320-52F0-008 Shell	Sumitomo 3M

(2) Cables

Name	Model Number	Length
I/O Cable (loose wires)	JEPMC-W2060-A5	0.5 m
	JEPMC-W2060-01	1 m
	JEPMC-W2060-03	3 m

(3) External Appearance of I/O Cable

JEPMC-W2060-□□



(4) Connector Pin Arrangement

The following table shows the connector pin arrangement.

Pin Number	Signal Name	I/O	Remarks	Pin Number	Signal Name	I/O	Remarks
1	DI_COM	P	Input common	11	DI_COM	P	Input common
2	DI_00	I	Input 00	12	DI_04	I	Input 04
3	DI_01	I	Input 01	13	DI_05	I	Input 05
4	DI_02	I	Input 02	14	DI_05	I	Input 06
5	DI_03	I	Input 03	15	DI_07	I	Input 07
6		–		16		–	
7		–		17	DO_24V	P	+24 V input
8	DO_COM	P	Output common	18	DO_COM	P	Output common
9	DO_00	O	Output 00	19	DO_02	O	Output 02
10	DO_01	O	Output 01	20	DO_03	O	Output 03

- P: Power input; I: Input signal; O: Open-collector output

(5) Input Circuits

The following table shows the CPU I/O Connector input circuit specifications.

Item	Specifications		
Inputs	8 points	DI-00	General-purpose input (shared with interrupts)
		DI-01 to DI-07	General-purpose input
Input Format	Sink mode/source mode input		
Isolation Method	Photocoupler		
Input Voltage	±24 VDC±20%		
Input Current	4.1 mA (TYP.)		
ON Voltage/Current	15 VDC min./2.0 mA min.		
OFF Voltage/Current	5 VDC max./1.0 mA max.		
ON Time/OFF Time	ON: 1 ms max. OFF: 1 ms max.		
Number of Commons	8 points		

- DI_00 is shared with an interrupt input. If DI_00 is turned ON while interrupts are enabled, the interrupt processing drawing is executed.

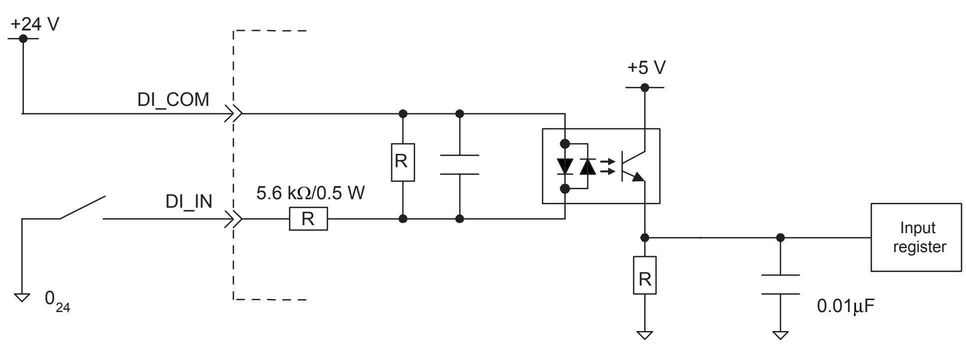


Fig. 4.1 Digital Input Circuit (Sink Mode Input)

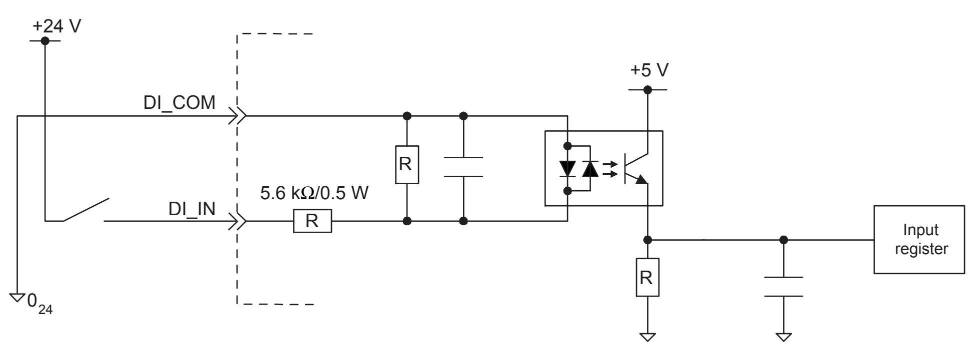


Fig. 4.2 Digital Input Circuit (Source Mode Input)

(6) Output Circuit

The following table shows the CPU I/O Connector output circuit specifications.

Item	Specifications
Outputs	4 points
Output Format	Transistor, open-collector, sink mode output
Isolation Method	Photocoupler
Output Voltage	+24 VDC ±20%
Output Current	100 mA max.
Leakage Current When OFF	0.1 mA max.
ON Time/OFF Time	ON: 1 ms max. OFF: 1 ms max.
Number of Commons	4 points
Protection Circuit	Fuse (The fuse is not, however, for circuit protection. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection is required.)

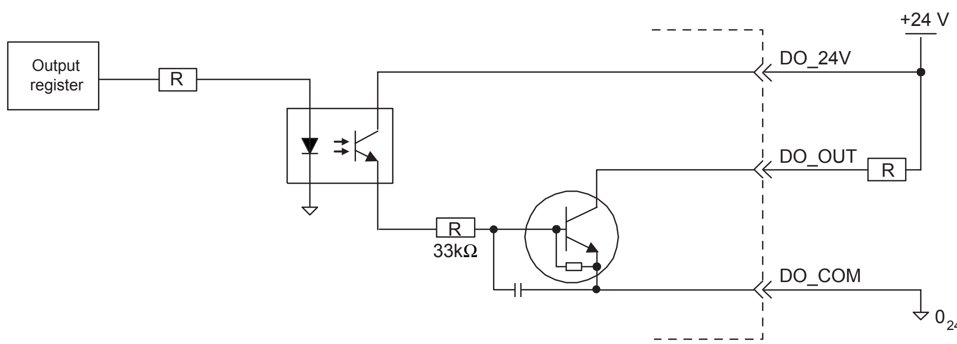
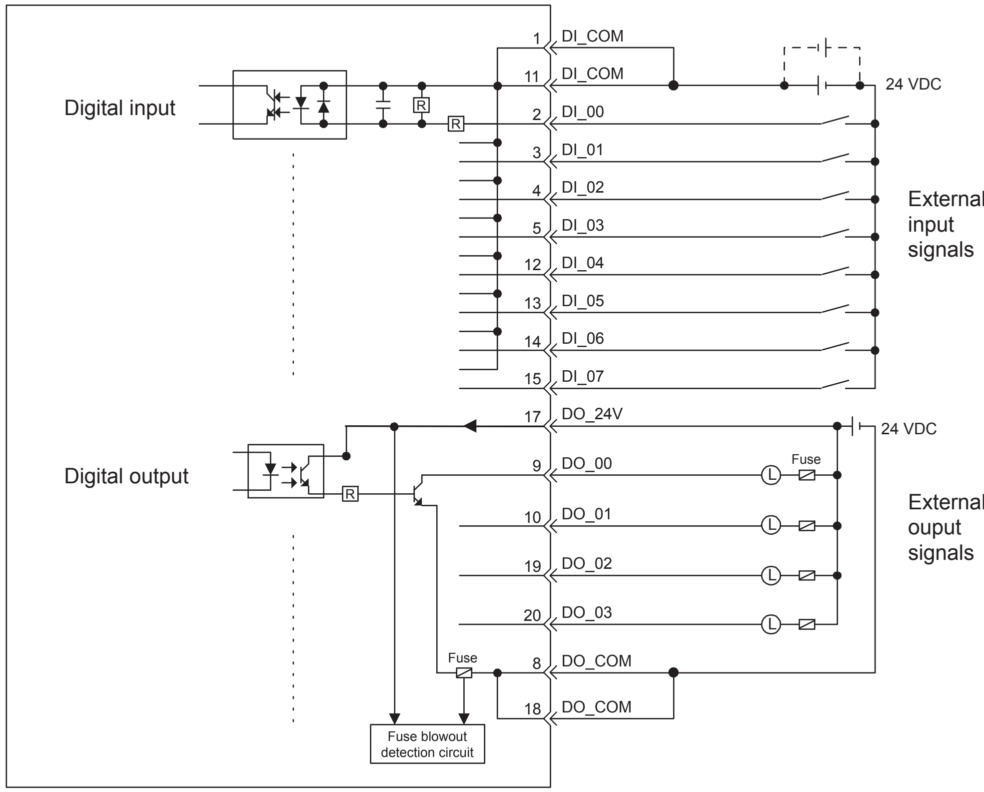


Fig. 4.3 Digital Output Circuit (Sink Mode Output)

(7) CPU I/O Connector Connections

The following diagram shows the connections for the CPU I/O connector.



- Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.
- The pins 1 and 11 and the pins 8 and 18 are internally connected. Connect them externally as well.

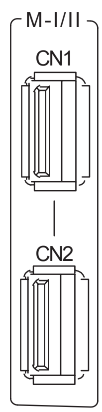
4.3 Motion Module (Optional) Connections

4.3.1 SVB-01 Module Connections

The MECHATROLINK-I/MECHATROLINK-II communication connectors (M-I/M-II) connect the SVB-01 Module to the SERVOPACK and distributed I/O.

(1) MECHATROLINK Connector Specifications and Pin Arrangement

Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
MECHATROLINK connector	M-I / II	4	USB-AR41-T11	DUSB-APA41B1-C50	DDK Ltd.



Pin No.	Signal Name	Description
1	(NC)	Not used
2	/DATA	Signal −
3	DATA	Signal +
4	SH	Not used
Shell	Shield	Connects the shield wire.

- Two connectors are provided, but the communication line supports one channel only.
- When connecting the SVB-01 Module to the end of the network, connect a JEPMC-W6022 Terminator to the unused connector.
- The top and bottom connectors are the same, so either can be connected.

(2) Cables

The same type of the cables for the MP2300 Basic Module MECHATROLINK connectors can be used for the SVB-01 Modules. For the cables for the SVB-01 Modules, refer to *4.2.3 (2) Cables* on page 4-11.

(3) Cable Connections between the SVB-01 and I/O Units and the SVB-01 and SERVOPACKs

The cable connections between the SVB-01 and I/O units and the SVB-01 and SERVOPACKs are the same as for the cable connections between the MP2300 Basic Module and I/O units and the MP2300 and SERVOPACKs. Refer to *4.2.3 (3) Cable Connections between the MP2300 and I/O Units and the MP2300 and SERVOPACKs* on page 4-12.

(4) Cable Connections between the SVB-01 and SGD-□□□N and SGDB-□□AN SERVOPACKs

The cable connections between the SVB-01 and SGD-□□□N and SGDB-□□AN SERVOPACKs are the same as for the cable connections between the MP2300 Basic Module and SGD-□□□N and SGDB-□□AN SERVOPACKs. Refer to *4.2.3 (4) Cable Connections between the MP2300 and SGD-□□□N and SGDB-□□AN SERVOPACKs* on page 4-13.

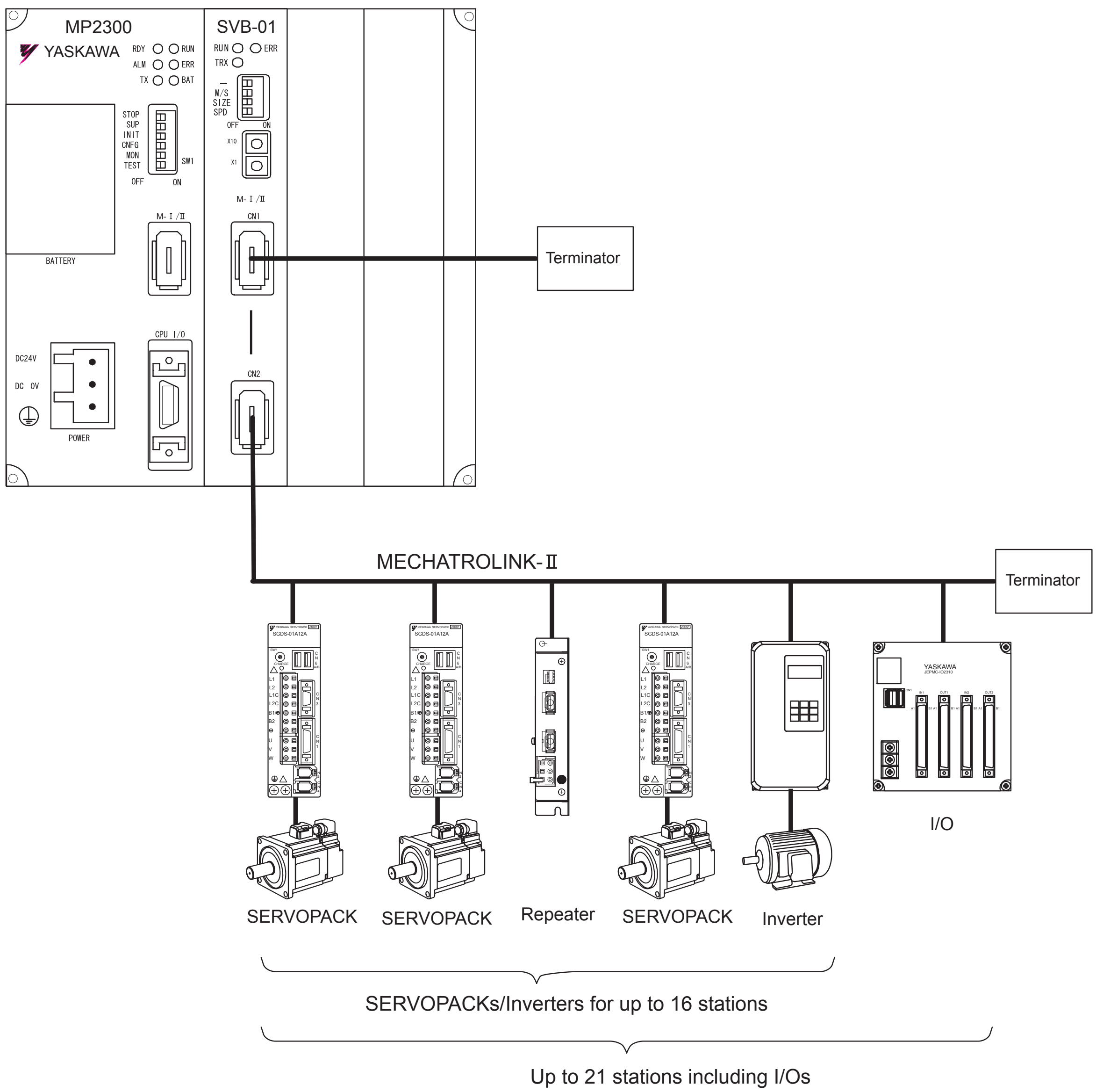
(5) Terminator

The JEPMC-W6011-☐☐ Terminator must be connected when connecting the SVB-01 Module in the MECHATROLINK network in the same way as for the MP2300 Basic Module. Refer to *4.2.3 (5) Terminator Connections* on page 4-13.

(6) System Configuration

■ Connecting the SVB-01 Module to the End of the MECHATROLINK Network

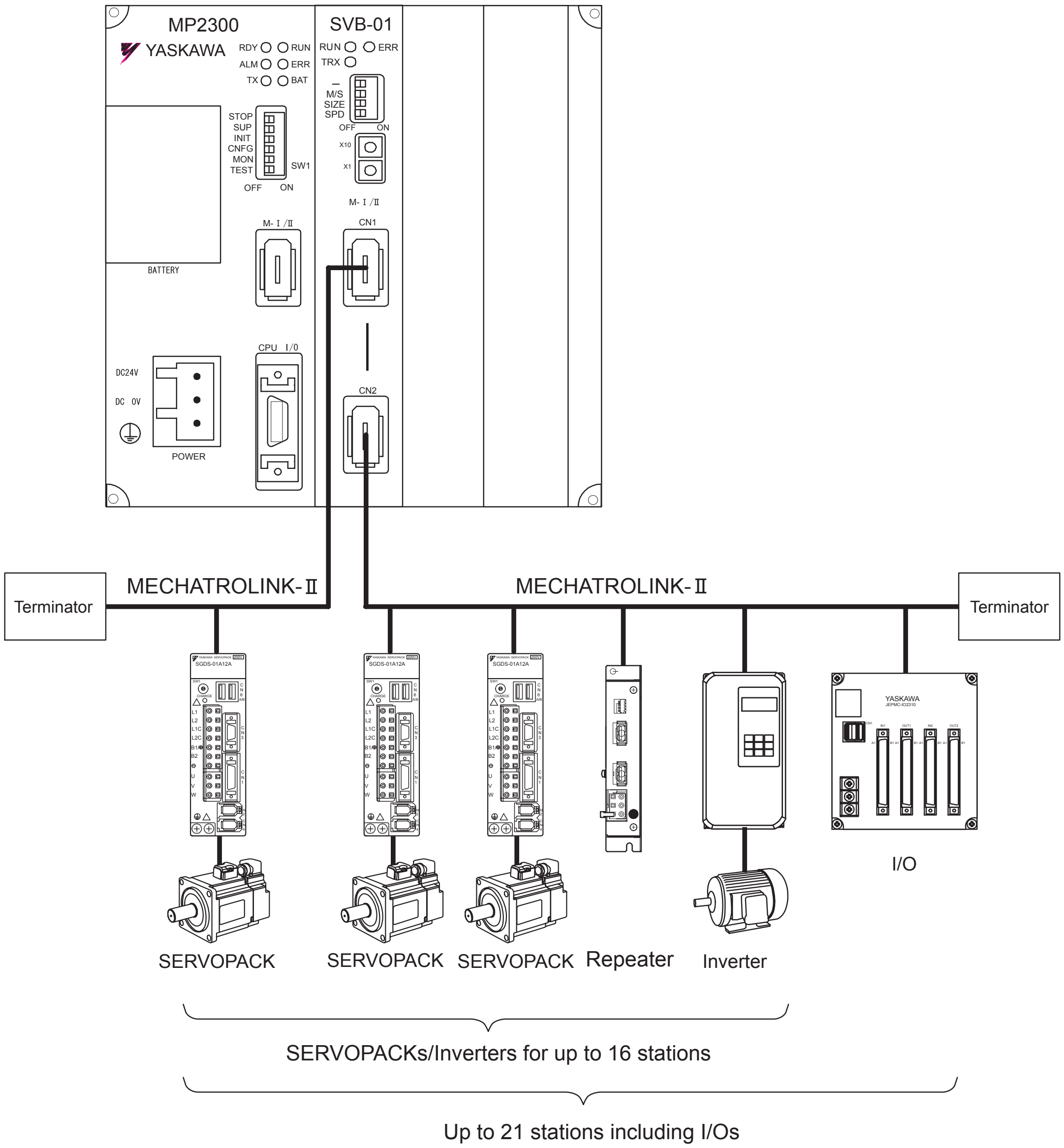
The following diagram shows the system configuration.



- Insert a JEPMC-W6022 Terminator into the unused MECHATROLINK port.

■ Connecting the SVB-01 Module in the Middle of the MECHATROLINK Network

The following diagram shows the system configuration.



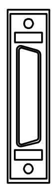
- Insert a JEPMC-W6022 Terminator into the unused MECHATROLINK port.

4.3.2 SVA-01 Module Connections

The Servo interface connectors connect the SVA-01 Module to analog Servos.

(1) Connectors

[a] Servo Interface Connectors (CN1 and CN2)



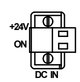
These connectors connect the SVA-01 Module to two SERVOPACKs.
They are connected using the following standard cable.

- JEPMC-W2040-☐☐ (For SGDH, SGDM, and SGDS SERVOPACKs)

♦ The user must provide cables for SGDA and SGDB SERVOPACKs.

[b] 24-V Input Connector (CN3)

This connector connects the SVA-01 Module to +24 VDC as a Servo I/O power supply.
A screw terminal connector is used (BL3.5/2F-AU manufactured by Weidmuller).



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

* Refer to *2.2.3 (1) (d) Connection Procedure for 24-V Input Cable* of *Machine Controller MP220/MP2300 Motion Module User's Manual (Manual No. SIEP C880700 16☐)* for information on how to connect the 24-V input cable.

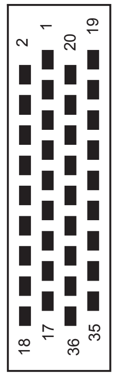
[c] Connector Specifications

The following table shows the connector specifications.

Name	Connector Name	No. of Pins	Connector Model			Cable Model Numbers
			Module Side	Cable Side	Manufacturer	
Servo Interface Connector 1 and Connector 2	CN1 CN2	36	10236-52A2JL	• Connector body: 10136-3000VE • Shell: 10336-52A0-008 (Screw locking) 10336-52F0-008 (One-touch locking)	3M	JEPMC-W2040-☐☐ (For the SGDH, SGDM, and SGDS SERVOPACKs)
24-V Input Connector	CN3	2	–	• BL3.5/2F-AU	Weidmuller	The CN3 connector is included with the SVA-01 Module, but a cable is not included. The user must connect the cable.

[d] Connector Pin Arrangement (CN1 and CN2)

The following figure shows the 36-pin arrangement of CN1 and CN2.



Arrangement viewed from Connector Wiring End on Cable

Pin	Signal	Description
2	AO_0 (NREF)	General-purpose analog output 0 (speed reference output)
4	PAL	5-V differential phase A pulse input (–)
6	PCL	5-V differential phase C pulse input (–)
8	AI_0	General-purpose analog input 0 (Feedback speed monitor input)
10	0V (For 24 V)	0 V (for 24 V) output
12	DO_2 (PCON)	General-purpose output DO_2 ★ (P action reference output)
14	DO_3	General-purpose output DO_3
16	+24V	+24 V output
18	DI_2 (ZERO/HOME LS) ◥	General-purpose input DI_2 (ZERO/HOME LS input)
1	SG	Ground (analog)
3	PA	5-V differential phase A pulse input (+)
5	PC	5-V differential phase C pulse input (+)
7	SG	Ground
9	AO_1 (TREF)	General-purpose analog output 1 (torque reference output)
11	0V (For 24 V)	0 V (for 24 V) output
13	DO_4	General-purpose output DO_4
15	DI_3 (P-OT)	General-purpose input DI_3 (positive overtravel input)
17	DI_0 (SVALM)	General-purpose input DI_0 ★ (Servo alarm input)
20	SEN (5V)	SEN Signal (Servo)
22	–	Not connected
24	PBL	5-V differential phase B pulse input (–)
26	AI-GND	Analog input ground
28	0V (For 24 V)	0 V (for 24 V) output
30	DO_1 (ALMRST)	General-purpose output DO_1 ★ (Alarm reset ouput)
32	DO_5 (SEN)	General-purpose output DO_5 ★ (VS866 24-V SEN signal)
34	+24V	+24 output
36	DI_5 (EXT/DEC) ◥	General-purpose input DI_5 (EXT/DEC signal input)
19	SG	Ground (For SEN signal)
21	AI_1	General-purpose analog input 1 (Torque (thrust) reference monitor input)
23	PB	5-V differential phase B pulse input (+)
25	SG	Ground
27	AO-GND	Analog output ground
29	0V (For 24 V)	0 V (for 24 V) output
31	DO_0 (SV ON)	General-purpose output DO_0 ★ (Servo ON output)
33	DI_4 (N-OT)	General-purpose input DI_4 (Negative overtravel input)
35	DI_1 (SRDY)	General-purpose input DI_1 ★ (Servo delay input)

Note 1. ◥: Inputs signals with a latch function.

2. ★: Signals that can be used as general-purpose I/O signals only in general-purpose I/O mode. In normal operation mode, the SVA-01 Module uses these as system I/O.

3. : Either 5 V or 24 V can be selected for the SEN signal. Connect pin 20 or pin 32 according to the application. Pin 20 (5 V) is connected in the standard cable.

(2) Cable Specifications and Connections

[a] Cables

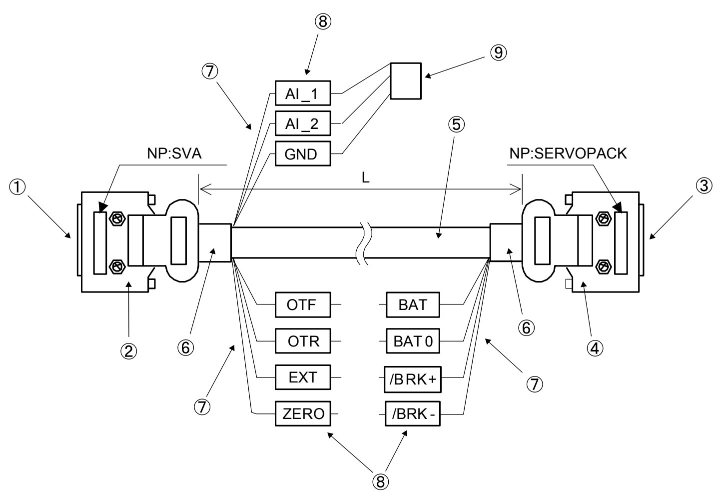
The following standard cables are available for use with the SVA-01 Module. These cables are used to connect the SVA-01 Module to SERVOPACKs, overtravel limit switches, and other machines.

Applicable SERVOPACKs	Model	Length
SGDA-☐☐☐S, SGDB-☐☐	No standard cable is available.	—
SGDM, SGDH, SGDS-☐☐☐01☐, SGDS-☐☐☐02☐	JEPMC-W2040-A5	0.5 m
	JEPMC-W2040-01	1.0 m
	JEPMC-W2040-03	3.0 m

[b] SERVOPACK Connection Cable JEPMC-W2040-☐☐

The external appearance, specifications and connections diagram of the standard cable JEPMC-W2040-☐☐ for SGDM, SGDH, SGDS-☐☐☐01☐, and SGDS-☐☐☐02☐ SERVOPACKs are shown below.

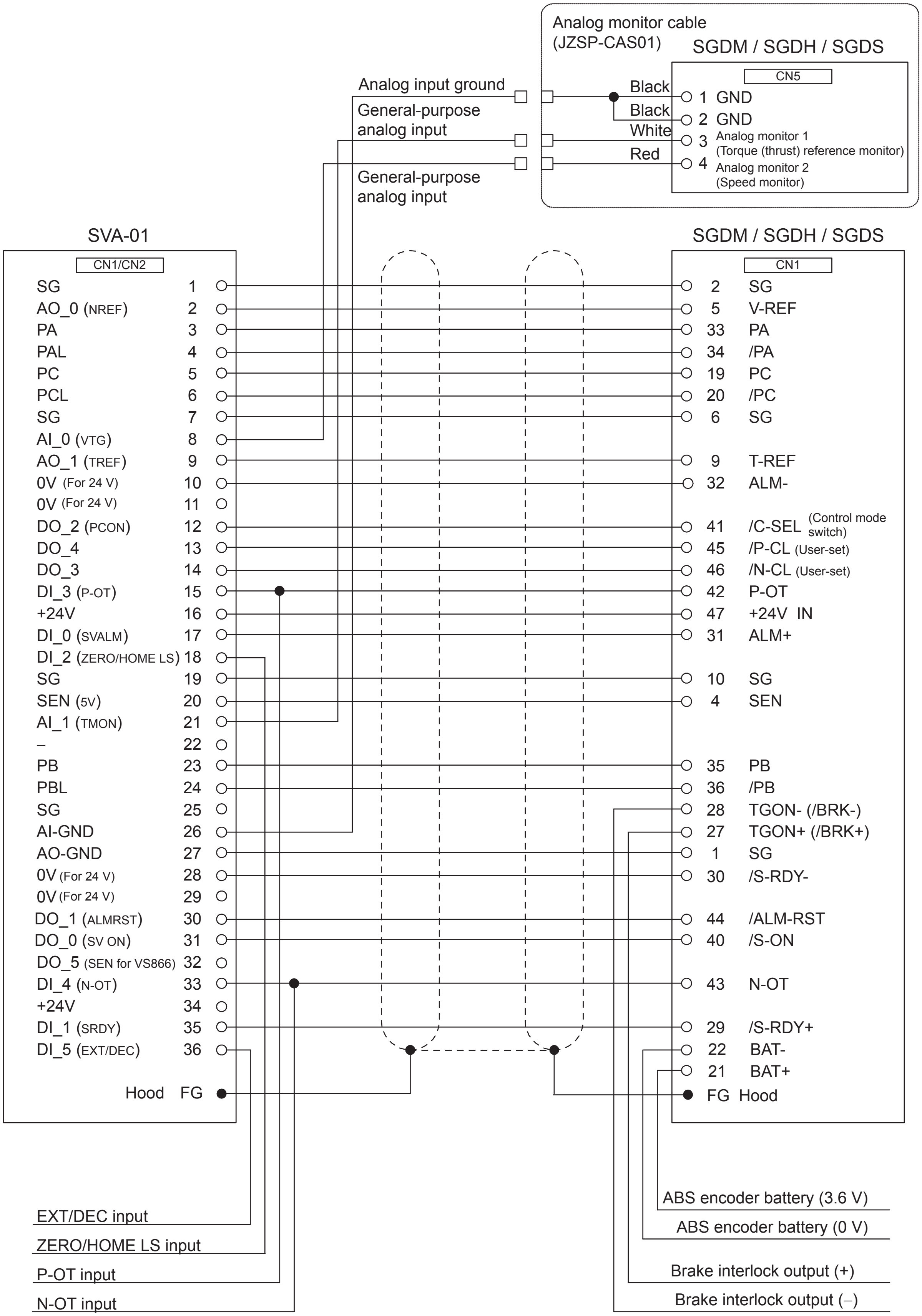
■ External Appearance



■ Specifications

No. in the above drawing	Name	Model	Qty	Manufacturer	Remarks	
①	Plug (SVA end)	10136-3000VE	1	Sumitomo 3M Corporation	Soldered	
②	Shell (SVA end)	10336-52A0-008	1	Sumitomo 3M Corporation	–	
③	Plug (SERVOPACK end)	10150-3000VE	1	Sumitomo 3M Corporation	Soldered	
④	Shell (SERVOPACK end)	10350-52Z0-008	1	Sumitomo 3M Corporation		
⑤	Cable	HP-SB/20276SR 26x28AWG	–	Taiyo Electric Wire and Cable Co., Ltd.	Shield wires	
⑥	Heat shrinkable tube	F2 (Z)	–	Sumitomo Electric Industries, Ltd.	F2 (Z) or equivalent	
⑦	Wires	UL1061 28AWG	–	–	OTF: Brown OTR: Orange EXT: Black ZERO: BAT: Blue BAT0: Purple	*BRK+: Gray *BRK-: White AI_1: White AI_2: Red GND: Black
⑧	Mark tube	2 mm dia., White	11	–	Characters in black	
⑨	Socket	DF11-4DS-2C	1	Hirose Electric Co., Ltd.	–	
	Contact	DF11-2428SCF	1	Hirose Electric Co., Ltd.	–	

■ Cable Connections Diagram



4.4 I/O Module (Optional) Connections

4.4.1 LIO-01/LIO-02 Modules

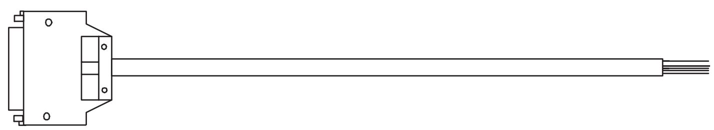
(1) Connector Specifications

Connects the external I/O signals and pulse input signals.

External input: 16 points, External output: 16 points, Pulse input: 1 channel

Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
I/O Connector	I/O	48	FCN-365P048-AU	FCN-360C048-E (cover), FCN-364J048-AU	Fujitsu component

(2) Cables

Name	Model Number	Length	(JEPMC-W2061-□□)
Cable for LIO-01/02 Modules	JEPMC-W2061-A5	0.5 m	
	JEPMC-W2061-01	1 m	
	JEPMC-W2061-03	3 m	

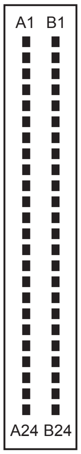
(3) Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W2061-□□ is shown below.

48-pin Connector Terminal No.	Marking		Wire Color	Marking		48-pin Connector Terminal No.
	Color	Marking		Color	Marks	
A1	Red	–	Orange	Black	–	B1
A2	Red	–	Gray	Black	–	B2
A3	Red	–	White	Black	–	B3
A4	Red	–	Yellow	Black	–	B4
A5	Red	–	Pink	Black	–	B5
A6	Red	– –	Orange	Black	– –	B6
A7	Red	– –	Gray	Black	– –	B7
A8	Red	– –	White	Black	– –	B8
A9	Red	– –	Yellow	Black	– –	B9
A10	Red	– –	Pink	Black	– –	B10
A11	Red	– – –	Orange	Black	– – –	B11
A12	Red	– – –	Gray	Black	– – –	B12
A13	Red	– – –	White	Black	– – –	B13
A14	Red	– – –	Yellow	Black	– – –	B14
A15	Red	– – –	Pink	Black	– – –	B15
A16	Red	– – – –	Orange	Black	– – – –	B16
A17	Red	– – – –	Gray	Black	– – – –	B17
A18	Red	– – – –	White	Black	– – – –	B18
A19	Red	– – – –	Yellow	Black	– – – –	B19
A20	Red	– – – –	Pink	Black	– – – –	B20
A21	Red	– – – – Continuous	Orange	Black	– – – – Continuous	B21
A22	Red	– – – – Continuous	Gray	Black	– – – – Continuous	B22
A23	Red	– – – – Continuous	White	Black	– – – – Continuous	B23
A24	Shield					B24

(4) Connector Pin Arrangement

The following table shows the connector pin arrangement for LIO-01/LIO-02 Modules viewing from the wiring side.



Pin Number	Signal Name	I/O	Remarks	Pin Number	Signal Name	I/O	Remarks
A1	PA	I	Phase-A pulse (+)	B1	PAL	I	Phase-A pulse (–)
A2	PB	I	Phase-B pulse (+)	B2	PBL	I	Phase-B pulse (–)
A3	PC	I	Phase-Z pulse (+)	B3	PCL5	I	Phase-Z pulse (–5-V input)
A4	GND	I	Pulse input ground	B4	PCL12	I	Phase-Z pulse (–12-V input)
A5	DO_COM	P	Output common	B5	DO_COM	P	Output common
A6	DO_24V	P	+24 V input	B6	DO_24V	P	+24 V input
A7	DO_15	O	Output 15	B7	DO_14	O	Output 14
A8	DO_13	O	Output 13	B8	DO_12	O	Output 12
A9	DO_11	O	Output 11	B9	DO_10	O	Output 10
A10	DO_09	O	Output 9	B10	DO_08	O	Output 8
A11	DO_07	O	Output 7	B11	DO_06	O	Output 6
A12	DO_05	O	Output 5	B12	DO_04	O	Output 4
A13	DO_03	O	Output 3	B13	DO_02	O	Output 2
A14	DO_01	O	Output 1	B14	DO_00	O	Output 0
A15	DI_15	I	Input 15	B15	DI_14	I	Input 14
A16	DI_13	I	Input 13	B16	DI_12	I	Input 12
A17	DI_11	I	Input 11	B17	DI_10	I	Input 10
A18	DI_09	I	Input 9	B18	DI_08	I	Input 8
A19	DI_07	I	Input 7	B19	DI_06	I	Input 6
A20	DI_05	I	Input 5	B20	DI_04	I	Input 4
A21	DI_03	I	Input 3	B22	DI_02	I	Input 2
A22	DI_01	I	Input 1	B22	DI_00	I	Input 0
A23	DI_COM0	P	Input common 0	B23	DI_COM1	P	Input common 1
A24	FG	–	Frame ground	B24	FG	–	Frame ground

- P: Power supply input; I: Input signal; O: Open-collector output

(5) Input Circuits

The following table shows the LIO-01/LIO-02 Module input circuit specifications.

Item	Specifications
Inputs	16 points
Input Format	Sink mode/source mode input
Isolation Method	Photocoupler
Input Voltage	±24 VDC, ±20%
Input Current	4.1 mA (typ.)
ON Voltage/Current	15 V min./2.0 mA min.
OFF Voltage/Current	5 V max./1.0 mA max.
ON Time/OFF Time	ON: 0.5 ms max. OFF: 0.5 ms max.
Number of Commons	8 points ((DI_COM0: DI_00 to DI_07, DI_COM1: DI_08 to DI_15)
Other Functions	• DI_00 is shared with interrupts. If DI_00 is turned ON while interrupts are enabled, the interrupt processing drawing is executed. • DI_01 is shared with pulse latch inputs. If DI-01 is turned ON while pulse latch inputs are enabled, the pulse counter will be latched.

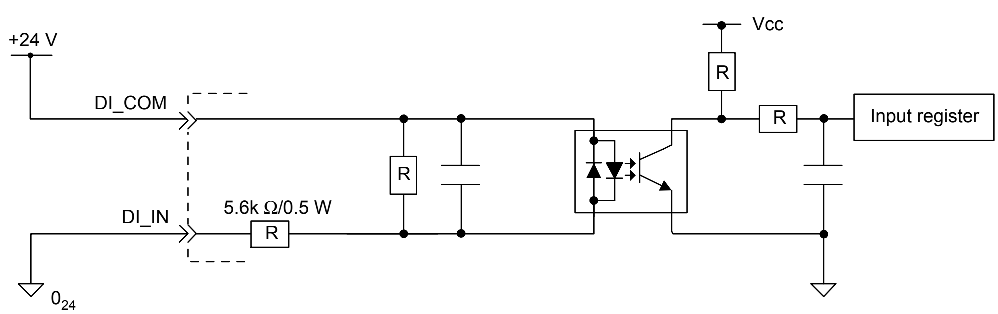


Fig. 4.4 Digital Input Circuit (Sink Mode Input)

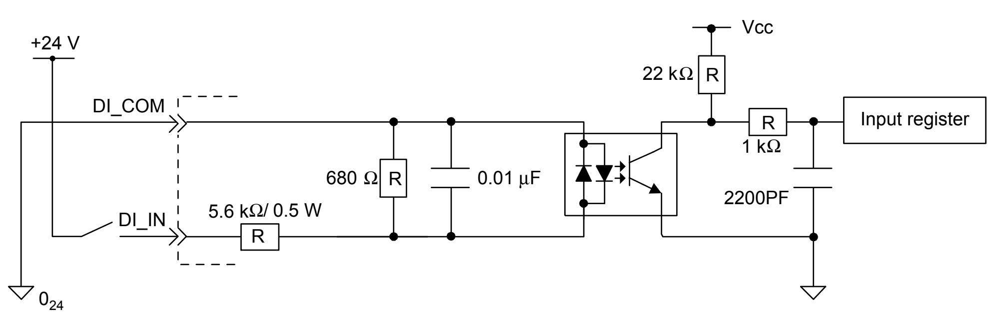


Fig. 4.5 Digital Input Circuit (Source Mode Input)

(6) Output Circuit

The following table shows the LIO-01/LIO-02 Module output circuit specifications.

Item	Specifications	
Outputs	16 points	
Output Format	LIO-01	Transistor, open collector sink mode outputs
	LIO-02	Transistor, open collector source mode outputs
Isolation Method	Photocoupler	
Output Voltage	+24 VDC, ±20%	
Output Current	100 mA max.	
Leakage Current When OFF	0.1 mA max.	
ON Time/OFF Time	ON: 1 ms max. OFF: 1 ms max.	
Number of Commons	16 points	
Protection Circuit	Fuse The fuse is not, however, for circuit protecttion. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection is required.	
Error Detection	Fuse blown detection	
Other Functions	DO_00 is shared with counter position detection.	

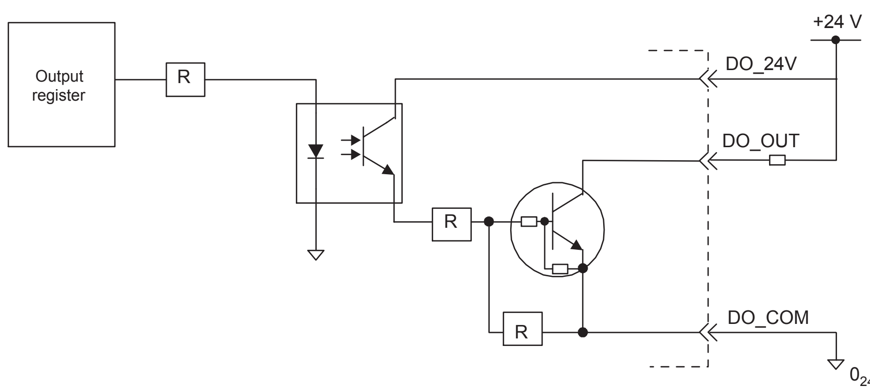


Fig. 4.6 LIO-01 Digital Output Circuit (Sink Mode Output)

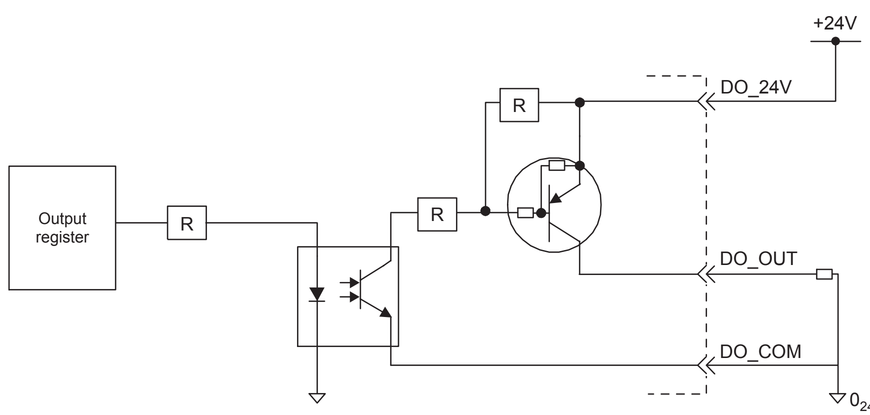


Fig. 4.7 LIO-02 Digital Output Circuit (Source Mode Output)

(7) Pulse Input Circuit

The following table shows the LIO-01/LIO-02 Module pulse input circuit specifications.

Item	Specifications
Number of Circuits	1 (Phase-A/B/Z input)
Input Circuit	Phase-AB: 5-V differential input, not isolated, max. frequency: 4 MHz Phase-Z: 5-V/12-V photocoupler input, max. frequency: 500 kHz
Input Mode	Phase-A/B, signed, incremental/decremental
Latch Input	Pulse latch on phase-Z or DI_01. Response time: 5 µs max. for phase-Z input; 60 µs max. for DI_01 input.
Other Functions	Coincidence detection, counter preset and clear

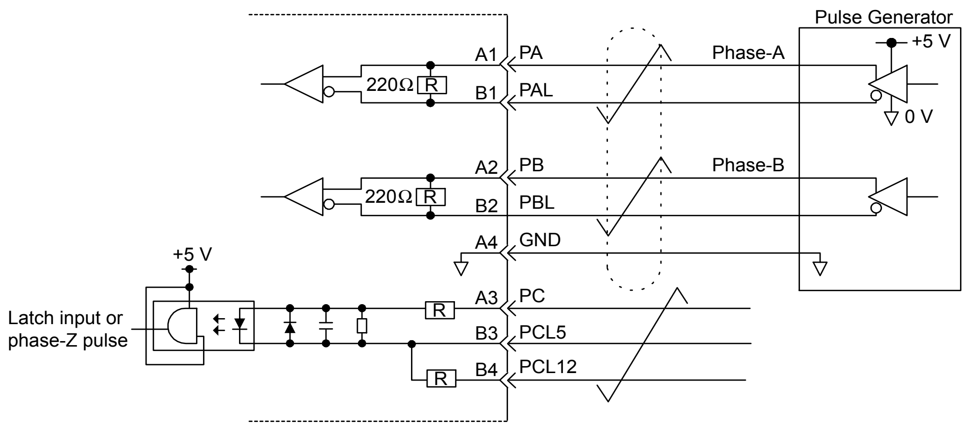
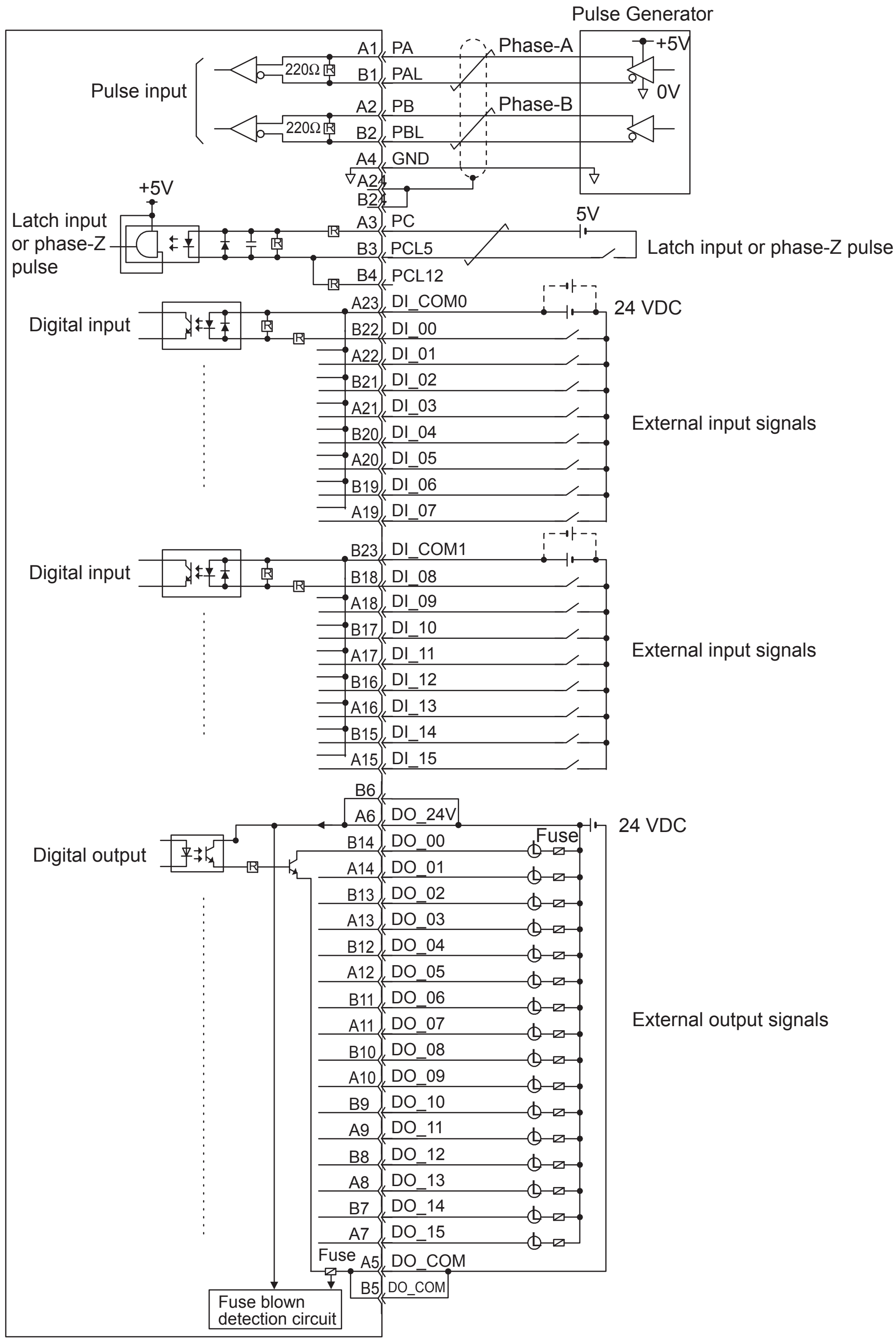


Fig. 4.8 Pulse Input Circuit

(8) LIO-01 Module Connections

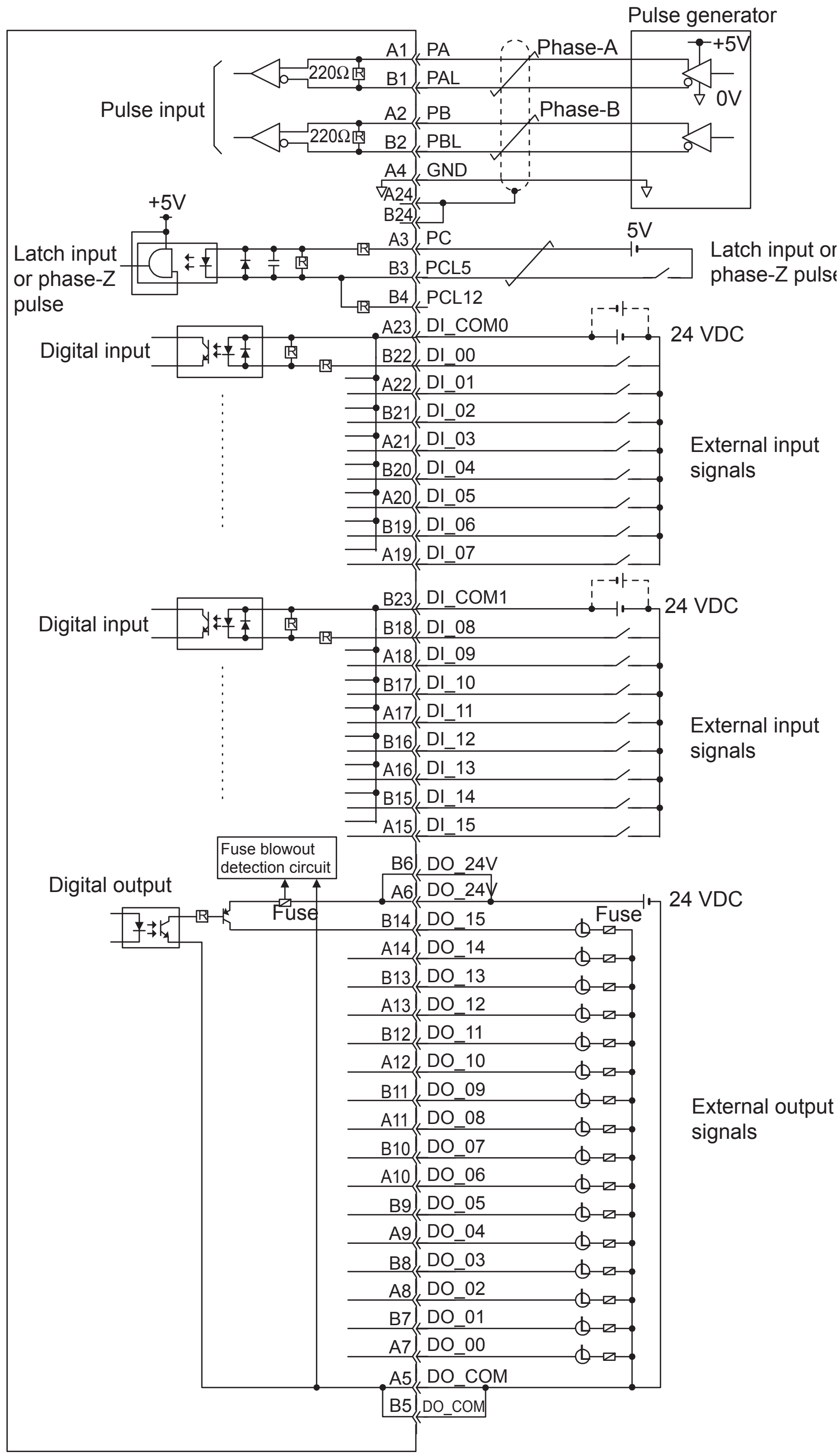
The following diagram shows a connection example for LIO-01 Module connectors.



- Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.
- The pins No. A5 and B5, and the pins A6 and B6 are internally connected. Connect them external as well.

(9) LIO-02 Module Connections

The following diagram shows a connection example for LIO-02 Module connectors.



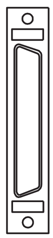
- Connect a fuse suitable for the load specifications in the output signal circuit in series with the load. If an external fuse is not connected, load shorts or overloads could result in fire, destruction of the load device, or damage to the output element.
- The pins No. A5 and B5, and the pins No. A6 and B6 are internally connected. Connect them externally as well.

4.4.2 LIO-04/LIO-05 Module Connections

(1) Connector Specifications

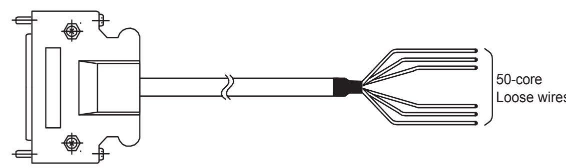
Connects external I/O signals and pulse input signals.

External input: 32 point, External output: 32 point



Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
External I/O Connector	CN1/ CN2	50	10250-52A2JL	・Connector 10150-3000VE ・Shell 10350-52A0-008 (screw locking) or 10350-52F0-008 (one-touch locking)	Sumitomo 3M Corporation

(2) Standard Cable Model and External Appearance

Name	Model	Length	External Appearance (JEPMC-6060-□□)
Cable for LIO-04/ LIO-05 Modules	JEPMC-W6060-05	0.5 m	
	JEPMC-W6060-10	1 m	
	JEPMC-W6060-30	3 m	

(3) Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6060-☐☐ is shown below.

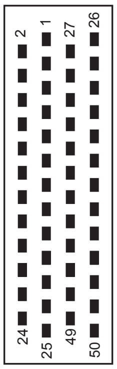
50-pin Connector Terminal No.	Marking	Wire Color	Marking	50-pin Connector Terminal No.
1	–	Orange	–	26
2	–	Gray	–	27
3	–	White	–	28
4	–	Yellow	–	29
5	–	Pink	–	30
6	– –	Orange	– –	31
7	– –	Gray	– –	32
8	– –	White	– –	33
9	– –	Yellow	– –	34
10	– –	Pink	– –	35
11	– – –	Orange	– – –	36
12	– – –	Gray	– – –	37
13	– – –	White	– – –	38
14	– – –	Yellow	– – –	39
15	– – –	Pink	– – –	40
16	– – – –	Orange	– – – – Continuous	41
17	– – – –	Gray	– – – – Continuous	42
18	– – – –	White	– – – – Continuous	43
19	– – – –	Yellow	– – – – Continuous	44
20	– – – –	Pink	– – – – Continuous	45
21	– – – – Continuous	Orange	– – – – –	46
22	– – – – Continuous	Gray	– – – – –	47
23	– – – – Continuous	White	– – – – –	48
24	– – – – Continuous	Yellow	– – – – –	49
25	– – – – Continuous	Pink	– – – – –	50

(4) LIO-04 Module Connector Pin Arrangement

The LIO-04 Module Connector (CN1 and CN2) pin arrangements are shown below.

■ CN1 Connector Pin Arrangement

Pin Arragement Viewing from Wiring Side



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	DI_00	1	DICOM_1	27	DI_01	26	
4	DI_04	3	DI_02	29	DI_05	28	DI_03
6	DICOM_2	5	DI_06	31		30	DI_07
8	DI_10	7	DI_08	33	DI_11	32	DI_09
10	DI_14	9	DI_12	35	DI_15	34	DI_13
12	DO_00	11		37	DO_01	36	
14		13	DO_02	39	OV_1	38	DO_03
16	DO_04	15	+24V_1	41	DO_05	40	
18		17	DO_06	43	OV_1	42	DO_07
20	DO_10	19	DO_08	45	DO_11	44	DO_09
22	+24V_2	21		47		46	OV_2
24	DO_14	23	DO_12	49	DO_15	48	DO_13
		25				50	OV_2

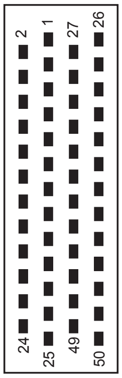
■ CN1 Connector Pin Details

Pin No.	Signal Name	I/O	Remarks	Pin No.	Signal Name	I/O	Remarks
1	DICOM_1	I	Input common 1	26			
2	DI_00	I	Digital input 0 (shared with interrupt input)	27	DI_01	I	Digital input 1 (shared with interrupt input)
3	DI_02	I	Digital input 2	28	DI_03	I	Digital input 3
4	DI_04	I	Digital input 4	29	DI_05	I	Digital input 5
5	DI_06	I	Digital input 6	30	DI_07	I	Digital input 7
6	DICOM_2	P	Input common 2	31			
7	DI_08	I	Digital input 8	32	DI_09	I	Digital input 9
8	DI_10	I	Digital input 10	33	DI_11	I	Digital input 11
9	DI_12	I	Digital input 12	34	DI_13	I	Digital input 13
10	DI_14	I	Digital input 14	35	DI_15	I	Digital input 15
11				36			
12	DO_00	O	Digital output 0	37	DO_01	O	Digital output 1
13	DO_02	O	Digital output 2	38	DO_03	O	Digital output 3
14				39	OV_1	O	Common ground 1
15	+24V_1	P	25-V power supply 1	40			
16	DO_04	O	Digital output 4	41	DO_05	O	Digital output 5
17	DO_06	O	Digital output 6	42	DO_07	O	Digital output 7
18				43	OV_1	O	Common ground 1
19	DO_08	O	Digital output 8	44	DO_09	O	Digital output 9
20	DO_10	O	Digital output 10	45	DO_11	O	Digital output 11
21				46	OV_2	O	Common ground 2
22	+24V_2	P	24-V power supply 2	47			
23	DO_12	O	Digital output 12	48	DO_13	O	Digital output 13
24	DO_14	O	Digital output 14	49	DO_15	O	Digital output 15
25				50	OV_2	O	Common ground 2

- P: Power supply input, I: Input signal, O: Open collector output

■ CN2 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



2	DI_16	1	DICOM_3	27	DI_17	26	
4	DI_20	3	DI_18	29	DI_21	28	DI_19
6	DICOM_4	5	DI_22	31		30	DI_23
8	DI_26	7	DI_24	33	DI_27	32	DI_25
10	DI_30	9	DI_28	35	DI_31	34	DI_29
12	DO_16	11		37	DO_17	36	
14		13	DO_18	39	OV_3	38	DO_19
16	DO_20	15	+24V_3	41	DO_21	40	
18		17	DO_22	43	OV_3	42	DO_23
20	DO_26	19	DO_24	45	DO_27	44	DO_25
22	+24V_4	21		47		46	OV_4
24	DO_30	23	DO_28	49	DO_31	48	DO_29
		25				50	OV_4

■ CN2 Connector Details

Pin No.	Signal Name	I/O	Remarks	Pin No.	Signal Name	I/O	Remarks
1	DICOM_3	I	Input common 3	26			
2	DI_16	I	Digital input 16 (shared with interrupt input)	27	DI_17	I	Digital input 17 (shared with interrupt input)
3	DI_18	I	Digital input 18	28	DI_19	I	Digital input 19
4	DI_20	I	Digital input 20	29	DI_21	I	Digital input 21
5	DI_22	I	Digital input 22	30	DI_23	I	Digital input 23
6	DICOM_4	P	Input common 4	31			
7	DI_24	I	Digital input 24	32	DI_25	I	Digital input 25
8	DI_26	O	Digital input 26	33	DI_27	I	Digital input 27
9	DI_28	O	Digital input 28	34	DI_29	I	Digital input 29
10	DI_30	O	Digital input 30	35	DI_31	I	Digital input 31
11				36			
12	DO_16	O	Digital output 16	37	DO_17	O	Digital output 17
13	DO_18	O	Digital output 18	38	DO_19	O	Digital output 19
14				39	OV_3	O	Common ground 3
15	+24V_3	P	24-V power supply 3	40			
16	DO_20	O	Digital output 20	41	DO_21	O	Digital output 21
17	DO_22	O	Digital output 22	42	DO_23	O	Digital output 23
18				43	OV_3	O	Common ground 3
19	DO_24	O	Digital output 24	44	DO_25	O	Digital output 25
20	DO_26	O	Digital output 26	45	DO_27	O	Digital output 27
21				46	OV_4	O	Common ground 4
22	+24V_4	P	24-V power supply 4	47			
23	DO_28	O	Digital output 28	48	DO_29	O	Digital output 29
24	DO_30	O	Digital output 30	49	DO_31	O	Digital output 31
25				50	OV_4	O	Common ground 4

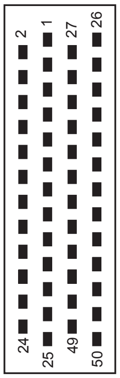
- P: Power supply input, I: Input signal, O: Open collector output

(5) LIO-05 Module Connector Pin Arrangement

The LIO-05 Module Connector (CN1 and CN2) pin arrangements are shown below.

■ CN1 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



2	DI_00	1	DICOM_1	27	DI_01	26	
4	DI_04	3	DI_02	29	DI_05	28	DI_03
6	DICOM_2	5	DI_06	31		30	DI_07
8	DI_10	7	DI_08	33	DI_11	32	DI_09
10	DI_14	9	DI_12	35	DI_15	34	DI_13
12	DO_00	11		37	DO_01	36	
14		13	DO_02	39	OV_1	38	DO_03
16	DO_04	15	+24V_1	41	DO_05	40	+24V_1
18		17	DO_06	43		42	DO_07
20	DO_10	19	DO_08	45	DO_11	44	DO_09
22	+24V_2	21		47	+24V_2	46	OV_2
24	DO_14	23	DO_12	49	DO_15	48	DO_13
		25				50	

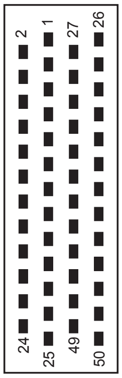
■ CN1 Connector Details

Pin No.	Signal Name	I/O	Remarks	Pin No.	Signal Name	I/O	Remarks
1	DICOM_1	I	Input common 1	26			
2	DI_00	I	Digital input 0 (shared with interrupt input)	27	DI_01	I	Digital input 1 (shared with interrupt input)
3	DI_02	I	Digital input 2	28	DI_03	I	Digital input 3
4	DI_04	I	Digital input 4	29	DI_05	I	Digital input 5
5	DI_06	I	Digital input 6	30	DI_07	I	Digital input 7
6	DICOM_2	P	Input common 2	31			
7	DI_08	I	Digital input 8	32	DI_09	I	Digital input 9
8	DI_10	I	Digital input 10	33	DI_11	I	Digital input 11
9	DI_12	I	Digital input 12	34	DI_13	I	Digital input 13
10	DI_14	I	Digital input 14	35	DI_15	I	Digital input 15
11				36			
12	DO_00	O	Digital output 0	37	DO_01	O	Digital output 1
13	DO_02	O	Digital output 2	38	DO_03	O	Digital output 3
14				39	OV_1	O	Common ground 1
15	+24V_1	P	24-V power supply 1	40	+24V_1	P	24-V power supply 1
16	DO_04	O	Digital output 4	41	DO_05	O	Digital output 5
17	DO_06	O	Digital output 6	42	DO_07	O	Digital output 7
18				43		O	
19	DO_08	O	Digital output 8	44	DO_09	O	Digital output 9
20	DO_10	O	Digital output 10	45	DO_11	O	Digital output 11
21				46	OV_2	O	Common ground 2
22	+24V_2	P	24-V power supply 2	47	+24V_2	P	24-V power supply 2
23	DO_12	O	Digital output 12	48	DO_13	O	Digital output 13
24	DO_14	O	Digital output 14	49	DO_15	O	Digital output 15
25				50			

- P: Power supply input, I: Input signal, O: Open collector output

■ CN2 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
2	DI_16	1	DICOM_3	27	DI_17	26	
4	DI_20	3	DI_18	29	DI_21	28	DI_19
6	DICOM_4	5	DI_22	31		30	DI_23
8	DI_26	7	DI_24	33	DI_27	32	DI_25
10	DI_30	9	DI_28	35	DI_31	34	DI_29
12	DO_16	11		37	DO_17	36	
14		13	DO_18	39	OV_3	38	DO_19
16	DO_20	15	+24V_3	41	DO_21	40	+24V_3
18		17	DO_22	43	OV_3	42	DO_23
20	DO_26	19	DO_24	45	DO_27	44	DO_25
22	+24V_4	21		47	+24V_4	46	
24	DO_30	23	DO_28	49	DO_31	48	DO_29
		25				50	

■ CN2 Connector Details

Pin No.	Signal Name	I/O	Remarks	Pin No.	Signal Name	I/O	Remarks
1	DICOM_3	I	Input common 3	26			
2	DI_16	I	Digital input 16 (shared with interrupt input)	27	DI_17	I	Digital input 17 (shared with interrupt input)
3	DI_18	I	Digital input 18	28	DI_19	I	Digital input 19
4	DI_20	I	Digital input 20	29	DI_21	I	Digital input 21
5	DI_22	I	Digital input 22	30	DI_23	I	Digital input 23
6	DICOM_4	P	Input common 4	31			
7	DI_24	I	Digital input 24	32	DI_25	I	Digital input 25
8	DI_26	O	Digital input 26	33	DI_27	I	Digital input 27
9	DI_28	O	Digital input 28	34	DI_29	I	Digital input 29
10	DI_30	O	Digital input 30	35	DI_31	I	Digital input 31
11				36			
12	DO_16	O	Digital output 16	37	DO_17	O	Digital output 17
13	DO_18	O	Digital output 18	38	DO_19	O	Digital output 19
14				39	OV_3	O	Common ground 3
15	+24V_3	P	24-V power supply 3	40	+24V_3	P	24-V power supply 3
16	DO_20	O	Digital output 20	41	DO_21	O	Digital output 21
17	DO_22	O	Digital output 22	42	DO_23	O	Digital output 23
18				43			
19	DO_24	O	Digital output 24	44	DO_25	O	Digital output 25
20	DO_26	O	Digital output 26	45	DO_27	O	Digital output 27
21				46	OV_4	O	Common ground 4
22	+24V_4	P	24-V power supply 4	47	+24V_4	P	24-V power supply 4
23	DO_28	O	Digital output 28	48	DO_29	O	Digital output 29
24	DO_30	O	Digital output 30	49	DO_31	O	Digital output 31
25				50			

- P: Power supply input, I: Input signal, O: Open collector output

(6) Input Circuit

The following table shows the LIO-04/LIO-05 Module input circuit specifications.

Item	Specifications
Inputs	32 points
Input Format	Sink mode/source mode input
Isolation Method	Photocoupler (PS2805-4)
Input Voltage	±24 VDC (+19.2 to +28.8 V)
Input Current	4.1 mA (typ.)
ON Voltage/Current	15 VDC min./2.0 mA min.
OFF Voltage/Current	5 VDC min./1.0 mA min.
ON Time/OFF Time	ON: 0.5 ms max. OFF: 0.5 ms max.
Number of Commons	Common ground
Other Functions	DI_00 is shared with an interrupt input. If DI_00 is turned ON while interrupts are enabled, the interrupt processing drawing is executed. DI_01, DI_16, and DI_7 are the same as DI_00.

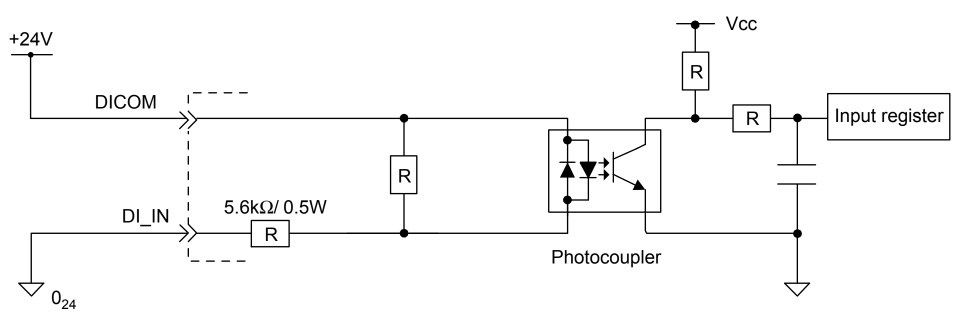


Fig. 4.9 Digital Input Circuit (Sink Mode Input)

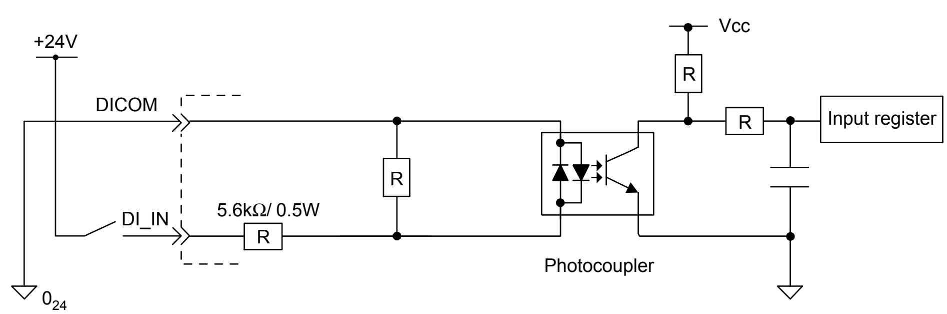


Fig. 4.10 Digital Input Circuit (Source Mode Input)

(7) Output Circuit

The following table shows the LIO-04/LIO-05 Module output circuit specifications.

Item	Specifications	
Outputs	32 points	
Output Format	LIO-04	Transistor, sink mode output
	LIO-05	Transistor, source mode output
Isolation Method	Photocoupler	
Output Voltage	+24 VDC (+192 to +28.8 VDC)	
Output Current	100 mA max.	
Leakage Current When OFF	0.1 mA max.	
ON Time/OFF Time	ON: 0.5 ms max. OFF: 1 ms max.	
Number of Commons	Common ground	
Protection Circuit	Fuse The fuse is not, however, for circuit protection. It is for protecting against fire at output shorts. Attach a fuse externally to each output if circuit protection is required.	
Fuse Rating	1 A	
Error Detection	Fuse blowout detection	

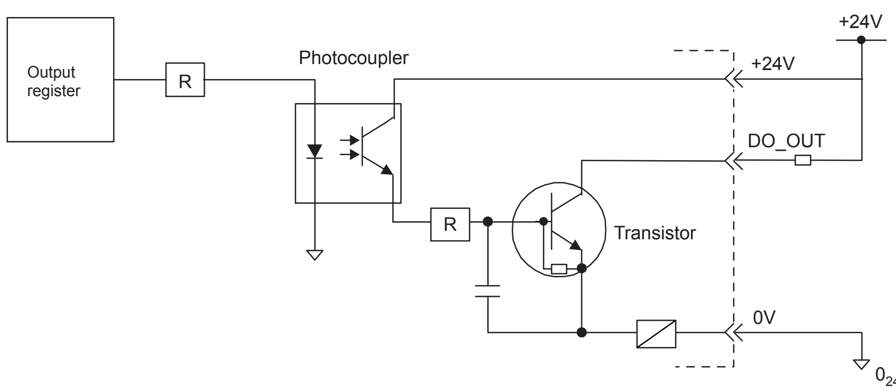


Fig. 4.11 LIO-04 Digital Output Circuit (Sink Mode Output)

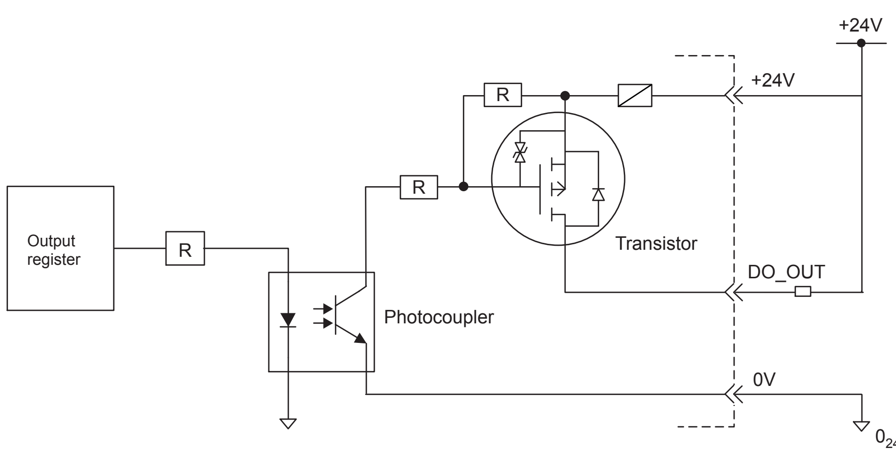
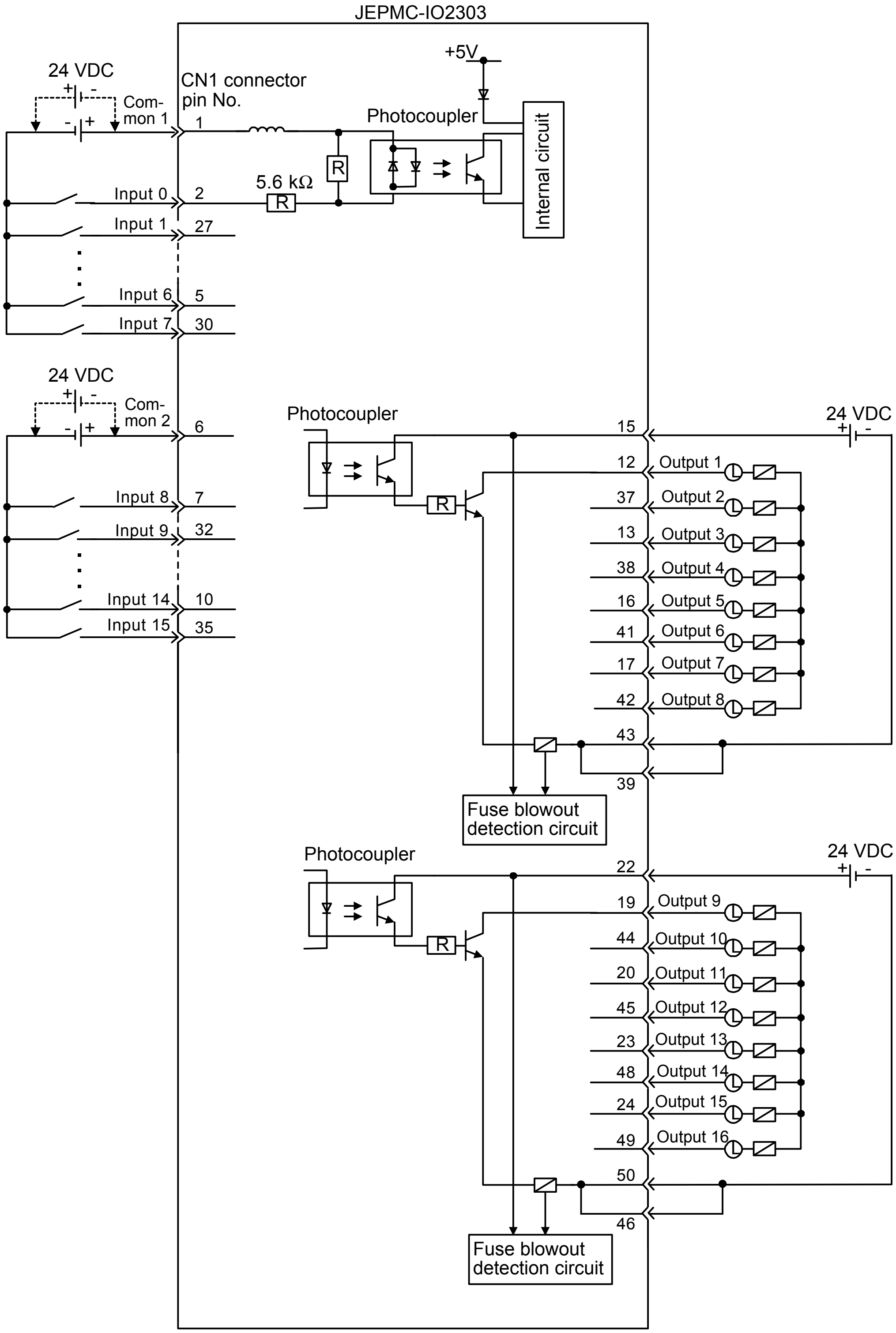


Fig. 4.12 LIO-05 Digital Output Circuit (Source Mode Output)

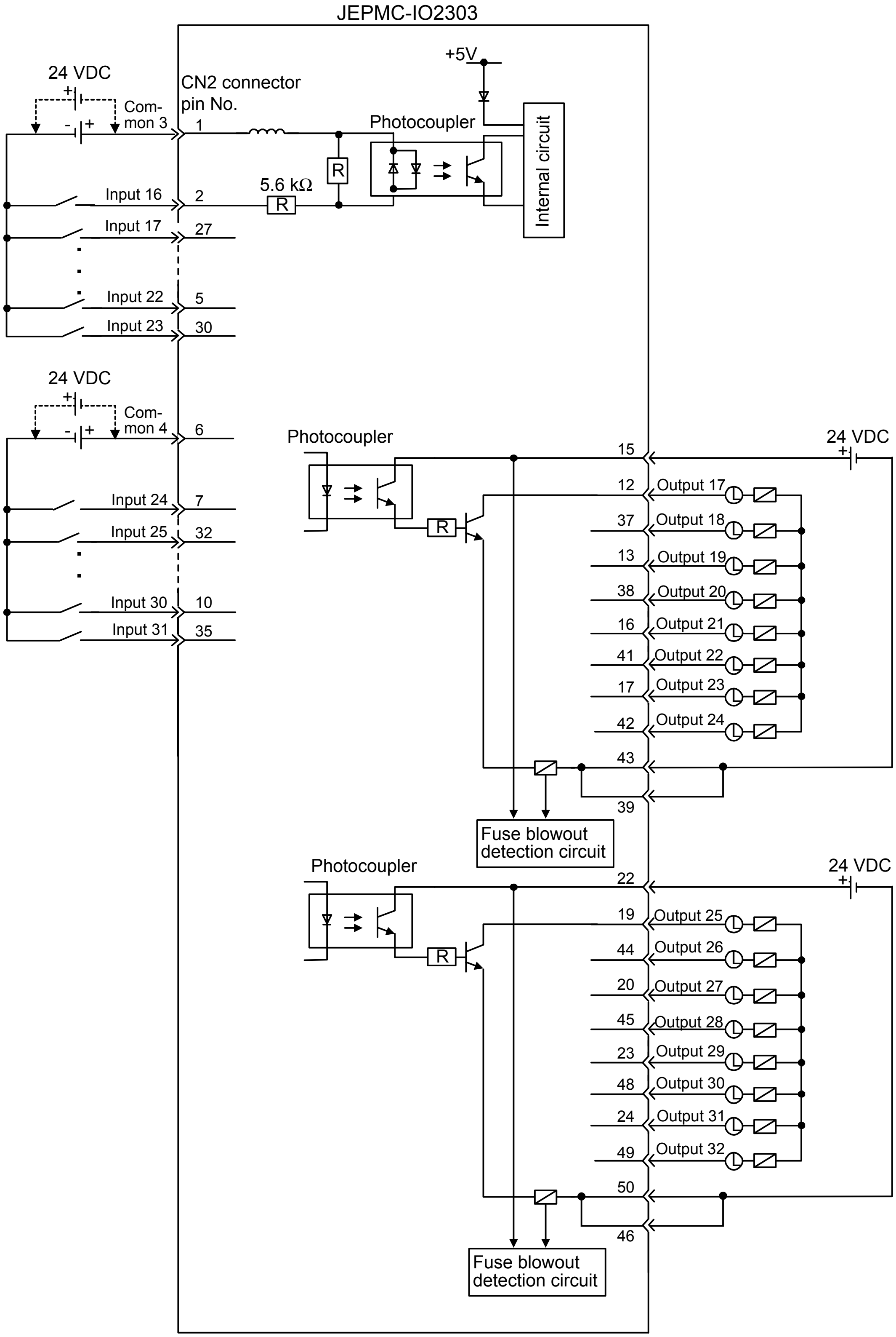
(8) LIO-04 Module Connector Connection Examples

■ CN1 Connector Connection Example



- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins No. 39 and 43 and the pins No. 46 and 50 are internally connected. Connect them externally as well.

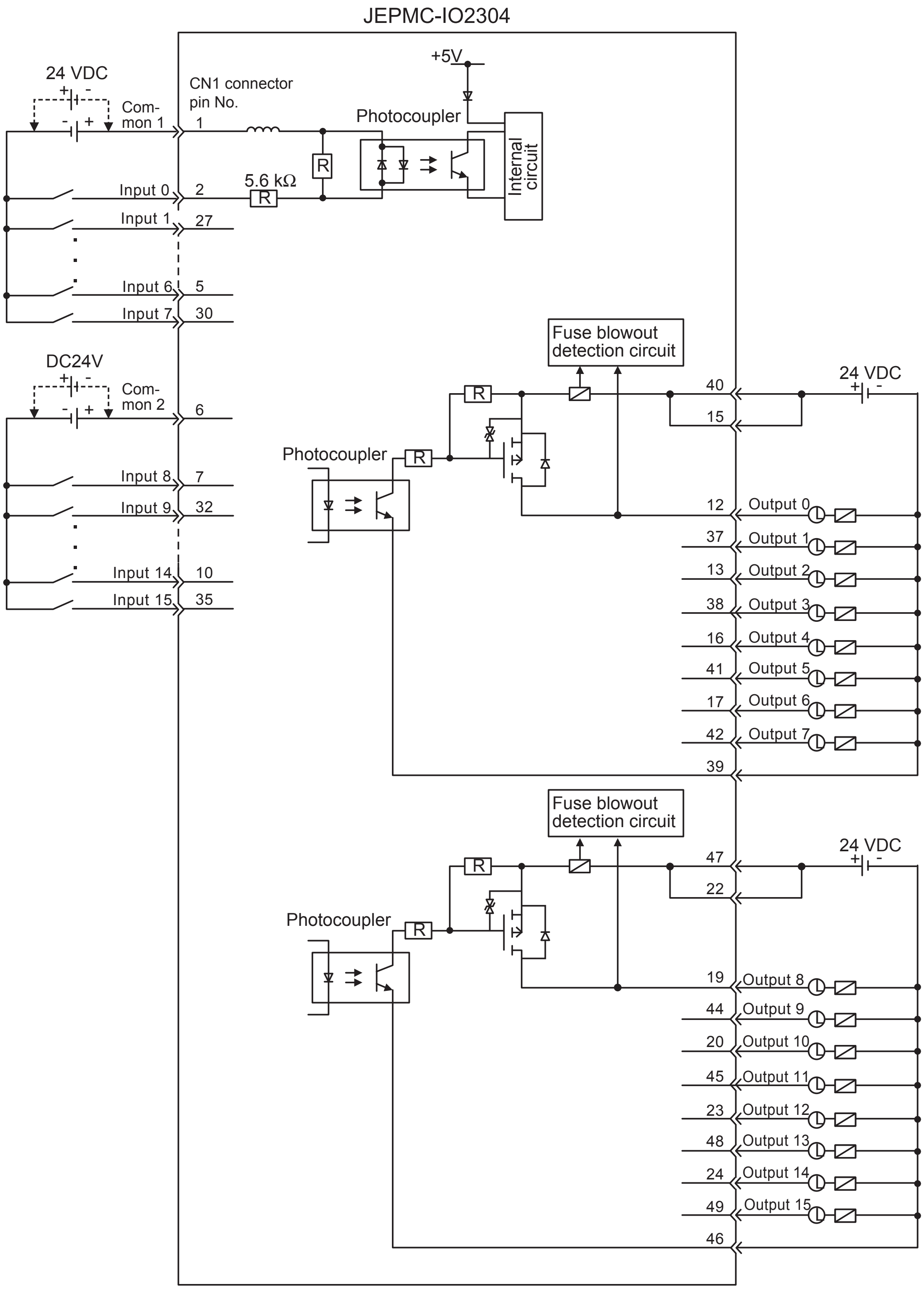
■ CN2 Connector Connection Example



- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins No. 39 and 32 and the pins No. 46 and 50 are internally connected. Connect them externally as well.

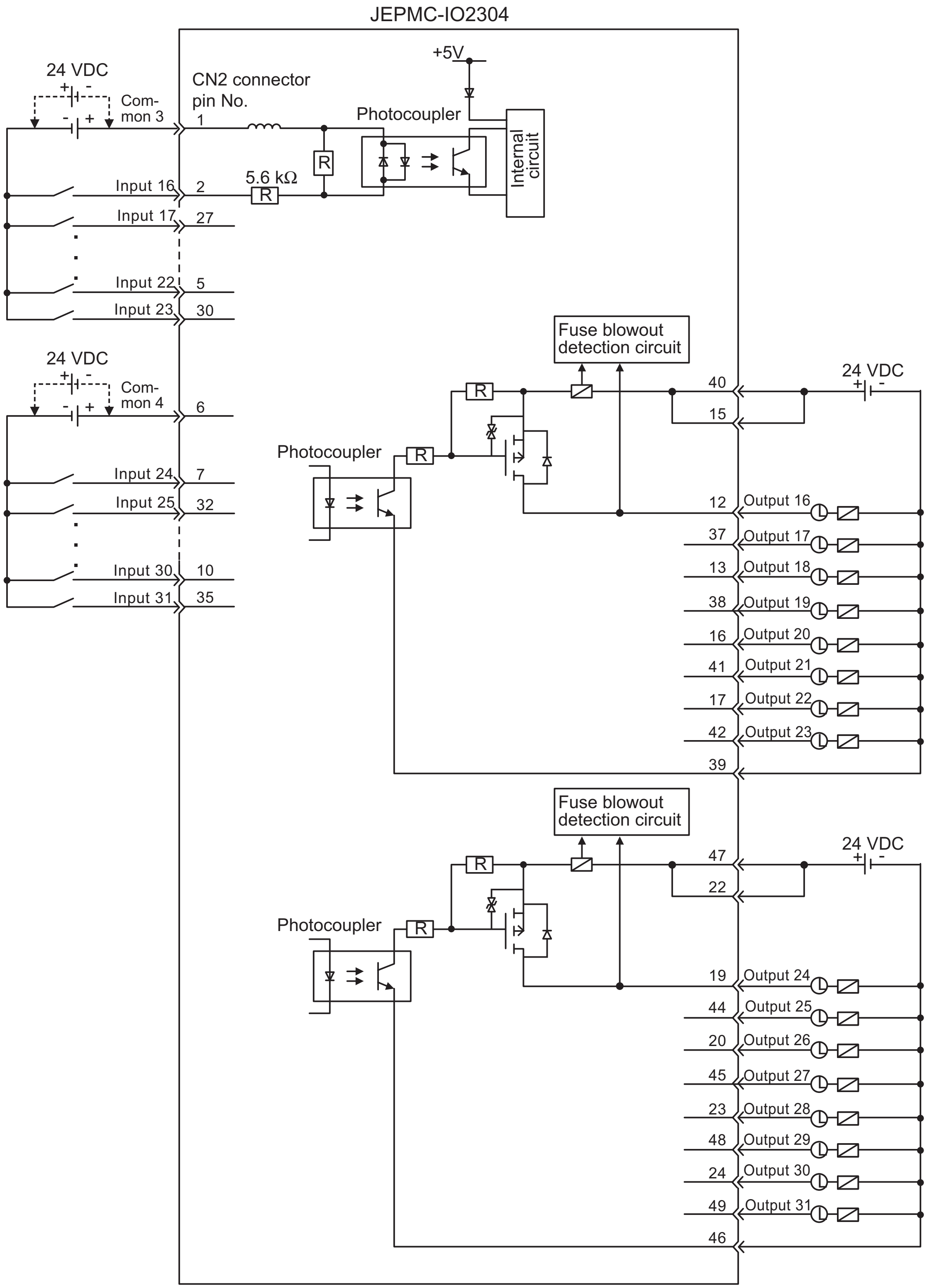
(9) LIO-05 Module Connector Connection Examples

■ CN1 Connector Connection Example



- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins No. 15 and 40 and the pins No. 22 and 47 are internally connected. Connect them externally as well.

■ CN2 Connector Connection Example



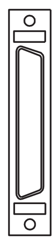
- Check the polarity of the external power supply when wiring. An adverse connection may cause a load malfunction.
- The pins No. 15 and 40 and the pins 22 and 47 are internally connected. Connect them externally as well.

4.4.3 DO-01 Module Connections

(1) Connector Specifications

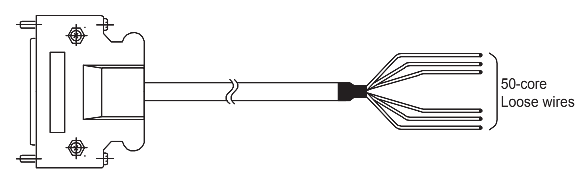
Connects the DO-01 Module to external output signals.

External outputs: 64 points



Name	Connector Name	No of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
External I/O Connector	CN1/CN2	50	10250-52A2JL	・Connector 10150-3000VE ・Shell 10350-52A0-008 (Screw locking), or 10350-52F0-008 (One-touch locking)	Sumitomo 3M Corporation

(2) Standard Cable Model and External Appearance

Name	Model	Length	External Appearance (JEPMC-W6060-□□)
Cables for DO-01 Modules	JEPMC-W6060-05	0.5 m	
	JEPMC-W6060-10	1.0 m	
	JEPMC-W6060-30	3.0 m	

(3) Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6060-☐☐ is shown below.

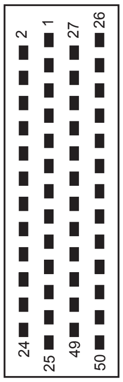
50-pin Connector Terminal No.	Marking	Wire Color	Marking	50-pin Connector Terminal No.
1	–	Orange	–	26
2	–	Gray	–	27
3	–	White	–	28
4	–	Yellow	–	29
5	–	Pink	–	30
6	– –	Orange	– –	31
7	– –	Gray	– –	32
8	– –	White	– –	33
9	– –	Yellow	– –	34
10	– –	Pink	– –	35
11	– – –	Orange	– – –	36
12	– – –	Gray	– – –	37
13	– – –	White	– – –	38
14	– – –	Yellow	– – –	39
15	– – –	Pink	– – –	40
16	– – – –	Orange	– – – Continuous	41
17	– – – –	Gray	– – – Continuous	42
18	– – – –	White	– – – Continuous	43
19	– – – –	Yellow	– – – Continuous	44
20	– – – –	Pink	– – – Continuous	45
21	– – – – Continuous	Orange	– – – – –	46
22	– – – – Continuous	Gray	– – – – –	47
23	– – – – Continuous	White	– – – – –	48
24	– – – – Continuous	Yellow	– – – – –	49
25	– – – – Continuous	Pink	– – – – –	50

(4) Connector Pin Arrangement

The DO-01 Module Connector (CN1 and CN2) pin arrangement is shown below.

■ CN1 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



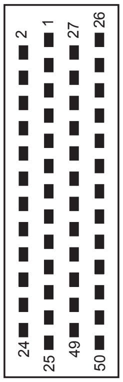
2	DO_00	1	+24V_1	27	DO_01	26	OV_1
4	DO_04	3	DO_02	29	DO_15	28	DO_03
6	OV_1	5	DO_06	31	OV_1	30	DO_07
8	DO_08	7	+24V_2	33	DO_09	32	OV_2
10	DO_12	9	DO_10	35	DO_13	34	DO_11
12	OV_2	11	DO_14	37	OV_2	36	DO_15
14	DO_16	13	+24V_3	39	DO_17	38	OV_3
16	DO_20	15	DO_18	41	DO_21	40	DO_19
18	OV_3	17	DO_22	43	OV_3	42	DO_23
20	DO_24	19	+24V_4	45	DO_25	44	OV_4
22	DO_28	21	DO_26	47	DO_29	46	DO_27
24	OV_4	23	DO_30	49	OV_4	48	DO_31
		25				50	

■ CN1 Connector Details

Pin No.	Signal Name	Remarks	Pin No.	Signal Name	Remarks
1	+24V_1	24-V power supply 0	26	0V_1	Common ground 1
2	DO_00	Digital output 0	27	DO_01	Digital output 1
3	DO_02	Digital output 2	28	DO_03	Digital output 3
4	DO_04	Digital output 4	29	DO_05	Digital output 5
5	DO_06	Digital output 6	30	DO_07	Digital output 7
6	0V_1	Common ground 1	31	0V_1	Common ground 1
7	+24V_2	24-V power supply 2	32	0V_2	Common ground 2
8	DO_08	Digital output 8	33	DO_09	Digital output 9
9	DO_10	Digital output 10	34	DO_11	Digital output 11
10	DO_12	Digital output 12	35	DO_13	Digital output 13
11	DO_14	Digital output 14	36	DO_15	Digital output 15
12	0V_2	Common ground 2	37	0V_2	Common ground 2
13	+24V_3	24-V power supply 3	38	0V_3	Common ground 3
14	DO_16	Digital output 16	39	DO_17	Digital output 17
15	DO_18	Digital output 18	40	DO_19	Digital output 19
16	DO_20	Digital output 20	41	DO_21	Digital output 21
17	DO_22	Digital output 22	42	DO_23	Digital output 23
18	0V_3	Common ground 3	43	0V_3	Common ground 3
19	+24V_4	24-V power supply 4	44	0V_4	Common ground 4
20	DO_24	Digital output 24	45	DO_25	Digital output 25
21	DO_26	Digital output 26	46	DO_27	Digital output 27
22	DO_28	Digital output 28	47	DO_29	Digital output 29
23	DO_30	Digital output 30	48	DO_31	Digital output 31
24	0V_4	Common ground 4	49	0V_4	Common ground 4
25			50		

■ CN2 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



2	DO_32	1	+24V_5	27	DO_33	26	OV_5
4	DO_36	3	DO_34	29	DO_37	28	DO_35
6	OV_5	5	DO_38	31	OV_5	30	DO_39
8	DO_40	7	+24V_6	33	DO_41	32	OV_6
10	DO_44	9	DO_42	35	DO_45	34	DO_43
12	OV_6	11	DO_46	37	OV_6	36	DO_47
14	DO_48	13	+24V_7	39	DO_49	38	OV_7
16	DO_52	15	DO_50	41	DO_53	40	DO_51
18	OV_7	17	DO_54	43	OV_7	42	DO_55
20	DO_56	19	+24V_8	45	DO_57	44	OV_8
22	DO_60	21	DO_58	47	DO_61	46	DO_59
24	OV_8	23	DO_62	49	OV_8	48	DO_63
		25				50	

■ CN2 Connector Details

Pin No.	Signal Name	Remarks	Pin No.	Signal Name	Remarks
1	+24V_5	+24-V power supply 5	26	0V_5	Common ground 5
2	DO_32	Digital output 32	27	DO_33	Digital output 33
3	DO_34	Digital output 34	28	DO_35	Digital output 35
4	DO_36	Digital output 36	29	DO_37	Digital output 37
5	DO_38	Digital output 38	30	DO_39	Digital output 39
6	0V_5	Common ground 5	31	0V_5	Common ground 5
7	+24V_6	+24-V power supply 6	32	0V_6	Common ground 6
8	DO_40	Digital output 40	33	DO_41	Digital output 41
9	DO_42	Digital output 42	34	DO_43	Digital output 43
10	DO_44	Digital output 44	35	DO_45	Digital output 45
11	DO_46	Digital output 46	36	DO_47	Digital output 47
12	0V_6	Common ground 6	37	0V_6	Common ground 6
13	+24V_7	+24-V power supply 7	38	0V_7	Common ground 7
14	DO_48	Digital output 48	39	DO_49	Digital output 49
15	DO_50	Digital output 50	40	DO_51	Digital output 51
16	DO_52	Digital output 52	41	DO_53	Digital output 53
17	DO_54	Digital output 54	42	DO_55	Digital output 55
18	0V_7	Common ground 7	43	0V_7	Common ground 7
19	+24V_8	+24-V power supply 8	44	0V_8	Common ground 8
20	DO_56	Digital output 56	45	DO_57	Digital output 57
21	DO_58	Digital output 58	46	DO_59	Digital output 59
22	DO_60	Digital output 60	47	DO_61	Digital output 61
23	DO_62	Digital output 62	48	DO_63	Digital output 63
24	0V_8	Common ground 8	49	0V_8	Common ground 8
25			50		

(5) Output Circuit

The following table shows the DO-01 Module output circuit specifications.

Item	Specifications
Outputs	64 points
Output Format	Transistor/open collector, sink mode output
Isolation Method	Photocoupler
Output Voltage	+ 24 VDC (+19.2 V to +28.8 V)
Output Current	100 mA max.
Leakage Current When OFF	0.1 mA max.
ON Time/OFF Time	ON: 0.5 ms max. OFF: 1 ms max.
Number of Commons	8 points
Protection Circuit	Fuse connected to each common line
Fuse Rating	1 A
Error Detection	Fuse blowout detection

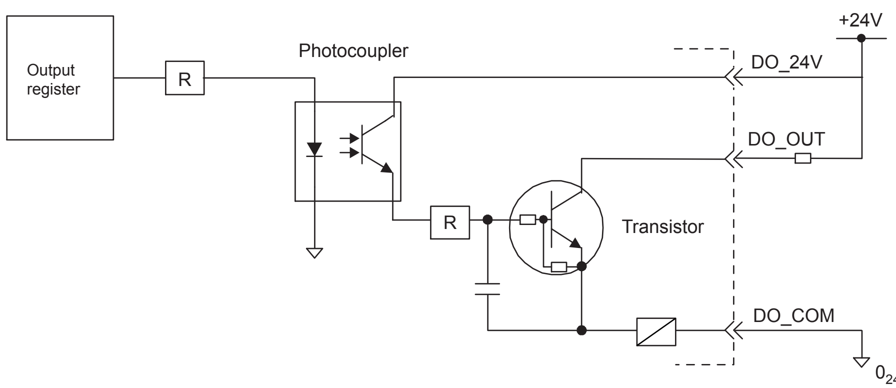
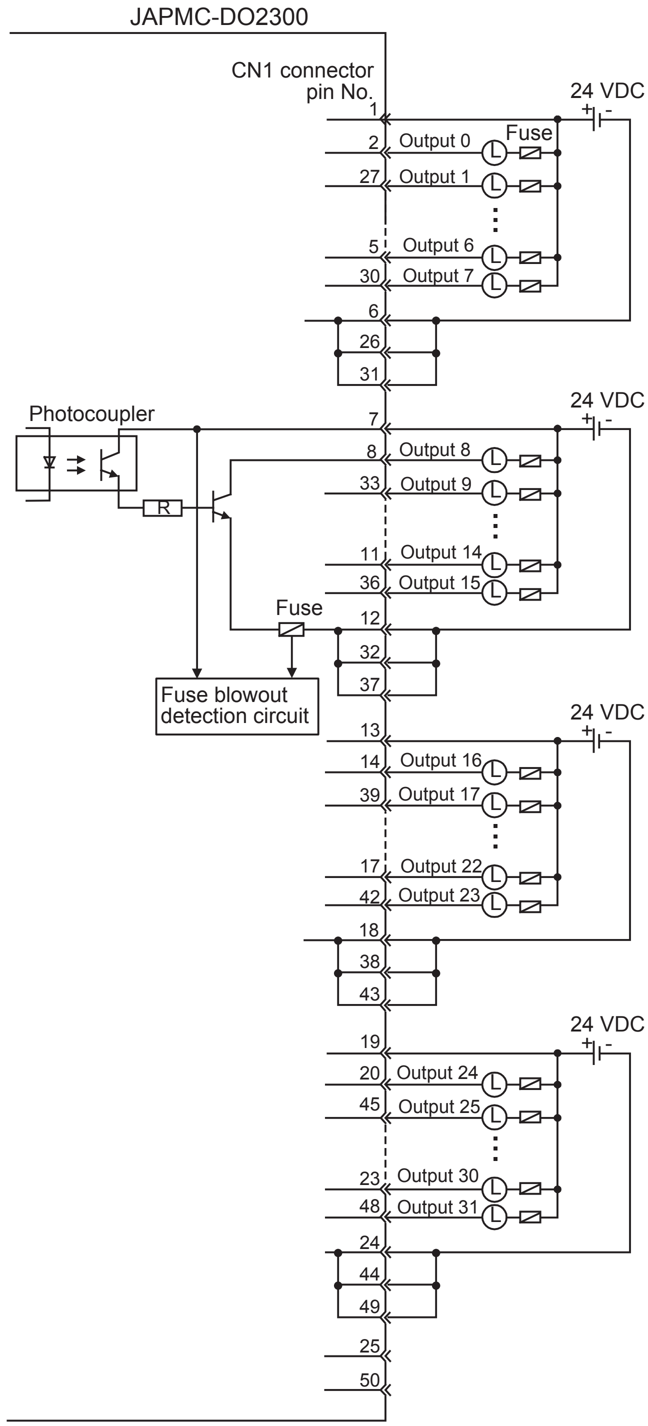


Fig. 4.13 DO-01 Digital Output Circuit (Sink Mode Output)

(6) DO-01 Module Connector Connection Examples

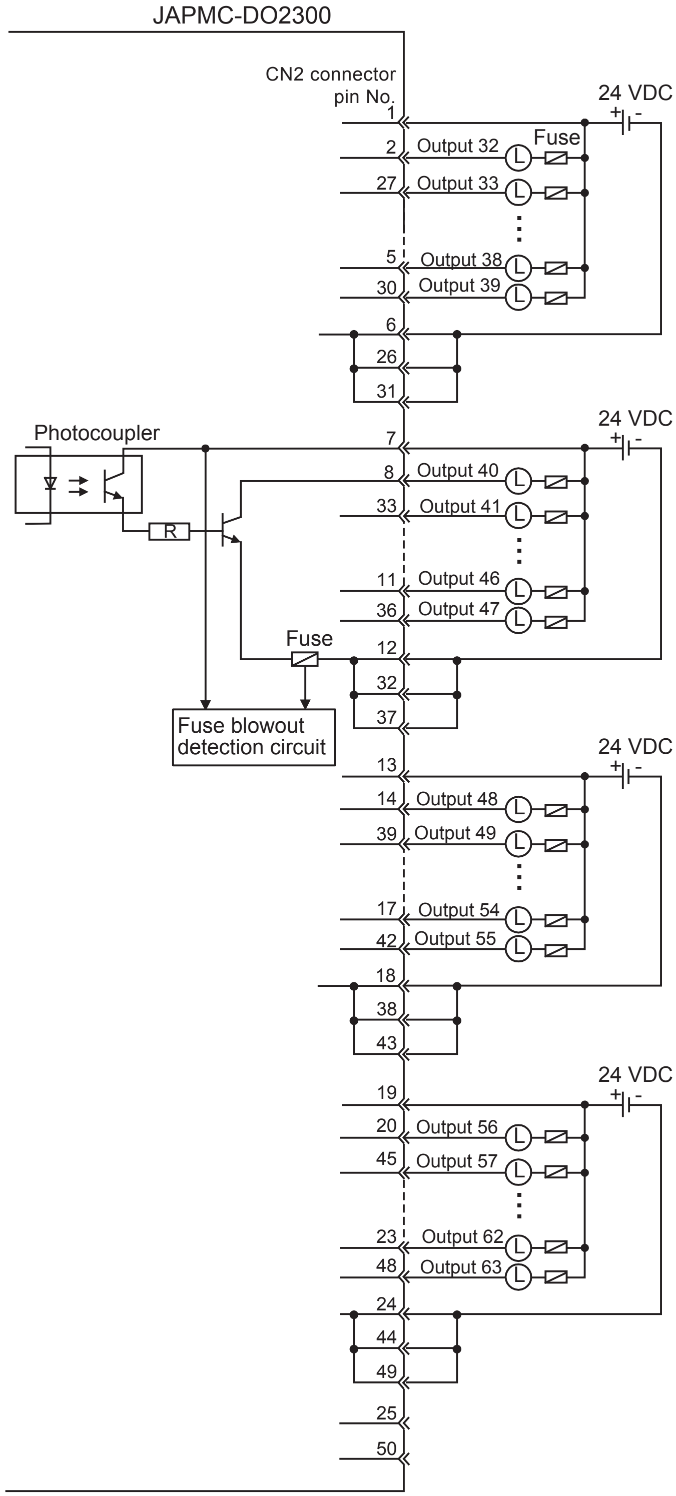
■ CN1 Connector Connection Example



- The pins No. 6, 26, and 31, the pins 12, 32, and 37, the pins 18, 38, and 43, and the pins No. 24, 44, and 49 are internally connected. Connect them externally as well.

- A fuse is inserted in the output common line of the DO-01 Module for circuit protection. However, the fuse may not be blown out in the cases such as layer shorts in outputs. To ensure the circuit protection, provide a protective element such as fuse in each output as shown in the above diagram.

■ CN2 Connector Connection Example



- The pins No. 6, 26, and 31, the pins No. 12, 32, and 37, the pins No. 18, 38, and 43, and the pins No. 24, 44, and 49 are internally connected. Connect them externally as well.

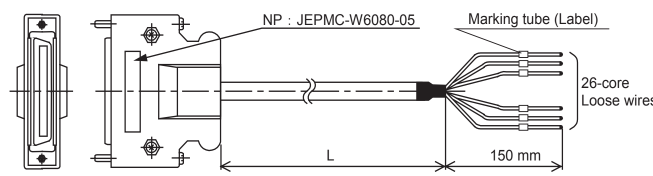
- A fuse is inserted in the output common line of the DO-01 Module for circuit protection. However, the fuse may not be blown out in the cases such as layer shorts in outputs. To ensure the circuit protection, provide a protective element such as fuse in each output as shown in the above diagram.

4.4.4 AI-01 Module Connections

(1) Connector Specifications

Name	Connector Name	No. of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
Analog Input Connector	CN1/CN2	26	10226-52A3PL	・Connector 10126-3000VE ・Shell 10326-52A0-008 (Screw locking), or 10326-52F0-008 (One-touch locking)	Sumitomo 3M Corporation

(2) Standard Cable Model and External Appearance

Name	Model	Length	External Appearance (JEPMC-W6080-□□)
Cables for AI-01 Modules	JEPMC-W6080-05	0.5 m	
	JEPMC-W6080-10	1.0 m	
	JEPMC-W6080-30	3.0 m	

(3) Standard Cable Wiring Table

The wiring table for the standard cable JEPMC-W6080-□□ is shown below.

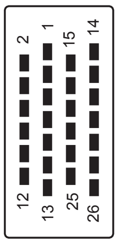
26-pin Connector Terminal No.	Wire Color	Marking		Label on Marking Tube
		Color	Marking	
1	Gray	Red	— — —	V1
2	Gray	Black	— — —	G1V
	Orange	Red	— — —	G1A
3	Orange	Black	— — —	A1
14	Yellow	Red	—	DP1
16	Yellow	Black	—	DN1
4	Pink	Red	— —	V2
5	Pink	Black	— —	G2V
	Yellow	Red	— —	G2A
6	Yellow	Black	— —	A2
17	White	Red	—	DP2
19	White	Black	—	DN2
7	White	Red	— —	V3
8	White	Black	— —	G3V
	Gray	Red	— —	G3A
9	Gray	Black	— —	A3
20	Gray	Red	—	DP3
22	White	Black	—	DN3
10	Orange	Red	— —	V4
11	Orange	Black	— —	GV4
	Pink	Red	— —	G4A
12	Pink	Black	— —	A4
23	Orange	Red	— —	DP4
25	Orange	Black	— —	DN4

(4) Connector Pin Arrangement

The AI-01 Module Connector (CN1 and CN2) pin arrangement is shown below.

■ CN1 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side



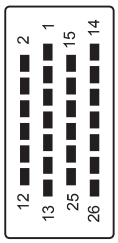
2	G1	1	V1	15	(G1)	14	MDP1
4	V2	3	A1	17	MDP2	16	MDN1
6	A2	5	G2	19	MDN2	18	(G2)
8	G3	7	V3	21	(G3)	20	MDP3
10	V4	9	A3	23	MDP4	22	MDN3
12	A4	11	G4	25	MDN4	24	(G4)
		13				26	

■ CN1 Connector Details

Pin No.	Signal Name	Remarks	Pin No.	Signal Name	Remarks
1	V1	Voltage input 1	14	MDP1	Mode switching terminal 1
2	G1	Ground 1	15	(G1)	(Ground 1)
3	A1	Current input 1	16	MDN1	Mode switching terminal 1
4	V2	Voltage input 2	17	MDP2	Mode switching terminal 2
5	G2	Ground 2	18	(G2)	(Ground 2)
6	A2	Current input 2	19	MDN2	Mode switching terminal 2
7	V3	Voltage input 3	20	MDP3	Mode switching terminal 3
8	G3	Ground 3	21	(G3)	(Ground 3)
9	A3	Current input 3	22	MDN3	Mode switching terminal 3
10	V4	Voltage input 4	23	MDP4	Mode switching terminal 4
11	G4	Ground 4	24	(G4)	(Ground 4)
12	A4	Current input 4	25	MDN4	Mode switching terminal 4
13			26		

■ CN2 Connector Pin Arrangement

Pin Arrangement Viewing from Wiring Side

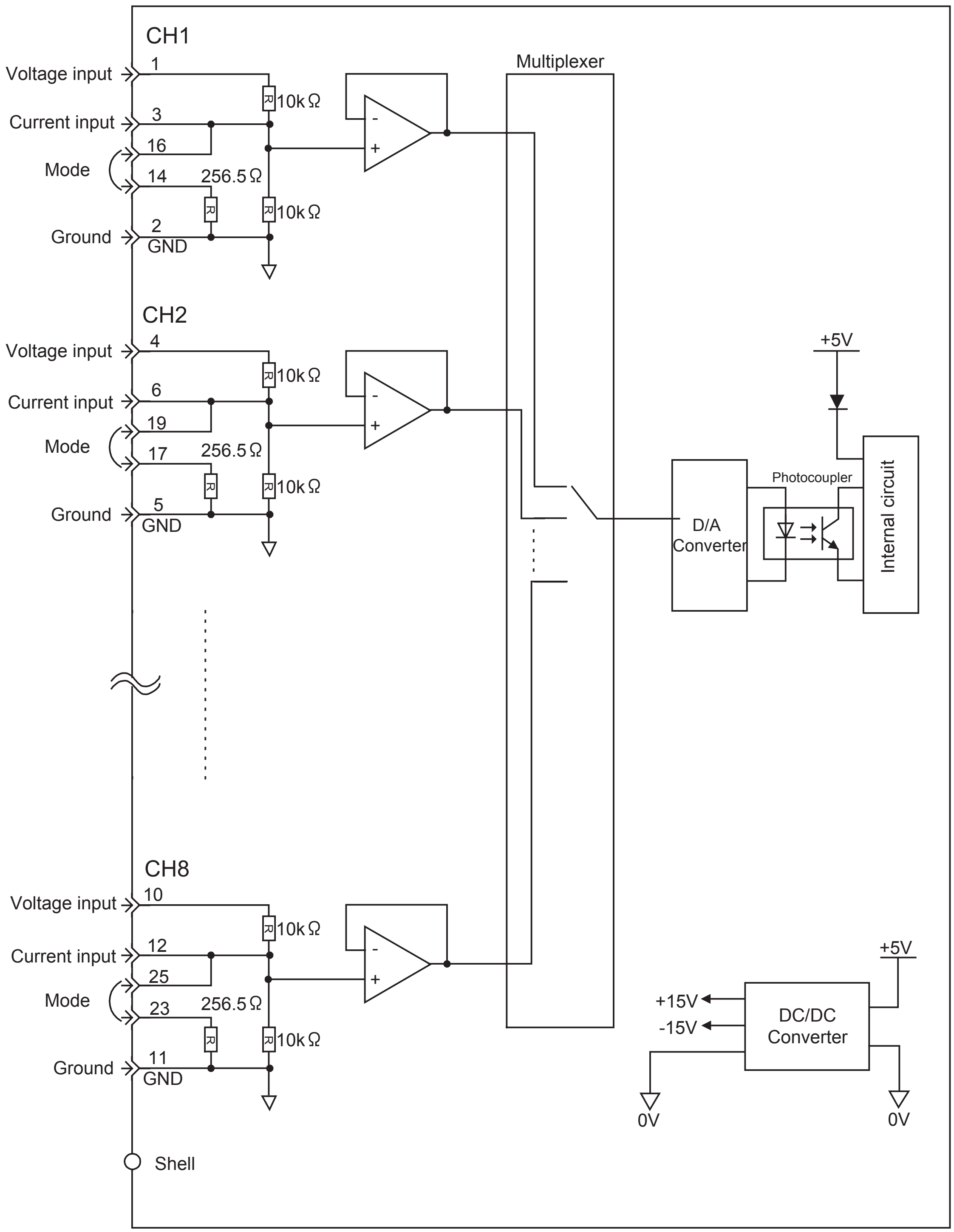


2	G5	1	V5	15	(G5)	14	MDP5
4	V6	3	A5	17	MDP6	16	MDN5
6	A6	5	G6	19	MDN6	18	(G6)
8	G7	7	V7	21	(G7)	20	MDP7
10	V8	9	A7	23	MDP8	22	MDN7
12	A8	11	G8	25	MDN8	24	(G8)
		13				26	

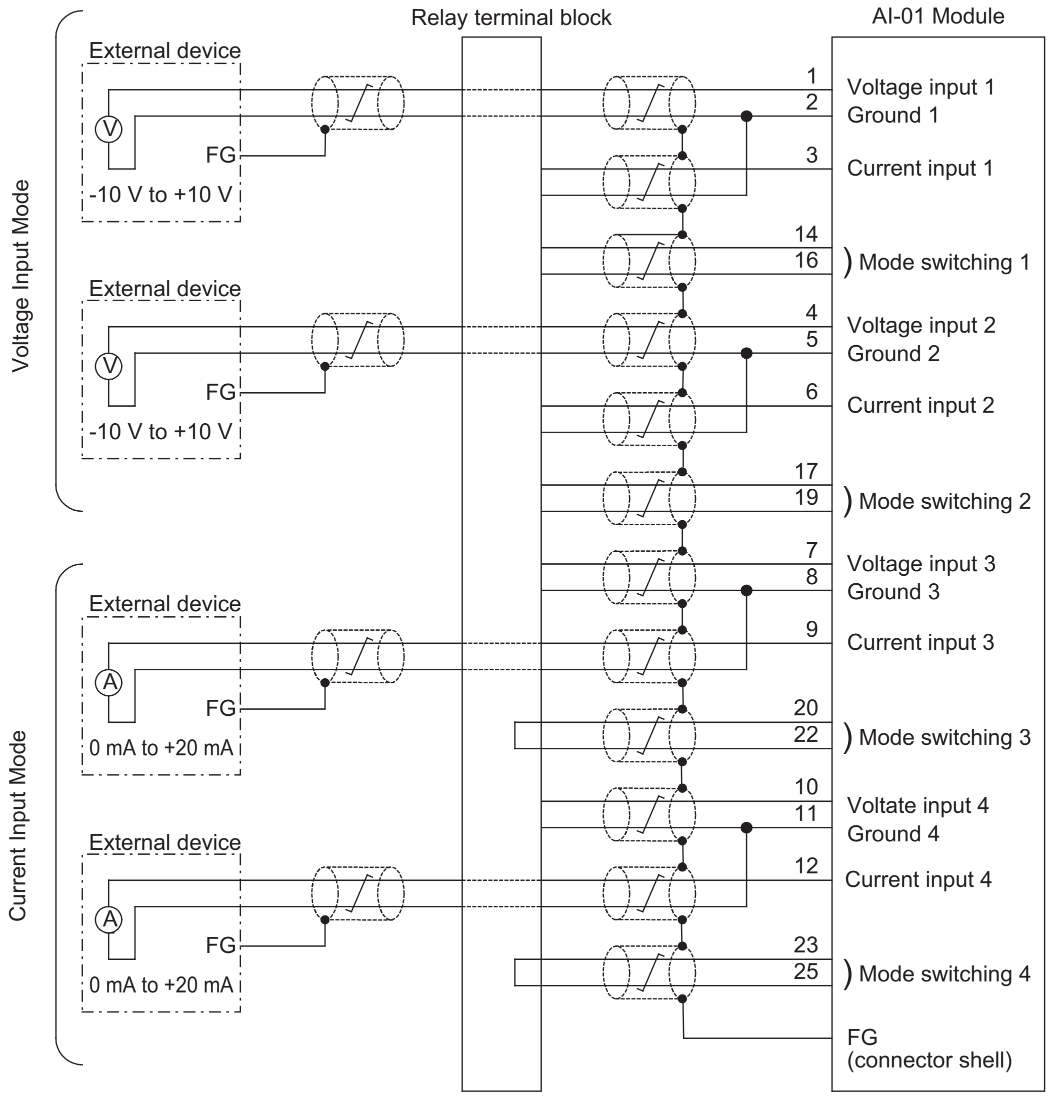
■ CN2 Connector Details

Pin No.	Signal Name	Remarks	Pin No.	Signal Name	Remarks
1	V5	Voltage input 5	14	MDP5	Mode switching terminal 5
2	G5	Ground 5	15	(G5)	(Ground 5)
3	A5	Current input 5	16	MDN5	Mode switching terminal 5
4	V6	Voltage input 6	17	MDP6	Mode switching terminal 6
5	G6	Ground 6	18	(G6)	(Ground 6)
6	A6	Current input 6	19	MDN6	Mode switching terminal 6
7	V7	Voltage input 7	20	MDP7	Mode switching terminal 7
8	G7	Ground 7	21	(G7)	(Ground 7)
9	A7	Current input 7	22	MDN7	Mode switching terminal 7
10	V8	Voltage input 8	23	MDP8	Mode switching terminal 8
11	G8	Ground 8	24	(G8)	(Ground 8)
12	A8	Current input 8	25	MDN8	Mode switching terminal 8
13			26		

(5) Circuit Configuration



(6) CN1 Connector Connection Example



- Use the standard cable (JEPMC-W6080-☐☐) for AI-01 Modules to connect to external devices. Use a relay terminal block to connect the AI-01 module to external devices because the wiring distance varies between the AI-01 module and each external device.
- Ground the cable shield between an external device and the relay terminal block on the external device side.

(7) Setting the Input Mode

The AI-01 Module Input Mode can be selected among the followings.

- Voltage Mode 1 (Input range: −10 V to +10 V)
- Voltage Mode 2 (Input range: 0 V to +10 V)
- Current Mode (Input range: 0 mA to 20 mA)

The input mode setting for each channel must be made on the hardware and the software (MPE720), and two settings must be matched.

[a] Input Mode Setting on Hardware

■ Voltage Input Mode 1 or 2 (see the Voltage Input Mode in the diagram above)

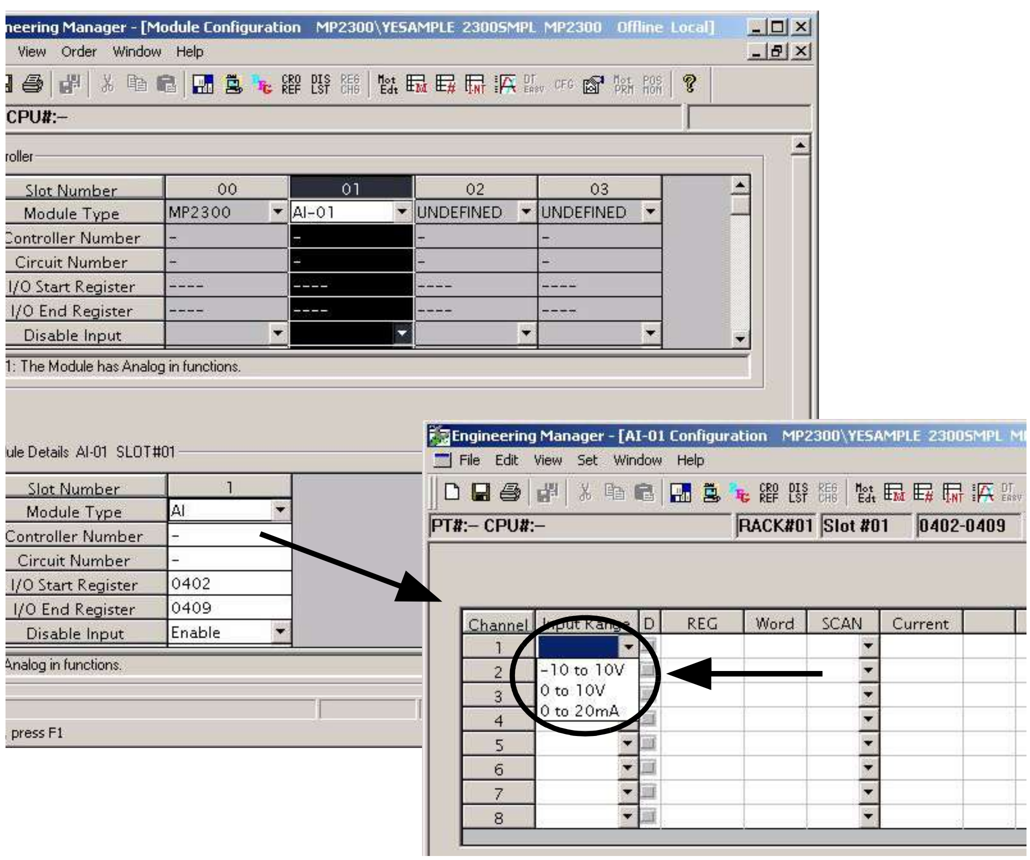
Open between the mode switching terminals (1 to 8), and do not connect anything to the current input terminals 1 to 8.

■ Current Input Mode (See the Current Input Mode in the diagram above)

Short between the mode switching terminals (1 to 8), and do not connect anything to the voltage input terminals 1 to 8.

[b] Input Mode Setting Using MPE720 Ver. 5.31B or later

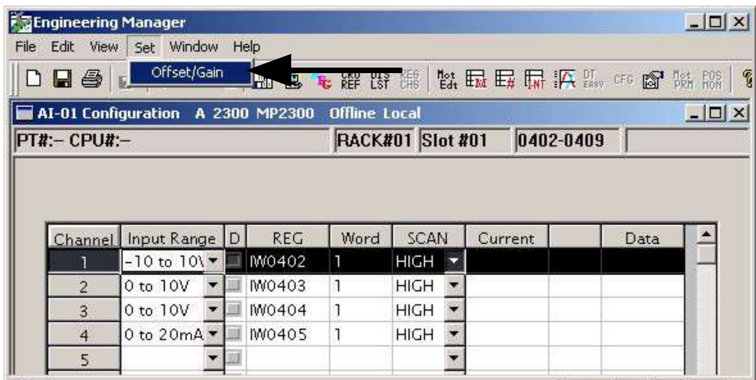
Set the input range of the channel to be used in the AI-01 Configuration Window on the MPE720.



(8) Offset and Gain Setting

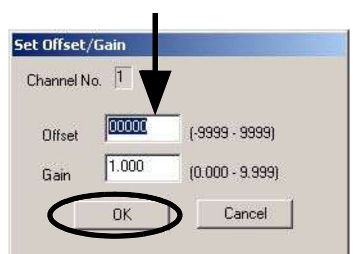
Normally the offset/gain setting need not to be adjusted since the AI-01 Module has been adjusted before shipment so that the register input value according to the specified voltage (current) is input. If more fine adjustment is required, use the following procedure to set the offset and gain.

1. Select the channel in the AI-01 Configuration Window and click ***Set - Offset/Gain***.



The Set **Offset/Gain** Dialog Box will be displayed.

2. While increasing the voltage of external device from 0V to 5V, and to 10V (for 0 to 10V input mode), adjust the ***Offset*** value and ***Gain*** value in the Set Offset/Gain Dialog Box checking the current value (Current) value of the AI-01. When the values are decided, click the **OK** Button.



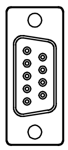
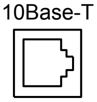
3. Repeat the steps 1 and 2 to set the offset and gain for the required channels.

- The value calculated using the data (A/D converted value) from the AI-01 Module and the set offset and gain values is stored in the input register (I register):
  Input register value = A/C converted value × Gain + Offset
- The offset and gain default values are as follows.
  Offset: 0000
  Gain: 1.000
  Therefore, if no offset/gain adjustment is performed, the input register value is equal to the A/D converted value.

4.5 Communication Module (Optional) Connections

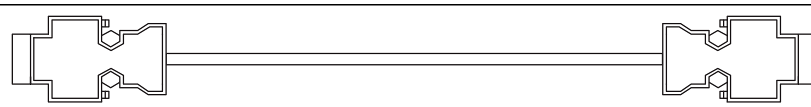
4.5.1 218IF-01 Module

(1) Connector Specifications

Connector	Name	Connector Name	No. of Pins	Connector Model		
				Module	Cable	Manufacturer
PORT 	RS-232C	PORT	9	17LE-13090-27(D2BC) 9-pin D-sub female connector	17JE-23090-02 (D8B) 9-pin D-sub male connector	DDK Ltd.
10Base-T 	Ethernet	10Base-T	8	555153-1 10Base-T Ethernet connector (modular jack)	–	Tyco Electronics AMP K.K.

(2) Cables

■ RS-232C Cable

Model Number	Length	Appearance (JEPMC-W5311-□□)
JEPMC-W5311-03	2.5 m	
JEPMC-W5311-15	15 m	

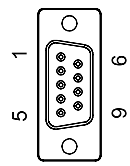
■ Ethernet Cable

The standard cables for Ethernet are not available. Use 10Base-T cross or straight cables.

(3) Connector Pin Arrangement

[a] PORT Connector

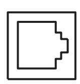
The PORT connector is used to connect the MP2300 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	
2	SD	Send data	7	SG	Signal ground (0V)
3	RD	Receive data	8	–	
4	RS	Ready to send	9	ER	Data terminal ready
5	CS	Clear to send			

[b] Ethernet Connector (10Base-T)

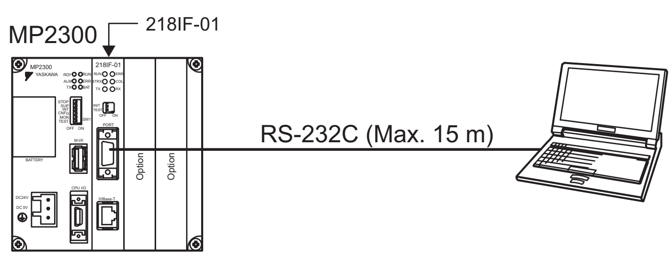
The Ethernet connector is used to connect the MP2300 to computers and HMI devices via an Ethernet (10Base-T) connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	TXD+	Transmission data +	5	–	–
2	TXD–	Transmission data –	6	RXD–	Reception data-
3	RXD+	Reception data +	7	–	–
4	–	–	8	–	–

(4) Module Connection Examples

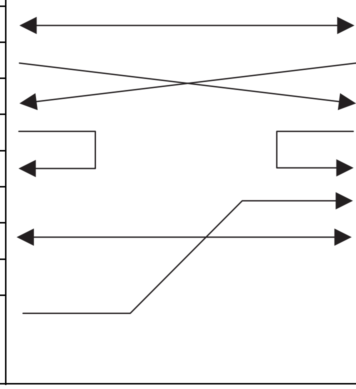
[a] PORT Connector Connections



The following tables show the PORT connector connections based on the device to be connected.

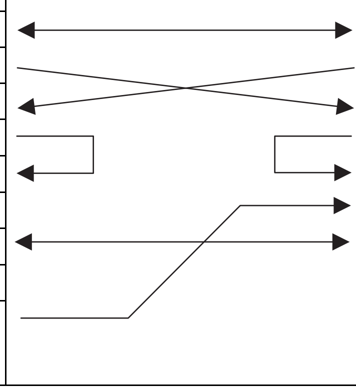
■ For 25-pin D-sub Remote Stations

MP2300 (PORT Connector)		Cable Connection and Signal Direction	Remote Station (25-pin D-sub)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS (RTS)	4		4	RS (RTS)
CS (CTS)	5		5	CS (CTS)
–	6		6	DSR (DR)
SG (GND)	7		7	SG (GND)
–	8		8	CD
ER (DTR)	9		20	DTR (ER)



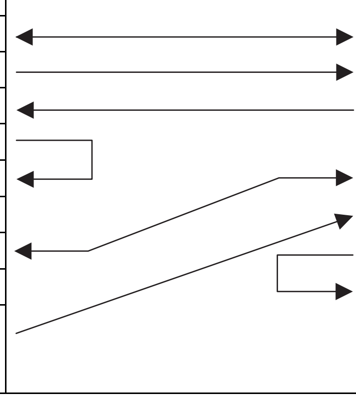
■ For 9-pin D-sub Remote Station Meeting Yaskawa Specifications

MP2300 (PORT Connector)		Cable Connection and Signal Direction	Remote Station (9-pin D-sub) (Yaskawa Specifications)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	SD (TXD)
RD (RXD)	3		3	RD (RXD)
RS (RTS)	4		4	RS (RTS)
CS (CTS)	5		5	CS (CTS)
–	6		6	DR (DSR)
SG (GND)	7		7	SG (GND)
–	8		8	CD
ER (DTR)	9		9	ER (DTR)



■ For DOS/V Computer Remote Stations

MP2300 (PORT Connector)		Cable Connection and Signal Direction	DOS/V Computer (9-pin D-sub male)	
Signal Name	Pin No.		Pin No.	Signal Name
FG	1		1	FG
SD (TXD)	2		2	RD (RXD)
RD (RXD)	3		3	SD (TXD)
RS (RTS)	4		4	ER (DTR)
CS (CTS)	5		5	SG (GND)
–	6		6	DR (DSR)
SG (GND)	7		7	RS (RTS)
–	8		8	CS (CTS)
ER (DTR)	9		9	–

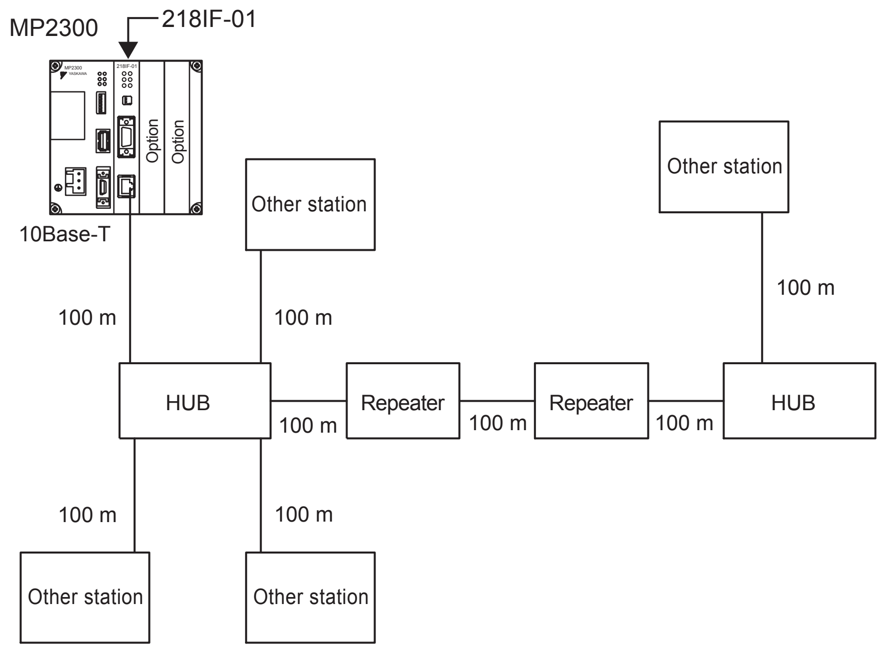


[b] Ethernet Connections

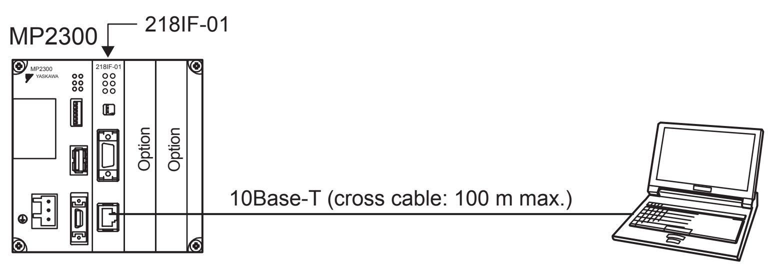
This section explains connections to the Ethernet using 10Base-T.

The maximum length between the end nodes is 500 m with 10Base-T connections.

< Connection Example 1 >



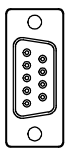
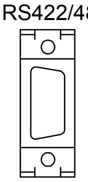
< Connection Example 2 >



4.5.2 217IF-01 Module

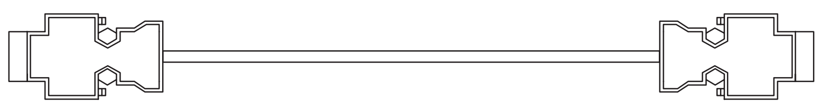
(1) Connectors

The following diagram shows the 217IF-01 Module connectors.

Connector	Name	Connector Name	No. of Pins	Connector Model		
				Module	Cable	Manufacturer
PORT 	RS-232C	PORT	9	17LE-13090-27(D2BC) 9-pin D-sub female connector	17JE-23090-02 (D8B) 9-pin D-sub male connector	DDK Ltd.
RS422/485 	RS422/485 port	RS422/ 485	14	10214-52A2JL connector	10114-3000VE connector 10314-52A0-008 shell	Sumitomo 3M Limited.

(2) Cables

■ RS-232C Cable

Model Number	Length	(JEPMC-W5311-□□)
JEPMC-W5311-03	2.5 m	
JEPMC-W5311-15	15 m	

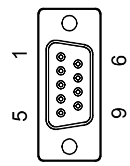
■ RS422/485 Cable

The standard cables for RS422/485 are not available. Assemble the cable using the connector specified in (1) and a commercially available cable.

(3) Connector Pin Arrangement

[a] PORT Connector

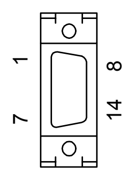
The PORT connector is used to connect the MP2300 to computers and HMI devices via an RS-232C connection.



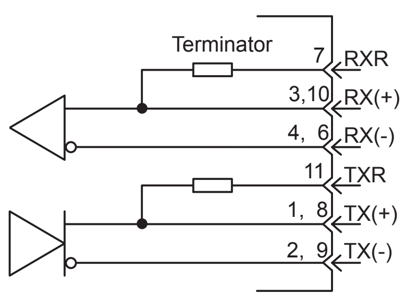
Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0V)
3	RD	Receive data	8	–	–
4	RS	Ready to send	9	ER	Data terminal ready
5	CS	Clear to send			

[b] RS422/485 Connector

The RS422/485 connector is used to connect the MP2300 to computers and HMI devices via an RS422/485 connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	TX+	Transmission data +	8	TX+	Transmission data +
2	TX–	Transmission data –	9	TX–	Transmission data –
3	RX+	Reception data +	10	RX+	Reception data +
4	RX–	Reception data –	11	TXR	Transmission data terminator
5	–	–	12	–	–
6	RX–	Reception data –	13	VCC	Power supply (+5 V)
7	RXR	Reception data terminator	14	GND	Ground



- Terminator has been included, as shown in the following diagram. If you need to add terminator, connect RXR to RX (-) and TXR to TX (-).
  Leave RXR and TXR open if not adding terminator.

- Always keep the communication cable separate from the drive, control, power supply, and other transmission systems.
- The maximum length of RS422/485 is 300 m. Keep all cables as short as possible.
- The 217IF-01 Module's RS422/485 interface is not an isolated system. Noise from connected terminals may cause malfunctions. If malfunctions occur, use a shielded cable, modem, or other measure to reduce noise.
- For RS422 connections, add terminator to the reception terminal if required.
- For RS485 connections, add terminator to the nodes at both ends of the transmission line.

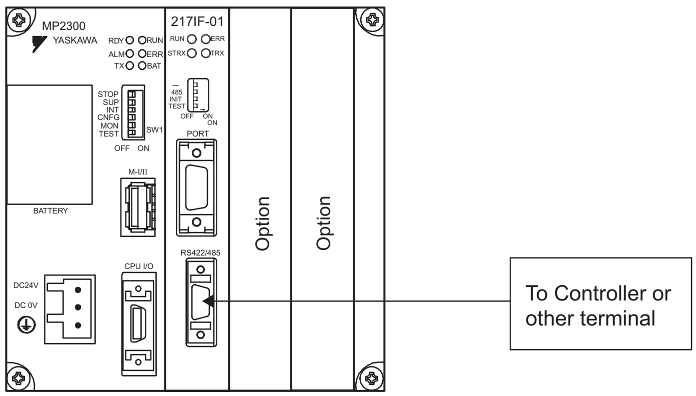
(4) Module Connection Examples

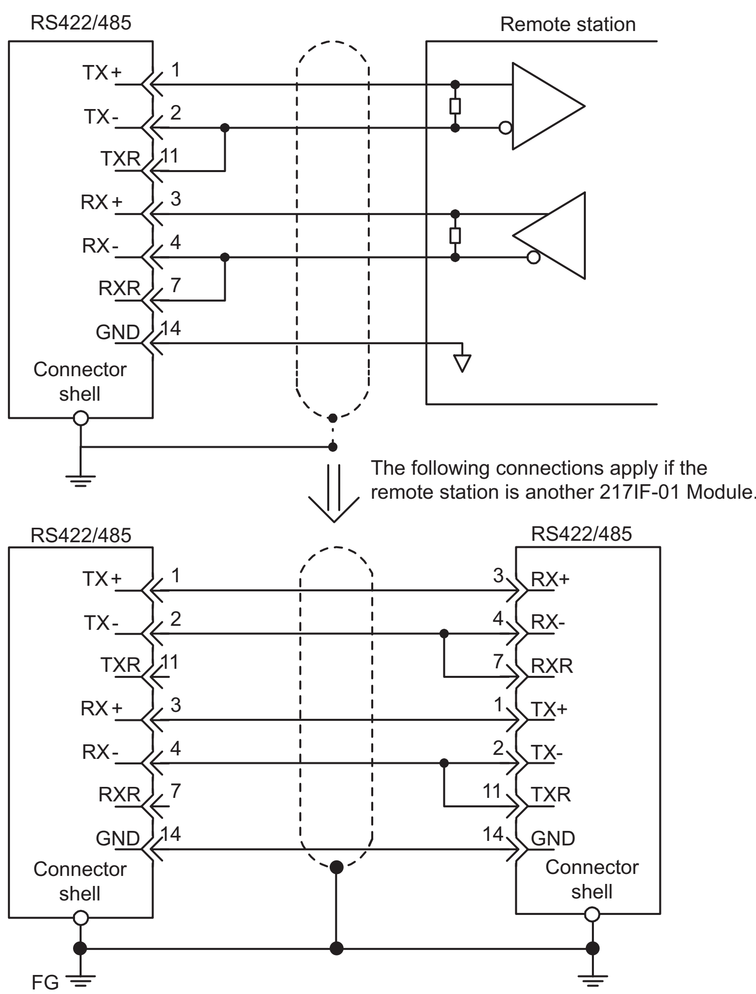
[a] PORT Connector Connections

For information on how to connect the PORT connector, refer to *4.5.1 (4) [a] PORT Connector Connections* on page 4-61.

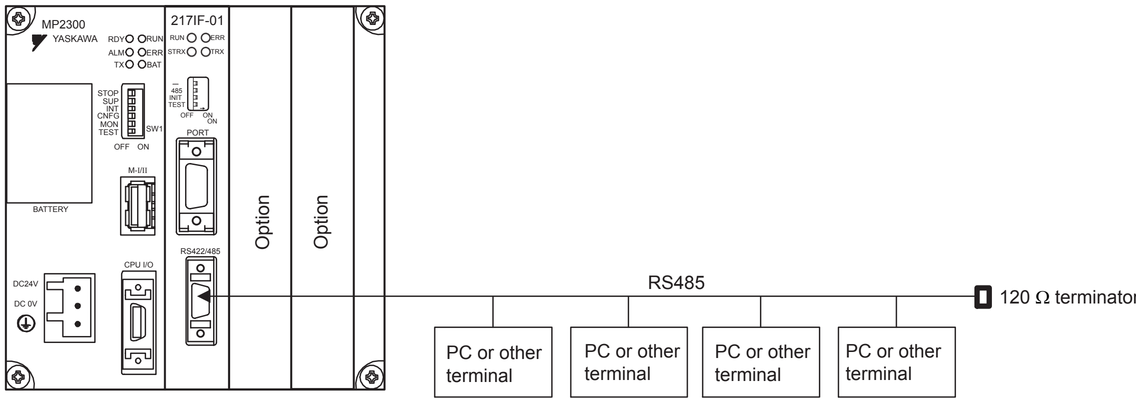
[b] RS422/485 Connections

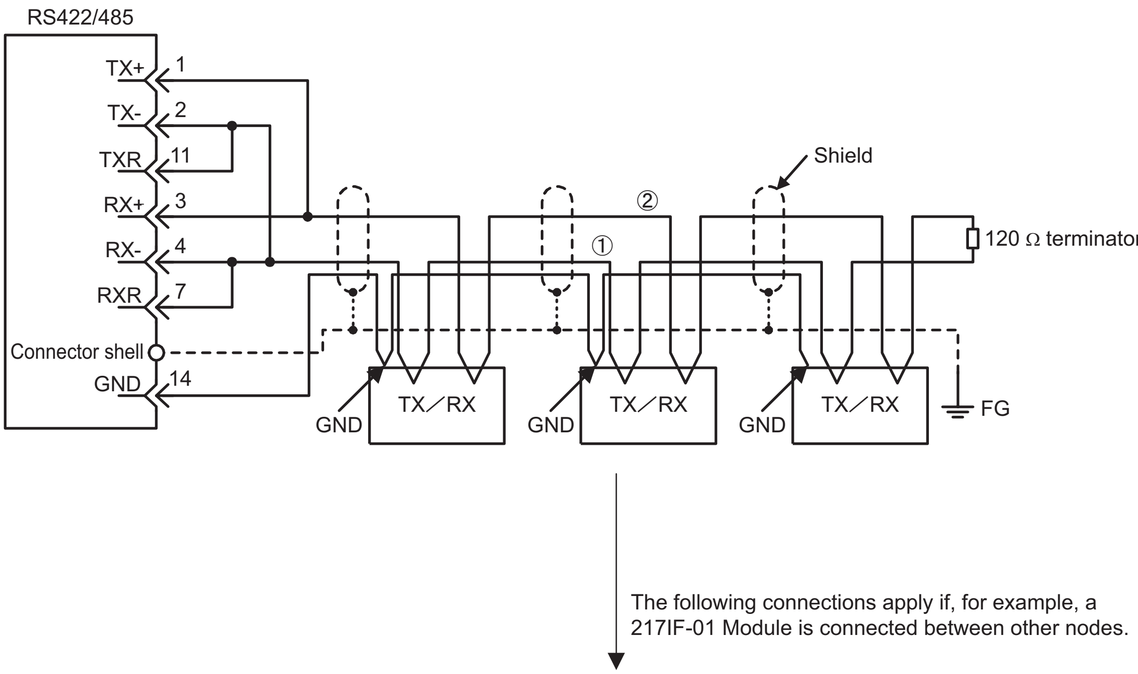
■ RS422 Wiring



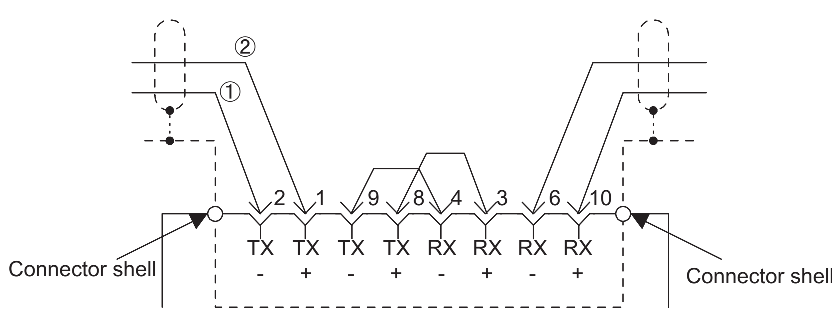


■ RS485 Wiring





The following connections apply if, for example, a 217IF-01 Module is connected between other nodes.

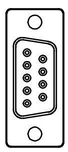
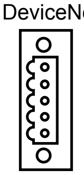


- The terminator is enabled by connecting terminals 2 to 11 and 4 to 7 for RS422/485 ports.

4.5.3 260IF-01 Module

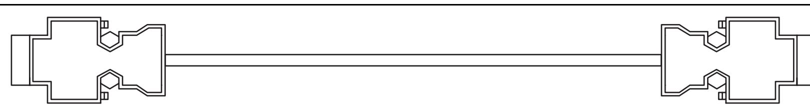
(1) Connectors

The following diagram shows the 260IF-01 Module connectors.

Connector	Name	Connector Name	No. of Pins	Connector Model		
				Module	Cable	Manufacturer
PORT 	RS-232C	PORT	9	17LE-13090-27(D2BC) 9-pin D-sub female connector	17JE-23090-02 (D8B) 9-pin D-sub male connector	DDK Ltd.
DeviceNet 	DeviceNet	DeviceNet	5	MSTB2-5/5-GF-5.08AM	–	PHEONIX CONTACT

(2) Cables

■ RS-232C Cable

Model Number	Length	Appearance (JEPMC-W5311-□□)
JEPMC-W5311-03	2.5 m	
JEPMC-W5311-15	15 m	

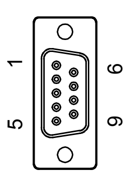
■ DeviceNet Cable

The standard cables for DeviceNet are not available. Use a commercially available cable for DeviceNet. Access to ODVA (Open DeviceNet Vendors Association Inc.) home page for information on DeviceNet cables.

(3) Connector Pin Arrangement

[a] PORT Connector

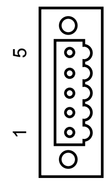
The PORT connector is used to connect the MP2300 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0 V)
3	RD	Receive data	8	–	–
4	RS	Ready to send	9	ER	Data terminal ready
5	CS	Clear to send			

[b] DeviceNet Connector

The DeviceNet connector is used to connect the MP2300 to computers and peripheral devices via a DeviceNet connection.



Pin Number	Signal Name	Description
1	V-	0-V external power supply for communication
2	CAN-L	CAN bus line dominant L
3	SHIELD	–
4	CAN-H	CAN bus line dominant H
5	V+	24-V external power supply for communication

(4) Module Connection Examples

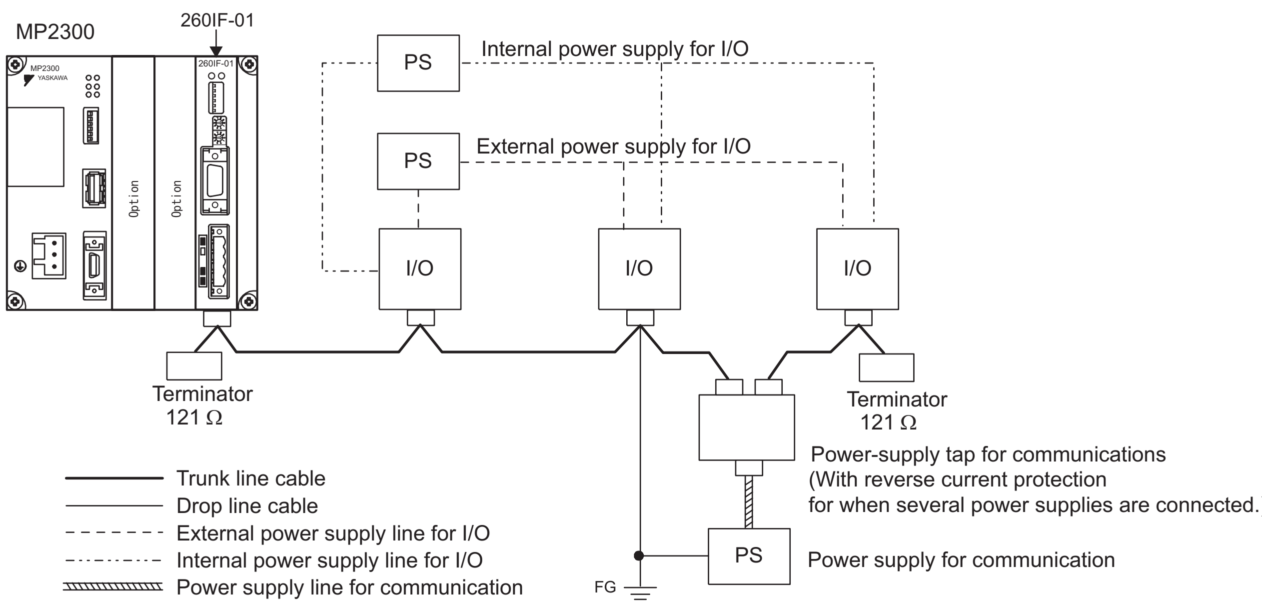
[a] PORT Connector Connections

For information on how to connect the PORT connector, refer to *4.5.1 (4) [a] PORT Connector Connections* on page 4-61.

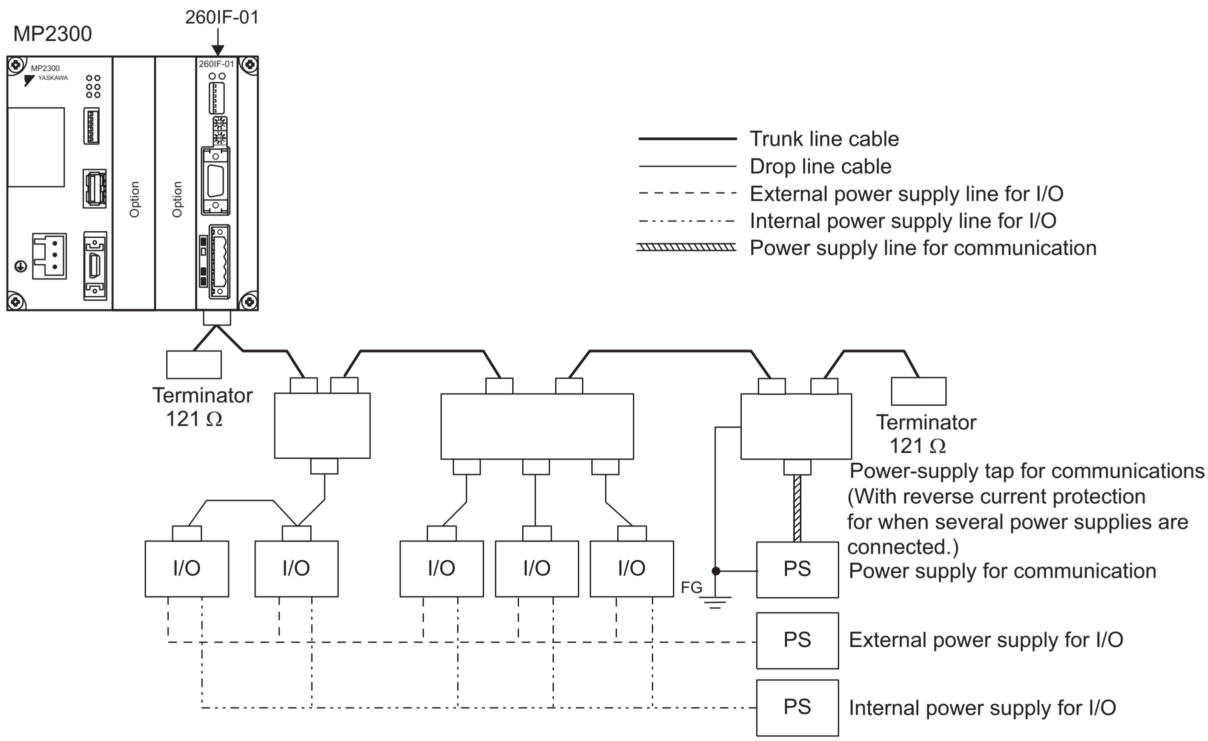
[b] DeviceNet Connections

There are two connection methods for master mode.

■ Multi-drop connections

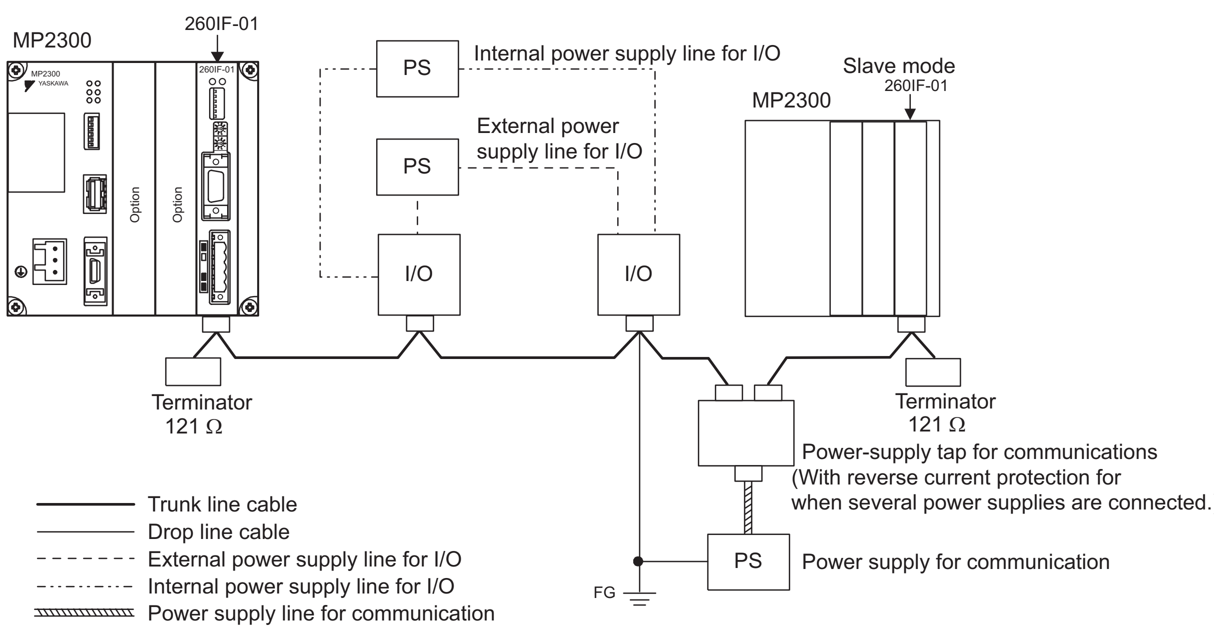


■ T-branch, Multi-branch, and Drop-line connections



[c] Slave Mode

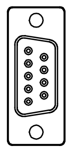
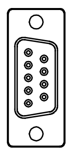
The following diagram shows the system configuration for slave mode.



4.5.4 261IF-01 Module

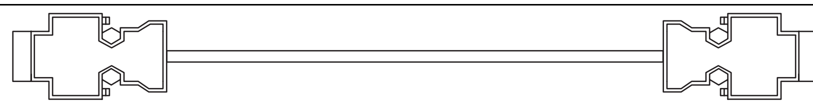
(1) Connectors

The following diagram shows 261IF-01 Module connectors.

Connector	Name	Connector Name	No. of Pins	Connector Model		
				Module	Cable	Manufacturer
PORT 	RS-232C	PORT	9	17LE-13090-27(D2BC) 9-pin D-sub female connector	17JE-23090-02（D8B） 9-pin D-sub male connector	DDK Ltd.
PROFIBUS 	PROFIBUS	PROFIBUS	9	17LE-13090-27(D33C) 9-pin D-sub female connector	–	DDK Ltd.

(2) Cables

■ RS-232C Cable

Model Number	Length	Appearance (JEPMC-W5311-□□)
JEPMC-W5311-03	2.5 m	
JEPMC-W5311-15	15 m	

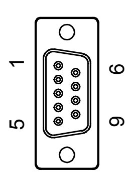
■ PROFIBUS Cable

The standard cables for PROFIBUS are not available. Assemble a cable using commercially available connectors with the specifications described in (1) and cable. Access to PROFIBUS organization home page for the PROFIBUS product list. When selecting connectors, check the position and direction of the cable outlet so that the PROFIBUS connector connection and the RS232-C connector connection are not interfered each other.

(3) Connector Pin Arrangement

[a] PORT Connector

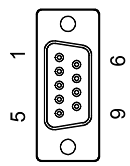
The PORT connectors is used to connect the MP2300 to computers and HMI devices via an RS-232C connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	FG	Frame ground	6	–	–
2	SD	Send data	7	SG	Signal ground (0V)
3	RD	Receive data	8	–	–
4	RS	Ready to send	9	ER	Data terminal ready
5	CS	Clear to send			

[b] PROFIBUS Connector

The PROFIBUS connector is used to connect to masters via a PROFIBUS connection.



Pin Number	Signal Name	Description	Pin Number	Signal Name	Description
1	–	–	6	+5V	External power supply
2	–	–	7	–	–
3	TXD/RDX+	Transmission and reception (+)	8	TXD/RDX-	Transmission and reception (–)
4	RTS	Transmission request	9	–	–
5	GND	Ground			

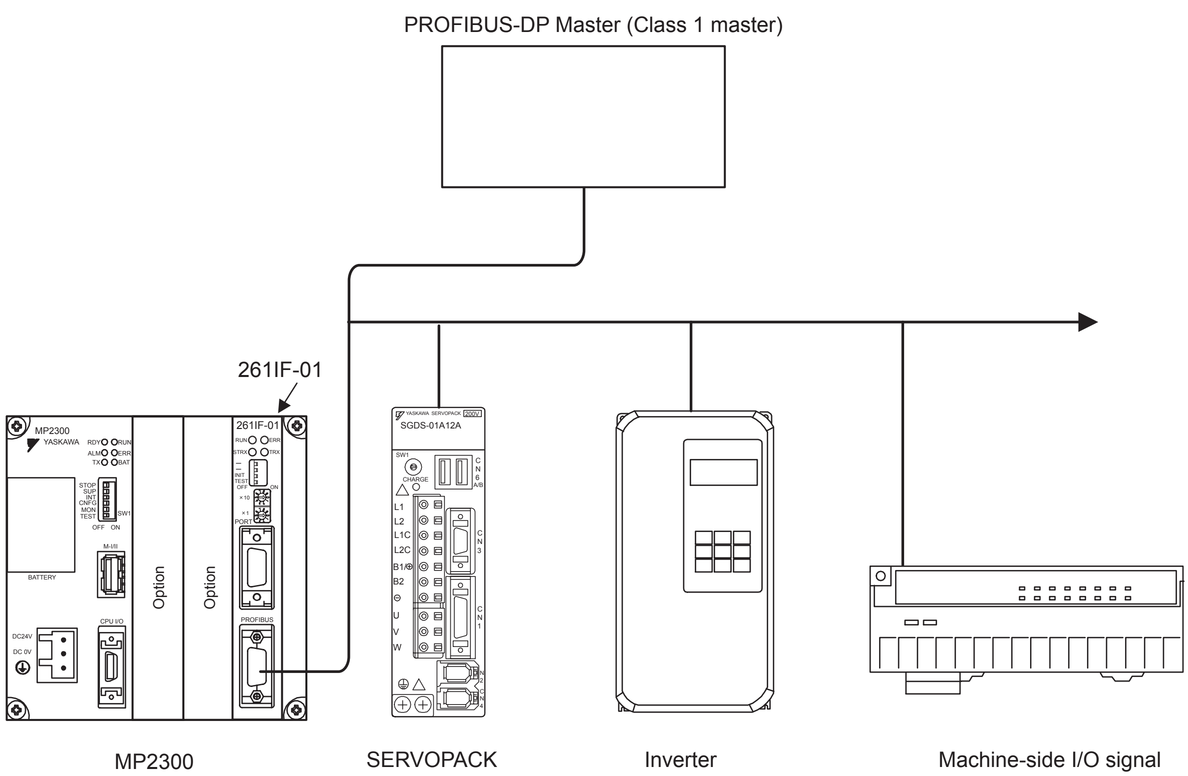
(4) Module Connection Examples

[a] PORT Connector Connections

For information on how to connect the PORT connector, refer to *4.5.1 (4) [a] PORT Connector Connections* on page 4-61.

[b] PROFIBUS Connections

The 261IF-01 Module only supports slave mode. The slave address can be set between 1 and 64.



5

Outline of Motion Control Systems

This chapter describes the basic operation of MP2300 Motion Control Systems and provides an outline of user programs and registers.

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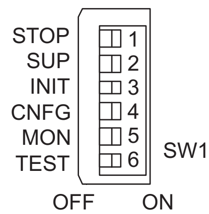
5.1 Startup Sequence and Basic Operation

This section describes the MP2300 startup sequence and basic operation together with the DIP switch settings, self-diagnosis at startup, and LED indicator patterns.

5.1.1 DIP Switch Settings

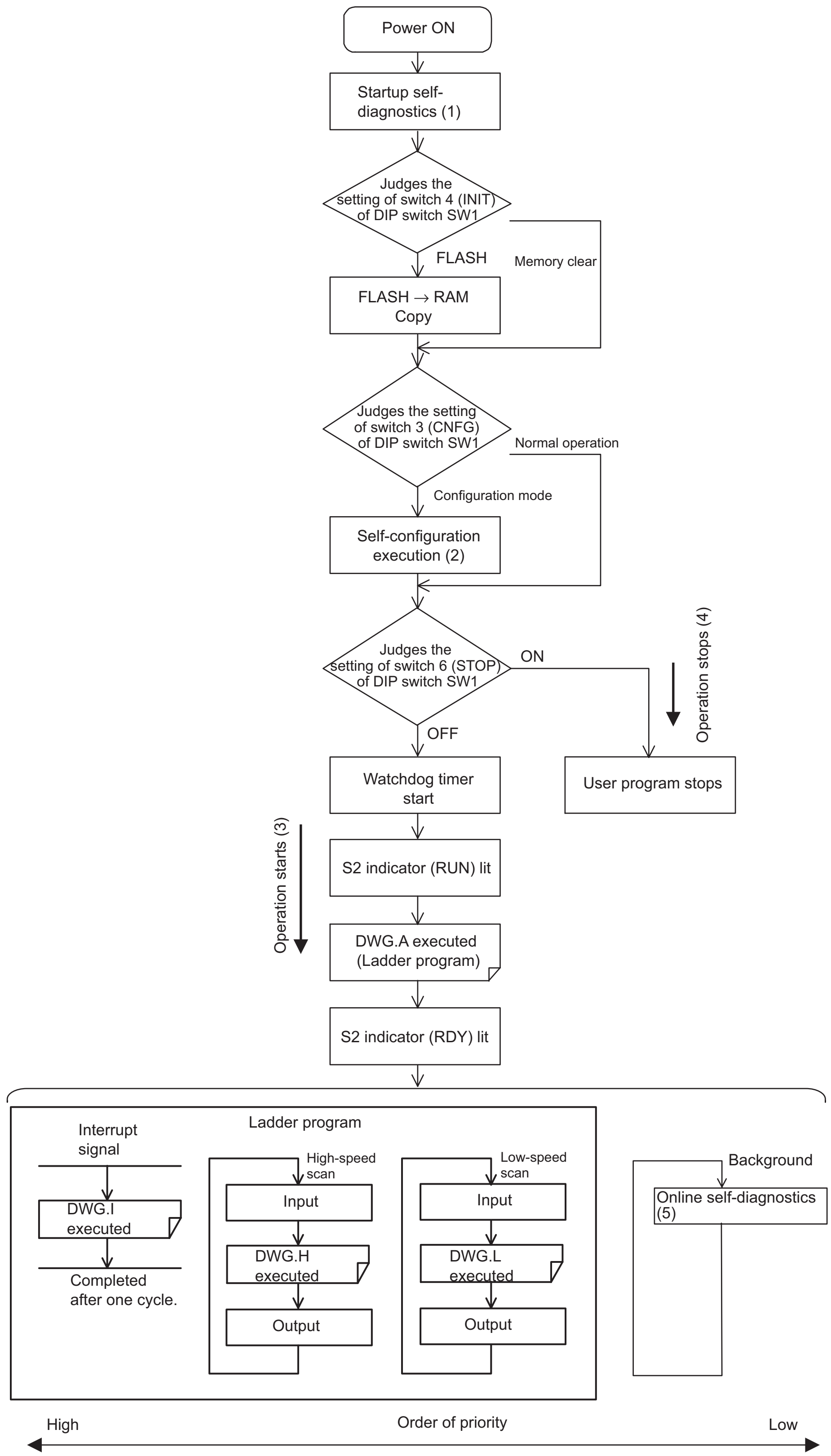
Set the DIP switch on the Basic Module to control operations of the startup sequence. The six switches are provided on the DIP switch on the Basic Module as shown in the figure below. The following table lists the functions of six switches.



No.	Switch Name	Status	Operating Mode	Default Setting	Remarks
1	STOP	ON	User program stops	OFF	Set to ON to stop user program operation and debug the program.
		OFF	User program operation		
2	SUP	ON	System use	OFF	Always use set to OFF.
		OFF	Normal operation		
3	INIT	ON	Memory clear	OFF	Set to ON to clear memory. Programs stored in flash memory will be run when Memory Clear is set to OFF. S and M registers are cleared to all zeros.
		OFF	Normal operation		
4	CNFG	ON	Configuration mode	OFF	Set to ON for self-configuration of connected devices.*1
		OFF	Normal operation		
5	MON	ON	System use	OFF	Always set to OFF.
		OFF	Normal operation		
6	TEST	ON	System use	OFF	Always set to OFF.
		OFF	Normal operation		

5.1.2 Startup Sequence

The startup sequence for the MP2300 from the moment when the power has been turned ON is shown in the following flowchart.



* Refer to *5.1.3 Startup Sequence Operation Details* on the next page for details on (1) to (5).

5.1.3 Startup Sequence Operation Details

(1) Self-diagnosis at Startup

Self-diagnosis is performed on the following items after the power is turned ON.

- Read/write diagnosis of memory (RAM)
- System program (ROM) diagnosis
- Main processor (CPU) function diagnosis
- Floating Point Unit (FPU) function diagnosis

If diagnosis results in an error, the ALM and ERR LED indicators will blink red for the specified number of times. Refer to *5.1.4 LED Indicator Details* on page 5-5.

(2) Self-configuration

Self-configuration automatically recognizes the connected Optional Modules, and automatically creates a definitions file. For details, refer to *5.4 Self-configuration* on page 5-28.
The RUN LED indicator will blink green during execution of self-configuration.

(3) Operation Start

When the STOP switch is set to OFF (RUN) or changes from ON (STOP) to OFF (RUN), the CPU starts the watchdog timer and then executes DWG.A in the ladder program. Refer to the startup processing drawing and *5.2.2 Execution Control of Drawings* on page 5-7.
First scan processing is executed once DWG.A has been completed and the high-speed or low-speed scan time has elapsed. System I/O are executed from the first scan.

(4) Operation Stop

MP2300 stops motion control operation when the STOP switch is ON (STOP) and in the following circumstances.

Cause	Restart method
Power supply turned OFF	Turn ON the power again.
Power interruption	
Fatal error	Check the LED indicator for the cause of the error and then turn the power OFF then ON.
STOP executed from MPE720	Execute RUN from MPE720 .

(5) Online Self-diagnosis

Self-diagnosis is performed on the following items when the user logs on online.

- System program (ROM) diagnosis
- Main processor (CPU) function diagnosis
- Floating Point Unit (FPU) function diagnosis

If diagnosis results in an error, the ALM and ERR LED indicators will blink red for the specified number of times. Refer to *5.1.4 LED Indicator Details* on page 5-5.

5.1.4 LED Indicator Details

The MP2300 performs a variety of diagnostics at startup. If an error is found, the ERR LED indicator blinks red. The number of times the indicators blink differs depending on the error details, so error details can be determined from counting the number of blinks.The following table shows details of MP2300 LED indicator.

- MPE720 cannot be operated when the indicators are blinking.
- For information on errors and countermeasures, refer to *Chapter 12 Maintenance and Inspection*.

<table>
<tr><th rowspan="2">Type</th><th colspan="5">LED Indicator Name</th><th rowspan="2">Indicator Details</th><th rowspan="2">Remarks</th></tr>
<tr><th>RDY
(Green)</th><th>FUN
(Green)</th><th>ALM
(Red)</th><th>ERR
(Red)</th><th>BAT</th></tr>
<tr><td rowspan="5">Normal</td><td>Not lit</td><td>Not lit</td><td>Lit</td><td>Lit</td><td>Not lit</td><td>Hardware reset status</td><td rowspan="3">–</td></tr>
<tr><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Initializing</td></tr>
<tr><td>Not lit</td><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Executing DWG.A</td></tr>
<tr><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>User program stopped
(Offline stop mode)</td><td>User program stops when the DIP switch or MPE720 is used to execute the STOP operation.</td></tr>
<tr><td>Lit</td><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>User program executing normally
(Online operation mode)</td><td>–</td></tr>
<tr><td rowspan="3">Error</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Lit</td><td>Not lit</td><td>Major damage has occurred</td><td>The ERR LED indicator is lit red when the CPU is down.</td></tr>
<tr><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Blinking</td><td>Not lit</td><td>(Software error)
No. of blinks
3: Address error (read) exception
4: Address error (write) exception
5: FPU exception
6: Illegal general command error
7: Illegal slot command error
8: General FPU inhibited error
9: Slot FPU inhibited error
10: TLB duplicated bit error
11: LTB mistake (read)
12: LTB mistake (write)
13: LTB protection violation (read)
14: LTB protection violation (write)
15: Initial page write error</td><td>The ERR LED indicator will blink red when an exception error has occurred.</td></tr>
<tr><td>Not lit</td><td>Not lit</td><td>Blinking</td><td>Blinking</td><td>Not lit</td><td>(Hardware errors)
No. of blinks
2: RAM diagnosis error
3: ROM diagnosis error
4: CPU function diagnosis error
5: FPU function diagnosis error</td><td>The ALM and ERR LED indicators will blink red if there is a self-diagnosis failure.</td></tr>
<tr><td rowspan="2">Alarm</td><td>–</td><td>–</td><td>–</td><td>–</td><td>Lit</td><td>Battery alarm</td><td>The BAT LED indicator will be lit when the battery voltage drops.</td></tr>
<tr><td>Lit</td><td>Not lit</td><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Operation error
I/O error</td><td>The ALM LED indicator will be lit red when an operation or I/O error is detected.</td></tr>
</table>

5.2 User Programs

User programs for executing machine control using the MP2300 include ladder programs and motion programs. This section describes the basic operation and other information about user programs.

- For programming details, refer to the following manuals.
  Machine Controller MP900/MP2000 Series User's Manual Ladder Programming (SIEZ-C887-1.2□)
  Machine Controller MP900/MP2000 Series User's Manual Motion Programming (SIEZ-C887-1.3□)
  Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual (SIEZ-C887-13.1□)
  Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual (SIEZ-C887-13.2□)

5.2.1 Ladder Drawings (DWG)

Ladder programs are managed in units of ladder drawings, which are identified by drawing numbers. These drawings form the basis of user programs.

(1) Types of Drawings

Ladder drawings include parent drawings, child drawings, grandchild drawings, and operation error processing drawings. In addition to drawings, there are functions that can be freely accessed from each drawing.

- Parent Drawings

  Parent drawings are automatically executed by the system program when the execution conditions, outlined in the table below, are met.

- Child Drawings

  Child drawings are accessed using a SEE command from a parent drawing.

- Grandchild Drawings

  Grandchild drawings are accessed using a SEE command from a child drawing.

- Operation Error Processing Drawings

  Operation error processing drawings are automatically executed by the system program when an operation error occurs.

- Functions

  Functions are accessed and executed from parent, child, and grandchild drawings using the FSTART command.

(2) Drawing Types and Order of Priority

Drawings are classified by their first letter (A, I, H, or L) based on the processing purpose. The following table outlines the order of priority and execution conditions for these drawings.

Type of Parent Drawing	Function	Priority	Execution Conditions	Max. No. of Drawings
DWG.A (Drawing A)	Startup processing	1	Power ON (Executed once only, when power turned ON)	64
DWG.I (Drawing I)	Interrupt processing	2	External interrupt (executed by Option Module DI interrupt or counter match interrupt)	64
DWG.H (Drawing H)	High-speed scan processing	3	Scheduled cycle startup (Executed each high-speed scan)	200
DWG.L (Drawing L)	Low-speed scan	4	Scheduled cycle startup (Executed each low-speed scan)	500

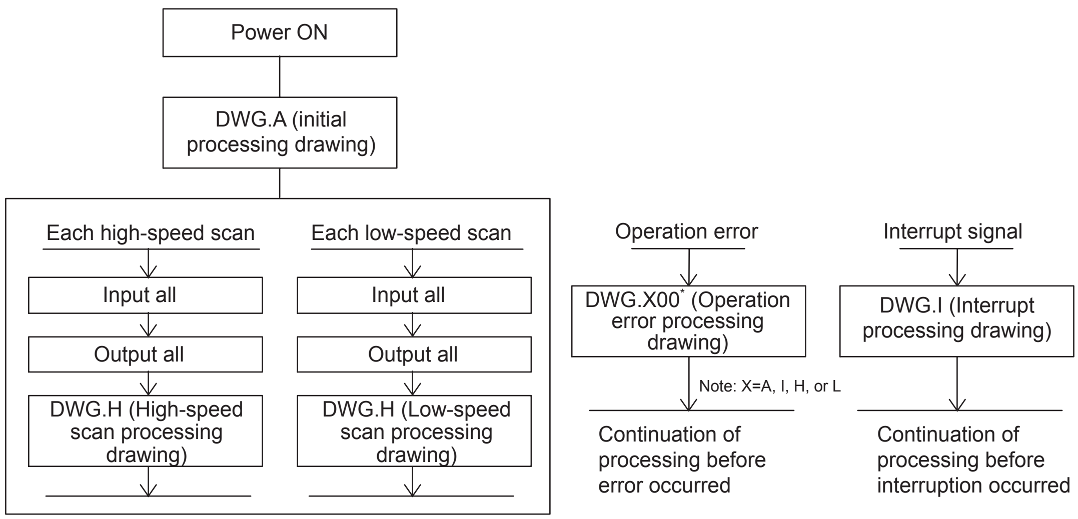
The following table provides details of the number of drawings for each drawing.

Drawing	Number of Drawings			
	DWG.A	DWG.I	DWG.H	DWG.L
Parent Drawings	1 (A)	1 (I)	1 (H)	1 (L)
Operation Error Processing Drawings	1 (A00)	1 (I00)	1 (H00)	1 (L00)
Child Drawings Grandchild Drawings	Total: 62 max.	Total: 62 max.	Total: 198 max.	Total: 498 max.

5.2.2 Execution Control of Drawings

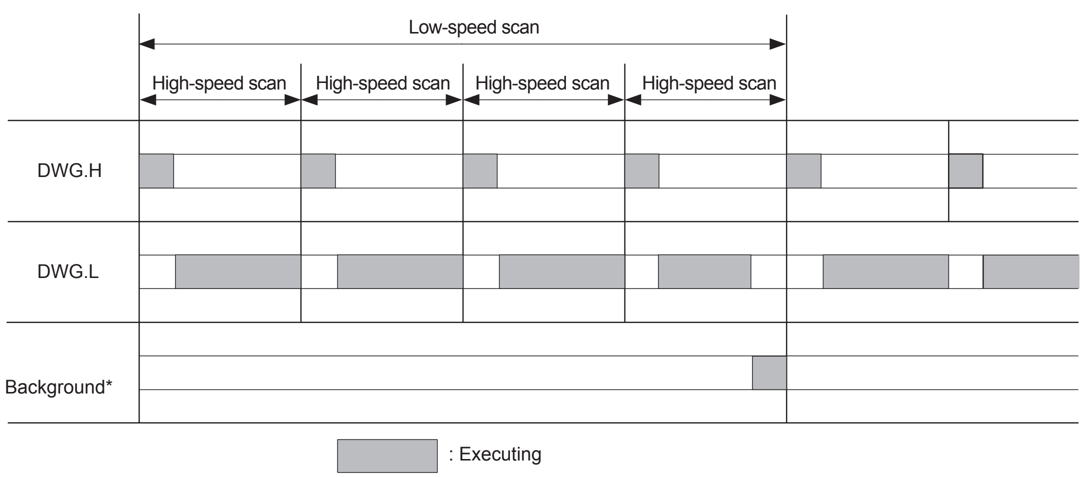
(1) Execution Control

The following table shows when each drawing is executed based on the order of priority.



(2) Execution Schedule for Scan Processing Drawings

The scan processing drawings are not executed simultaneously. As shown in the following figure, the execution of each drawing is scheduled based on the order of priority and time sharing.

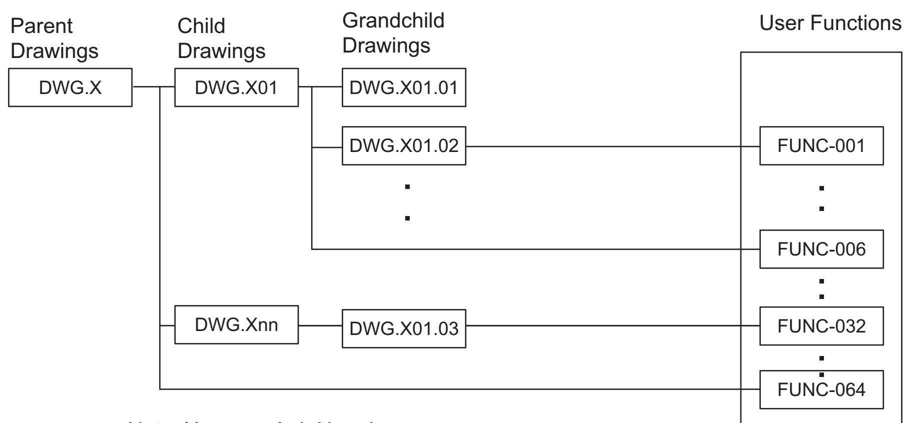


* Background processing is used to execute internal system processing, e.g., communication processing.

Low-speed scan processing is executed in spare processing time of the high-speed scan. Set the time of the high-speed scan to approximately double the total execution time for DWG.H.

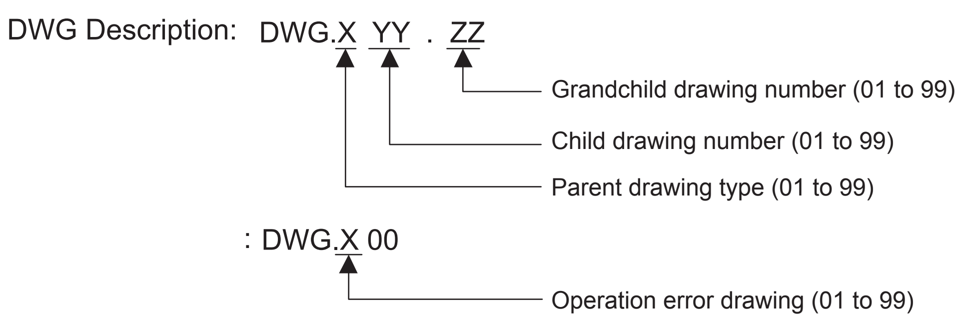
(3) Hierarchical Structure of Drawings

Each processing program is made up of parent drawings, child drawings, and grandchild drawings. Parent drawings cannot call child drawings from a different type of drawing and child drawings cannot call grandchild drawings from a different type of drawing. Also, parent drawings cannot directly call grandchild drawings. Child drawings are always called from parent drawings and grandchild drawings are always called from child drawings. This is the hierarchical structure of drawings.
As shown in the following figure, each processing program is created from a hierarchy of parent, child, and grandchild drawings.



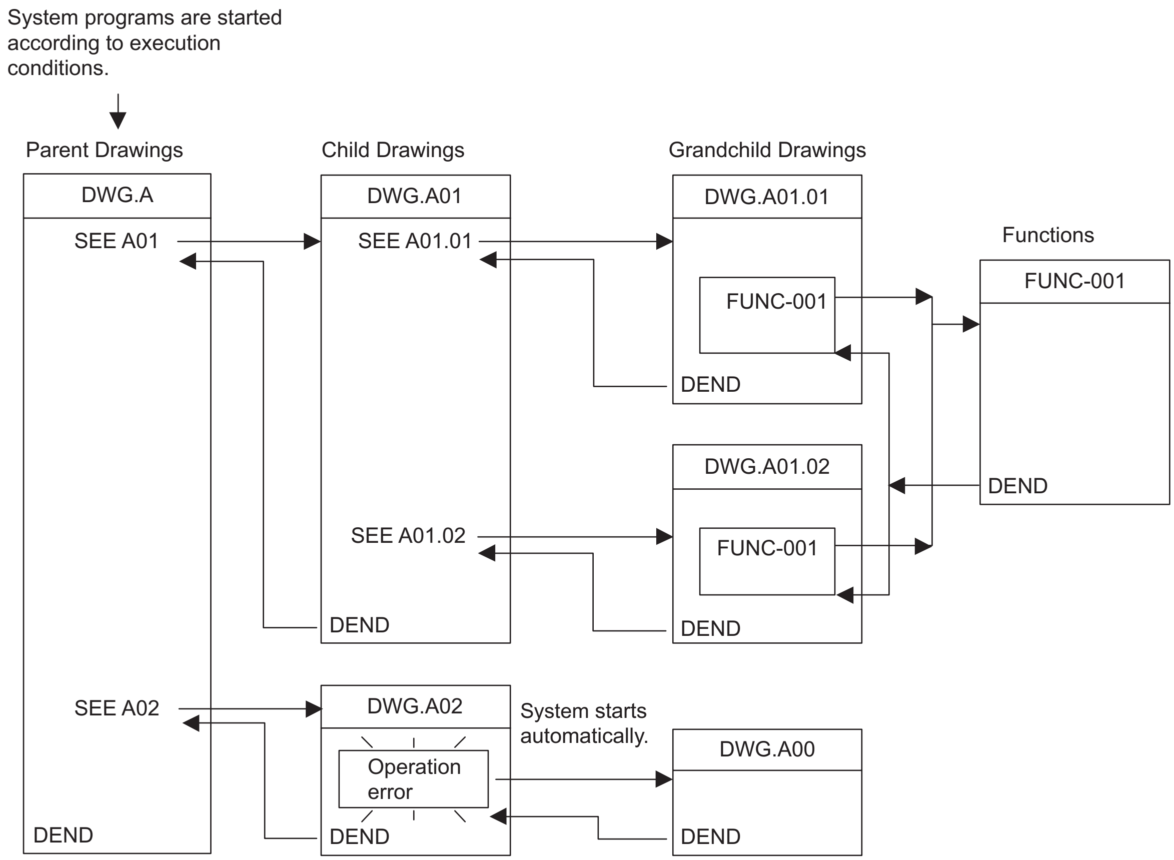
Note: X means A, I, H, or L.

The type of drawing and the parent-child-grandchild relationship can be determined from the descriptors after “DWG.”



(4) Drawing Execution Processing Method

The execution processing of hierarchical drawings are performed by calling lower-level drawings from higher-level drawings.
The following figure shows the execution processing for drawings, using DWG.A as an example.



- Functions can be called from any drawing. Functions can also be called from other functions.
- When an operation error occurs, the operation error processing drawing for that drawing will be started.

5.2.3 Motion Programs

(1) Outline

Motion programs are programs written in a text-based language called motion language. Up to 256 motion programs can be created separate from ladder drawings.
The following table shows the two types of motion programs.

Type	Specification Method	Features	No. of Programs
Main Program	MPM□□□ (□□□ = 1 to 256)	Accessed from DWG.H	Up to 256 programs (including main and sub programs) can be created.
Subprogram	MPS□□□ (□□□ = 1~256)	Can be called from main programs	

- Specify a different MPM and MPS program number (□□□) between 1 and 256 for each program.
- The MP2300 can execute up to 16 motion programs simultaneously. An alarm (no system work error*) will occur if 17 or more programs are executed simultaneously.

  * No system work error: Bit E of the leading word in the MSEE work registers

There are two methods for specifying motion programs: direct specification of the program number or indirect specification by specifying the register number where the program number is stored.

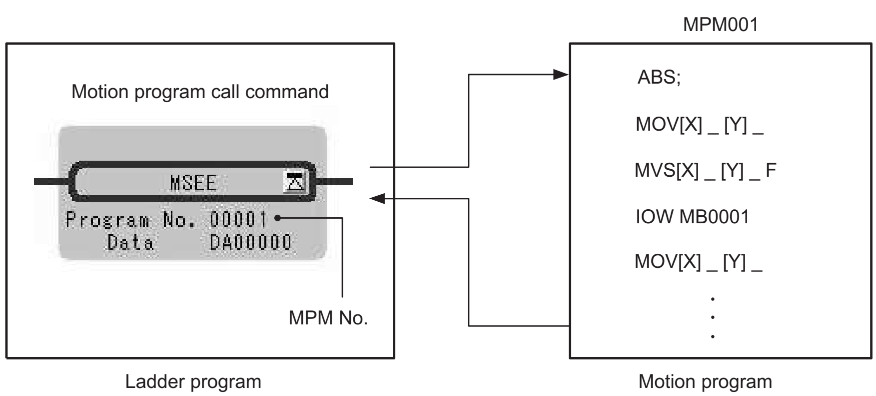


Fig. 5.1 Calling Motion Programs Using Direct Specification

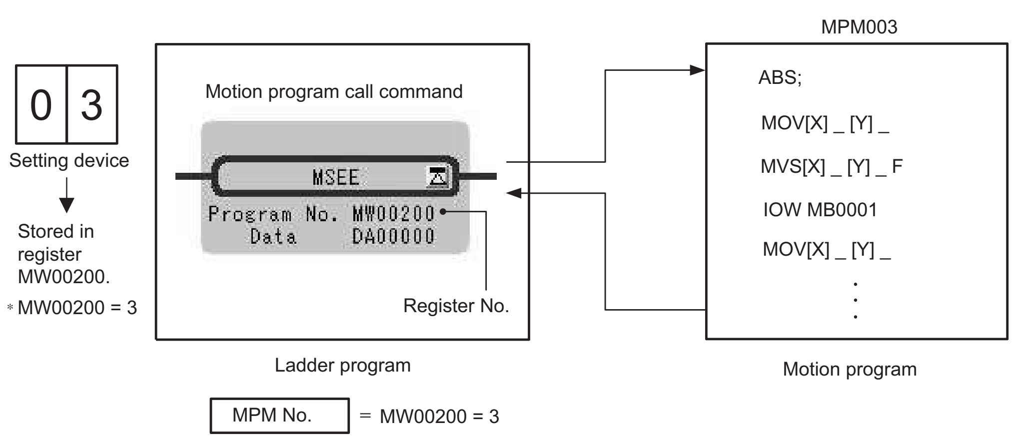


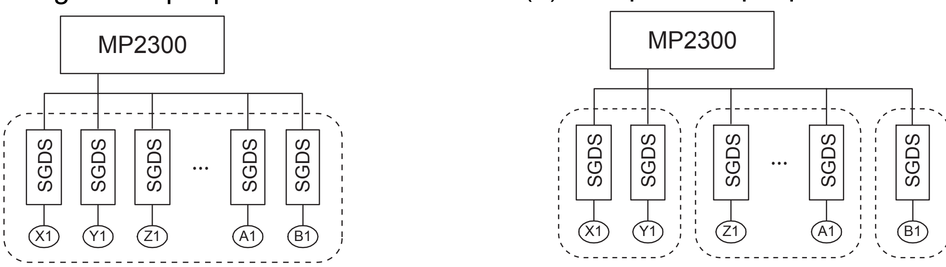
Fig. 5.2 Calling Motion Programs Using Indirect Specification

- For the meaning of register numbers and how to interpret them, refer to *5.3 Registers* on page 5-21.

(2) Groups

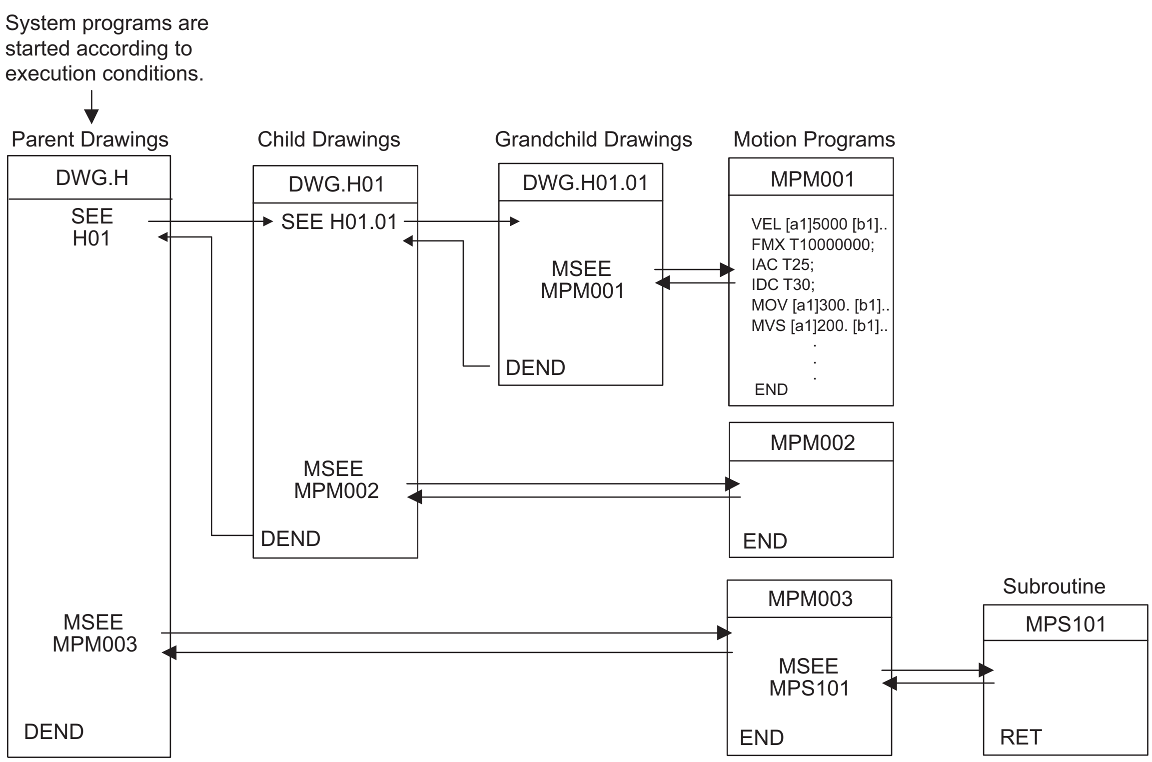
A group of axes with related operations can be treated as one group by motion programs and programs can be executed for each group. This allows one MP2300 to independently control multiple machines using group operation. Group operation can be single group operation or multiple group operation.
Definitions for axes to be grouped together are made under *Group Definitions*. For details on group definitions, refer to *Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device (SIEPC88070005□)*.

(a) Single Group Operation (b) Multiple Group Operation



(3) Motion Program Execution Example

Motion programs are always called from H drawings using the MSEE command (motion program call command). Motion programs can be called from any parent, child, or grandchild drawing in an H drawing.
The following figure shows an example of motion program execution.



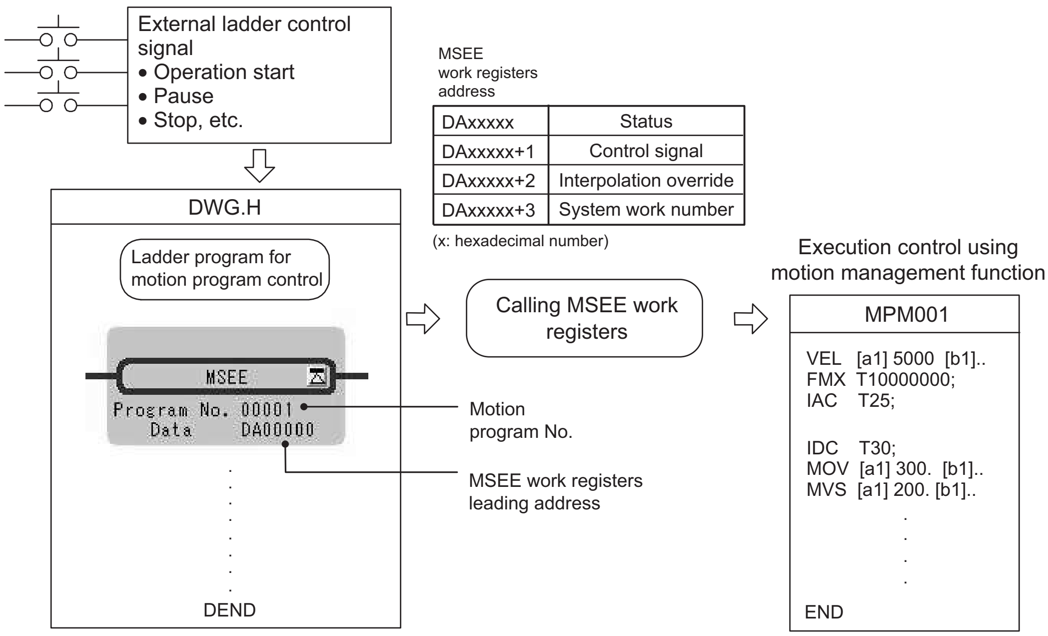
H drawing ladder commands are executed in hierarchical order i.e., parent drawings, child drawings, then grandchild drawings each high-speed scan cycle.
Motion programs are also called each scan cycle, but unlike ladder programs, all motion programs cannot be executed in one scan. For this reason, motion programs are executed and controlled by special system's motion management function.

- Ladder program MSEE commands cannot call motion program subroutines (MPS□□□). Subroutines can be called only from motion programs (MPM□□□ and MPS□□□).
- The same motion program or same subroutine can be called only once in one scan.

5.2.4 Motion Programs and MSEE and S Registers

Motion program status, control signal, interpolation override, and system work number data is saved in four MSEE registers (4 words) with a DAxxxx (x: hexadecimal number) leading address. This data is called every time the MSEE command is executed in an H drawing. Motion program execution information can be monitored in the S registers.

The following figure shows the method for executing motion programs. MSEE register details and S register descriptions are also provided below from (1) onwards.



Ladder program Motion program

- For the meaning of register numbers and how to interpret them, refer to *5.3 Registers* on page 5-21.

(1) Motion Program Status Bits (DAxxxxx+0)

The leading word (DAxxxxx+0) in the MSEE work registers contains the motion program status bits for monitoring execution status of the motion program.
The following table shows details of status bit.

Bit No.	Status
0	Program running
1	Program paused
2	Program stopped by stop request (used by system)
3	(Used by system)
4	Single program block operation stopped
8	Program alarm
9	Stopped by brake point
B	In debug mode (EWS debugging operation)
D	Start request signal history
E	No system work error
F	Main program number exceeded error

- Alarm details are saved in the S registers.

(2) Motion Program Control Signals (DAxxxxx+1)

Program control signals (e.g., program operation start requests and program stop requests) need to be entered to execute the motion program called from DWG.H using the MSEE command. The second word of the MSEE work registers (DAxxxxx+1) is the motion program control signal.

The following types of signals for controlling motion programs are available.

Bit No.	Signal Name	Signal Type
0	Program operation start request	Differential or NO contact input
1	Program pause request	NO contact
2	Program stop request	NO contact
3	Program single block mode selection	NO contact
4	Program single block start request	Differential or NO contact input
5	Alarm reset request	NO contact
6	Program continuous operation start request	Differential or NO contact input
8	Skip 1 information	NO contact
9	Skip 2 information	NO contact
D	System work number setting	NO contact OFF: The system will use the automatically obtained system work number. The system work number may be different each time. ON: The work with the set system work number will be used.
E	Interpolation override setting	NO contact OFF: Interpolation override 100% fixed ON: Conforms to set interpolation override

These signals can perform run, stop, hold, and other controls for motion programs by entering from the ladder program to the work register specified by the MSEE command +1.

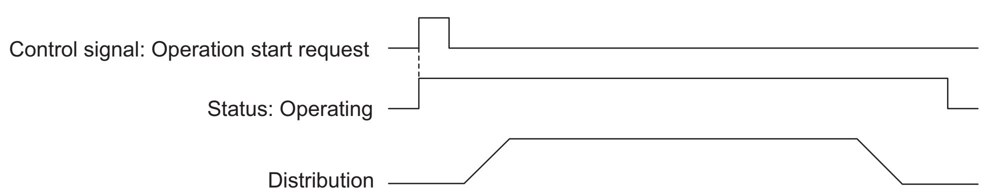
Use signals conforming to the above signal types when writing ladder programs.

- Motion programs are executed if the program operation start request signal is ON when the power is turned ON (e.g., when a start request signal is left in M register).

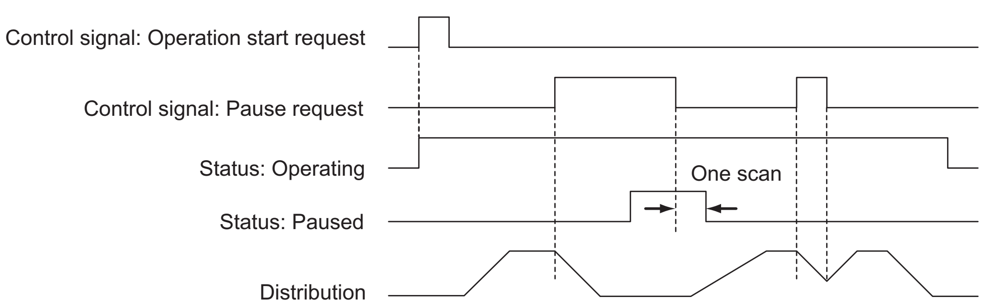
■ Timing Chart for Motion Program Control Signals

The following figure shows an example of a timing chart for motion program control signals.

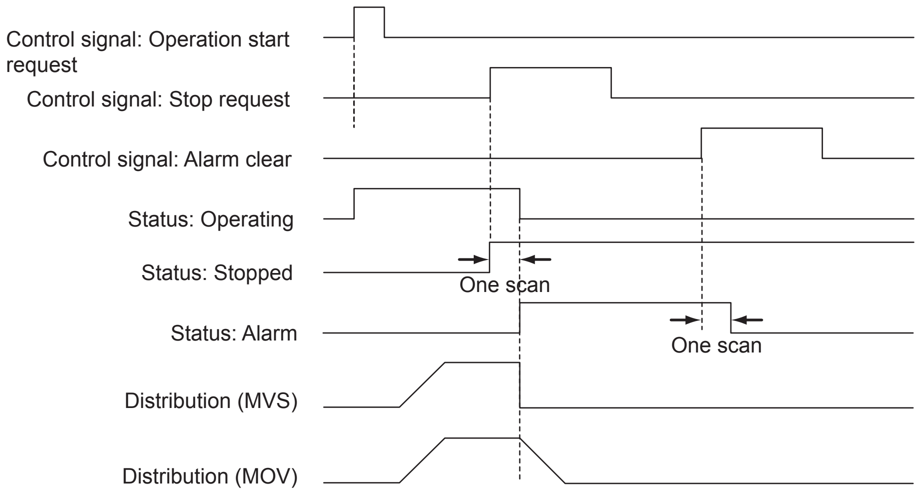
Program Operation Start Request



Pause Request



Stop Request



- An alarm will occur if the stop request is turned ON during axis operation using a motion command.

(3) Interpolation Override (DAxxxxx+2)

The override when executing interpolation travel commands (setting; unit: 1 = 0.01%) is set in the third word of the MSEE work registers (DAxxxxx+2).
This interpolation override is enabled only when the motion program control signal bit E (interpolation override setting) is ON.

(4) System Work Number (DAxxxxx+3)

The system work number n (setting range: 1 to 16) used when executing motion programs is set by the fourth word of the MSEE work registers (DAxxxxx+3).
This system work number is enabled only when the motion program control signal bit D (system work number setting) is ON. The status bit, bit E (No system work error), will turn ON if the work number setting is outside the setting range or the specified system work is in use.

(5) Monitoring Motion Program Execution Information Using S Registers

The S registers (SW03200 to SW04191) can be used to monitor motion program execution information.

■ Register Areas for Motion Program Execution Information

Motion program execution information

Register	Contents	Size
SW03200	Executing program number (No. of main program currently executing)	16W
SW03216	Reserved by the system.	16W
SW03232	Executing Program Bit (Executing when corresponding bit is ON)	16W
SW03248	Reserved by the system.	16W
SW03264	Program information used by work 1	58W
SW03222	Program information used by work 2	58W
SW03380	Program information used by work 3	58W
SW03438	Program information used by work 4	58W
SW03496	Program information used by work 5	58W
SW03554	Program information used by work 6	58W
SW03612	Program information used by work 7	58W
SW03670	Program information used by work 8	58W
SW03728	Program information used by work 9	58W
SW03786	Program information used by work 10	58W
SW03844	Program information used by work 11	58W
SW03902	Program information used by work 12	58W
SW03960	Program information used by work 13	58W
SW04018	Program information used by work 14	58W
SW04076	Program information used by work 15	58W
SW04134	Program information used by work 16	58W
SW04192	Reserved by the system.	928W
SW05120	Reserved by the system.	64W

Executing program number

Register	Contents
SW03200	Program number used by work 1
SW03201	Program number used by work 2
SW03202	Program number used by work 3
SW03203	Program number used by work 4
SW03204	Program number used by work 5
SW03205	Program number used by work 6
SW03206	Program number used by work 7
SW03207	Program number used by work 8
SW03208	Program number used by work 9
SW03209	Program number used by work 10
SW03210	Program number used by work 11
SW03211	Program number used by work 12
SW03212	Program number used by work 13
SW03213	Program number used by work 14
SW03214	Program number used by work 15
SW03215	Program number used by work 16
SW03216	Program number used by work 17

Executing program bit

Register	Contents
SW03232	MP□016 (Bit15) to MP□001 (Bit0)
SW03233	MP□032 (Bit15) to MP□017 (Bit0)
SW03234	MP□048 (Bit15) to MP□033 (Bit0)
SW03235	MP□054 (Bit15) to MP□049 (Bit0)
SW03236	MP□080 (Bit15) to MP□055 (Bit0)
SW03237	MP□096 (Bit15) to MP□081 (Bit0)
SW03238	MP□112 (Bit15) to MP□097 (Bit0)
SW03239	MP□128 (Bit15) to MP□113 (Bit0)
SW03240	MP□144 (Bit15) to MP□129 (Bit0)
SW03241	MP□160 (Bit15) to MP□145 (Bit0)
SW03242	MP□176 (Bit15) to MP□161 (Bit0)
SW03243	MP□192 (Bit15) to MP□177 (Bit0)
SW03244	MP□208 (Bit15) to MP□193 (Bit0)
SW03245	MP□224 (Bit15) to MP□209 (Bit0)
SW03246	MP□240 (Bit15) to MP□225 (Bit0)
SW03247	MP□256 (Bit15) to MP□241 (Bit0)

Note: □ indicates M or S.

■ Details of Program Information Used by Work n

Program information used by work n

Offset	Contents	Size
+0	Program status	
+1	Program control signal	
+2	Parallel 0 information	3W
+5	Parallel 1 information	3W
+8	Parallel 2 information	3W
+11	Parallel 3 information	3W
+14	Parallel 4 information	3W
+17	Parallel 5 information	3W
+20	Parallel 6 information	3W
+23	Parallel 7 information	3W
+26	Logical axis #1 program current position	2W
+28	Logical axis #2 program current position	2W
+30	Logical axis #3 program current position	2W
+32	Logical axis #4 program current position	2W
+34	Logical axis #5 program current position	2W
+36	Logical axis #6 program current position	2W
+38	Logical axis #7 program current position	2W
+40	Logical axis #8 program current position	2W
+42	Logical axis #9 program current position	2W
+44	Logical axis #10 program current position	2W
+46	Logical axis #11 program current position	2W
+48	Logical axis #12 program current position	2W
+50	Logical axis #13 program current position	2W
+52	Logical axis #14 program current position	2W
+54	Logical axis #15 program current position	2W
+56	Logical axis #16 program current position	2W

Executing program number
Executing block number
Error code

The monitoring method differs depending on the setting for bit D of the motion program control signal (system work number setting).

[a] When Bit D of Motion Program Control Signal (System Work Number Setting) is ON

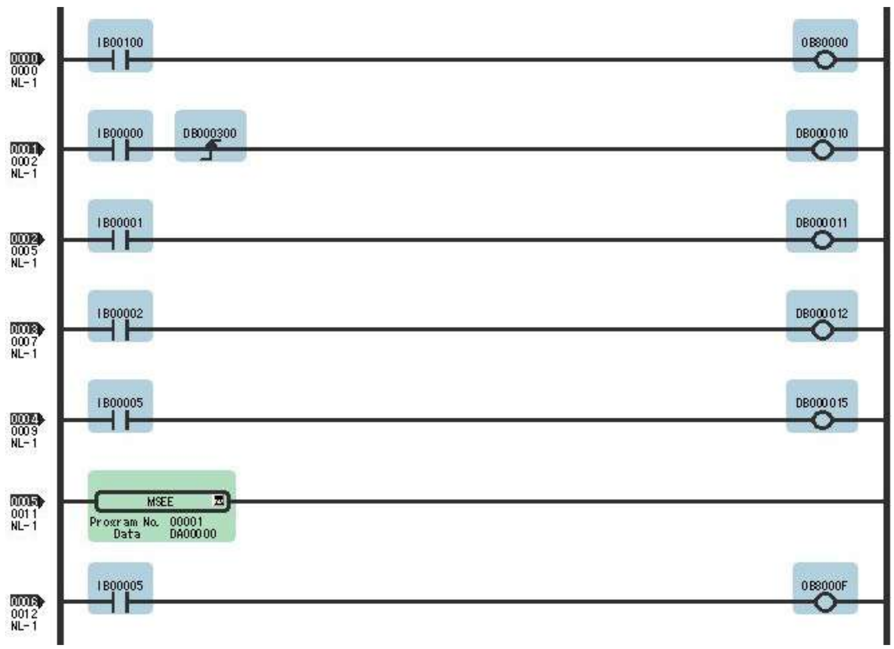
The execution information is reported to the “Program information used by work n” registers (SW03264 to SW04133).
For example, when the system work number is 1, the motion program execution information can be monitored using SW03246 to SW03321 “Program information used by work 1.”

[b] When Bit D of Motion Program Control Signal (System Work Number Setting) is OFF

The system automatically determines the system work to be used. This means that the work being used can be checked under “Executing program number” (SW03200 to SW03215).
For example, if the motion program to be monitored is MPM001, and SW03202 is 001, the number of the work being used is 3. This means that the execution information for motion program MPM001 can be monitored using “Program information used by work 3” (SW03380 to SW03437).

5.2.5 Example of Ladder Programs for Motion Program Control

The following figure shows the minimum ladder programming required for controlling motion programs.



The following table shows the details of the above ladder program.

Step No.	Program Details
1	The servo ON signal (IB00100) sets the Servo ON motion settings parameter (OB80000) and turns ON the Servo.
2 to 10	The signals connected to the MP2300 external input signals are stored as the motion program control signals. IW0000 (external input signal) → DW00001 (Second word of MSEE work registers) • Start program operation • Pause program • Stop program • Reset alarm
11	Calls motion program MPM001 MSEE MPM001 DA00000 (1) (2) (1) Motion program number (2) Leading MSEE work register address
12	Sets motion settings parameter Alarm Clear (OB0000F) using the alarm reset signal (IB00005) and clears the alarm.

If the above ladder program is used to enter external input signals connected to the MP2300 (IB00000 to IB00005) to DW00001 (second word of MSEE work registers) as the motion program control signals, motion program operations such as run, pause, and stop can be performed using the system's motion management function.

The following tables show an example of the minimum external input signals required to create the above ladder program.

External Signal Address	External Signal Name
IB00000:	Start program operation
IB00001:	Pause program
IB00002:	Stop program
IB00005:	Reset the alarm.

Bit No.	Motion Program Control Signal
0:	Program operation start request
1:	Program pause request
2:	Program stop request
5:	Alarm reset request

5.2.6 Functions

Functions are executed by calling them from parent, child, or grandchild drawings using the FSTART command.
Functions can be called from any drawing, and the same function can be called at the same time from different types of drawings and from different levels of drawings. Another completed functions can also be called from functions.
Using functions has the following advantages.

- Easier creation of user program components
- Easier writing and maintenance of user programs

Functions include standard system functions that are already in the system and user functions that are defined by the user.

(1) Standard System Functions

The transmission and other functions listed below are already created as standard system functions. Standard system functions cannot be changed by users.

Type	Name	Symbol	Contents
System functions	Counter	COUNTER	Incremental/decremental counter
	First in/first out	FINFOUT	First in/first out
	Trace function	TRACE	Data trace execution control
	Data trace read	DTRC-RD	Reads data from data trace memory to user memory
	Inverter trace read function	ITRC-RD	Reads trace data from inverter trace memory to user memory
	Message send	MSG-SND	Sends messages to external communication devices
	Message receive	MSG-RCV	Receives messages from external communication devices

(2) User Functions

The functions (programs) and the function definitions can be changed (programmed) freely by users. The maximum number of user functions that can be defined is 500 drawings.

- Refer to the following manual for information on defining functions.
  Machine Controller MP900/MP2000 Series User's Manual Ladder Programming (SIEZ-C887-1.2□)
  Machine Controller MP900/MP2000 Series User's Manual Motion Programming (SIEZ-C887-1.3□)
  Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual (SIEZ-C887-13.1□)
  Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual (SIEZ-C887-13.2□)

5.3 Registers

This section describes the types of registers used in MP2300 user programs (mainly ladder programs) and how to use them.

5.3.1 Types of Registers

(1) DWG Registers

Registers used by ladder programs (ladder drawings; DWG). Each drawing can use the registers outlined in the following table.

Type	Name	Specification Method	Range	Details	Characteristics
S	System registers	SB, SW, SL, SFnnnnn (SAnnnnn)	SW00000 to SW08191	Registers provided by the system. SW00000 to SW00049 are cleared to all zeros when the system starts.	Common to all drawings
M	Data registers	MB, MW, ML, MFnnnnn (MAnnnnn)	MW00000 to MW65534	Registers shared by all drawings. Used, e.g., as an interface between drawings.	
I	Input registers	IB, IW, IL, IFhhhh (IAhhhh)	IW0000 to IW13FFF	Registers used for input data.	
O	Output registers	OB, OW, OL, OFhhhh (OAhhhh)	OW0000 to OW13FFF	Registers used for output data.	
C	Constants registers	CB, CW, CL, CFnnnnn (CAnnnnn)	CW00000 to CW16383	Registers that can only be called from programs.	
#	# registers	#B, #W, #L, #Fnnnnn (#Annnnn)	#W00000 to #W16383	Call-only registers Can be called only by corresponding drawing. The usage range is set by the user using MPE720.	Unique to each drawing
D *	D registers	DB, DW, DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each drawing. Can be used only by corresponding drawing. The usage range is set by the user using MPE720.	

- n: Decimal number; h: Hexadecimal number
- B, W, L, F, and A: Data type (B: Bit, W: Integer, L: Double-length integer, F: Real number, A: Address. Refer to *5.3.2 Data Types and Register Specifications* on page 5-24.)

* Up to 32 D registers (32 words, DW0000 to DW0031) can be used when creating drawings, but this can be changed in the MPE720 Drawings Properties Window. Refer to the *Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device (SIEPC88070005□)* for details.

- S and M register data has a battery backup to ensure the data is held even if the MP2300 power is turned OFF and ON. Other register data is saved to flash memory, so when the MP2300 power is turned OFF to ON, data saved to flash memory is read and data not saved to flash memory is lost.
  It is recommended, therefore, that data to be held regardless of whether or not the power is turned OFF to ON should be written to M registers if possible.

(2) Function Registers

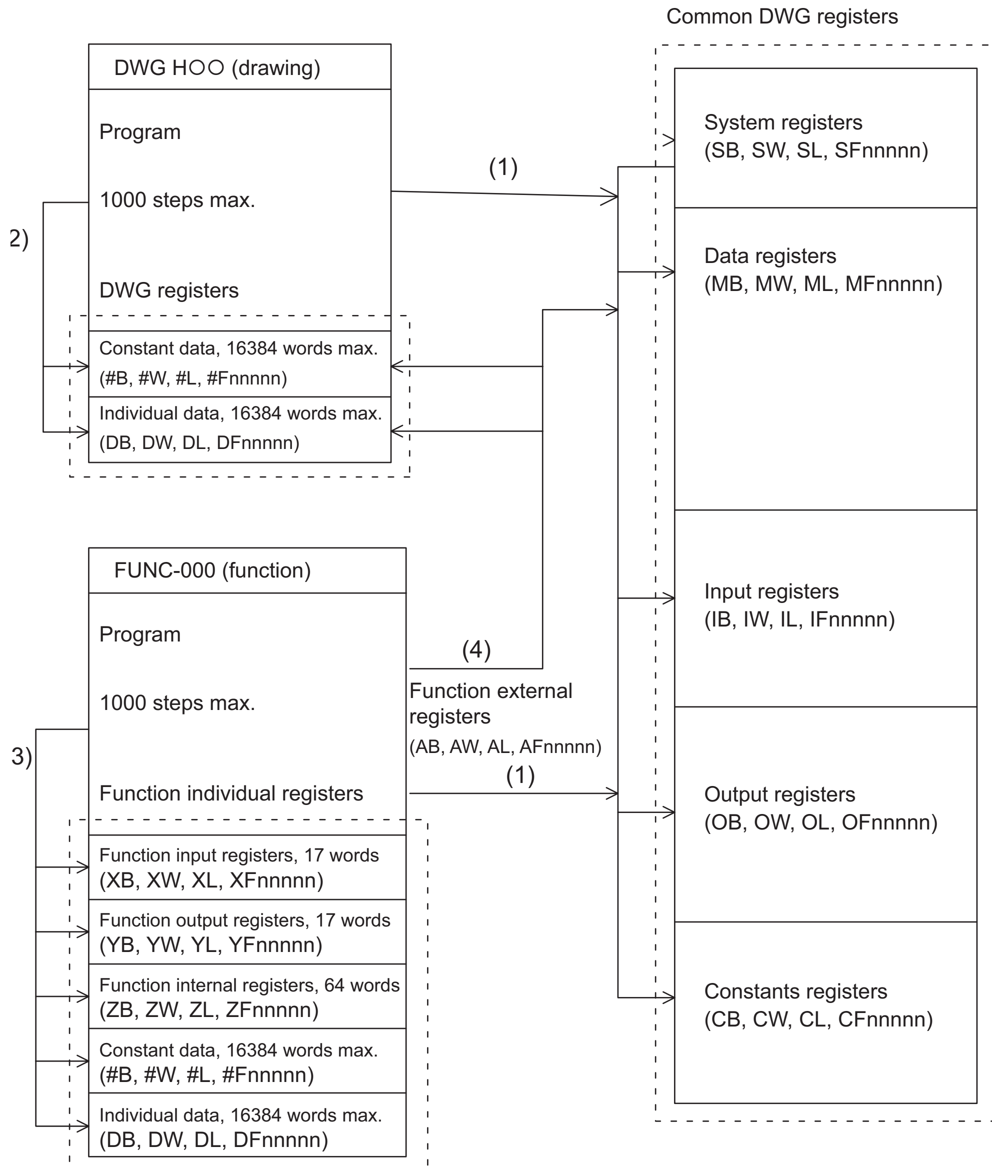
The following table shows the registers that can be used with each function.

<table>
<tr><th>Type</th><th>Name</th><th>Specification Method</th><th>Range</th><th>Details</th><th>Characteristics</th></tr>
<tr><td>X</td><td>Function input registers</td><td>XB, XW, XL, XFnnnnn</td><td>XW00000 to XW00016</td><td>Input to functions
Bit input: XB000000 to XB00000F
Integer input: XW00001 to XW00016
Double-length integer input: XL00001 to XL00015</td><td rowspan="6">Unique to each function</td></tr>
<tr><td>Y</td><td>Function output registers</td><td>YB, YW, YL, YFnnnnn</td><td>YW00000 to YW00016</td><td>Output from functions
Bit output: YB000000 to YB00000F
Integer output: YW00001 to YW00016
Double-length integer output: YL00001 to YL00015</td></tr>
<tr><td>Z</td><td>Internal function registers</td><td>ZB, ZW, ZL, ZFnnnnn</td><td>ZW0000 to ZW00063</td><td>Internal registers unique to each function
Can be used for function internal processing.</td></tr>
<tr><td>A</td><td>External function registers</td><td>AB, AW, AL, AFhhhh</td><td>AW0000 to AW32767</td><td>External registers with the address input value as the base address.
For linking with S, M, I, O, #, and DAnnnnn.</td></tr>
<tr><td>#</td><td># registers</td><td>#B, #W, #L, #Fnnnnn (#Annnnn)</td><td>#W00000 to #W16383</td><td>Call-only registers
Can be called only from the relevant function. The usage range is set by the user using MPE720.</td></tr>
<tr><td>D</td><td>D registers</td><td>DB, DW, DL, DFnnnnn (DAnnnnn)</td><td>DW00000 to DW16383</td><td>Internal registers unique to each function.
Can be called only the relevant function.
The usage range is set by the user using MPE720.</td></tr>
<tr><td>S</td><td>System registers</td><td>SB, SW, SL, SFnnnnn (SAnnnnn)</td><td colspan="3" rowspan="5">Same as DWG registers
These registers are shared by drawings and functions. Pay attention to how these registers are to be used when calling the same function from a drawing of a different priority level.</td></tr>
<tr><td>M</td><td>Data registers</td><td>MB, MW, ML, MFnnnnn (MAnnnnn)</td></tr>
<tr><td>I</td><td>Input registers</td><td>IB, IW, IL, IFhhhh (IAhhhh)</td></tr>
<tr><td>O</td><td>Output registers</td><td>OB, OW, OL, OFhhhh (OAhhhh)</td></tr>
<tr><td>C</td><td>Constants registers</td><td>CB, CW, CL, CFhhhh (CAnnnn)</td></tr>
</table>

- n: Decimal number; h: Hexadecimal number
- B, W, L, F, and A: Data type (B: Bit, W: Integer, L: Double-length integer, F: Real number, A: Address. Refer to *5.3.2 Data Types and Register Specifications* on page 5-24.)
- SA, MA, IA, OA, DA, #A, and CA registers can be used within functions.

(3) Register Ranges in Programs

The following figure shows DWG programs, function programs, and register call ranges.

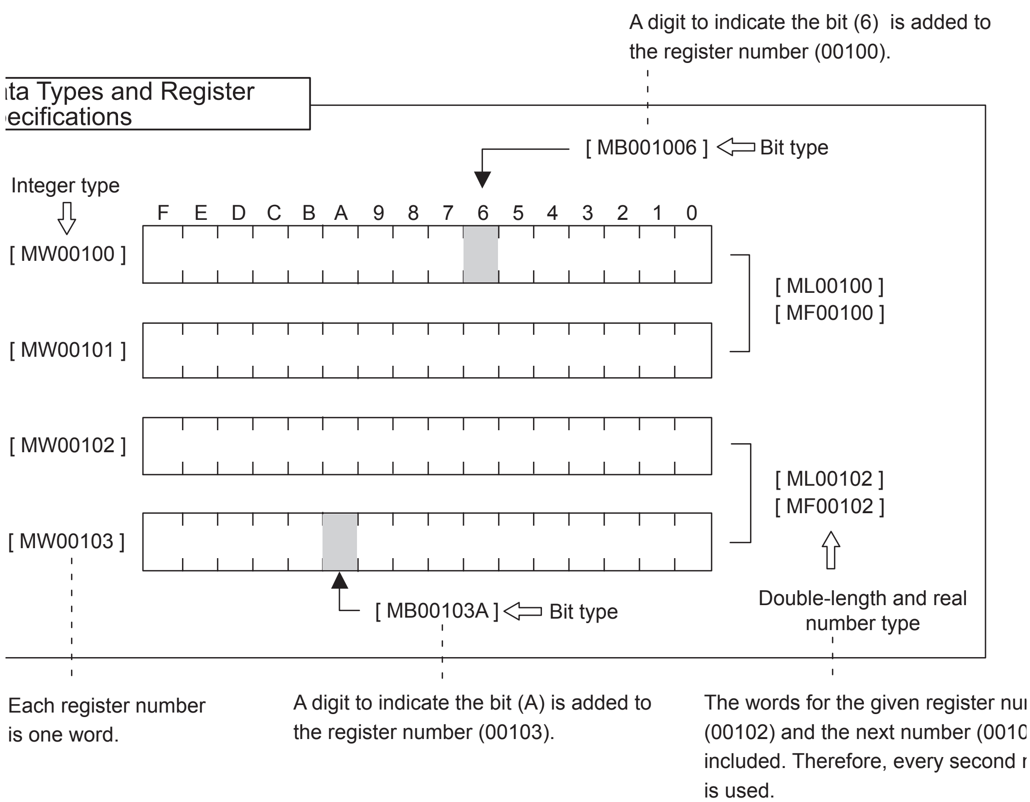


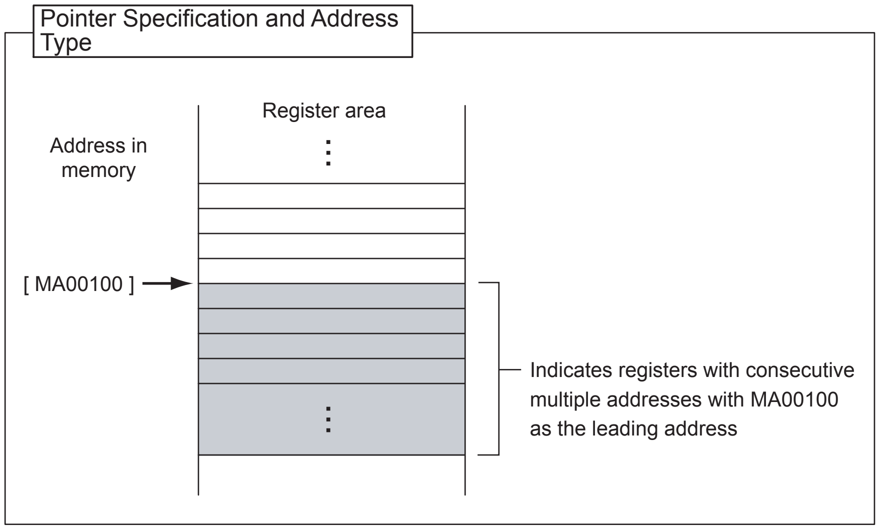
(1): Registers that are common to all drawings can be called from any drawing or function.
(2): Registers that are unique to each drawing can be called only from within the drawing.
(3): Registers that are unique to each function can be called only from within the function.
(4): Registers that are common to all drawings and registers that are unique to each drawing can be called from functions using the external function registers.

5.3.2 Data Types and Register Specifications

There are five kinds of data: Bit, integer, double-length integer, real number, and address data. Each is used differently depending on the application. Address data, however, is used only inside functions when specifying pointers. The following table shows the types of data.

Type	Data types	Numeric Value Range	Remarks
B	Bit	0, 1	Used by relay circuits.
W	Integer	–32768 to +32767 (8000H) (7FFFH)	Used for numeric value operations. The values in parentheses ( ) indicate use with logical operations.
L	Double-length integer	–2147483648 to +2147483647 (80000000H) (7FFFFFFFH)	Used for numeric value operations. The values in parentheses ( ) are for use with logical operations.
F	Real number	± (1.175E-38 to 3.402E+38), 0	Used for numeric value operations.
A	Address	0 to 32767	Used only when specifying pointers.



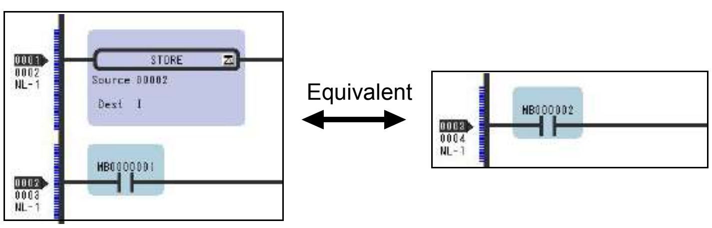


5.3.3 Using i and j Subscripts

There are two special register modifiers, i and j, that can be used with relay and register numbers. The functions of i and j are exactly the same. They are used for handling register numbers as variables.

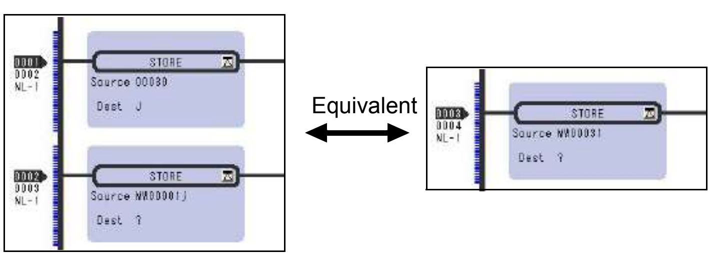
Examples of each register data type are used to explain the use of i and j.

(1) Bit Registers with Subscripts



These are the same as when i or j values are added to relay numbers. For example, when i = 2, MB000000i is the same as MB000002. And when j = 27, MB000000j is the same as MB00001B.

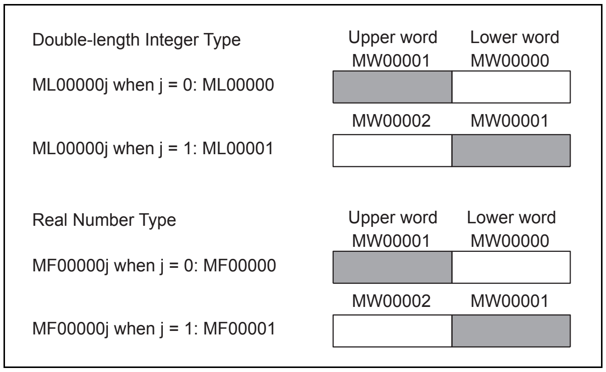
(2) Integer Registers with Subscripts



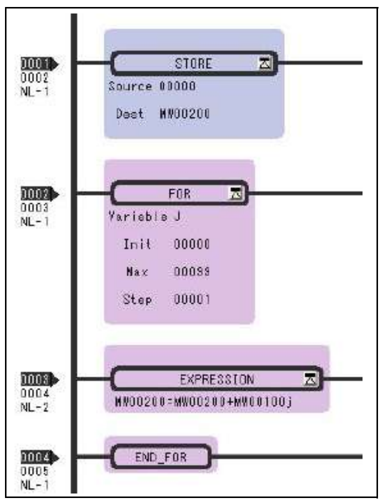
These are the same as when i or j values are added to register numbers.

For example, when i = 3, MW00010i is the same as MW00013. And when j = 30, MW00001j is the same as MW00031.

(3) Double-length Integers and Real Numbers with Subscripts



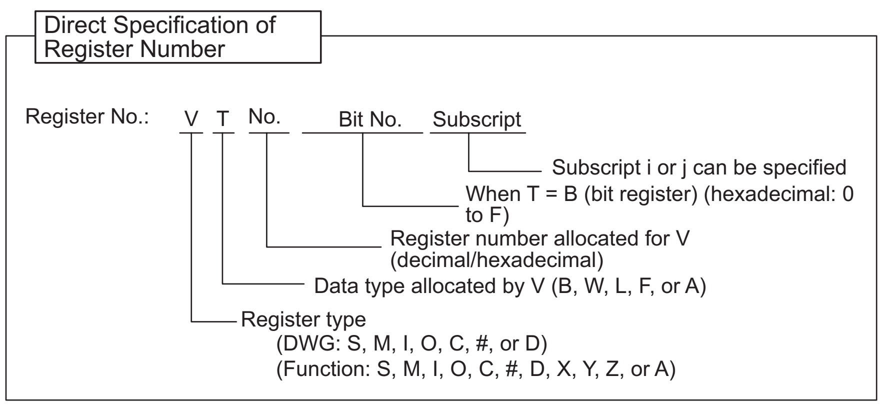
Example Program Using Subscripts

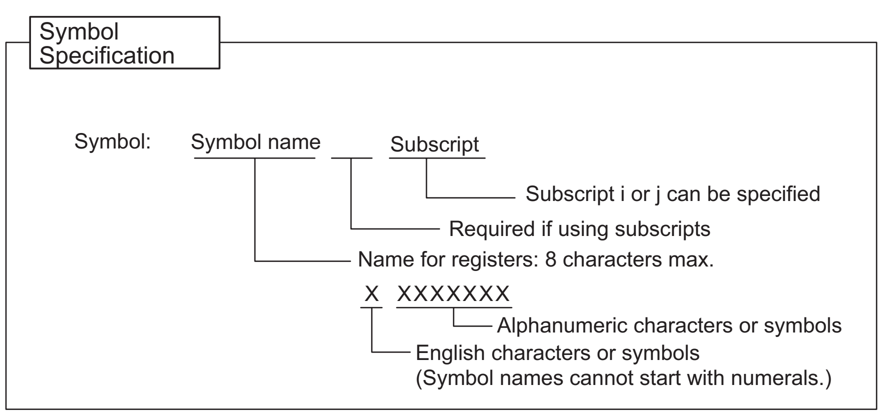


5.3.4 Register Specification Methods

Registers can be specified directly by register number or by symbol (register name) specification. A combination of both of these register specification methods can be used in ladder programs.
When using the symbol specification method, the relationship between symbols and register numbers must be defined.
The following table shows the register specification methods.

Specification Method	Specification Example by Data Type	
Register number direct specification	Bit register: Integer register: Double-length integer register: Real number register: Address register:	MB00100AX MW00100X ML00100X MF00100X MA00100X
	X: When specifying subscripts, subscript i or j is added after the register number.	
Symbol specification	Bit register: Integer register: Double-length integer registers: Real number registers: Address registers:	RESET1-A.X STIME-H.X POS-REF.X IN-DEF.X PID-DATA.X ↓ 8 alphanumeric characters max.
	X: When specifying subscripts, a period (.) is added after the symbol (8 alphanumeric characters max.) and then a subscript i or j is added.	





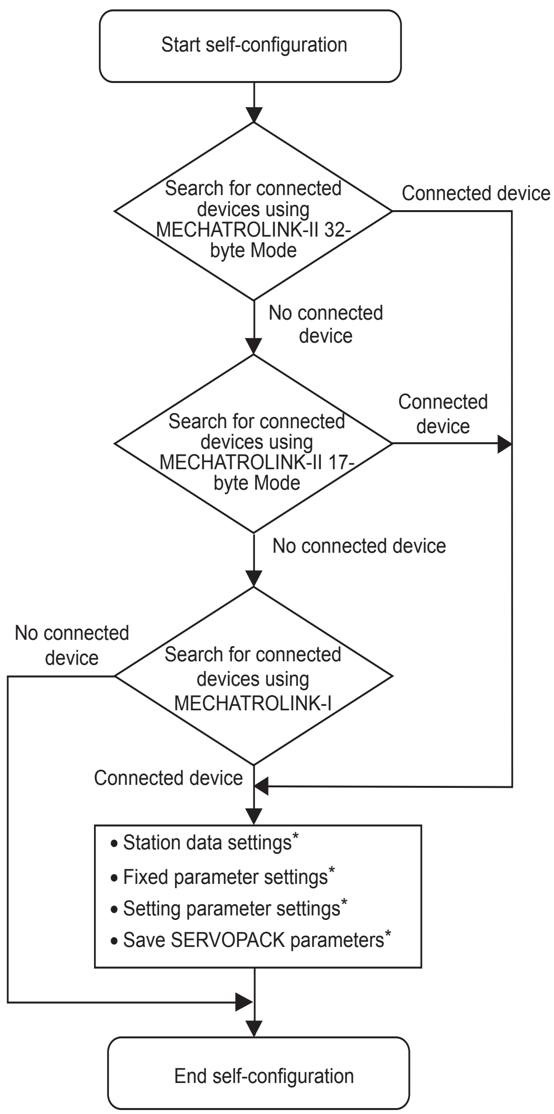
5.4 Self-configuration

The self-configuration function automatically recognizes the Optional Modules mounted to MP2300 Basic Module and all slave data for slaves connected to the MECHATROLINK network, and automatically generates a definition file.
Self-configuration can be executed from MPE720 or from a Basic Module switch.

- Refer to *5.4.2 Execution Procedure for Self-configuration Using the DIP Switch* on page 5-29 and *5.4.3 Execution Procedure for Self-configuration Using MPE720* on page 5-31 for the procedure to execute the self-configuration.

5.4.1 Self-configuration Processing Procedure

Self-configuration collects MECHATROLINK transmission definition data and slave data using the following procedure.
In the MP2300, the communication method is determined when the slave is detected, after which communication method switching and slave detection are not performed. When not even a single slave station is detected, MECHATROLINK-I communication continues.



- Slaves detection is performed for each communication in the following order: SERVOPACK, I/O, inverter.
- No connection is detected for stations with disconnected cables, for which a communication error has occurred, from which no response is received, or with the same station number as another station.

* Refer to *2.3 System Startup Using Self-Configuration* on page 2-59 and *2.1.4 MP2300 Self-configuration* on page 2-5 for information on station data settings, fixed parameters settings, setting parameter settings, and saving SERVOPACK parameters.

5.4.2 Execution Procedure for Self-configuration Using the DIP Switch

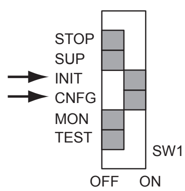
Self-configuration can be executed from the Basic Module DIP switch.

(1) Executing Self-configuration for the First Time after Connecting Devices

Turn ON the power to the MP2300 and then use the procedure described below. With this operation, self-configuration will be executed for all modules and all new definition files will be created. In addition, ladder drawings, functions, and all registers will be cleared.

In the following procedure, it is assumed that the power supply to all Σ-III SERVOPACKs are already turned ON.

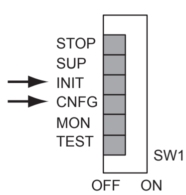
1. Turn OFF the power supply.
   Turn OFF the 24-VDC power supply to the MP2300.



2. Set the DIP switch.
   Set the switches INIT and CNFG of the DIP switch SW1 on the MP2300 Basic Module to ON.

3. Turn ON the power supply.
   Turn ON the 24-VDC power supply to the MP2300.

4. Check the LED indicators.
   Check that the LED indicators on the MP2300 Basic Module change as follows.



5. Reset the DIP siwtch.
   Set the switches INIT and CNFG of the DIP switch SW1 on the MP2300 Basic Module to OFF.

(2) Self-configuration after Adding Devices Such as SERVOPACKs

For self-configurations after having added network devices such as SERVOPACKs, leave the switch INIT to OFF in step (2) of the above procedure, then perform the rest of the steps.

- For network devices with existing definitions files, correctly connect and turn ON the power to the devices when executing self-configuration.

- If register allocations have been changed manually since the last time self-configuration was executed, the register allocations will return to the default settings when self-configuration is executed again. If the SVR is set to disabled (UNDEFINED), the setting will return to enabled. To keep the changed register allocations, do not use self-configuration, but manually make the register allocations for added devices and refresh the definitions file.

■ INIT Switch and RAM Data

RAM data will be cleared if the INIT switch on the DIP switch on the MP2300 Basic Module is turned ON and the power is turned ON. Flash memory data is read when the INIT switch is turned OFF and the power is turned ON. Therefore, always save data to the MP2300 flash memory before turning OFF the power when writing or editing programs.

For information on how to save data to flash memory, refer to *2.1.5 Starting and Preparing MPE720* on page 2-7.

■ Turning OFF Power After Executing Self-configuration

Do not turn OFF the 24-VDC power supply to the MP2300 after executing self-configuration until the definitions data has been saved to flash memory in the MP2300. If the power is turned OFF somehow before the data is saved to flash memory, execute self-configuration again.

5.4.3 Execution Procedure for Self-configuration Using MPE720

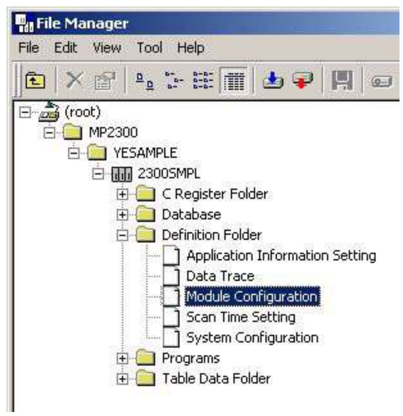
Executing self-configuration from the MPE20 allows not only self-configuration for all the Modules but also self-configuration for individual Modules.

(1) Self-configuration for All the Modules

Select ***Self Configure All Modules*** when executing the self-configuration for the first time after connecting devices.

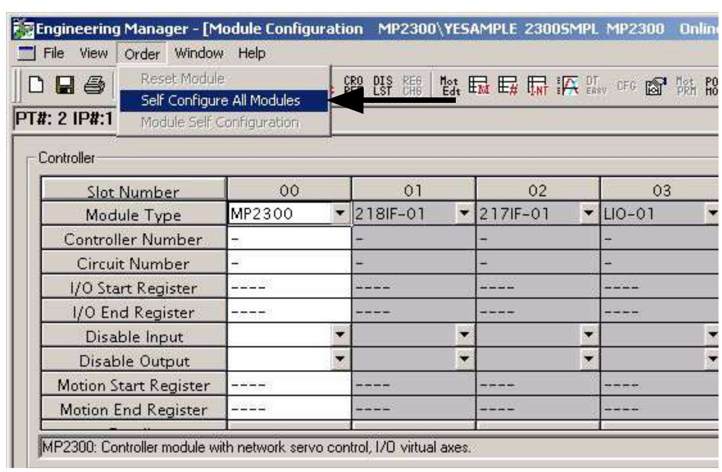
- After having added or deleted Modules or devices, use the procedure described in (2) Self-configuration of Each Module to detect the configuration. Executing ***Self Configure All Modules*** will overwrite the parameters that have been set.

1. In the File Manager Window, double-click the Controller folder and double-click the **Definition** folder. Five definition files will appear under the Definition folder. Double-click **Module Configuration.**



The **Engineering Manager** Window will open and the **Module Configuration** Window will appear.

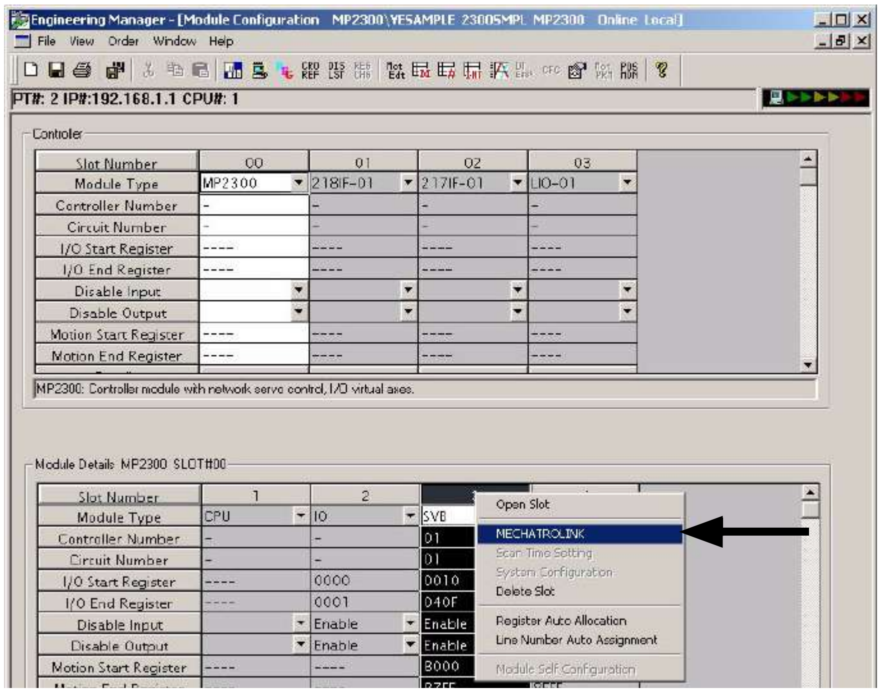
2. Select ***Order - Self Configure All Modules*** to execute self-configuration.



The RUN LED indicator will blink and a message indicating that *the module configuration definitions are being created* will be displayed. Once self-configuration has been completed, the message will disappear and the RUN LED indicator will return to its original state.

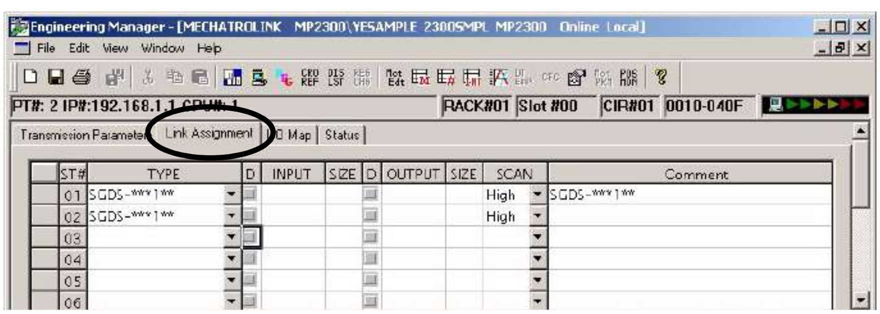
3. Select ***File - Save & Save to FLASH*** to save the definitions data to the flash memory.

4. Right-click the ***No. 3*** column in the Module Details area and click ***MECHATROLINK*** on the pop-menu that appears.



The **MECHATROLINK** Window will appear.

5. Select the Link Assignment Tab Page to display the devices currently connected to the Motion Board (SERVOPACK SGDS on this window) and the station numbers for those devices.

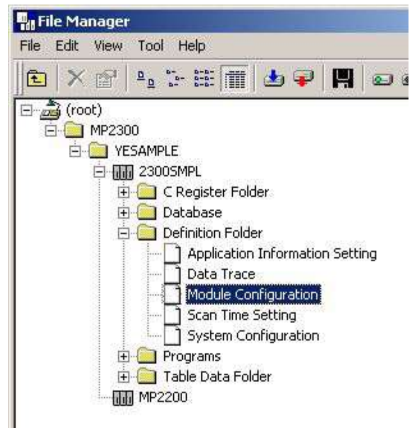


After confirming the devices, click $\boxed{\times}$ to close the **MECHATROLINK** Window.

(2) Self Configuration of Each Module

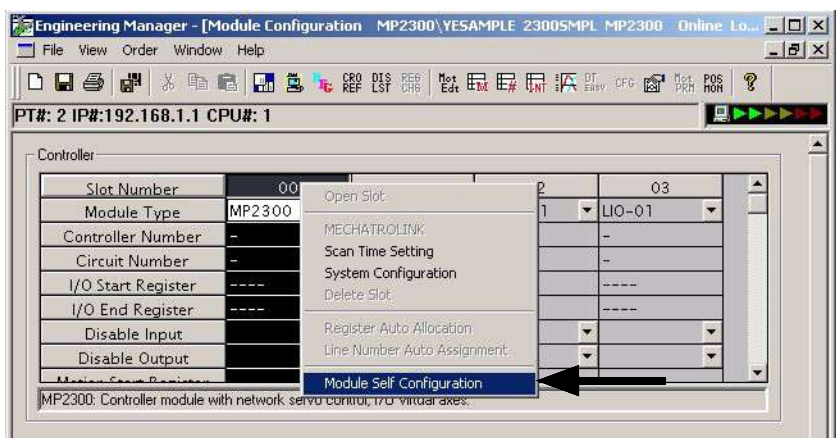
If devices are added, self-configuration can be executed separately for the Module (port) that has been changed.

1. Double-click the Controller folder and the **Definition** folder in the File Manager Window to display five definition files under the Definition folder. Double-click **Module Configuration**.



The Engineering Manager Window will start and the Module Configuration Window will appear.

2. Right-click the Module for which devices have been added and select ***Module Self Configuration*** from the pop menu to execute self-configuration.



The RUN LED indicator will blink and a message indicating that *the module configuration definitions are being created* will be displayed. Once self-configuration has been completed, the message will disappear and the RUN LED indicator will return to its original state.

- When MP2300 is selected as an individual module, executing ***Module Self Configuration*** will configure all the modules.

3. Select ***File - Save & Save to Flash***. A confirmation message will appear. Click the **Yes** Button to save the module configuration definitions.

5.5 Definition Data Refreshed by Self-configuration and Allocation Examples

The definition data refreshed when self-configuration is executed and module configuration definition examples according to combination of modules are shown below.

5.5.1 MP2300 Basic Module Definition Data

(1) I/O Allocations

Item	Allocation
Digital input (DI 18 points)	IW0000
Digital output (DO 4 points)	OW0001
MECHATROLINK	Leading I/O registers: IW0010/OW0010 Ending I/O registers: IW040F/OW040F (Input registers: IW0010 to IW040F Output registers: OW0010 to OW040F)

(2) MECHATROLINK Transmission Definition Data

The following table shows the MECHATROLINK transmission definitions that are automatically set based on the detected communication method and number of slaves.

Communication type	MECHATROLINK-II (32-byte)		MECHATROLINK-II (17-byte)		MECHATROLINK-I
Transmission speed	10 Mbps		10 Mbps		4 Mbps
Transmission bytes (transfer bytes)	32		17		17
Communication cycle	1 ms*	2 ms*	1 ms		2 ms
Maximum number of slave stations	*	*	14	15	14
Number of retry stations	*	*	1	0	—
SigmaWin	Not supported		Not supported		—

- The communication cycle and number of retry stations in MECHATROLINK-II 32-byte Mode change according to the highest station number of the detected slaves as shown in the following table.

Highest Slave Station Number	Communication Cycle (ms)	Number of Retry Station
1 to 8	1	1
9	1	0
10 to 16	2	5
17 to 21	2	Determined by the following equation. 21 - (Highest station number)

■ Slave Devices Not Recognized by Self-configuration

The following slave devices (I/O modules) are recognized as wildcard I/O (***** I/O) because they do not have a model code. Make allocations again for these devices in the Module Configuration Window of the MPE720.

- JEPMC-IO350
- JAMSC-120DAI53330
- JAMSC-120DAI73330
- JAMSC-120DAO83330
- JAMSC-120DRA83030

Servos with special specifications and that cannot be automatically recognized are recognized as wildcard Servos (*****SERVO). Make allocations again for these Servos in the Module Configuration Window of the MPE720.

(3) Motion Parameters

When self-configuration is executed, the motion parameters are set from SERVOPACK data. Some of the parameters are written to the SERVOPACK's RAM.
For details of this data, refer to *11.1.5 Parameters Updated during Self-configuration* on page 11-5.

(4) SERVOPACK Parameters

When self-configuration is executed, SERVOPACK parameters are written to the SERVOPACK's EEPROM or RAM. These settings, however, are not written to the set values for the SERVOPACK parameters saved in the MP2300 and SVB-01 Module.
For details of the data that is written, refer to *11.1.5 Parameters Updated during Self-configuration* on page 11-5.

- To save the SERVOPACK parameters to the MP2300 Basic Module, MPE720 must be used. For details, refer to *2.1.6 (5) Making Servo Adjustments and Saving SERVOPACK Parameters* on page 2-30.

5.5.2 SVB-01 Modules

The definition data (MECHATROLINK transmission definition data, motion parameters, and SERVOPACK parameters) are the same as for the MP2300 Basic Module. Refer to *5.5.1 (2) MECHATROLINK Transmission Definition Data* on page 5-34 to *5.5.1 (4) SERVOPACK Parameters* on page 5-35.

5.5.3 LIO-01/LIO-02 Modules

Details on definition data when self-configuration is executed are shown below.

(1) I/O Allocation

Modules mounted in option slots are detected and input registers and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.
With LIO-01/LIO-02 Module, 48 words are allocated for both input registers and output registers.

<table>
<tr><th>Item</th><th colspan="2">Allocation</th></tr>
<tr><td rowspan="2">Digital inputs
(16 points)</td><td colspan="2">Out of the 48 words allocated to one Module, the first word is automatically allocated to input registers.</td></tr>
<tr><td>Example: If LIO-01 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way:
・LIO-01 Module mounted in slot 1: IW0410
・LIO-01 Module mounted in slot 2: IW0440</td><td>Example: If LIO-02 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way:
・LIO-02 Module mounted in slot 1: IW0410
・LIO-02 Module mounted in slot 2: IW0440</td></tr>
<tr><td rowspan="2">Digital Outputs
(16 points)</td><td colspan="2">Out of the 48 words allocated to one Module, the second word is automatically allocated to output registers.</td></tr>
<tr><td>Example:If LIO-01 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way:
・LIO-01 Module mounted in slot 1: OW0411
・LIO-01 Module mounted in slot 2: OW0441</td><td>Example:If LIO-02 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way:
・LIO-02 Module mounted in slot 1: OW0411
・LIO-02 Module mounted in slot 2: OW0441</td></tr>
<tr><td rowspan="2">Counters</td><td colspan="2">Out of the 48 words allocated to one Module, the last 32 words are automatically allocated to the input and output registers.</td></tr>
<tr><td>Example:If LIO-01 Modules are mounted in slots 1 and 2, counters will be allocated in the following way:
・LIO-01 Module mounted in slot 1: IW0420/ OW0420
・LIO-01 Module mounted in slot 2: IW0450/ OW0450</td><td>Example:If LIO-01 Modules are mounted in slots 1 and 2, counters will be allocated in the following way:
・LIO-02 Module mounted in slot 1: IW0420/ OW0420
・LIO-02 Module mounted in slot 2: IW0450/ OW0450</td></tr>
</table>

- The allocation configuration shown above is only an example. The leading register number allocation differs when registers are allocated manually.

(2) Counter Fixed Parameters

When self-configuration is executed, all of the counter fixed parameters will take their default settings. For details on counter fixed parameters, refer to *3.4.2 (2) Setting Counter Fixed Parameters* on page 3-29.

5.5.4 LIO-04/LIO-05 Modules

Details on definition data when self-configuration is executed are shown below.

(1) I/O Allocation

Modules mounted in option slots are detected and input registers and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.
With LIO-04/LIO-05 Module, 2 words are allocated for both input registers and output registers.

<table>
<tr><th>Item</th><th colspan="2">Allocation</th></tr>
<tr><td rowspan="2">Digital Inputs
(32 points)</td><td colspan="2">Out of the 2 words allocated to one Module, the first word is automatically allocated to input registers.</td></tr>
<tr><td>Example: If LIO-04 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way:
・LIO-04 Module mounted in slot 1: IW0402
・LIO-04 Module mounted in slot 2: IW0404</td><td>Example: If LIO-05 Modules are mounted in slots 1 and 2, digital inputs will be allocated in the following way:
・LIO-05 Module mounted in slot 1: IW0402
・LIO-05 Module mounted in slot 2: IW0404</td></tr>
<tr><td rowspan="2">Digital Outputs
(32 points)</td><td colspan="2">Out of the 2 words allocated to one Module, the second word is automatically allocated to output registers.</td></tr>
<tr><td>Example: If LIO-04 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way:
・LIO-04 Module mounted in slot 1: OW0403
・LIO-04 Module mounted in slot 2: OW0405</td><td>Example: If LIO-05 Modules are mounted in slots 1 and 2, digital outputs will be allocated in the following way:
・LIO-05 Module mounted in slot 1: OW0403
・LIO-05 Module mounted in slot 2: OW0405</td></tr>
</table>

* The allocation configuration shown above is only an example. The leading register number allocation differs when registers are allocated manually.

5.5.5 DO-01 Modules

Details on definition data when self-configuration is executed are shown below.

(1) Output Allocation

Modules mounted in option slots are detected and output registers are allocated automatically. Allocation is performed in ascending order from the Module with the lowest option slot number.
With DO-01 Module, 4 words are allocated for output registers.

<table>
<tr><th>Item</th><th>Allocation</th></tr>
<tr><td rowspan="2">Digital Outputs
(64 points)</td><td>4 words allocated to one Module</td></tr>
<tr><td>Example: If DO-01 Modules are mounted in slots 1 and 2,
・DO-01 Module mounted in slot 1: OW0402, OW0403, OW0404, OW0405
・DO-01 Module mounted in slot 2: OW0406, OW0407, OW0408, OW0409</td></tr>
</table>

* The allocation configuration shown above is only an example. The leading register number allocation differs when registers are allocated manually.

5.5.6 AI-01 Modules

The default input settings cannot be specified for the AI-01 Module. Therefore, only the registers will be allocated and all the channels will be in unused status.

5.5.7 218IF-01 Modules

When self-configuration is executed, the following parameter settings will be made for the Ethernet interface and RS-232C interface of 218IF-01 Modules.

(1) Ethernet Interface

Item	Setting
Local IP address	192.168.1.1
Subnet mask	255.255.255.0
Gateway IP address	0.0.0.0
System port (engineering port)	10000 (UDP)
TCP zero window timer value	3 s
TCP resend timer value	500 ms
TCP end timer value	60 s
IP build timer	30 s
Maximum packet length	1,500 bytes

- Engineering communication connection with the MPE720 is possible using self-configuration.
  To perform MEMOBUS message communication, the MSG-SND (MSG-RCV) function is required.

(2) RS-232C Interface

<table>
<tr><th>Item</th><th colspan="3">Setting</th></tr>
<tr><td>Communication protocol</td><td colspan="3">MEMOBUS</td></tr>
<tr><td>Master/Slave</td><td colspan="3">Slave</td></tr>
<tr><td>Device address</td><td colspan="3">1</td></tr>
<tr><td>Serial interface</td><td colspan="3">RS-232C</td></tr>
<tr><td>Communication mode</td><td colspan="3">RTU</td></tr>
<tr><td>Data length</td><td colspan="3">8 bits</td></tr>
<tr><td>Parity</td><td colspan="3">Even</td></tr>
<tr><td>Stop bits</td><td colspan="3">1 bit</td></tr>
<tr><td>Baud rate</td><td colspan="3">19.2 Kbps</td></tr>
<tr><td>Transmission delay</td><td colspan="3">Disable</td></tr>
<tr><td>Automatic reception</td><td colspan="3">Enable</td></tr>
<tr><td rowspan="8">Interface register settings at the slave</td><td></td><td>Leading Register</td><td>Number of Words</td></tr>
<tr><td>Reading input relays</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading input registers</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading/writing coils</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Reading/writing holding registers</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Writing range for coil holding registers</td><td>MW00000</td><td>–</td></tr>
<tr><td>–</td><td>LO: MW00000</td><td>–</td></tr>
<tr><td>–</td><td>HI: MW65534</td><td>–</td></tr>
</table>

- Engineering communication connection with the MPE720 is possible using self-configuration.
  Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

5.5.8 217IF-01 Modules

(1) RS422/485 Interface

When self-configuration is executed, the following parameter settings will be made for the RS422/485 interface of 217IF-01 Modules.

<table>
<tr><th>Item</th><th colspan="3">Setting</th></tr>
<tr><td>Communication protocol</td><td colspan="3">MEMOBUS</td></tr>
<tr><td>Master/Slave</td><td colspan="3">Slave</td></tr>
<tr><td>Device address</td><td colspan="3">1</td></tr>
<tr><td>Serial interface</td><td colspan="3">RS485</td></tr>
<tr><td>Communication mode</td><td colspan="3">RTU</td></tr>
<tr><td>Data length</td><td colspan="3">8 bits</td></tr>
<tr><td>Parity</td><td colspan="3">Even</td></tr>
<tr><td>Stop bits</td><td colspan="3">1 bit</td></tr>
<tr><td>Baud rate</td><td colspan="3">19.2 Kbps</td></tr>
<tr><td>Transmission delay</td><td colspan="3">Disable</td></tr>
<tr><td>Automatic reception</td><td colspan="3">Enable</td></tr>
<tr><td rowspan="8">Interface register settings at the slave</td><td></td><td>Leading Register</td><td>Number of Words</td></tr>
<tr><td>Reading input relays</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading input registers</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading/writing coils</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Reading/writing holding registers</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Writing range for coil holding registers</td><td>MW00000</td><td>–</td></tr>
<tr><td>–</td><td>LO: MW00000</td><td>–</td></tr>
<tr><td>–</td><td>HI: MW65534</td><td>–</td></tr>
</table>

- Depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

(2) RS-232C Interface

When self-configuration is executed, the following parameter settings will be made for the RS-232C interface of 217IF-01 Modules.

Item	Setting		
Communication protocol	MEMOBUS		
Master/Slave	Slave		
Device address	1		
Serial interface	RS-232C		
Communication mode	RTU		
Data length	8 bits		
Parity	Even		
Stop bits	1 bit		
Baud rate	19.2 Kbps		
Transmission delay	Disable		
Automatic reception	Enable		
Interface register settings at the slave		Leading Register	Number of Words
	Reading input relays	IW0000	32,768
	Reading input registers	IW0000	32,768
	Reading/writing coils	MW00000	65,535
	Reading/writing holding registers	MW00000	65,535
	Writing range for coil holding registers	MW00000	–
	–	LO: MW00000	–
	–	HI: MW65534	–

- Engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

5.5.9 260IF-01 Modules

When self-configuration is executed, the following parameter settings will be made for the DeviceNet interface and RS-232C interface of 260IF-01 Modules.

(1) DeviceNet Communication

Item	Setting
Master/Slave specification	Depends on switch settings.
MAC ID	Depends on switch settings.
Communication cycle time	Master: 300 ms Slave: 0 ms
I/O allocations	Depends on switch settings.
I/O leading register number	Depends on switch settings.
I/O end register number	Depends on switch settings.

(2) RS-232C Interface

<table>
<tr><th>Item</th><th colspan="3">Setting</th></tr>
<tr><td>Communication protocol</td><td colspan="3">MEMOBUS</td></tr>
<tr><td>Master/Slave</td><td colspan="3">Slave</td></tr>
<tr><td>Device address</td><td colspan="3">1</td></tr>
<tr><td>Serial interface</td><td colspan="3">RS-232C</td></tr>
<tr><td>Communication mode</td><td colspan="3">RTU</td></tr>
<tr><td>Data length</td><td colspan="3">8 bits</td></tr>
<tr><td>Parity</td><td colspan="3">Even</td></tr>
<tr><td>Stop bits</td><td colspan="3">1 bit</td></tr>
<tr><td>Baud rate</td><td colspan="3">19.2 Kbps</td></tr>
<tr><td>Transmission delay</td><td colspan="3">Disable</td></tr>
<tr><td>Automatic reception</td><td colspan="3">Enable</td></tr>
<tr><td rowspan="8">Interface register settings at the slave</td><td></td><td>Leading Register</td><td>Number of Words</td></tr>
<tr><td>Reading input relays</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading input registers</td><td>IW0000</td><td>32,768</td></tr>
<tr><td>Reading/writing coils</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Reading/writing holding registers</td><td>MW00000</td><td>65,535</td></tr>
<tr><td>Writing range for coil holding registers</td><td>MW00000</td><td>–</td></tr>
<tr><td>–</td><td>LO: MW00000</td><td>–</td></tr>
<tr><td>–</td><td>HI: MW65534</td><td>–</td></tr>
</table>

- Engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

5.5.10 261IF-01 Modules

When self-configuration is executed, the following parameter settings will be made for the PROFIBUS interface and RS-232C interface of 261IF-01 Modules.

(1) PROFIBUS Interface

Item	Setting
SYNC-SCAN	Low
Local station number	Depends on switch settings.
I/O allocation	Depends on switch settings.
Baud rate	Automatically detected from the master’s transmission data.
I/O leading register number	Depends on switch settings.
I/O end register number	Depends on switch settings.

(2) RS-232C Interface

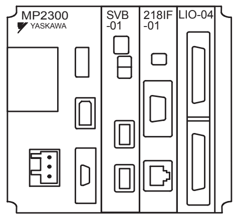
Item	Setting		
Communication protocol	MEMOBUS		
Master/Slave	Slave		
Device address	1		
Serial interface	RS-232C		
Communication mode	RTU		
Data length	8 bits		
Parity	Even		
Stop bits	1 bit		
Baud rate	19.2 Kbps		
Transmission delay	Disable		
Automatic reception	Enable		
Interface register settings at the slave		Leading Register	Number of Words
	Reading input relays	IW0000	32,768
	Reading input registers	IW0000	32,768
	Reading/writing coils	MW00000	65,535
	Reading/writing holding registers	MW00000	65,535
	Writing range for coil holding registers	MW00000	–
	–	LO: MW00000	–
	–	HI: MW65534	–

- Engineering communication connection with the MPE720 is possible using self-configuration. Also, depending on the settings of connected devices, MEMOBUS message communication may be possible using the automatic reception function.

5.5.11 Examples of Register Allocation by Self-configuration

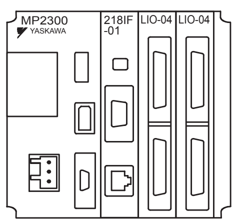
Module configuration definition examples when self-configuration is executed are shown below.

- The configuration definitions shown below are only examples. The configuration definition differs depending on Optional Module model, number of mounted modules, and module mounted slot numbers.



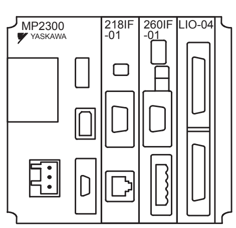
■ Configuration Example 1: SVB-01, 218IF-01, and LIO-04

Slot No.	00			01	02		03
Module Name	MP2300 I/O	MP2300 SVB	MP2300 SVR	SVB-01	218IF-01		LIO-04
					217IF	218IF	
Circuit Number	–	01	02	03	01	01	–
I/O Leading Register Number	0000	0010	–	0410	–	–	0420
I/O End Register Number	0001	040F	–	080F	–	–	0421
Motion Leading Register Number	–	8000	8800	9000	–	–	–
Motion End Register Number	–	87FF	8FFF	97FF	–	–	–



■ Configuration Example 2: 218IF-01, LIO-04, and LIO-04

Slot No.	00			01		02	03
Module Name	MP2300 I/O	MP2300 SVB	MP2300 SVR	218IF-01		LIO-04	LIO-04
				217IF	218IF		
Circuit Number	–	01	02	01	01	–	–
I/O Leading Register Number	0000	0010	–	–	–	0410	0420
I/O End Register Number	0001	040F	–	–	–	0411	0421
Motion Leading Register Number	–	8000	8800	–	–	–	–
Motion End Register Number	–	87FF	8FFF	–	–	–	–



■ Configuration Example 3: 218IF-01, 260IF-01, and LIO-04

Slot No.	00			01		02		03
Module Name	MP2300 I/O	MP2300 SVB	MP2300 SVR	218IF-01		260IF-01		LIO-04
				217IF	218IF	217IF	260IF	
Circuit Number	–	01	02	01	01	02	01	–
I/O Leading Register Number	0000	0010	–	–	–	–	0410	0810
I/O End Register Number	0001	040F	–	–	–	–	080F	0811
Motion Leading Register Number	–	8000	8800	–	–	–	–	–
Motion End Register Number	–	87FF	8FFF	–	–	–	–	–

6

Motion Parameters

This chapter explains each of the motion parameters.

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6.1 Motion Parameters Register Numbers

6.1.1 Motion Parameter Register Numbers for MP2300

The leading motion parameter register numbers (I and O register numbers) are determined by the circuit number and axis number.
The leading register numbers for each axis's motion parameters can be obtained using the following equation.

Motion parameter register number
= I (or O)W8000 + (circuit number - 1) $\times$ 800h + (axis number - 1) $\times$ 80h

The following tables lists the motion parameters register numbers.

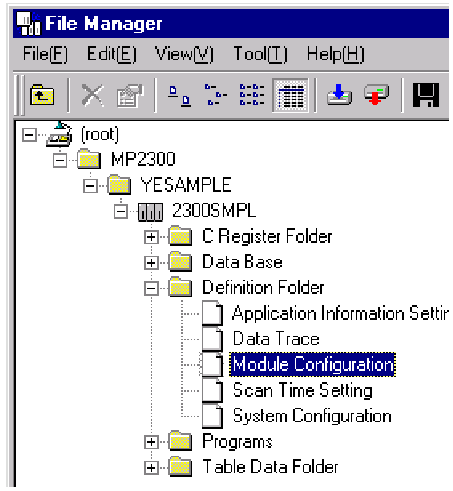
Circuit No.	Axis No. 1	Axis No. 2	Axis No. 3	Axis No. 4	Axis No. 5	Axis No. 6	Axis No. 7	Axis No. 8
1	8000 to 807F	8080 to 80FF	8100 to 817F	8180 to 81FF	8200 to 827F	8280 to 82FF	8300 to 837F	8380 to 83FF
2	8800 to 887F	8880 to 88FF	8900 to 897F	8980 to 89FF	8A00 to 8A7F	8A80 to 8AFF	8B00 to 8B7F	8B80 to 8BFF
3	9000 to 907F	9080 to 90FF	9100 to 917F	9180 to 91FF	9200 to 927F	9280 to 92FF	9300 to 937F	9380 to 93FF
4	9800 to 987F	9880 to 98FF	9900 to 997F	9980 to 99FF	9A00 to 9A7F	9A80 to 9AFF	9B00 to 9B7F	9B80 to 9BFF
5	A000 to A07F	A080 to A0FF	A100 to A17F	A180 to A1FF	A200 to A27F	A280 to A2FF	A300 to A37F	A380 to A3FF
6	A800 to A87F	A880 to A8FF	A900 to A97F	A980 to A9FF	AA00 to AA7F	AA80 to AAFF	AB00 to AB7F	AB80 to ABFF
7	B000 to B07F	B080 to B0FF	B100 to B17F	B180 to B1FF	B200 to B27F	B280 to B2FF	B300 to B37F	B380 to B3FF
8	B800 to B87F	B880 to B8FF	B900 to B97F	B980 to B9FF	BA00 to BA7F	BA80 to BAFF	BB00 to BB7F	BB80 to BBFF
9	C000 to C07F	C080 to C0FF	C100 to C17F	C180 to C1FF	C200 to C27F	C280 to C2FF	C300 to C37F	C380 to C3FF
10	C800 to C87F	C880 to C8FF	C900 to C97F	C980 to C9FF	CA00 to CA7F	CA80 to CAFF	CB00 to CB7F	CB80 to CBFF
11	D000 to D07F	D080 to D0FF	D100 to D17F	D180 to D1FF	D200 to D27F	D280 to D2FF	D300 to D37F	D380 to D3FF
12	D800 to D87F	D880 to D8FF	D900 to D97F	D980 to D9FF	DA00 to DA7F	DA80 to DAFF	DB00 to DB7F	DB80 to DBFF
13	E000 to E07F	E080 to E0FF	E100 to E17F	E180 to E1FF	E200 to E27F	E280 to E2FF	E300 to E37F	E380 to E3FF
14	E800 to E87F	E880 to E8FF	E900 to E97F	E980 to E9FF	EA00 to EA7F	EA80 to EAFF	EB00 to EB7F	EB80 to EBFF
15	F000 to F07F	F080 to F0FF	F100 to F17F	F180 to F1FF	F200 to F27F	F280 to F2FF	F300 to F37F	F380 to F3FF
16	F800 to F87F	F880 to F8FF	F900 to F97F	F980 to F9FF	FA00 to FA7F	FA80 to FAFF	FB00 to FB7F	FB80 to FBFF

Circuit No.	Axis No. 9	Axis No. 10	Axis No. 11	Axis No. 12	Axis No. 13	Axis No. 14	Axis No. 15	Axis No. 16
1	8400 to 847F	8480 to 84FF	8500 to 857F	8580 to 85FF	8600 to 867F	8680 to 86FF	8700 to 877F	8780 to 87FF
2	8C00 to 8C7F	8C80 to 8CFF	8D00 to 8D7F	8D80 to 8DFF	8E00 to 8E7F	8E80 to 8EFF	8F00 to 8F7F	8F80 to 8FFF
3	9400 to 947F	9480 to 94FF	9500 to 957F	9580 to 95FF	9600 to 967F	9680 to 96FF	9700 to 977F	9780 to 97FF
4	9C00 to 9C7F	9C80 to 9CFF	9D00 to 9D7F	9D80 to 9DFF	9E00 to 9E7F	9E80 to 9EFF	9F00 to 9F7F	9F80 to 9FFF
5	A400 to A47F	A480 to A4FF	A500 to A57F	A580 to A5FF	A600 to A67F	A680 to A6FF	A700 to A77F	A780 to A7FF
6	AC00 to AC7F	AC80 to ACFF	AD00 to AD7F	AD80 to ADFF	AE00 to AE7F	AE80 to AEFF	AF00 to AF7F	AF80 to AFFF
7	B400 to B47F	B480 to B4FF	B500 to B57F	B580 to B5FF	B600 to B67F	B680 to B6FF	B700 to B77F	B780 to B7FF
8	BC00 to BC7F	BC80 to BCFF	BD00 to BD7F	BD80 to BDFF	BE00 to BE7F	BE80 to BEFF	BF00 to BF7F	BF80 to BFFF
9	C400 to C47F	C480 to C4FF	C500 to C57F	C580 to C5FF	C600 to C67F	C680 to C6FF	C700 to C77F	C780 to C7FF
10	CC00 to CC7F	CC80 to CCFF	CD00 to CD7F	CD80 to CDFF	CE00 to CE7F	CE80 to CEFF	CF00 to CF7F	CF80 to CFFF
11	D400 to D47F	D480 to D4FF	D500 to D57F	D580 to D5FF	D600 to D67F	D680 to D6FF	D700 to D77F	D780 to D7FF
12	DC00 to DC7F	DC80 to DCFF	DD00 to DD7F	DD80 to DDFF	DE00 to DE7F	DE80 to DEFF	DF00 to DF7F	DF80 to DFFF
13	E400 to E47F	E480 to E4FF	E500 to E57F	E580 to E5FF	E600 to E67F	E680 to E6FF	E700 to E77F	E780 to E7FF
14	EC00 to EC7F	EC80 to ECFF	ED00 to ED7F	ED80 to EDFF	EE00 to EE7F	EE80 to EEFF	EF00 to EF7F	EF80 to EFFF
15	F400 to F47F	F480 to F4FF	F500 to F57F	F580 to F5FF	F600 to F67F	F680 to F6FF	F700 to F77F	F780 to F7FF
16	FC00 to FC7F	FC80 to FCFF	FD00 to FD7F	FD80 to FDFF	FE00 to FE7F	FE80 to FEFF	FF00 to FF7F	FF80 to FFFF

6.2 Motion Parameters Setting Window

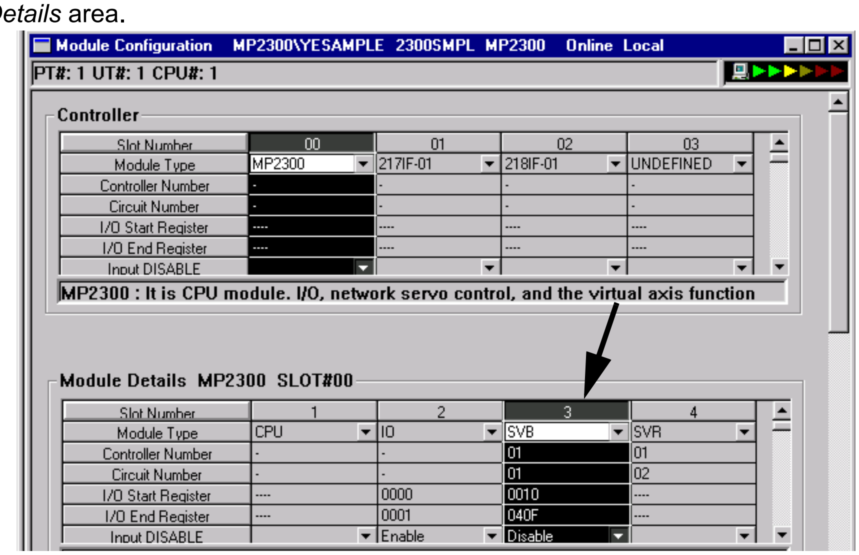
This section describes how to display the Motion Parameters Setting Window for the MP2300.

1. Double-click the ***Controller*** folder and then the ***Definition*** folder in the File Manager Window to display five definition files under the ***Definition*** Folder. Double-click ***Module Configuration***.



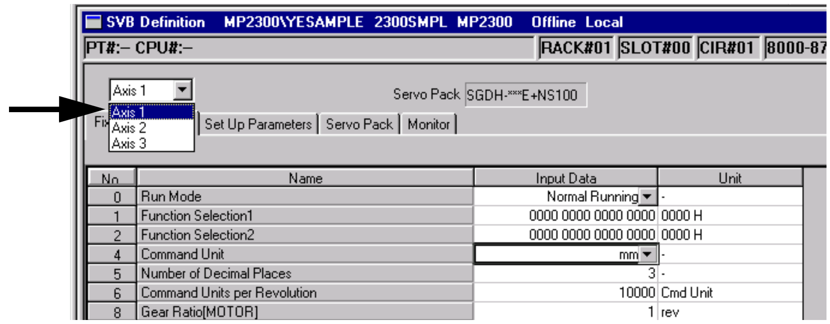
The Engineering Manager Window will start and the Module Configuration Window will be displayed.

2. With No. **00** in the *Controller* area selected, double-click No.***3*** (SVB) in the *Module Details* area.



The Fixed Parameters Tab Page on the SVB Configuration Window will be displayed.

3. Select the axis to be set from the *Axis* pull-down list.



4. Click each of the *Fixed Parameters*, *Setup Parameters*, and *Monitor* Tab Page to switch between the tab pages and make or browse the settings.

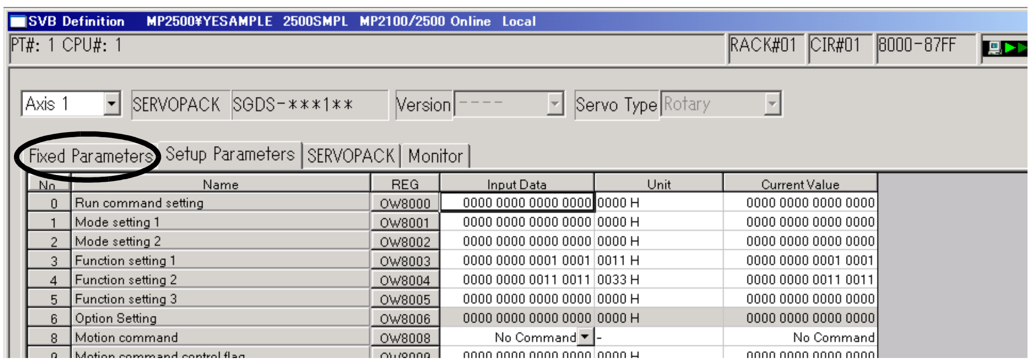


Fig. 6.1 Fixed Parameters Tab Page

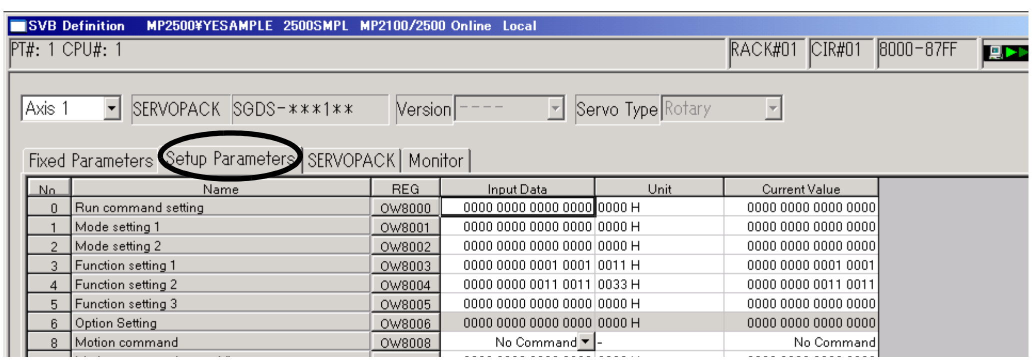


Fig. 6.2 Setup Parameters Tab Page

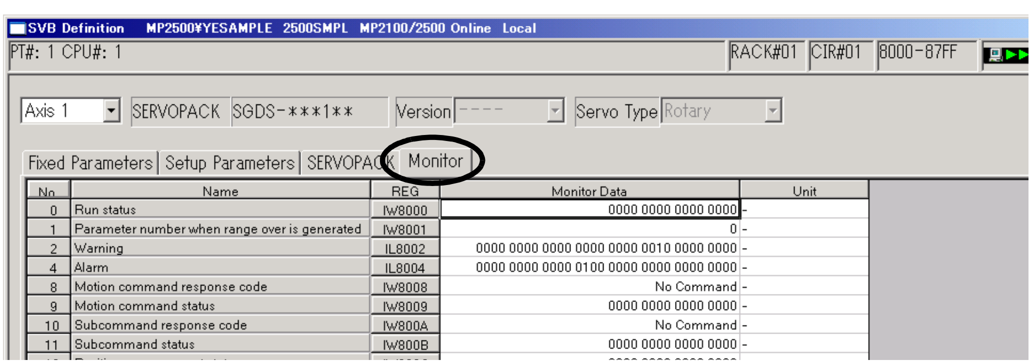


Fig. 6.3 Monitor Parameters Tab Page (Read-Only)

6.3 Motion Parameter Details

6.3.1 Fixed Parameter List

The following table provides a list of SVB and SVR motion fixed parameters.

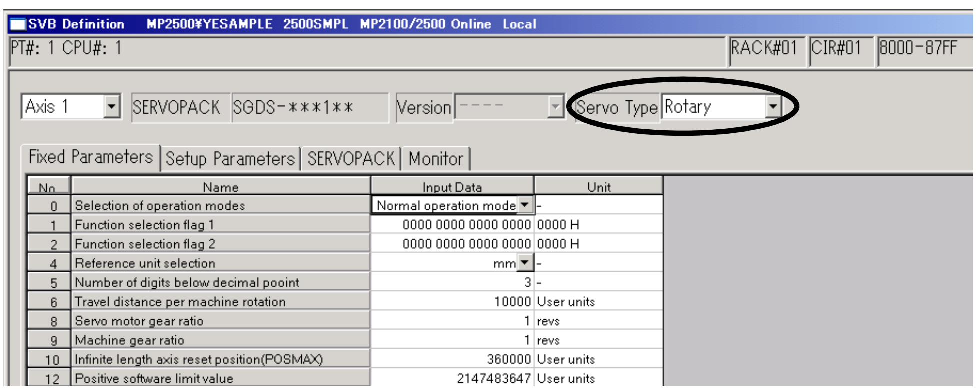
- Refer to the pages listed in the Details column for details of each fixed parameter.
- For information on SVR, refer to *3.2.4 SVR Virtual Motion Module* on page 3-11.
- Refer to *Machine Controller MP900/MP2000 Series User's Manual for Linear Servomotors (SIEP C880700 06□)* for information on parameters when *Linear* is selected for the *Servo Type*.
- Refer to the end of this table (next page) for information on how to specify the *Servo Type*.

Slot Number	Name	Contents	SVB	SVR	Reference Page
0	Run Mode	0: Normal Running	Yes	Yes	6-18
		1: Axis unused	Yes	Yes	
		2: Simulation mode	Yes		
		3: Servo Driver Command (SERVOPACK Transparent Command Mode)	Yes		
		4 and 5: Reserved for system use.	–	–	
1	Function Selection 1	Bit 0: Axis Type (0: Finite length axis/1: Infinite length axis)	Yes	Yes	6-18
		Bit 1: Forward Software Limit Enabled (0: Disabled/1: Enabled)	Yes		
		Bit 2: Reverse Software Limit Enabled (0: Disabled/1: Enabled)	Yes		
		Bit 3: Positive Overtravel (0: Disabled/1: Enabled)	Yes		
		Bit 4: Negative Overtravel (0: Disabled/1: Enabled)	Yes		
		Bits 5 to 7: Reserved for system use.	–	–	
		Bit 8: Segment Distribution Processing	Yes		
		Bit 9: Simple ABS Infinite Axis (0: Disabled/1: Enabled)	Yes		
		Bit A: User Constants Self-writing Function	Yes		
		Bits B to F: Reserved for system use.			
2	Function Selection 2	Bit 0: Communication Error Mask	Yes		6-20
		Bit 1: WDT Error Mask	Yes		
		Bits 2 to F: Reserved for system use.	–	–	
3	–	Reserved for system use.	–	–	–
4	Command Unit Setting	0: pulse 1: mm 2: deg 3: inch	Yes	Yes	6-20
5	Number of Decimal Places	1 = 1 digit	Yes	Yes	
6	Reference Units per Revolution (rotary motor)*	1 = 1 reference unit	Yes	Yes	
8	Gear Ratio (Motor)	1 = 1 rotation (This setting is ignored if a linear motor is selected.*)	Yes	Yes	
9	Gear Ratio (Load)	1 = 1 rotation (This setting is ignored if a linear motor is selected. *)	Yes	Yes	
10	Maximum Value of Rotary Counter	1 = 1 reference unit	Yes	Yes	6-21
12	Forward Software Limit	1 = 1 reference unit	Yes		6-21
14	Reverse Software Limit	1 = 1 reference unit	Yes		
16	Backlash Compensation	1 = 1 reference unit	Yes		6-22
18 to 29	–	Reserved for system use.	–	–	–

(cont'd)

Slot Number	Name	Contents	SVB	SVR	Reference Page
30	Encoder Selection	0: Incremental encoder 1: Absolute encoder 2: Absolute encoder used as an incremental encoder. 3: Reserved	Yes		6-22
31 to 33	–	Reserved for system use.	–	–	–
34	Rated speed (Rotary Motor)*	1 = 1 rpm	Yes	Yes	
36	Encoder Resolution in Pulses/ Revolution (Rotary Motor)*	1 = 1 pulse/rev Set the value after multiplication.	Yes	Yes	6-23
38	Max. Revolutions of Absolute Encoder	1 = 1 rotation ♦ Set to 0 when a direct drive motor is being used.	Yes		
40 to 41	–	Reserved for system use.	–	–	–
42	Feedback Speed Moving Average Time Constant	1 = 1 ms	Yes	Yes	6-23

* The motor type (rotary or linear) can be selected in the *Servo Type* pull-down list on the **SVB Definition** Window.



♦ Refer to *Machine Controller MP900/MP2000 Series User's Manual for Linear Servomotors (SIEP C880700 06□)* for information on parameters when *Linear* is selected for the *Servo Type*.

6.3.2 Setting Parameter List

The following table provides a list of SVB and SVR motion setting parameters.

- Refer to the pages listed in the *Details* column for details of each setting parameter.
- Refer to *3.2.4 SVR Virtual Motion Module* on page 3-11 for information on SVR.

Register No.	Name	Contents	SVB	SVR	Reference Page
OW□□00	RUN Commands	Bit 0: Servo ON (0: OFF/1: ON)	Yes	Yes	6-24
		Bit 1: Machine Lock (0: Normal operation/1: Machine locked)	Yes		
		Bits 2 to 3: Reserved for system use.			
		Bit 4: Latch Request (0: Latch request OFF/1: Latch request ON)	Yes		
		Bit 5: Reserved for system use.			
		Bit 6: POSMAX Preset (0: OFF/1: ON)	Yes	Yes	
		Bit 7: Infinite Length Axis Position Information LOAD Request (0: OFF/1: ON)	Yes		
		Bit 8: Forward External Torque Limit Input (0: OFF/1: ON)	Yes		
		Bit 9: Reverse External Torque Limit Input (0: OFF/1: ON)	Yes		
		Bit A: Reserved for system use.			
		Bit B: Integration Reset (0: OFF/1: ON)	Yes		
		Bit C to E: Reserved for system use.			
		Bit F: Alarm Clear (0: OFF/1: ON)	Yes	Yes	
OW□□01	Mode 1	Bit 0: Deviation Abnormal Detection Error Level (0: Alarm/1: Warning)	Yes		6-26
		Bits 1 to 2: Reserved for system use.			
		Bit 3: Speed Loop P/PI Switch	Yes		
		Bit 4: Gain Switch	Yes		
		Bits 5 to F: Reserved for system use.			
OW□□02	Mode 2	Bit 0: Monitor 2 Enabled (0: Disabled/1: Enabled)	Yes		6-26
		Bits 1 to F: Reserved for system use.			
OW□□03	Function 1	Bits 0 to 3: Speed Unit 0: Reference unit/s 1: 10^n reference unit/min 2: Percentage of rated speed (1 = 0.01%) 3: Percentage of rated speed (1 = 0.0001%)	Yes	Yes	6-27
		Bits 4 to 7: Acceleration/Deceleration Unit 0: Reference units/s^2 1: ms	Yes	Yes	
		Bits 8 to B: Filter Type 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	Yes	Yes	
		Bits C to F: Torque Unit Selection 0: Percentage of rated toque (1 = 0.01%) 1: Percentage of rated toque (1 = 0.0001%)	Yes	Yes	

- Register number OW□□00 indicates the leading output register number + 00.
- Refer to *6.1.1 Motion Parameter Register Numbers for MP2300* on page 6-2 for information on how to find the leading output register number.

(cont'd)

Register No.	Name	Contents	SVB	SVR	Reference Page
OW□□04	Function 2	Bits 0 to 3: Latch Input Signal Type			6-28
		0: -			
		1: -			
		2: Phase-C pulse input signal	Yes		
		3: /EXT1	Yes		
		4: /EXT2	Yes		
		5: /EXT3	Yes		
		Bits 4 to 7: External Positioning Signal			6-28
		0: –			
		1: –			
		2: Phase-C pulse input signal	Yes		
		3: /EXT1	Yes		
		4: /EXT2	Yes		
		5: /EXT3	Yes		
		Bits 8 to F: Reserved for system use.			
OW□□05	Function 3	Bit 1: Close Position Loop Using OL□□16 (Disable Phase Reference Generation) (0: Enabled/1: Disabled)	Yes		6-28
		Bits 2 to A: Reserved for system use.			
		Bit B: INPUT Signal for Zero Point Return (0: OFF/1: ON)	Yes		
		Bits C to F: Reserved for system use.			
OW□□06 to OW□□07	–	Reserved for system use.	–	–	–
OW□□08	Motion Command	0: NOP (No Command) 1: POSING (Positioning) 2: EX_POSING (External Positioning) 3: ZRET (Zero Point Return) 4: INTERPOLATE (Interpolation) 5: ENDOF_ INTERPOLATE (Reserved) 6: LATCH (Latch) 7: FEED (JOG Operation) 8: STEP (STEP Operation) 9: ZSET (Zero Point Setting) 10: ACC (Change Linear Acceleration Time Constant) 11: DCC (Change Linear Deceleration Time Constant) 12: SCC (Change Filter Time Constant) 13: CHG FILTER (Change Filter Type) 14 : KVS (Change Speed Loop Gain) 15 : KPS (Change Position Loop Gain) 16: KFS (Change Feed Forward) 17: PRM_RD (Read SERVOPACK Parameter) 18: PRM_WR (Write SERVOPACK Parameter) 19: ALM_MON (Monitor SERVOPACK Alarm) 20: ALM_HIST (Monitor SERVOPACK Alarm History) 21: ALMHIST_CLR (Clear SERVOPACK Alarm History) 22: ABS_RST (Reset Absolute Encoder) 23: VELO (Speed Reference) 24: TRQ (Torque Reference) 25: PHASE (Phase Reference) 26: KIS (Change Position Loop Integration Time)	Yes	Yes	6-29

(cont'd)

Register No.	Name	Contents	SVB	SVR	Reference Page
OW□□09	Motion Command Control Flags	Bit 0: Command Pause (0: OFF/1: ON)	Yes	Yes	6-30
		Bit 1: Command Abort (0: OFF/1: ON)	Yes	Yes	
		Bit 2: JOG/STEP Direction (0: Forward rotation/1: Reverse rotation)	Yes	Yes	
		Bit 3: Home Direction (0: Reverse rotation/1: Forward rotation)	Yes		
		Bit 4: Latch Zone Enable (0: Disabled/1: Enabled)	Yes		
		Bit 5: Position Reference Type (0: Incremental Addition Mode/1: Absolute Mode)	Yes	Yes	
		Bit 6: Phase Compensation Type with an Electronic Cam (0: Incremental Addition Mode/1: Absolute Mode)	Yes		
		Bits 7 to F: Reserved for system use.			
OW□□0A	Motion Subcommand	0: NOP (No command)	Yes	Yes	6-31
		1: PRM_RD (Read SERVOPACK Parameter) 2: PRM_WR (Write SERVOPACK Parameter) 3: Reserved 4: SMON (Monitor status)	Yes		
		5: FIXPRM_RD (Read Fixed Parameters)	Yes	Yes	
OW□□0B	–	Reserved for system use.			
OL□□0C	Torque/Thrust Reference	Unit is according to OW□□03, bits 12 to 15 (Torque Unit).	Yes	Yes	6-32
OW□□0E	Speed Limit during Torque/Thrust Reference	1 = 0.01% (percentage of rated speed)	Yes		
OW□□0F	–	Reserved for system use.			
OL□□10	Speed Reference	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes	6-33
OW□□12 to OW□□13	–	Reserved for system use.	–	–	–
OL□□14	Positive Side Limiting Torque/Thrust Setting at Speed Reference	Unit is according to OW□□03, bits C to F (Torque Unit).	Yes		6-33
OL□□16	Secondary Speed Compensation	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes	6-33
OW□□18	Speed Override	1 = 0.01%	Yes		6-34
OW□□19 to OW□□1B	–	Reserved for system use.	–	–	–
OL□□1C	Position Reference Setting	1 = 1 reference unit	Yes	Yes	6-34
OL□□1E	Position Completed Width	1 = 1 reference unit	Yes		6-35
OL□□20	Position Completed Width 2	1 = 1 reference unit	Yes		6-36
OL□□22	Deviation Abnormal Detection Value	1 = 1 reference unit	Yes		6-36
OL□□24	–	Reserved for system use.	–	–	–
OW□26	Position Complete Timeout	1 = 1 ms	Yes		6-37
OW□□27	–	Reserved for system use.			
OL□□28	Phase Compensation	1 = 1 reference unit	Yes		6-37

(cont'd)

Register No.	Name	Contents	SVB	SVR	Reference Page
OL□□2A	Latch Zone Lower Limit Setting	1 = 1 reference unit	Yes		6-37
OL□□2C	Latch Zone Upper Limit Setting	1 = 1 reference unit	Yes		
OW□□2E	Position Loop Gain	1 = 0.1/s	Yes		6-38
OW□□2F	Speed Loop Gain	1 = 1 Hz	Yes		
OW□□30	Speed Feed Forward Compensation	1 = 0.01% (percentage of distribution segment)	Yes		
OW□□31	Speed Amends	1 = 0.01% (percentage of rated speed)	Yes	Yes	
OW□□32	Position Integration Time Constant	1 = 1 ms	Yes		
OW□□33	–	Reserved for system use.	–	–	
OW□□34	Speed Integration Time Constant	1 = 0.01 ms	Yes		
OW□□35	–	Reserved for system use.	–	–	
OL□□36	Linear Acceleration Time	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes	6-40
OL□□38	Linear Deceleration Time	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes	
OW□□3A	S-curve Acceleration Time	1 = 0.1 ms	Yes	Yes	6-41
OW□□3B	Bias Speed for Exponential Acceleration/ Deceleration Filter	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).		Yes	
OW□□3C	Home Return Type	0: DEC1 + Phase C 1: ZERO Signal 2: DEC1 + ZERO Signal 3: Phase-C Signal	Yes		6-42
		4 to 10: Reserved for system use.	–	–	
		11: Phase-C Only Method 12: P-OT + Phase-C Signals 13: P-OT 14: HOME LS + Phase-C Signals 15: HOME LS	Yes		
		16: N-OT + Phase-C Signals 17: N-OT 18: INPUT + Phase-C Signals 19: INPUT	Yes		
OW□□3D	Home Window	1 = 1 reference unit	Yes	Yes	6-42
OL□□3E	Approach Speed	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes		
OL□□40	Creep Speed	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes		
OL□□42	Home Offset	1 = 1 reference unit	Yes		
OL□□44	STEP Distance	1 = 1 reference unit	Yes	Yes	6-43
OL□□46	External Positioning Move Distance	1 = 1 reference unit	Yes		6-43

(cont'd)

Register No.	Name	Contents	SVB	SVR	Reference Page
OL□□48	Zero Point Offset	1 = 1 reference unit	Yes	Yes	6-43
OL□□4A	Work Coordinate System Offset	1 = 1 reference unit	Yes	Yes	
OL□□4C	Preset Data of POSMAX Turns	1 = 1 reference unit	Yes	Yes	
OW□□4E	Servo User Monitor	Bits 0 to 3: Monitor 1 (Cannot be set.) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Cannot be set.) Bits C to F: Monitor 4	Yes		6-44
OW□□4F	Servo Alarm Monitor Number	Set the number of the alarm to monitor.	Yes		6-45
OW□□50	Servo Constant Number	Set the number of the SERVOPACK parameter.	Yes		
OW□□51	Servo Constant Number Size	Set the number of words in the SERVOPACK parameter.	Yes		
OL□□52	Servo User Constant	Set the setting for the SERVOPACK parameter.	Yes		
OW□□54	Auxiliary Servo User Constant Number	Set the number of the SERVOPACK parameter number.	Yes		
OW□□55	Auxiliary Servo Constant Number Size	Set the number of words in the SERVOPACK parameter.	Yes		
OL□□56	Auxiliary Servo User Constant	Set the setting for the SERVOPACK parameter.	Yes		
OW□□5C	Fixed Parameter Number	Set the number of the fixed parameter to read with the FIXPRM_RD motion subcommand.	Yes	Yes	6-45
OW□□5D	–	Reserved for system use.	–	–	–
OL□□5E	Absolute Position at Power OFF (Lower 2 words)	1 = 1 pulse	Yes		6-46
OL□□60	Absolute Position at Power OFF (Upper 2 words)	1 = 1 pulse	Yes		
OL□□62	Modularized Position at Power OFF (Lower 2 words)	1 = 1 pulse	Yes		
OL□□64	Modularized Position at Power OFF (Upper 2 words)	1 = 1 pulse	Yes		
OL□□66 to OL□□6E	–	Reserved for system use.	–	–	–
OW□□70 to OW□□7F	Command Buffer for Transparent Command Mode	This area is used for command data when MECHATROLINK servo commands are specified directly.	Yes		6-46

6.3.3 Monitoring Parameter List

The following table provides a list of SVB and SVR motion monitoring parameters.

- Refer to the pages listed in the *Details* column for details of each monitoring parameter.
- Refer to *3.2.4 SVR Virtual Motion Module* on page 3-11 for information on SVR.

Register No.	Name	Contents	SVB	SVR	Detail
IW□□00	Drive Status	Bit 0 Motion Controller Operation Ready	Yes	Yes	6-47
		Bit 1: Running (Servo ON)	Yes	Yes	
		Bit 2: System Busy	Yes		
		Bit 3: Servo Ready	Yes		
		Bits 4 to F: Reserved for system use.	–	–	
IW□□01	Over Range Parameter Number	Setting parameters: 0 or higher Fixed Parameters: 1000 or higher	Yes	Yes	6-47
IL□□02	Warning	Bit 0: Excessively Following Error	Yes		6-48
		Bit 1: Setting Parameter Error	Yes	Yes	
		Bit 2: Fixed Parameter Error	Yes	Yes	
		Bit 3: Servo Driver Error	Yes		
		Bit 4: Motion Command Setting Error	Yes	Yes	
		Bit 5: Reserved for system use.	–	–	
		Bit 6: Positive Overtravel	Yes		
		Bit 7: Negative Overtravel	Yes		
		Bit 8: Servo Not ON	Yes		
		Bit 9: Servo Driver Communication Warning	Yes		
		Bits A to 1F: Reserved for system use.			
IL□□04	Alarm	Bit 0: Servo Driver Error	Yes		6-49
		Bit 1: Positive Overtravel	Yes		
		Bit 2: Negative Overtravel	Yes		
		Bit 3: Positive Soft Limit (Positive Software Limit)	Yes		
		Bit 4: Negative Soft Limit (Negative Software Limit)	Yes		
		Bit 5: Servo OFF	Yes	Yes	
		Bit 6: Positioning Time Over	Yes		
		Bit 7: Excessive Positioning Moving Amount	Yes		
		Bit 8: Excessive Speed	Yes		
		Bit 9: Excessively Following Error	Yes		
		Bit A: Filter Type Change Error	Yes		
		Bit B: Filter Time Constant Change Error	Yes		
		Bit C: Reserved for system use.	–	–	
		Bit D: Zero Point Not Set	Yes		
		Bit E: Zero Point Set During Travel	Yes		
		Bit F: Servo Driver Parameter Setting Error	Yes		
		Bit 10: Servo Driver Synchronization Communication Error	Yes		
		Bit 11: Servo Driver Communication Error	Yes		
		Bit 12: Servo Driver Command Timeout Error	Yes		
		Bit 13: ABS Encoder Count Exceeded	Yes		
		Bits 14 to 1F: Reserved for system use.	–	–	

- Register number IW□□00 indicates the leading input register number + 00.
- Refer to *6.1.1 Motion Parameter Register Numbers for MP2300* on page 6-2 for information on how to find the leading input register number.

(cont'd)

Register No.	Name	Contents	SVB	SVR	Detail
IL□□06	–	Reserved for system use.	–	–	
IW□□08	Motion Command Response Code	Same as OW□□08 (Motion Command).	Yes	Yes	6-51
IW□□09	Motion Command Status	Bit 0: Command Executing (BUSY) Flag	Yes	Yes	6-51
		Bit 1: Command Hold Completed (HOLD)	Yes	Yes	
		Bit 2: Reserved for system use.			
		Bit 3: Command Error Occurrence (FAIL)	Yes	Yes	
		Bits 4 to 6: Reserved for system use.			
		Bit 7: Reset Absolute Encoder Completed	Yes		
		Bit 8: Command Execution Completed (COMPLETE)	Yes	Yes	
		Bits 9 to F: Reserved for system use.			
IW□□0A	Motion Subcommand Response Code	Same as OW□□0A (Motion Subcommand).	Yes	Yes	6-51
IW□□0B	Motion Subcommand Status	Bit 0: Command Executing (BUSY) Flag	Yes	Yes	6-52
		Bits 1 to 2: Reserved for system use.			
		Bit 3: Command Error Occurrence	Yes	Yes	
		Bits 4 to 7: Reserved for system use.			
		Bit 8: Command Execution Completed	Yes	Yes	
		Bits 9 to F: Reserved for system use.			
IW□□0C	Position Management Status	Bit 0: Distribution Completed (DEN)	Yes	Yes	
		Bit 1: Positioning Completed (POSCOMP)	Yes	Yes	
		Bit 2: Latch Completed (LCOMP)	Yes		
		Bit 3: Position Proximity (NEAR)	Yes	Yes	
		Bit 4: Zero Point Position (ZERO)	Yes	Yes	
		Bit 5: Zero Point Return (Setting) Completed (ZRNC)	Yes	Yes	
		Bit 6: Machine Lock ON (MLKL)	Yes		
		Bit 7: Absolute Position Read Completed			
		Bit 8: ABS System Infinite Length Position Control Information LOAD Completed (ABSLDE)	Yes		
		Bit 9: POSMAX Turn Number Presetting Completed (TPRSE)	Yes	Yes	
		Bits A to F: Reserved for system use.			
IW□□0D	–	Reserved for system use.	–	–	–

(cont'd)

Register No.	Name	Contents	SVB	SVR	Detail
IL□□0E	Machine Coordinate Target Position (TPOS)	1 = 1 reference unit	Yes	Yes	6-53
IL□□10	Target Position (CPOS)	1 = 1 reference unit	Yes	Yes	
IL□□12	Machine Coordinate System Position (MPOS)	1 = 1 reference unit	Yes	Yes	
IL□□14	32-bit Coordinate System Position (DPOS)	1 = 1 reference unit	Yes	Yes	
IL□□16	Machine Coordinate Feedback Position (APOS)	1 = 1 reference unit	Yes	Yes	
IL□□18	Machine Coordinate Latch Position (LPOS)	1 = 1 reference unit	Yes		
IL□□1A	Position Error (PERR)	1 = 1 reference unit	Yes		
IL□□1C	Target Position Difference Monitor	1 = 1 reference unit		Yes	6-53
IL□□1E	POSMAX Number of Turns	1 = 1 turn	Yes	Yes	
IL□□20	Speed Reference Output Monitor	pulse/s	Yes		6-54
IL□□22 to IL□□2A	–	Reserved for system use.	–	–	–
IW□□2C	Network Servo Status	Bit 0: Alarm Occurred (ALM) Bit 1: Warning Occurred (WARNING) Bit 2: Command Ready (CMDRDY) Bit 3: Servo ON (SVON) Bit 4: Main Power ON (PON) Bit 5: Machine Lock (MLOCK) Bit 6: Zero Point Position (ZPOINT) Bit 7: Positioning Completed (PSET)/Speed Coincidence (V-CMP) Bit 8: Distribution Completed (DEN)/Zero Speed (ZSPD) Bit 9: Torque Being Limited (T_LIM) Bit A: Latch Completed (L_CMP) Bit B: Position Proximity (NEAR)/Speed Limit (V_LIM) Bit C: Positive Soft Limit (Positive Software Limit) (P_SOT) Bit D: Negative Soft Limit (Negative Software Limit) (N_SOT)	Yes		6-55
		Bits E to F: Reserved for system use.	–	–	–
IW□□2D	Servo Alarm Code	Stores the alarm code from the SERVOPACK.	Yes		6-56

(cont'd)

Register No.	Name	Contents	SVB	SVR	Detail
IW□□2E	Network Servo I/O Monitor	Bit 0: Positive Drive Prohibited Input (P_OT) Bit 1: Negative Drive Prohibited Input (N_OT) Bit 2: Zero Point Return Deceleration Limit Switch Input (DEC) Bit 3: Encoder Phase-A Input (PA) Bit 4: Encoder Phase-B Input (PB) Bit 5: Encoder Phase-C Input (PC) Bit 6: First External Latch Input (EXT1) Bit 7: Second External Latch Input (EXT2) Bit 8: Third External Latch Input (EXT3) Bit 9: Brake Output (BRK) Bit A: Reserved for system use. Bit B: Reserved for system use. Bit C: CN1 input signal (IO12) Bit D: CN1 input signal (IO13) Bit E: CN1 input signal (IO14) Bit F: CN1 input signal (IO15)	Yes		6-56
IW□□2F	Network Servo User Monitor Information	Bits 0 to 3: Monitor 1 Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 Bits C to F: Monitor 4	Yes		6-57
IL□□30	Servo User Monitor 2	Stores the result of the selected monitor.	Yes		6-57
IL□□32	Servo User Monitor 3	Reserved for system use.			
IL□□34	Servo User Monitor 4	Stores the result of the selected monitor.	Yes		
IW□□36	Servo Constant Number	Stores the number of the parameter being processed.	Yes		
IW□□37	Auxiliary Servo User Constant Number	Stores the number of the parameter being processed.	Yes		
IL□□38	Servo User Constant	Stores the data of the parameter being read.	Yes		
IL□□3A	Auxiliary Servo User Constant	Stores the data of the parameter being read.	Yes		
IW□□3F	Motor Type	Stores the type of motor actually connected. 0: Rotary motor 1: Linear motor	Yes		
IL□□40	Feedback Speed	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes	
IL□□42	Torque (Thrust) Reference Monitor	Unit is according to OW□□03, bits 12 to 15 (Torque Unit).	Yes	Yes	
IW□□44 to IW□□55	—	Reserved for system use.	–	–	–
IL□□56	Fixed Parameter Monitor	Stores the data of the fixed parameter when FIXPRM-RD has been specified in the Motion Subcommand.	Yes	Yes	6-58
IW□□58 to IW□□5C	—	Reserved for system use.	–	–	–
IL□□5E	Absolute Position at Power OFF (Lower 2 words)	1 = 1 pulse	Yes		6-58
IL□□60	Absolute Position at Power OFF (Upper 2 words)	1 = 1 pulse	Yes		
IL□□62	Modularized Position at Power OFF (Lower 2 Words)	1 = 1 pulse	Yes		
IL□□64	Modularized Position at Power OFF (Upper 2 Words)	1 = 1 pulse	Yes		

(cont'd)

Register No.	Name	Contents	SVB	SVR	Detail
IW□□66 to IW□□6F	–	Reserved for system use.	–	–	–
IW□□70 to IW□□7F	Response Buffer for Transparent Command Mode	Stores the response data when MECHATROLINK Servo commands are specified directly.	Yes		6-58

6.4 MP2300 Parameter Details

This section provides details for each motion parameter (fixed parameters, setting parameters, and monitoring parameters).

6.4.1 Motion Fixed Parameter Details

The following tables provide details of motion fixed parameters.

- Refer to *6.3.1 Fixed Parameter List* on page 6-6 for a list of motion fixed parameters.
- R in the following tables indicates that the item is also compatible with SVR.

(1) Run Mode

<table>
<tr><td colspan="2" rowspan="2">No. 0
Run Mode</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to 3</td><td>–</td><td>0</td></tr>
<tr><td>Description</td><td colspan="4">Specify the application method of the axis.
0: Normal Running (default) R
Use this setting when actually using an axis.
1: Axis Unused R
No control will be performed for an axis set to this mode, and monitoring parameters will not be updated. If an axis is changed from any other run mode to this mode, the monitoring parameters will be held at the current status except for the Drive Status (monitoring parameter IW□□00), which will be cleared to zeros.
Set any axis that is not being used to this mode (Axis Unused) to reduce the processing time.
2: Simulation Mode
In Simulation Mode, position information will be stored in the monitoring parameters even if a Servo Driver is not connected.
This mode is used to virtually check the operation of the applications program.
3: Servo Driver Command (SERVOPACK Transparent Command Mode)
Servo Driver Command Mode is used to directly control the command-response communication with the MECHATROLINK SERVOPACK from the application.
No processing other than communication processing with the SERVOPACK will be performed in this mode. Position control and other processing must be performed in the application.
Commands to the SERVOPACK are set in the area starting with setting parameter OW□□70 and responses are stored in the area starting with monitoring parameter IW□□70.</td></tr>
</table>

(2) Function Selection 1

<table>
<tr><td colspan="3" rowspan="2">No. 1
Function Selection 1</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>–</td><td>–</td><td>0000H</td></tr>
<tr><td rowspan="2">Description</td><td>Bit 0</td><td colspan="4">Axis Type R
Set whether or not there is a limit on controlled axis travel.
0: Linear (finite length axis) (default); The axis will have limited movement.The software limit function is enabled.
1: Rotating (infinite length axis); The axis will have unlimited movement.The software limit function is disabled.
If an infinite length axis is set, the position information will be reset each time the position exceeds the value set for the Maximum Value of Rotary Counter (fixed parameter 10).</td></tr>
<tr><td>Bit 1</td><td colspan="4">Forward Software Limit Enabled
Set whether or not to use the software limit function in the positive direction.
Set the software limit as the Forward Software Limit (fixed parameter 12).
This setting is disabled if the axis is set as an infinite length axis.
The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation (IB□□0C5 is ON).
For details, refer to 10.3 Software Limit Function on page 10-12.
0: Disabled (default)
1: Enabled</td></tr>
</table>

<table>
<tr><td colspan="3" rowspan="2">No. 1
Function Selection 1 (cont.)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>—</td><td>—</td><td>0000H</td></tr>
<tr><td rowspan="6">Description</td><td>Bit 2</td><td colspan="4">Reverse Software Limit Enabled
Set whether or not to use the software limit function in the negative direction.
Set the software limit as the Reverse Software Limit (fixed parameter 14).
This setting is disabled if the axis is set as an infinite length axis.
The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation (IB□□0C5 is ON).
For details, refer to 10.3 Software Limit Function on page 10-12.
0: Disabled (default)
1: Enabled</td></tr>
<tr><td>Bit 3</td><td colspan="4">Positive Overtravel
Set whether or not to use the overtravel detection function in the positive direction. A setting must also be made in the SERVOPACK.
If this function is disabled and the positive OT signal is input, an alarm will not occur, but a warning will occur.
For details, refer to 10.2 Overtravel Function on page 10-8.
0: Disabled (default)
1: Enabled</td></tr>
<tr><td>Bit 4</td><td colspan="4">Negative Overtravel
Set whether or not to use the overtravel detection function in the negative direction. A setting must also be made in the SERVOPACK.
If this function is disabled and the negative OT signal is input, an alarm will not occur, but a warning will occur.
For details, refer to 10.2 Overtravel Function on page 10-8.
0: Disabled (default)
1: Enabled</td></tr>
<tr><td>Bit 8</td><td colspan="4">Segment Distribution Processing
When executing an interpolation command (INTERPOLATE, LATCH or PHASE), converts reference value that is generated with high-speed scan to a reference value for the MECHATROLINK communication cycle.
Set to 0 when using an interpolation command.
0: Enabled (default)
1: Disabled</td></tr>
<tr><td>Bit 9</td><td colspan="4">Simple ABS Infinite Axis
Set whether or not the infinite length position control function is used, on the condition that the number of turns that the encoder can count is a multiple of the number of turns corresponding to the reference unit reset frequency.
With this function, it is not necessary to save and load absolute infinite axis information, eliminating the need for a ladder program and thus simplifying handling. It is recommended that the ABS infinite length axis is used set to Enabled.
0: Disabled (default)
1: Enabled
Refer to 9.4.2 (2) MP2300 Fixed Parameters for Absolute Position Detection on page 9-15 and 9.4.1 (2) Conditions to Enable the Simple Absolute Infinite Axis Position Control on page 9-13 for details.</td></tr>
<tr><td>Bit A</td><td colspan="4">User Constants Self-Writing Function
Set whether or not to use the function that automatically writes MP2300 setting parameters to the SERVOPACK parameters when a MECHATROLINK communication connection is established. Also, the automatic writing is triggered by changing the setting parameters or starting execution of a motion command.
0: Enabled (default)
1: Disabled
Refer to 11.1 Parameters That Are Automatically Updated on page 11-2 for details.</td></tr>
</table>

(3) Function Selection 2

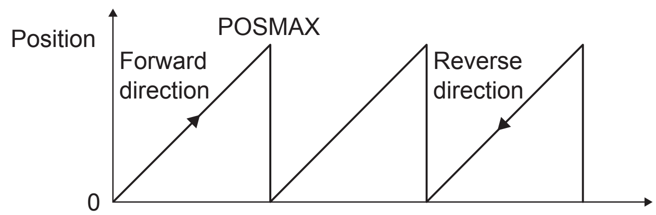
<table>
<tr><td colspan="2" rowspan="2">No. 2
Function Selection 2</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>—</td><td>—</td><td>0000H</td></tr>
<tr><td rowspan="2">Description</td><td>Bit 0</td><td colspan="3">Communication Error Mask
Masks MECHATROLINK communication errors detected at the MP2300.
0: Disabled (default)
1: Enabled</td></tr>
<tr><td>Bit 1</td><td colspan="3">WDT Error Mask
Masks MECHATROLINK watchdog timeout errors detected at the MP2300.
0: Disabled (default)
1: Enabled</td></tr>
</table>

(4) Reference Unit

<table>
<tr><td colspan="2" rowspan="2">No. 4 R
Reference Unit Settings</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to 3</td><td>—</td><td>0</td></tr>
<tr><td>Description</td><td colspan="4">Set the unit for the reference.
The minimum reference unit is determined by this parameter and the Number of Decimal Places setting (fixed parameter 5). If pulse is selected, the Electronic Gear Ratio (fixed parameters 8 and 9) will be disabled.
Refer to 6.5.1 Reference Unit on page 6-59 for details.
0: pulse (electronic gear disabled)
1: mm
2: deg
3: inch</td></tr>
<tr><td colspan="2" rowspan="2">No. 5 R
Number of Decimal Places</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to 5</td><td>—</td><td>3</td></tr>
<tr><td>Description</td><td colspan="4">Set the number of digits below the decimal point in the reference unit.
The minimum reference unit is determined by this parameter and the Command Unit (fixed parameter 4).
Example: When the Command Unit is set to mm and the Number of Decimal Places is set to 3,
a reference unit of 1 will be 0.001 mm.
The setting of this parameter is disabled if the Command Unit is set to pulse in fixed parameter 4.
Refer to 6.5.1 Reference Unit on page 6-59 for details.</td></tr>
<tr><td colspan="2" rowspan="2">No. 6 R
Reference Units per Revolution</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>1 to 2^{31}-1</td><td>Reference unit</td><td>10000</td></tr>
<tr><td>Description</td><td colspan="4">Specify the amount of travel in the load as the number of reference units for each turn of the load shaft.
Refer to 6.5.2 Electronic Gear on page 6-59 for details.</td></tr>
<tr><td colspan="2" rowspan="2">No. 8 R
Gear Ratio (Motor)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>1 to 65535</td><td>rev
(revolutions)</td><td>1</td></tr>
<tr><td>Description</td><td colspan="4">Set 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
The setting of this parameter is disabled if the Command Unit (Reference Unit) is set to pulse in fixed parameter 4.
Refer to 6.5.2 Electronic Gear on page 6-59 for details.</td></tr>
<tr><td colspan="2" rowspan="2">No. 9 R
Gear Ratio (Load)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>1 to 65535</td><td>rev
(revolutions)</td><td>1</td></tr>
<tr><td>Description</td><td colspan="4">Same as for No. 8.</td></tr>
</table>

(5) Infinite Axis Reset Position

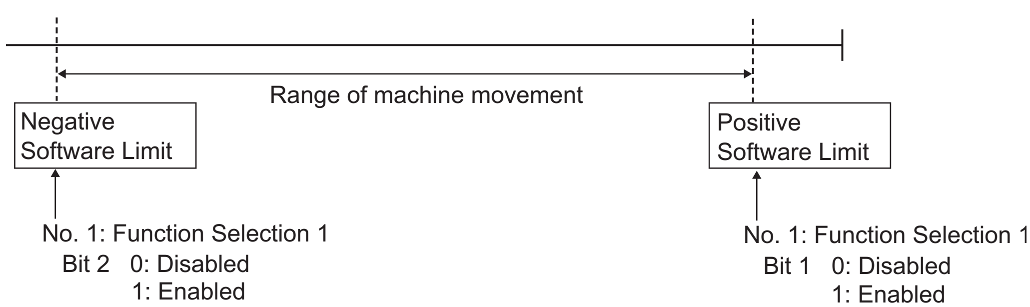
No. 10 R Maximum Value of Rotary Counter (POSMAX)	Setting Range	Setting Unit	Default Value
	1 to 2^{31}-1	Reference unit	360000
Description	Set the reset position when an infinite length axis is set. Enabled when bit 0 of the Function Selection 1 (fixed parameter 1) is set to infinite axis. The position data for infinite axes is controlled in the range from 0 to POSMAX.		



(6) Software Limits

No. 12 Forward Software Limit	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Reference unit	$2^{31}-1$
Description	Set the position to be detected for the software limit in the positive direction at the MP2300. If an axis attempts to move in the positive direction past the position set here, a positive software limit alarm (IB□□043) will occur. Enabled when bit 1 of the Forward Software Limit Enabled (fixed parameter 1, bit 1) is set to 1 (enabled).		
No. 14 Reverse Software Limit	**Setting Range**	**Setting Unit**	**Default Value**
	-2^{31} to $2^{31}-1$	Reference unit	-2^{31}
Description	Set the position to be detected for the software limit in the negative direction at the MP2300. If an axis attempts to move in the negative direction past the position set here, a negative software limit alarm (IB□□044) will occur. Enabled when bit 2 of the Reverse Software Limit Enabled (fixed parameter 1, bit 2) is set to 1 (enabled).		

Outline of Software Limit



- The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation (IB□□0C5 is ON).
- For details, refer to *10.3 Software Limit Function* on page 10-12.

(7) Backlash Compensation

No. 16 Backlash Compensation	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Reference unit	0

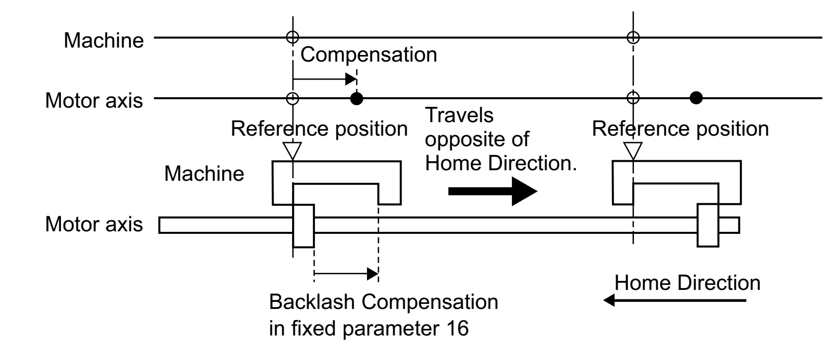
Description

Set the backlash compensation in reference units. Backlash compensation can be performed by setting this parameter to 0.

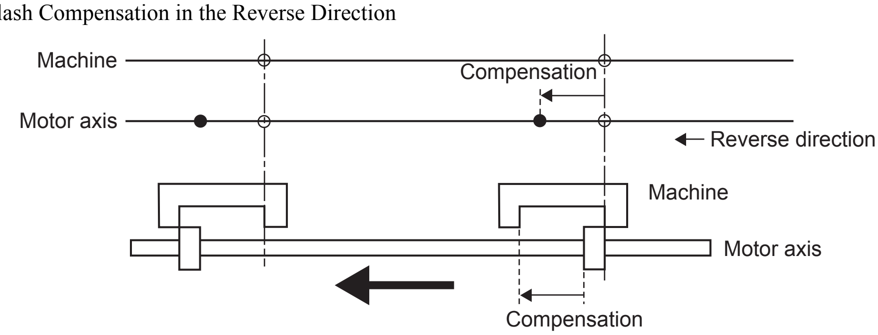
Perform backlash compensation using the functions at the SERVOPACK. The setting is enabled when communication is established with the SERVOPACK (NS115: Pn81B, SGDS: Pn214).

Backlash compensation cannot be used for the SGD-N, SGDB-N, or SGDH + NS100 SERVOPACKs because they do not have a parameter to set the backlash compensation.

Using Backlash Compensation in the Forward Direction



Using Backlash Compensation in the Reverse Direction



(8) SERVOPACK Settings

Fixed Parameter 30 Encoder Type	Setting Range	Setting Unit	Default Value
	0 to 3	–	0

Description

Set the type of encoder that is being used.

0: Incremental encoder
1: Absolute encoder
2: Absolute encoder used as an incremental encoder.
3: Reserved

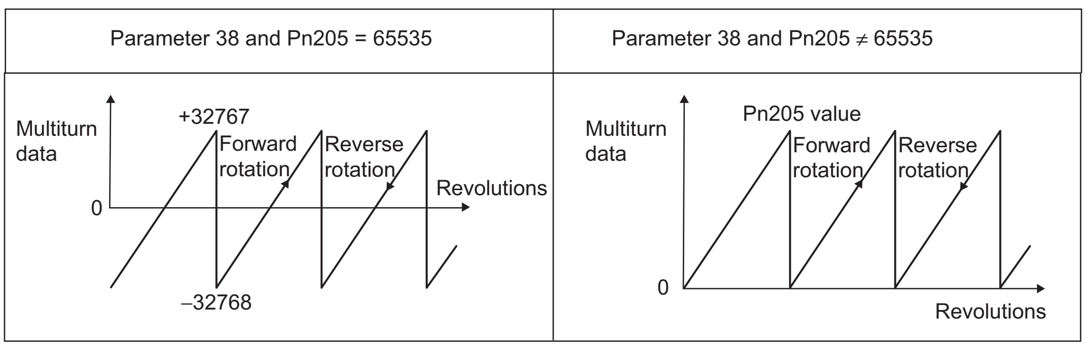
(9) Encoder Settings

No. 34 R Rated Speed	Setting Range	Setting Unit	Default Value
	1 to 32000	min^{-1}	3000
Description	Set the rated motor speed in 1 min^{-1} units. Set this parameter based on the specifications of the motor that is used.		

No. 36 R Encoder Resolution	Setting Range	Setting Unit	Default Value
	1 to 2^{31}–1	pulse	65536
Description	Set the number of feedback pulses per motor rotation. Set the value after multiplication to match the specifications of the motor used. (For example, if a 16-bit encoder is used, set 2^{16} = 65536.)		

No. 38 Maximum Number of Absolute Encoder Turns	Setting Range	Setting Unit	Default Value
	1 to 2^{31}–1	rev	65534
Description	Set the maximum number of rotations for the absolute encoder to the highest number that the encoder can manage. Set this parameter to match the settings of the encoder being used. • Σ-series: Set to 99999 (fixed). • Σ-II or Σ-III Series: Set to the same value as the multiturn limit in the SERVOPACK. For axes set as infinite axes (bit 0 of fixed parameter Function Selection 1 set to 1), set to 65534 max. (same value as Pn205).		

Finite Axes　　　Infinite Axes



This parameter is used to manage position information when an absolute encoder is used and an infinite length axis has been set.

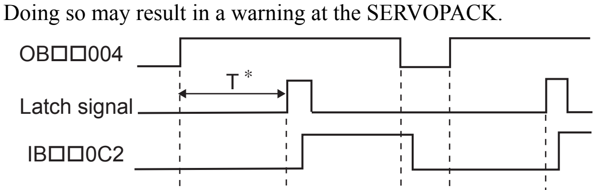
No. 42 R Feedback Speed Moving Average Time Constant	Setting Range	Setting Unit	Default Value
	0 to 32	ms	10
Description	Set the moving average time constant for the feedback speed. The Feedback Speed (monitoring parameter IL□□40) is the value obtained by calculating the moving average for the time constant from the feedback position for every scan.		

6.4.2 Setting Parameter List

The following tables provide details of motion setting parameters.

- Refer to *6.3.2 Setting Parameter List* on page 6-8 for a list of the motion setting parameters.
- Register number OW□□00 indicates the leading output register number + 00.Other register numbers listed below indicate output register numbers in the same way.
- Refer to *6.1.1 Motion Parameter Register Numbers for MP2300* on page 6-2 for information on how to find the leading output register number.
- R in the following tables indicates that the item is also compatible with SVR.
- Position Phase Speed Torque in the following descriptions indicate that parameter is enabled in position control, phase control, speed control, or torque control.
- Similarly, Position Phase Speed Torque in the following descriptions indicate that parameter is disabled in position control, phase control, speed control, or torque control.

(1) RUN Commands

<table>
<tr><td colspan="2" rowspan="2">OW□□00
RUN Commands</td><td rowspan="2">Position Phase
Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>—</td><td>—</td><td>0000H</td></tr>
<tr><td rowspan="3">Description</td><td>Bit 0</td><td colspan="4">Servo ON R
Sends a SERVO ON command to the SERVOPACK.
0: Servo OFF (default)
ON: Servo ON</td></tr>
<tr><td>Bit 1</td><td colspan="4">Machine Lock
During the machine lock mode, the Target Position (CPOS) (monitoring parameter IL□□10) will be updated but no movement will occur on the axis.
A change in the machine lock mode is valid after all pulses have been distributed. The machine lock mode cannot be changed during speed or torque control.
0: Machine lock mode released (default)
1: Machine lock mode</td></tr>
<tr><td>Bit 4</td><td colspan="4">Latch Request
Store the current position when the latch signal turns ON as the Machine Coordinate Latch Position (LPOS) (monitoring parameter IL□□18).
When latch detection is completed, the Latch Completed bit will turn ON in the Position Management Status (monitoring parameter IW□□0C, bit 2).
To perform latch detection again, change this bit from 0 to 1.
Set the latch signal to be used in Latch Input Signal Type of Function 2 (setting parameter OW□□04, bits 0 to 3).
This function is achieved using the Servo command expansion area and can be executed only with the MECHATROLINK-II, 32-byte Mode communication method.
Do not change this bit to 1 during execution of the motion commands for zero point return, external positioning, or latching. Doing so may result in a warning at the SERVOPACK.


* $T \geq t_1 + t_2 + t_3$
Where
T: Latch processing time
t1: MECHATROLINK communication cycle
t2: Two scans
t3: SERVOPACK latch processing preparation time (≤ 4 ms)
0: Latch request OFF (default)
1: Latch request ON</td></tr>
</table>

OW□□00 Run Commands (cont.) Position Phase Speed Torque			Setting Range	Setting Unit	Default Value
			—	—	0000H
Description	Bit 6	POSMAX Preset R Preset the POSMAX Number of Turns (monitoring parameter IL□□1E) to the value set for the Preset Data of POSMAX Turn (setting parameter OL□□4C). 0: POSMAX Preset OFF (default) 1: POSMAX Preset ON			
	Bit 7	Infinite Length Axis Position Information LOAD When an infinite length axis is used with an absolute encoder, this bit can be set to 1 to reset the position information with the data (encoder position and pulse position) that was set when the power was last turned OFF. When processing has been completed for this bit, the ABS System Infinite Length Position Control Information LOAD Completed bit will be turned ON in the Position Management Status (monitoring parameter IW□□0C, bit 8). 0: Infinite Length Axis Position Information LOAD OFF (default) 1: Infinite Length Axis Position Information LOAD ON			
	Bit 8	Forward External Torque Limit Input Limit the torque by the value set in the SERVOPACK parameters. The setting is enabled when the move command or the SERVO ON command is sent. There is no torque limit switch parameter in the Servo command option area in the SGD-N, SGDB-N, or SGDH+NS100/NS115 SERVOPACKs, so the torque limit input cannot be used. 0: Forward External Torque Limit Input OFF (default) 1: Forward External Torque Limit Input ON			
	Bit 9	Reverse External Torque Limit Input Limit the torque by the value set in the SERVOPACK parameters. The setting is enabled when the move command or the SERVO ON command is sent. There is no torque limit switch parameter in the Servo command option area in the SGD-N, SGDB-N, or SGDH+NS100 SERVOPACKs, so the torque limit input cannot be used. 0: Reverse External Torque Limit Input OFF (default) 1: Reverse External Torque Limit Input ON			
	Bit B	Integration Reset Reset the position loop integral items for the SERVOPACK. The setting is enabled when the move command or the SERVO ON command is sent. The Integration Reset (Position Loop Integration Reset) is supported only by the SGDS SERVOPACK and cannot be used for other SERVOPACKs. 0: Integration Reset OFF (default) 1: Integration reset ON			
	Bit F	Clear Alarm R Clear alarms. If a communication error occurs, communication can be reestablished by clearing the alarm. 0: Clear alarm OFF (default) 1 : Clear alarm ON • Do not execute Clear Alarm during axis movement using motion commands. Using Clear Alarm may affect axis movement.			

(2) Mode 1

<table>
<tr><td colspan="2">OW☐☐01
Mode 1</td><td>Position Phase
Speed Torque</td><td>Setting Range
—</td><td>Setting Unit
—</td><td>Default Value
0000H</td></tr>
<tr><td rowspan="3">Description</td><td>Bit 0</td><td colspan="4">Deviation Abnormal Detection Error Level
Set whether excessively following errors are treated as warnings or as alarms.
0: Alarm (default): Axis stops operating when an excessively following error is detected.
1: Warning: Axis continues to operate even if an excessively following error is detected.
■ Related Parameters
OL☐☐22 Deviation Abnormal Detection Value
IB☐☐020 Warning (excessively following error)
IB☐☐049 Error (excessively following error)</td></tr>
<tr><td>Bit 3</td><td colspan="4">Speed Loop P/PI Switch
Switch the SERVOPACK's speed loop between PI control and P control.
The setting is enabled when the move command or the SERVO ON command is sent.
0: PI control (default)
1: P control</td></tr>
<tr><td>Bit 4</td><td colspan="4">Gain Switch
Switch the gain to the Second Gain set in the SERVOPACK parameters.
The setting is enabled when the move command or the SERVO ON command is sent.
There is no gain switch parameter in the Servo command option area in the SGD-N, SGDB-N, or SGDH+NS100 SERVOPACKs, so the Gain Switch cannot be used.
0: Gain Switch OFF (default)
1: Gain Switch ON</td></tr>
</table>

(3) Mode 2

<table>
<tr><td colspan="2">OW☐☐02
Mode 2</td><td>Position Phase
Speed Torque</td><td>Setting Range
—</td><td>Setting Unit
—</td><td>Default Value
0000H</td></tr>
<tr><td>Description</td><td>Bit 0</td><td colspan="4">Monitor 2 Enabled
Disable/enable Monitor 2 in the Servo User Monitor (setting parameter OW☐☐4E, bits 4 to 7).
0: Disabled (default)
1: Enabled
This bit is valid only when the communication mode is MECHATROLINK-I or MECHATROLINK-II 17-byte Mode. This bit is ignored for MECHATROLINK-II 32-byte Mode.</td></tr>
</table>

(4) Function 1

<table>
<tr><td colspan="2">OW□□03
Function 1</td><td>Position Phase
Speed Torque</td><td>Setting Range
—</td><td>Setting Unit
—</td><td>Default Value
0011H</td></tr>
<tr><td rowspan="4">Description</td><td>Bit 0 to Bit 3</td><td colspan="4">Speed Units R
Set the unit for speed references.
0: Reference unit/s
1: 10^n reference unit/min (default) (n = number of decimal places/fixed parameter 5)
2: 0.01%
3: 0.0001%
♦ Refer to 6.5.5 Speed Reference on page 6-63 for setting examples when also setting of the combination with the number of digits below the decimal point.</td></tr>
<tr><td>Bit 4 to Bit 7</td><td colspan="4">Acceleration/Deceleration Units R
Set whether to specify acceleration/deceleration rates or acceleration/deceleration time constants for acceleration/deceleration commands.
0: Reference units/s^2
1: ms (default)</td></tr>
<tr><td>Bit 8 to Bit B</td><td colspan="4">Filter Type R
Set the acceleration/deceleration filter type.
The set filter type changes when the motion command Change Filter Type is executed.
0: No filter (default)
1: Exponential acceleration/deceleration filter
2: Moving average filter
♦ When a filter is used, set the type in this parameter and execute the motion command Change Filter Type.
For details, refer to 7.2.12 Change Filter Type (CHG_FILTER) on page 7-60.</td></tr>
<tr><td>Bit C to Bit F</td><td colspan="4">Torque Unit Selection R
Set the unit for torque references.
0: 0.01% (default)
1: 0.0001%</td></tr>
</table>

(5) Function 2

OW□□04 Function 2		Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
			—	—	0033H
Description	Bit 0 to Bit 3	Latch Input Signal Type Set the latch signal type. 0: - 1: - 2: Phase-C pulse input signal 3: /EXT1 (default) 4: /EXT2 5: /EXT3 • The signal is input to the SERVOPACK.The SGD-N and SGDB-N SERVOPACKs support only the /EXT1 latch signal, so the /EXT2 and /EXT3 latch signals cannot be used. If a signal that is not supported is selected, the following warning will occur: Setting Parameter Error. • The setting is enabled when a latch command is executed.			
	Bit 4 to Bit 7	External Positioning Signal Set the external signal for external positioning. 0: - 1: - 2: Phase-C pulse input signal 3: /EXT1 (default) 4: /EXT2 5: /EXT3 • The signal is input to the SERVOPACK. The SGD-N and SGDB-N SERVOPACKs support only the /EXT1 latch signal, so the /EXT2 and /EXT3 latch signals cannot be used. If a signal that is not supported is selected, the following warning will occur: Setting Parameter Error.			

(6) Function 3

OW□□05 Function 3		Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
			—	—	0000H
Description	Bit 1	Close Position Loop Using OL□□16 (Disable Phase Reference Generation) Set whether to disable or enable phase reference generation processing when executing phase reference commands. Enable this processing when an electronic shaft is being used. Disable the processing when an electronic cam is being used. 0: Enabled (default) 1: Disabled Speed feed forward control cannot be used for the SGD-N or SGDB-N SERVOPACK, so the Disable Phase Reference Generation command cannot be used.			
	Bit B	INPUT Signal for Zero Point Return This bit functions as the INPUT signal when the INPUT & C pulse method or INPUT Only method is being used for the Zero Point Return operation. 0: INPUT signal OFF (default) 1: INPUT signal ON			

(7) Motion Commands

<table>
<tr><td colspan="2" rowspan="2">OW□□08 R
Motion Commands
Position Phase
Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to 26</td><td>—</td><td>0</td></tr>
<tr><td>Description</td><td colspan="4">Set motion command.
0: NOP — No command
1: POSING — Positioning
2: EX_POSING — External Positioning
3: ZRET — Zero Point Return
4: INTERPOLATE — Interpolation
5: ENDOF_INTERPOLATE — Reserved for system use.
6: LATCH — Latch
7: FEED — JOG Operation
8: STEP — STEP Operation
9: ZSET — Zero Point Setting
10: ACC — Change Linear Acceleration Time Constant
11: DCC — Change Linear Deceleration Time Constant
12: SCC — Change Filter Time Constant
13: CHG_FILTER — Change Filter Type
14: KVS — Change Speed Loop Gain
15: KPS — Change Position Loop Gain
16: KFS — Change Feed Forward
17: PRM_RD — Read SERVOPACK Parameter
18: PRM_WR — Write SERVOPACK Parameter
19: ALM_MON — Monitor SERVOPACK Alarms
20: ALM_HIST — Monitor SERVOPACK Alarm History
21: ALMHIST_CLR — Clear SERVOPACK Alarm History
22: ABS_RST — Reset Absolute Encoder
23: VELO — Speed Reference
24: TRQ — Torque Reference
25: PHASE — Phase Reference
26: KIS — Change Position Loop Integration Time Constant
• Refer to Chapter 7 Motion Commands for details.</td></tr>
</table>

(8) Motion Command Control Flags

OW□□09 Motion Command Options	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		—	—	0000H

Description	Bit 0	Command Pause R The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving during positioning, external positioning, STEP operation, or speed reference. While this bit is 1, the command is held. When this bit is changed to 0, the hold is canceled and positioning restarts. After the axis has been stopped, the Command Hold Completed bit will turn ON in the Servo Module Command Status (monitoring parameter IW□□09, bit 1). 0: Command Pause OFF (default) 1: Command Pause ON
	Bit 1	Command Abort R The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving during positioning, external positioning, zero point return, JOG operation, STEP operation, speed reference, or torque reference, and the remaining movement will be canceled. 0: Command Abort OFF (default) 1: Command Abort ON
	Bit 2	Jog/Step Direction R Set the movement direction for JOG or STEP. 0: Forward (default) 1: Reverse
	Bit 3	Home Direction Set the direction to move for zero point return. This setting is valid for zero point returns using DEC1 + C, ZERO, DEC1 + ZERO, or phase-C. 0: Reverse (default) 1: Forward
	Bit 4	Latch Zone Enabled Disable/enable the area where the external signal is valid for external positioning (called the latch zone). This parameter writes the set values for OL□□2A/OL□□2C in the SERVOPACK parameters (Pn820, Pn822) when it is enabled. This setting is valid each time a new external positioning command is executed. When this parameter is disabled, sets the SERVOPACK parameters Pn820 and Pn822 to the same value (zero). 0: Disabled (default) 1: Enabled Always disable this parameter when sending latch commands (latch, zero point return) other than those for external positioning. ■ Related Parameters Latch Zone Lower Limit (setting parameter OL□□2A) and Latch Zone Upper Limit (setting parameter OL□□2C)
	Bit 5	Position Reference Type R Specify whether the value set for the Position Reference (setting parameter OL□□1C) is an Incremental Addition Mode value (calculated by adding the movement amount to the current position) or an Absolute Mode value (an absolute position). Always set this parameter to Incremental Addition Mode when using motion programs or infinite axes. For details, refer to *6.5.2 (2) Parameter Setting Example Using Rotating Table* on page 6-60. 0: Incremental addition mode (default) 1: Absolute mode

OW□□09 Motion Command Options	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		—	—	0000H

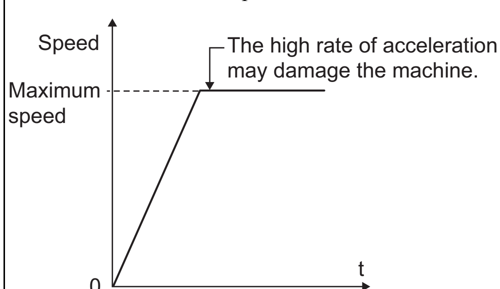
Description	Bit 6	Phase Compensation Type with an Electronic Cam Select a setting method for Phase Compensation (OL□□28). 0: Incremental addition mode (Default) 1: Absolute mode This bit is valid when the electronic cam function is enabled (setting: OW□□05, bit 1 = 1). If using an electronic shaft (OW□□05, bit 1 = 0), the incremental value of Phase Compensation (OL□□28), which is the difference between the values from the previous H scan and the current H scan, is added to the target position regardless of the setting of this bit. ■ Precautions if using as an electronic cam (OW05, bit 1 = 1) • if Absolute value 1 is selected for the Phase Compensation Type when using an electronic cam, always take measures to prevent a sudden and extreme change in the target position before executing the move command. For example, set the Phase Compensation (OL□□28) to the same value as 32-bit Coordination System Position (DPOS) (IL□□14). If preventive measures are not taken, the axis may abruptly move, resulting in a serious situation. • If using the electronic cam function, do not change the setting of this bit while the move command is being executed. Although the setting of this bit can be changed at any time, changing the setting while the move command is being executed may move the axis abruptly, resulting in serious situation. ■ Precautions if using as an electronic shaft (OW□□05, bit 1 = 0) • The setting method of Phase Compensation (OL□□28) for the SVA-01 Module and that for the SVB/SVB-01 Modules are different. For the SVA-01 Module, the set value of Phase Compensation (OL□□28) is simply added to the target position.

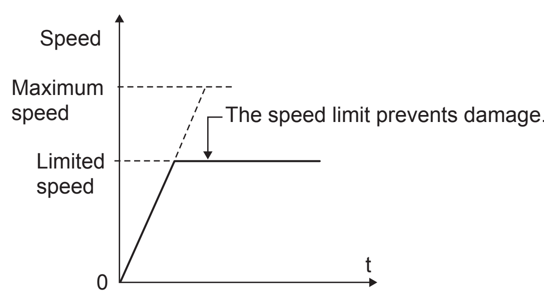
(9) Motion Subcommands

OW□□0A Motion Subcommands	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 5	—	0

Description	Set the motion subcommands that can be used with the motion command. R 0: NOP — No command 1: PRM_RD — Read SERVOPACK Parameter 2: PRM_WR — Write SERVOPACK Parameter 3: Reserved — Reserved 4: SMON — Monitor Status R 5: FIXPRM_RD — Read Fixed Parameters • These commands can be used only with MECHATROLINK-II in 32-byte mode, except for Read Fixed Parameters. For details, refer to *7.3 Motion Subcommands* on page 7-95 and *7.4 Motion Subcommand Details* on page 7-96.

(10) Torque Reference

<table>
<tr><td colspan="2" rowspan="2">OL□□0C R
Torque/Thrust Reference
/Torque Feed Forward Compensation
Position Phase Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Depends on the torque unit set in Function 1 (setting parameter OW□□03 bits C to F).</td><td>0</td></tr>
<tr><td>Description</td><td colspan="4">The meaning will depend on the command.
• Set the torque reference for torque reference commands.
Refer to 7.2.23 Torque Reference (TRQ) on page 7-84 for details.
• Set the torque feed forward gain* for interpolation commands.
* Torque Feed Forward Gain Function
Torque feed forward gain can be used when interpolation commands (INTERPOLATE, LATCH) are sent using SGDS SERVOPACKs.
Conditions of Use
・SERVOPACK parameter Pn002.0 = 2
・SGDS communication interface version 8 or later
♦ The setting unit for this parameter depends on the Torque Unit Selection (OW□□03, bits C to F), but the result of applying the torque unit setting is not shown here.</td></tr>
<tr><td colspan="2" rowspan="2">OW□□0E
Speed Limit at Torque/Thrust Reference
Position Phase Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>–32768 to 32767</td><td>0.01%</td><td>15000</td></tr>
<tr><td>Description</td><td colspan="4">Set the speed limit for torque references as a percentage of the rated speed.
Torque control is used to control the Servomotor to output the specified torque, so it does not control the motor speed. Therefore, when an excessive reference torque is set relative to the load torque of the machine, the machine's torque is overpowered by the torque reference and the motor speed rapidly increases.
The torque reference speed limit functions to limit the Servomotor speed during torque control to protect the machine.
♦ The setting is enabled when a torque reference command is executed.
No speed limit


Speed limit used


■ Related Parameters
SGDS, SGDH+NS115, SGDH+NS110
: Pn002.1
Pn407
Pn408.1
Pn300
SGD-N, SGDB-N
: Cn-02, bit 2
Cn-14</td></tr>
</table>

(11) Speed Reference

		Setting Range	Setting Unit	Default Value
OL□□10 R Speed Reference	**Position** **Phase** **Speed** Torque	-2^{31} to $2^{31}-1$	Depends on the Speed Unit set in Function 1 (setting parameter OW□□03, bits 0 to 3).	3000
Description	Set the speed reference. This parameter is used by the following commands. Refer to *Chapter 7 Motion Commands* for details. 1: POSING — Positioning 2: EX_POSING — External Positioning 3: ZRET — Zero Point Return 7: FEED — JOG operation 8: STEP — STEP operation 23: VELO — Speed Reference 25: PHASE — Phase Reference • The setting unit for this parameter depends on the Speed Unit (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.			

(12) Positive Side Limiting Torque/Thrust Setting at the Speed Reference

		Setting Range	Setting Unit	Default Value
OL□□14 Positive Side Limiting Torque/Thrust Setting at the Speed Reference	Position Phase **Speed** Torque	-2^{31} to $2^{31}-1$	Depends on the torque unit set in Function 1 (setting parameter OW□□03 bits C to F).	30000
Description	Set the torque limit for the speed reference command. The same value is used for both the forward and reverse directions. This parameter is used when a torque limit is required at specific timing during operation of the machine, such as applications for pushing a load to stop it or holding a workpiece. • The setting unit for this parameter depends on the Torque Unit Selection (OW□□03, bits C to F), but the result of applying the torque unit setting is not shown here. • The setting is enabled when a speed reference command is executed.			

(13) Secondary Speed Compensation

		Setting Range	Setting Unit	Default Value
OL□□16 R Secondary Speed Compensation	Position **Phase** Speed Torque	-2^{31} to $2^{31}-1$	Depends on the Speed Unit set in Function 1 (setting parameter OW□□03, bits 0 to 3).	0
Description	Set the speed feed forward amount for the Phase Reference command (PHASE). The setting unit for Speed Amends (setting parameter OW□□31) is 0.01% (fixed). The unit for this parameter, however, can be selected using Speed Unit Selection. When used at the same time as OW□□31, speed compensation can be performed twice. • The setting unit for this parameter depends on the Speed Unit (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.			

(14) Speed Override

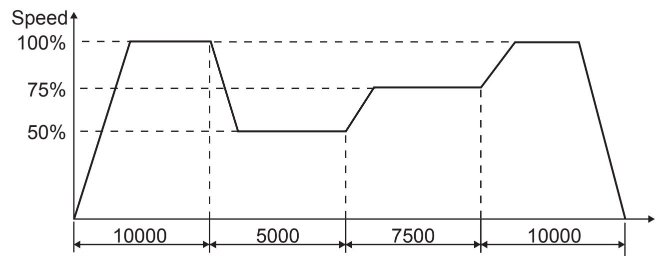
OW□□18 Speed Override	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 32767	0.01%	10000

Description

Set the percentage of the Speed Reference (OL□□10) to output in units of 0.01%.
The override value is always enabled. Set to 10000 (fixed) when not using the override function.

Speed reference (OL□□10) × Speed override (OL□□18) = Output speed

This parameter can be changed at any time to any value during execution of speed reference, and acceleration/deceleration is performed immediately according to the set value.



Override set value

When the speed override is set to 0, the output speed is 0 and the motor will not operate.

(15) Position Reference Setting

OL□□1C R Position Reference Setting	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	0

Description

Set the position reference.

This parameter is used for the following commands.

1: POSING	Positioning
2: EX_POSING	External Positioning
4: INTERPOLATE	Interpolation
6: LATCH	Latch

■ Related Parameters

OW□□09, bit 5: Position Reference Type

(16) Position Completed Width

OL□□1E Position Completed Width	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 65535	Reference unit	100

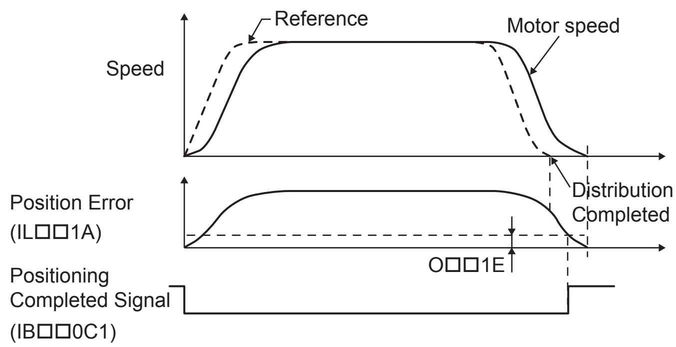
Description

This bit shows the set value of a SERVOPACK parameter.

Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for details.

When the Positioning Completed Signal (IB□□2C7) turns ON after position reference distribution has completed for position control, the Positioning Completed Signal (IB□□0C1) turns ON.

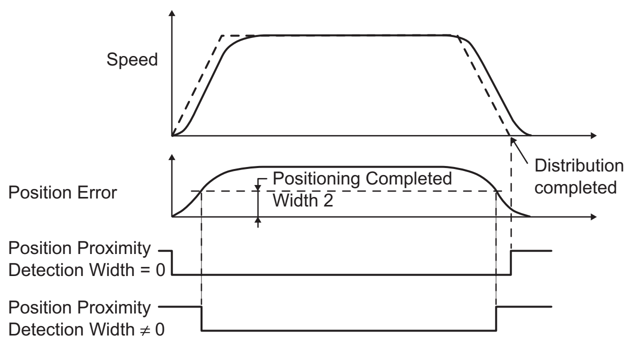
Set values that are appropriate for all machines in the system. If the value is too small, a long time will be required for positioning to complete.



■ Related Parameters

Fixed Parameter 4: Command Unit
Fixed Parameter 5: Number of Decimal Places
Fixed Parameter 6: Command Units per Revolution
Fixed Parameter 8: Gear Ratio [MOTOR]
Fixed Parameter 9: Gear Ratio [LOAD]
OW□□2E: Position Loop Gain
IB□□0C0: Distribution Completed (DEN)
IB□□0C1: Positioning Completed (POSCOMP)

(17) Positioning Completed Width 2

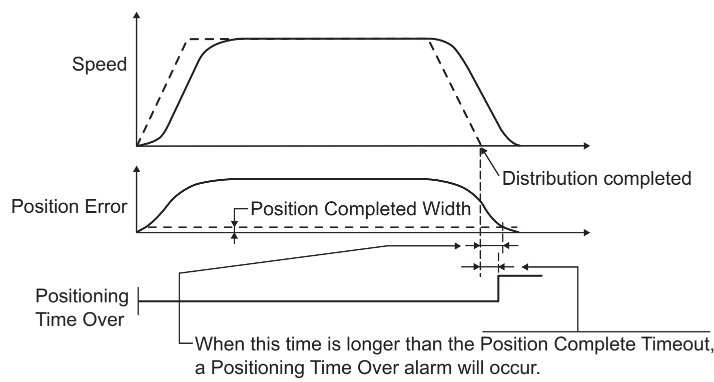
<table>
<tr><td colspan="2" rowspan="2">OL□□20
Positioning Completed Width 2</td><td rowspan="2">Position Phase
Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to 65535</td><td>Reference unit</td><td>0</td></tr>
<tr><td>Description</td><td colspan="5">Position Proximity (IB□□0C3) will be turned ON when the absolute value of the difference between the command position and the feedback position is less than the value set here.
If the Positioning Completed Width 2 is set to 0, the Position Proximity bit (monitoring parameter IB□□0C3) will be turned ON when reference pulses have been distributed. (monitoring parameter IB□□0C0).
If the Positioning Completed Width 2 is set to a value other than 0, this bit will be turned ON when the result of subtracting the Machine Coordinate Feedback Position (monitoring parameter IL□□16) from the Machine Coordinate System Position (monitoring parameter IL□□12) is less than the Position Completed Width 2, even if the reference pulses have not been distributed.
This parameter has no relation to the SERVOPACK parameter Position Proximity (NEAR) Signal Width.

■ Related Parameters
IB□□0C3: Position Proximity</td></tr>
</table>

(18) Deviation Abnormal Detection Value

<table>
<tr><td colspan="2" rowspan="2">OL□□22
Deviation Abnormal Detection Value</td><td rowspan="2">Position Phase
Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0 to $2^{31}-1$</td><td>Reference unit</td><td>$2^{31}-1$</td></tr>
<tr><td>Description</td><td colspan="5">Set the value to detect an excessively following error during position control.
The Excessively Following Error (IB□□049) turns ON if the result from subtracting the Machine Coordinate Feedback Position (monitoring parameter IL□□16) from the Machine Coordinate System Position (monitoring parameter IL□□12) is greater than the Positioning Completed Width 2. An excessively following error will not be detected if this value is set to 0.
■ Related Parameters
An excessively following error can be set to be treated either as a warning or as an alarm in the Deviation Abnormal Detection Error Level Setting in Mode 1 (setting parameter OB□□010).
OB□□010 = 0: Alarm (default) (stops axis operation)
OB□□010 = 1: Warning (continues axis operation)</td></tr>
</table>

(19) Position Complete Timeout

OW□□26 Position Complete Timeout	**Position** Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 65535	ms	0
Description	Set the time to detect a positioning time over error. If the Positioning Completed bit does not turn ON within the time set here after reference pulses have been distributed during position control, a Positioning Time Over alarm (monitoring parameter IB□□046) will occur. The completion of positioning will not be checked if this parameter is set to 0.			



(20) Phase Compensation

OL□□28 Phase Compensation	Position **Phase** Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the phase compensation in reference units for phase reference commands. Using as Electronic Shaft Use this parameter to compensate for reference pulses in control systems without rigidity, in which higher gain cannot be applied. Using as Electronic Cam Use this parameter as the target position for the cam pattern with incremental addition. • Refer to *7.2.24 Phase References (PHASE)* on page 7-89 for details on phase reference commands.			

(21) Latch

OL□□2A Latch Zone Lower Limit Setting	**Position** Phase Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	-2^{31}
Description	Set the range in which the latch signal is valid (position from the zero position) for external positioning. The set value here is written to the SERVOPACK parameters each time an external positioning command is executed as long as the latch zone is enabled in the Latch Zone Enabled bit in Motion Command Options (setting parameter OW□□09, bit 4). The latch zone setting is supported for SGDS SERVOPACKs for MECHATROLINK-II communication only. Latching Area Lower Limit: Pn822 Latching Area Upper Limit: Pn820			
OL□□2C Latch Zone Upper Limit Setting	**Position** Phase Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	$2^{31}-1$
Description	Same as for OL□□2A.			

(22) Gain and Bias Settings

OW□□2E Position Loop Gain	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 32767	0.1/s	300

Description

Determine the responsiveness for the SERVOPACK's position loop.

If the position loop gain is set high, the responsiveness is high and the positioning time is short. Set the optimum value for the machine rigidity, inertia, and type of Servomotor. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters.

If this parameter changes, the corresponding SERVOPACK parameter will change automatically. This function is achieved using the Servo command expansion area and can be executed when using the MECHATROLINK-II (32-byte Mode) communication method. The motion command KPS must be used to make changes to this parameter.

OW□□2F Speed Loop Gain	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		1 to 2000	Hz	40

Description

Determine the responsiveness for the SERVOPACK's speed loop.

The Servo system will be more stable the higher this parameter is set, as long as the value is within the range in which the mechanical system does not oscillate. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters.

If this parameter changes, the corresponding SERVOPACK parameter will change automatically.

This function is achieved using the Servo command expansion area and can be executed when using the MECHATROLINK-II (32-byte Mode) communication method. The motion command KVS must be used to make changes to this parameter.

OW□□30 Speed Feed Forward Compensation	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 32767	0.01%	0

Description

Reduces positioning time by applying feed forward compensation.

This setting is effective for positioning control commands. Always set this parameter to 0 for phase control.

If this parameter changes, the corresponding SERVOPACK parameter will change automatically.

This function is achieved using the Servo command expansion area and can be executed when using the MECHATROLINK-II (32-byte Mode) communication method. The motion command KFS must be used to make changes to this parameter.

OW□□31 R Speed Amends	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		–32768 to 32767	0.01%	0

Description

Set the speed feed forward gain as a percentage of the rated speed for the interpolation (INTERPOLATE), phase reference (PHASE), and latch (LATCH) commands.

The setting unit for this parameter is 0.01% (fixed).

- Secondary Speed Compensation (OL□□16) can be used with the phase reference command (PHASE) , and the unit can be selected for OL□□16. When used at the same time as OL□□16, speed compensation can be applied twice.

OW□□32 Position Integration Time Constant	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 32767	ms	0

Description

Set the position loop integration time constant.

Use this parameter to improve the following precision in applications such as electronic cams or shafts.

The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters.

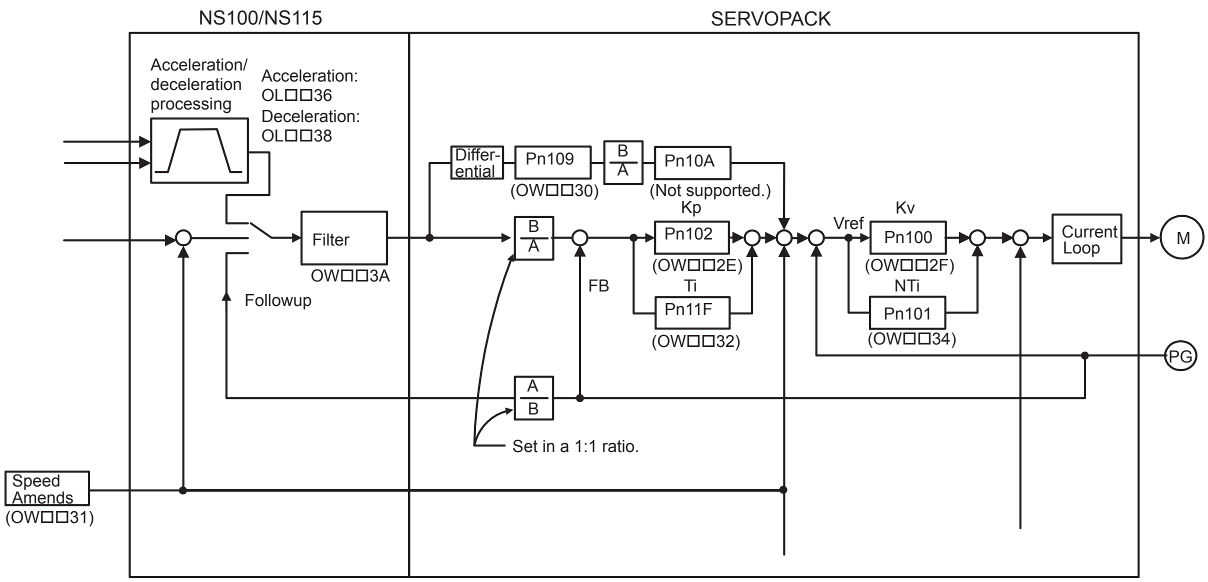
If this parameter changes, the corresponding SERVOPACK parameter will change automatically.

This function is achieved using the Servo command expansion area and can be executed when using the MECHATROLINK-II (32-byte Mode) communication method. The motion command KIS must be used to make changes to this parameter.

There is no parameter to set the integration time constant in the SGD-N or SGDB-N SERVOPACK, so the Position Integration Time Constant cannot be used.

OW□□34 Speed Integration Time Constant — Position, Phase, Speed, Torque	Setting Range	Setting Unit	Default Value
	15 to 65535	0.01 ms	2000
Description	The speed loop has an integral element to enable responding to minute inputs. This element, however, causes a delay in the Servo system, adversely affecting the response if the time constant is set too large. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters.		

The following figure shows the relationship between the above related parameters.



(23) Acceleration/Deceleration Settings

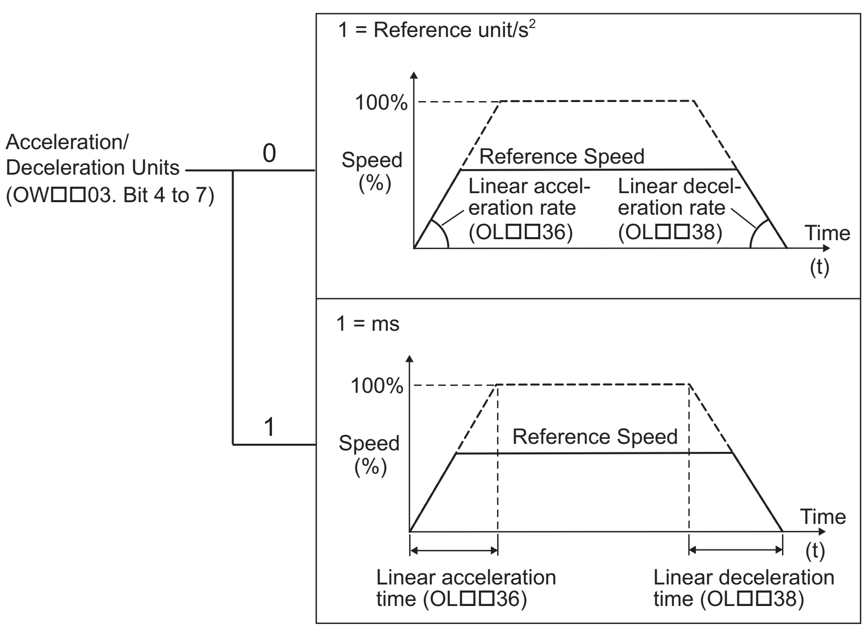
Parameter		Setting Range	Setting Unit	Default Value
OL□□36 R Linear Acceleration Time	Position Phase Speed Torque	0 to $2^{31}-1$	Acceleration/Deceleration Units (setting parameter OW□□03, bits 4 to 7)	0
Description	Set the linear acceleration rate or linear acceleration time constant. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters. • The setting unit for this parameter depends on the Acceleration/Deceleration Units (OW□□03, bits 4 to 7), but the result of applying the acceleration/deceleration unit setting is not shown here.			
OL□□38 R Linear Deceleration Time		0 to $2^{31}-1$	Acceleration/Deceleration Units (setting parameter OW□□03, bits 4 to 7)	0
Description	Set the linear deceleration rate or linear deceleration time constant. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters. • The setting unit for this parameter depends on the Acceleration/Deceleration Unit (OW□□03, bits 4 to 7), but the result of applying the acceleration/deceleration unit setting is not shown here.			

The following two methods can be used to specify the acceleration/deceleration speed.

1. Setting the acceleration/deceleration speed

2. Setting the time to reach the rated speed from zero speed.

   For this method, the setting range is 0 to 32,767 ms. A setting parameter error will occur if the setting exceeds 32,767.



• For details on each acceleration/deceleration parameter, refer to *6.5.6 Acceleration/Deceleration Settings* on page 6-65 and *6.5.7 Acceleration/Deceleration Filter Settings* on page 6-67.

(24) Filter

OW☐☐3A R S-curve Acceleration Time	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 65535	0.1 ms	0
Description	Set the acceleration/deceleration filter time constant. Always make sure that pulse distribution has been completed (i.e., that monitoring parameter IB☐☐0C0 is ON) before changing the time constant. The actual machine operation depends on the settings in the SERVOPACK parameters. Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2 for information on automatic updating of parameters. Change the time constant for the filter set using the motion command Change Filter Type. After setting the filter type to be used, change the time constant. The overall flow for setting the filter time constant is as follows: 1. Select the filter type in Function 1 (setting parameter OW☐☐03, bits 8 to B). ↓ 2. Execute the motion command Change Filter Type (CHG_FILTER). ↓ 3. Set the S-curve Acceleration Time (setting parameter OW☐☐3A). ↓ 4. Execute the motion command Change Filter Time Constant. Once the filter type is set using the motion command, the setting is held until the power is turned OFF or the filter type is changed.			

OW☐☐3B (R only) Bias Speed for Exponential Acceleration/Deceleration Filter	Setting Range	Setting Unit	Default Value
	0 to 32767	Speed Units (setting parameter OW☐☐03, bits 0 to 3)	100
Description	Set the bias speed for the exponential acceleration/deceleration filter. • The setting unit for this parameter depends on the Speed Units (OW☐☐03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.		

- There are two types of acceleration/deceleration filter: an exponential acceleration/deceleration filter and a moving average filter.
- For details on each acceleration/deceleration parameter, refer to *6.5.6 Acceleration/Deceleration Settings* on page 6-65 and *6.5.7 Acceleration/Deceleration Filter Settings* on page 6-67.

(25) Zero Point Return

OW□□3C Home Return Type	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to 19	–	0

Description	Set the operation method when the Zero Point Return (ZRET) motion command is executed. With an incremental encoder, there are 13 different methods that can be performed for the Zero Point Return operation. • Refer to *7.2.3 Zero Point Return (ZRET)* on page 7-16 for information on each method. With an absolute encoder, the axis is returned to the zero point of the machine coordinate system regardless of which method is being used.

OW□□3D R Home Window	Setting Range	Setting Unit	Default Value
	0 to 65535	Reference unit	100

Description	Set the width in which the Zero Point Position bit (monitoring parameter IB□□0C4) will be ON.

OL□□3E Approach Speed	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Depends on Speed Units.	1000

Description	Set the approach speed for a zero point return operation after the deceleration LS is passed. • The setting unit for this parameter depends on the Speed Units (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.

OL□□40 Creep Speed	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Depends on Speed Units.	500

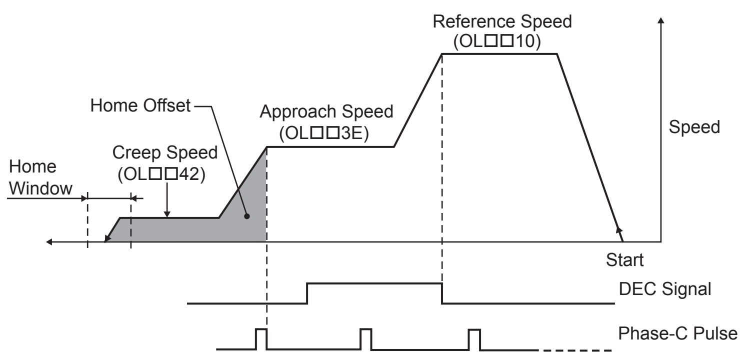
Description	Set the creep speed for a zero point return operation after the ZERO signal is detected. • The setting unit for this parameter depends on the Speed Units (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.

OL□□42 Home Offset	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Reference unit	0

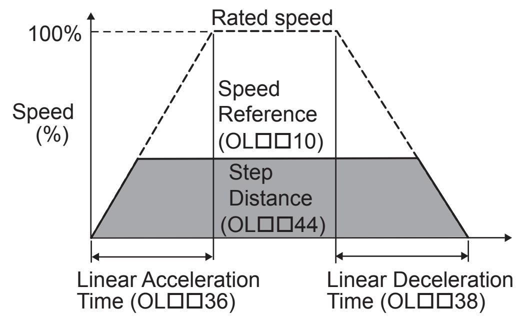
Description	Set the distance from where the signal is detected to the zero point position.

A typical example of a zero point return operation is shown below.

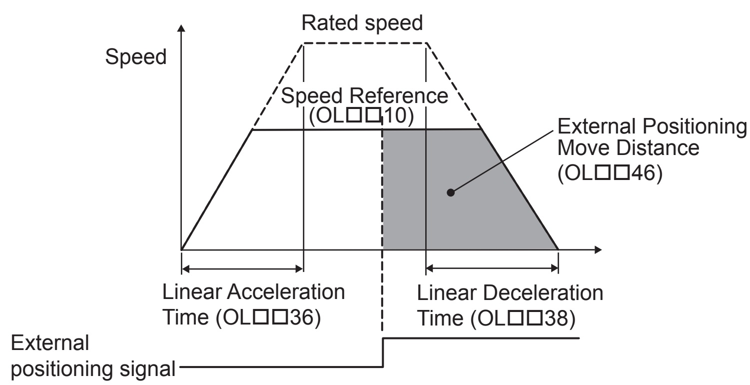
• Refer to *7.2.3 Zero Point Return (ZRET)* on page 7-16 for details.



(26) Step Distance

OL□□44 R Step Distance	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		0 to $2^{31}-1$	Reference unit	1000
Description	Set the moving amount for STEP commands.  • Refer to *7.2.7 STEP Operation (STEP)* on page 7-48 for details on STEP commands.			

(27) External Positioning Move Distance

OL□□46 External Positioning Move Distance	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the distance from the time the external signal is input for external positioning commands (EX_POSING).  • Refer to *7.2.2 External Positioning (EX_POSING)* on page 7-11 for details.			

(28) Coordinate System Settings

OL□□48 R Zero Point Offset	Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the offset to shift the machine coordinate system. • This parameter is always enabled, so be sure that the setting is correct.			

OL□□4A R Work Coordinate System Offset	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the offset to shift the work coordinate system. • This parameter is always enabled, so be sure that the setting is correct.		

OL□□4C R Preset Data of POSMAX Turn	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	Rev	0
Description	When the POSMAX Preset bit (setting parameter OW□□00 bit 6) is set to 1, the value set here will be preset as the POSMAX Number of Turns (monitoring parameter IL□□1E).		

• For information on how to use these functions, refer to *Chapter 9 Absolute Position Detection*.

(29) SERVOPACK User Monitor

<table>
<tr><td colspan="2">OW□□4E
Servo User Monitor</td><td>Position Phase
Speed Torque</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td colspan="3"></td><td>—</td><td>—</td><td>0E00H</td></tr>
<tr><td rowspan="2">Description</td><td>Bit 4 to Bit 7</td><td colspan="4">Monitor 2
Monitor 2 is used with the MECHATROLINK-I and the MECHATROLINK-II in 17-byte Mode when bit 0 of OW□□02 is 1.
0 : Reference position in command coordinate system (reference unit)
1: Reference position in machine coordinate system (reference unit)
2: Following error (reference unit)
3 : Feedback position in machine coordinate system (reference unit)
4 : Feedback latch position in machine coordinate system (reference unit)
5 : Reference position in command coordinate system (reference unit)
6 : Target position in command coordinate system (reference unit)
7 :
8: Feedback speed (position/torque control: reference units/s, speed control: maximum speed/40000000 hex)
9: Command speed (position/torque control: reference units/s, speed control: maximum speed/40000000 hex)
A: Target speed (position/torque control: reference units/s, speed control: maximum speed/40000000 hex)
B: Torque reference (position/speed control: reference units/s, torque control: maximum torque/40000000 hex)
C:
D:
E: Option Monitor 1 (default)
F: Option Monitor 2</td></tr>
<tr><td>Bit C to Bit F</td><td colspan="4">Monitor 4
Monitor 4 is used only with the MECHATROLINK-II in 32-byte Mode.
0 to F: Same as for Monitor 2.</td></tr>
</table>

(30) SERVOPACK Commands

OW□□4F Servo Alarm Monitor Number Position Phase Speed Torque		Setting Range	Setting Unit	Default Value
		0 to 10	–	0
Description	Set the number of the alarm to monitor. Set the number of the alarm to monitor for the ALM_MON or ALM_HIST motion command. The result of monitoring will be stored as the Servo Alarm Code (monitoring parameter IW□□2D). • Refer to *Chapter 7 Motion Commands* for details.			

OW□□50 Servo Constant Number		Setting Range	Setting Unit	Default Value
		0 to 65535	–	0
Description	Set the number of the SERVOPACK parameter. Set the number of the SERVOPACK parameter to be processed for the PRM_RD or PRM_WR motion command. • Refer to *Chapter 7 Motion Commands* for details.			

OW□□51 Servo Constant Number Size		Setting Range	Setting Unit	Default Value
		1, 2	–	1
Description	Set the number of words in the SERVOPACK parameter. Set the number of words in the SERVOPACK parameter to be processed for the PRM_RD or PRM_WR motion command. • Refer to *Chapter 7 Motion Commands* for details.			

OL□□52 Servo User Constant		Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	–	0
Description	Set the setting for the SERVOPACK parameter. Set the setting value to be written to the SERVOPACK parameter with the PRM_WR motion command. • Refer to *Chapter 7 Motion Commands* for details.			

OW□□54 Auxiliary Servo User Constant Number		Setting Range	Setting Unit	Default Value
		0 to 65535	–	0
Description	Set the number of the SERVOPACK parameter. Set the number of the SERVOPACK parameter to be processed for the PRM_RD or PRM_WR motion subcommand. • Refer to *Chapter 7 Motion Commands* for details.			

OW□□55 Auxiliary Servo Constant Number Size		Setting Range	Setting Unit	Default Value
		1, 2	–	1
Description	Set the number of words in the SERVOPACK parameter. Set the number of words in the SERVOPACK parameter to be processed for the PRM_RD or PRM_WR motion subcommand. • Refer to *Chapter 7 Motion Commands* for details.			

OL□□56 Auxiliary Servo User Constant		Setting Range	Setting Unit	Default Value
		-2^{31} to $2^{31}-1$	–	0
Description	Set the setting for the SERVOPACK parameter. Set the setting value to be written to the SERVOPACK parameter with the PRM_WR motion subcommand. • Refer to *Chapter 7 Motion Commands* for details.			

(31) Supplemental Settings

OW□□5C R Fixed Parameter Number Position Phase Speed Torque		Setting Range	Setting Unit	Default Value
		0 to 65535	–	0
Description	Set the number of the fixed parameter to be read with the motion subcommand FIXPRM_RD. The results of the Read Fixed Parameters operation are stored in the Fixed Parameter Monitor (monitoring parameter IW□□56). • For details, refer to *7.3 Motion Subcommands* on page 7-95 and *7.4 Motion Subcommand Details* on page 7-96.			

(32) Absolute Infinite Length Axis Position Control Information

OL□□5E Absolute Position at Power OFF (Lower 2 words) Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	pulse	0
Description	This is the information for infinite length axis position control when an absolute encoder is used. The encoder position is stored in 4 words. If the Infinite Length Axis Position Information LOAD bit is set to 1 in the RUN Commands (setting parameter OW□□00, bit 7), the position information will be recalculated with the values set here and the Modularized Position at Power OFF (OL□□62 and OL□□64). ♦ Refer to *9.4 Absolute Position Detection for Infinite Length Axes* on page 9-13 for details.		

OL□□60 Absolute Position at Power OFF (Upper 2 words)	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	pulse	0
Description	Same as for OL□□5E. ♦ Refer to *9.4 Absolute Position Detection for Infinite Length Axes* on page 9-13 for details.		

OL□□62 Modularized Position at Power OFF (Lower 2 words)	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	pulse	0
Description	This is the information for infinite length axis position control when an absolute encoder is used. The axis position in pulses managed internally by the controller is stored in 4 words. If the Infinite Length Axis Position Information LOAD bit is set to 1 in the Run Commands (setting parameter OW□□00, bit 7), the position information will be recalculated with the values set here and the Absolute Position at Power OFF (OL□□5E and OL□□60). ♦ Refer to *9.4 Absolute Position Detection for Infinite Length Axes* on page 9-13 for details.		

OL□□64 Modularized Position at Power OFF (Upper 2 words)	Setting Range	Setting Unit	Default Value
	-2^{31} to $2^{31}-1$	pulse	0
Description	Same as for OL□□62. ♦ Refer to *9.4 Absolute Position Detection for Infinite Length Axes* on page 9-13 for details.		

(33) Transparent Command Mode

OW□□70 to OW□□7E Command Buffer for Transparent Command Mode Position Phase Speed Torque	Setting Range	Setting Unit	Default Value
	—	—	0
Description	This area is used for response data when MECHATROLINK Servo commands are specified directly. • MECHATROLINK-I and MECHATROLINK-II, 17-byte Mode: Data area = OW□□70 to OW□□77 • MECHATROLINK- II, 32-byte Mode: Data area = OW□□70 to OW□□7E		

■ Terminology: Store

The use of "store" here refers to information that is automatically transferred by the CPU system without any action by the user. This term is mainly used with this meaning in describing motion monitoring parameters.

6.4.3 Motion Monitoring Parameter Details

The motion monitoring parameter details are listed in the following table.

- Refer to *6.3.3 Monitoring Parameter List* on page 6-13 for a list of motion monitoring parameters.
- Register number IW□□00 indicates the leading input register number + 00. Other register numbers listed below indicate input register numbers in the same way.
- Refer to *6.1.1 Motion Parameter Register Numbers for MP2300* on page 6-2 for information on how to find the leading input number.
- R in the following tables indicates that the item is also compatible with SVR.

(1) Drive Status

IW□□00 Drive Status	Setting Range	Setting Unit	
	—	—	

Description	Bit 0	Motion Controller Operation Ready R OFF: Operation not ready ON: Operation ready This bit turns ON when RUN preparations for the Motion Module have been completed. This bit will be OFF under the following conditions: ・Major damage has occurred. ・Axis that is not used was selected. ・Motion fixed parameter setting error ・Motion fixed parameters are being changed. ・Communication is not synchronized. ・SERVOPACK parameters are being accessed by a command from an MPE720. ・The Motion Parameter Window (SVB Definitions Window) is being opened using the MPE720. ◆ Configure an OR circuit with IB□□002 when using as a Servo ON interlock.
	Bit 1	Running (Servo ON) R This bit is ON while the axis is in Servo ON status. OFF: Stopped ON: Running (Servo ON)
	Bit 2	System Busy OFF: System not busy ON: System busy This bit is ON when the system is processing and cannot execute a motion command. This bit is ON for the following conditions. ・Fixed parameters are being changed. ・SERVOPACK parameters are being read by a command from an MPE720. ・SERVOPACK parameters are being written by a command from an MPE720.
	Bit 3	Servo Ready OFF: Servo not ready ON: Servo ready This bit is ON when all of the following conditions are satisfied. ・Communication is synchronized. ・The main power supply for the SERVOPACK is ON. ・There are no alarms in the SERVOPACK.

(2) Over Range Parameter Number

IW□□01 R Over Range Parameter Number	Setting Range	Setting Unit	
	0 to 65535	—	

Description	Stores the number of a parameter set outside the setting range. ・Setting parameters: 0 or higher ・ Fixed Parameters: 1000 or higher This parameter stores the number of the setting or fixed parameter that exceeds the setting range either individually or in combination with the settings of other parameters. When motion fixed parameters are used, the parameter stores the parameter number plus 1000.

(3) Warning

<table>
<tr><td colspan="3" rowspan="2">IL□□02
Warning</td><td>Setting Range</td><td>Setting Unit</td><td></td></tr>
<tr><td>—</td><td>—</td><td></td></tr>
<tr><td rowspan="9">Description</td><td>Bit 0</td><td colspan="4">Excessively Following Error
OFF: In normal deviation range
ON: Abnormal deviation detected
This bit turns ON if the following error exceeds the value set for the Deviation Abnormal Detection Value (setting parameter OL□□22) when Excessively Following Error is set to be treated as an warning by setting the Deviation Abnormal Detection Error Level to 0 in Mode 1 (setting parameter OW□□01, bit 0).</td></tr>
<tr><td>Bit 1</td><td colspan="4">Setting Parameter Error R
OFF: In setting range
ON: Outside setting range
This bit turns ON when one or more motion setting parameters is set outside the setting range. The number of the parameter for which the value is out of range is stored as the Over Range Parameter Number (monitoring parameter IW□□01).</td></tr>
<tr><td>Bit 2</td><td colspan="4">Fixed Parameter Error R
OFF: In setting range
ON: Outside setting range
This bit turns ON when one or more motion setting parameters is set outside the motion fixed parameter setting range. The number of the most recent out-of-range parameter is stored as the Over Range Parameter Number (monitoring parameter IW□□01).</td></tr>
<tr><td>Bit 3</td><td colspan="4">Servo Driver Error
OFF: No warning
ON: Warning
This bit turns ON when there is a warning in the SERVOPACK for MECHATROLINK communication. The content of the warning can be confirmed using the Servo Alarm Code (monitoring parameter IW□□2D).</td></tr>
<tr><td>Bit 4</td><td colspan="4">Motion Command Setting Error R
OFF: Command setting normal
ON: Command setting error
This bit turns ON when a motion command that cannot be used is set.</td></tr>
<tr><td>Bit 6</td><td colspan="4">Positive Overtravel
OFF: No positive overtravel
ON: Positive overtravel
This bit turns ON when positive overtravel is disabled in the fixed parameter settings and the positive overtravel signal is input.</td></tr>
<tr><td>Bit 7</td><td colspan="4">Negative Overtravel
OFF: No negative overtravel
ON: Negative overtravel
This bit turns ON when negative overtravel is disabled in the fixed parameter settings and the negative overtravel signal is input.</td></tr>
<tr><td>Bit 8</td><td colspan="4">Servo Not ON
OFF: Servo ON
ON: Servo not ON
This bit turns ON when the Servo ON bit in the RUN Commands (setting parameter OW□□00, bit 0) set to 1 but the SERVOPACK is not in the Servo ON condition.</td></tr>
<tr><td>Bit 9</td><td colspan="4">Servo Driver Communication Warning
OFF: Communication normal
ON: Communication error detected
This bit turns ON if a communication error is detected in communication with the SERVOPACK for MECHATROLINK communication. This bit is cleared automatically when communication is performed normally.</td></tr>
</table>

(4) Alarm

IL□□04 Alarm		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Servo Driver Error OFF: No Servo Driver alarm ON: Servo Driver alarm occurred This bit turns ON when there is a alarm in the SERVOPACK for MECHATROLINK communication. The content of the alarm can be confirmed using the Servo Alarm Code (monitoring parameter IW□□2D).		
	Bit 1	Positive Overtravel OFF: No positive overtravel ON: Positive overtravel occurred This bit turns ON when the positive overtravel signal has been input and a move command is executed in the positive direction. For details, refer to *10.2 Overtravel Function* on page 10-8.		
	Bit 2	Negative Overtravel OFF: No negative overtravel ON: Negative overtravel occurred This bit turns ON when the negative overtravel signal is input and a move command is executed in the negative direction. For details, refer to *10.2 Overtravel Function* on page 10-8.		
	Bit 3	Positive Soft Limit (Positive Software Limit) OFF: In positive software limit range ON: Not in positive software limit range This bit turns ON if a move command that exceeds the positive software limit is executed with the following conditions: A finite axis is selected, the positive software limit is enabled, and a Zero Point Return operation has been completed. For details, refer to *10.3 Software Limit Function* on page 10-12.		
	Bit 4	Negative Soft Limit (Negative Software Limit) OFF: In negative software limit range ON: Not in negative software limit range This bit turns ON if a move command that exceeds the negative software limit is executed with the following conditions: A finite axis is selected, the negative software limit is enabled, and a Zero Point Return operation has been completed. For details, refer to *10.3 Software Limit Function* on page 10-12.		
	Bit 5	Servo OFF R OFF: Servo ON ON: Servo OFF This bit turns ON when a move command is executed during Servo OFF status.		
	Bit 6	Positioning Time Over OFF: No timeout ON: Timeout occurred This bit turns ON when positioning is not completed within the specified time after the end of pulse distribution. The time is set for the Position Complete Timeout (setting parameter OW□□26).		
	Bit 7	Excessive Positioning Moving Amount OFF: Moving amount normal ON: Excessive moving amount This bit turns ON when a moving amount is specified that exceeds the setting range for the positioning moving amount.		
	Bit 8	Excessive Speed OFF: Speed normal ON: Excessive speed This bit turns ON when a speed was set that exceeds the setting range for the speed reference.		

IL□□04 Alarm (cont.)	Setting Range	Setting Unit	
	—	—	

Description	Bit 9	Excessively Following Error OFF: In normal deviation range ON: Abnormal deviation detected This bit turns ON if the following error exceeds the value set for the Deviation Abnormal Detection Value (setting parameter OL□□22) when an Excessively Following Error is set to be treated as an alarm by setting the Deviation Abnormal Detection Error Level to 0 in Mode 1 (setting parameter OW□□01, bit 0).
	Bit A	Filter Type Change Error OFF: No change error ON: Change error occurred This bit turns ON if the filter type is changed while the pulses are still distributing.
	Bit B	Filter Time Constant Change Error OFF: No change error ON: Change error occurred This bit turns ON if the filter type is changed while the pulses are still distributing.
	Bit D	Zero Point Not Set OFF: Zero point set ON: Zero point not set error This bit turns ON if a move command (except for JOG or STEP) is performed when an infinite length axis is set and the zero point has not been set.
	Bit E	Zero Point Set during Travel OFF: Zero point not set during travel ON: Zero point set during travel This bit turns ON if the zero point is set during axis moving.
	Bit F	Servo Driver Parameter Setting Error OFF: Zero point set ON: Zero point not set error This bit turns ON if a failure occurs while changing MECHATROLINK SERVOPACK parameter settings.
	Bit 10	Servo Driver Synchronization Communication Error OFF: No synchronization communication error ON: Synchronization communication error This bit turns ON if a synchronization communication error is detected with the SERVOPACK for MECHATROLINK communication.
	Bit 11	Servo Driver Communication Error OFF: No consecutive synchronization communication error ON: Consecutive synchronization communication errors This bit turns ON if two communication errors are detected consecutively in communication with the SERVOPACK for MECHATROLINK communication.
	Bit 12	Servo Driver Command Timeout Error 0: Servo Driver command completed within specified time. 1: Servo Driver command not completed within specified time. This bit turns ON if a command sent to the SERVOPACK for MECHATROLINK communication is not completed within a specific amount of time.
	Bit 13	ABS Encoder Count Exceeded OFF: In count range ON: Outside count range This bit turns ON if the number of turns from the absolute encoder exceeds the range that the SVB can handle. This parameter is valid when using an absolute encoder and a finite-length axis. This bit also turns ON if the result of the operation converting the current position to reference units when the power is turned ON exceeds 32 bits.

(5) Motion Command Response Codes

IW□□08 R Motion Command Response Codes	Setting Range	Setting Unit	
	0 to 65535	—	
Description	Stores the motion command code for the command that is currently being executed. This is the motion command code that is currently being executed and is not necessarily the same as the Motion Command (setting parameter OW□□08). Response codes are also stored when the following processing is executed. ・Servo ON: 29 ・Servo OFF: 30 ・Clear alarms: 31		

(6) Motion Command Status

IW□□09 Servo Module Command Status		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Command Executing (BUSY) R OFF: READY (completed) ON: BUSY (processing) This bit indicates the motion command status. Refer to *Chapter 7 Motion Commands* for details on command timing charts. This bit turns ON during execution of commands that have been completed or during abort processing.		
	Bit 1	Command Hold Completed (HOLDL) R OFF: Command hold processing not completed ON: Command hold completed This bit turns ON when command hold processing has been completed. Refer to *Chapter 7 Motion Commands* for details on command timing charts.		
	Bit 3	Command Error Occurrence (FAIL) R OFF: Normal completion ON: Abnormal completion This bit turns ON if motion command processing does not complete normally. If motion command execution ends in an error, the axis will stop any motion. Refer to *Chapter 7 Motion Commands* for details on command timing charts.		
	Bit 7	Reset Absolute Encoder Completed OFF: Reset not completed ON: Reset completed This bit turns ON when the Reset Absolute Encoder command (ABS_RST) is executed and initialization is completed. Refer to *Chapter 7 Motion Commands* for details on command timing charts.		
	Bit 8	Command Execution Completed (COMPLETE) R OFF: Normal execution not completed ON: Normal execution completed This bit turns ON when motion command processing was completed normally. Refer to *Chapter 7 Motion Commands* for details on command timing charts.		

(7) Motion Subcommand Response Code

IW□□0A R Motion Subcommand Response Code	Setting Range	Setting Unit	
	0 to 65535	—	
Description	Stores the motion subcommand code for the command that is being executed. This is the motion subcommand code that is currently being executed and is not necessarily the same as the Motion Subcommand (setting parameter OW□□0A). ♦ Subcommands are used by the system for latch commands and reading/writing parameters.		

(8) Motion Subcommand Status

IW□□0B Motion Subcommand Status		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Command Executing (BUSY) R OFF: READY (completed) ON: BUSY (processing) This bit indicates the motion subcommand status. This bit turns ON during execution of commands that have been completed or during abort processing.		
	Bit 3	Command Error Occurrence (FAIL) R OFF: Normal completion ON: Abnormal completion This bit turns ON if motion subcommand processing does not complete normally.		
	Bit 8	Command Execution Completed (COMPLETE) R OFF: Normal execution not completed ON: Normal execution completed This bit turns ON when motion subcommand processing was completed normally.		

(9) Position Management Status

IW□□0C Position Management Status		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Distribution Completed (DEN) R OFF: Distributing pulses. ON: Distribution completed. This bit turns ON when pulse distribution has been completed for a move command. This bit turns ON when the SERVOPACK parameter Distribution Completed (monitoring parameter IB□□2C8) turns ON and the SVB's internal distribution processing is completed.		
	Bit 1	Positioning Completed (POSCOMP) R OFF: Outside Positioning Completed Width. ON: In Positioning Completed Width. This bit turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width (i.e., after SERVOPACK Positioning Completed (IB□□2C7) turns ON).		
	Bit 2	Latch Completed (LCOMP) OFF: Latch not completed. ON: Latch completed. This bit turns OFF when a new latch command is executed and turns ON when the latch has been completed. The latched position is stored as the Machine Coordinate Latch Position (monitoring parameter IL□□18).		
	Bit 3	Position Proximity (NEAR) R OFF: Outside position proximity range. ON: In position proximity range. The operation of this bit depends on the setting of Positioning Completed Width 2 (setting parameter OL□□20). ・OL□□20 = 0: This bit turns ON when pulse distribution has been completed (monitoring parameter IB□□0C0). ・OL□□20 ≠ 0: This bit turns ON when the result of subtracting the Machine Coordinate Feedback Position (IL□□16) from the Machine Coordinate System Position (IL□□12) is less than the Position Completed Width 2, even if pulse distribution has not been completed.		

IW□□0C Position Management Status (cont.)	Setting Range	Setting Unit	
	—	—	

Description	Bit 4	Zero Point Position (ZERO) R OFF: Outside zero point position range ON: In zero point position range. This bit turns ON when the Machine Coordinate System Position (monitoring parameter IL□□12) is within the Home Window (setting parameter OW□□3D) after a Zero Point Return (Zero Point Setting) has been completed.
	Bit 5	Zero Point Return (Setting) Completed (ZRNC) OFF: Zero point return (setting) not completed. ON: Zero point return (setting) completed. This bit turns ON when a zero point return (setting) has been completed. This bit turns OFF when a new zero point return (setting) operation is started, when communication with the SERVOPACK stop, or when a Servo alarm related to the encoder occurs.
	Bit 6	Machine Lock ON (MLKL) OFF: Machine lock mode released. ON: Machine lock mode. This bit turns ON when the Machine Lock bit is set to 1 in the RUN Commands (setting parameter OW□□00, bit 1) and the axis has actually entered machine lock mode.
	Bit 8	ABS System Infinite Length Position Control Information LOAD Completed (ABSLDE) OFF: LOAD not completed. ON: LOAD completed. This bit turns ON when the Infinite Length Axis Position Information LOAD bit is set to 1 in the Run Commands (setting parameter OW□□00, bit 7) and loading of the information has been completed.
	Bit 9	POSMAX Turn Number Presetting Completed (TPRSE) R OFF: Preset not completed. ON: Preset completed. This bit turns ON when the POSMAX Preset bit in the Run Commands (setting parameter OW□□00, bit 6) is set to 1 and the POSMAX Number of Turns has been preset with the Preset Data of POSMAX Turn (setting parameter OL□□4C).

(10) Position Information

IL□□0E R Machine Coordinate Target Position (TPOS)	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the target position in the machine coordinate system* managed by the Motion Module. This is the target position per scan for INTERPOLATE or LATCH commands. ・This parameter will be set to 0 when the power supply is turned ON. ・The data is refreshed even when the machine lock mode is enabled. ・ This parameter will not be reset even when an infinite length axis type is selected.		

IL□□10 R Target Position (CPOS)	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the calculated position in the machine coordinate system managed by the Motion Module. The position data stored in this parameter is the target position for each scan. ・This parameter will be set to 0 when the power supply is turned ON. ・The data is updated even when the machine lock mode is enabled. ・When an infinite length axis type is selected, a range of 0 to (Maximum Value of Rotary Counter (POSMAX) (fixed parameter 10) – 1) is stored.		

IL□□12 R Machine Coordinate System Position (MPOS)	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the reference position in the machine coordinate system managed by the Motion Module. ・This parameter will be set to 0 when the power supply is turned ON. ・This data is not updated when the machine lock mode is enabled. (When the machine lock mode is enabled, the position reference data is not output externally.) ・When the machine lock mode function is not used, this position is the same as that in IL□□10.		
IL□□14 32-bit Coordinate System Position (DPOS)	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the reference position in the machine coordinate system managed by the Motion Module. For a finite length axis, this is the same as the target position (CPOS). For both finite and infinite length axes, the value is refreshed between -2^{31} and $2^{31}-1$.		
IL□□16 R Machine Coordinate Feedback Position (APOS)	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the feedback position in the machine coordinate system managed by the Motion Module. ・This parameter will be set to 0 when a Zero Point Return (ZRET) is executed. ・When an infinite length axis type is selected, a range of 0 to (Maximum Value of Rotary Counter (POSMAX) (fixed parameter 10) – 1) is stored.		
IL□□18 Machine Coordinate Latch Position (LPOS)	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the latch position when the latch has been completed.		
IL□□1A Position Error (PERR)	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the following error (Machine Coordinate System Position (IL□□12) – Machine Coordinate Feedback Position (IL□□16)) managed by the Motion Module.		
IL□□1C (R only) Target Position Difference Monitor	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	Reference unit	
Description	Stores the number of pulses distributed each scan.		
IW□□1E R POSMAX Number of Turns	**Setting Range**	**Setting Unit**	
	-2^{31} to $2^{31}-1$	rev	
Description	This parameter is valid for an infinite length axis. The count stored in this parameter goes up and down every time the current position exceeds the Maximum Value of Rotary Counter (fixed parameter 10).		

■ Terminology: Machine Coordinate System

The basic coordinate system that is set according to Zero Point Return (ZRET) command execution or Zero Point Setting (ZSET) command execution. The MP2300 manages the positions using this machine coordinate system.

(11) Reference Monitor

IL□□20 Speed Reference Output Monitor	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	pulse/s	
Description	Stores the speed reference that is being output. This parameter monitors the speed being output to the MECHATROLINK. This parameter will be 0 for interpolation or phase control.		

(12) SERVOPACK Status

IW□□2C Network Servo Status		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Alarm Occurred (ALM) OFF: No alarm occurred. ON: Alarm occurred.		
	Bit 1	Warning Occurred (WARNING) OFF: No warning occurred. ON: Warning occurred.		
	Bit 2	Command Ready (CMDRDY) OFF: Command cannot be received. ON: Command can be received.		
	Bit 3	Servo ON (SVON) OFF: Servo OFF. ON: Servo ON.		
	Bit 4	Main Power ON (PON) OFF: Main power OFF. ON: Main power ON.		
	Bit 5	Machine Lock (MLOCK) OFF: Machine lock mode released. ON: Machine lock mode.		
	Bit 6	Zero Point Position (ZPOINT) OFF: Outside Zero Point Position Range. ON: In Zero Point Position Range.		
	Bit 7	Positioning Completed (PSET) OFF: Outside Positioning Completed Width. ON: In Positioning Completed Width (for position control).		
		Speed Coincidence (V-CMP) OFF: Speed does not agree. ON: Speed agrees (for speed control).		
	Bit 8	Distribution Completed (DEN) OFF: Distributing pulses. ON: Distribution completed (for position control).		
		Zero Speed (ZSPD) OFF: Zero speed not detected. ON: Zero speed detected (for speed control).		
	Bit 9	Torque Being Limited (T_LIM) OFF: Torque not being limited. ON: Torque being limited.		
	Bit A	Latch Completed (L_CMP) OFF: Latch not completed. ON: Latch completed.		
	Bit B	Position Proximity (NEAR) OFF: Outside Position Proximity Range. ON: In Position Proximity Range.		
		Speed Limit (V_LIM) OFF: Speed limit not detected. ON: Speed limit detected.		
	Bit C	Positive Soft Limit (Positive Software Limit) (P_SOT) OFF: In Positive Software Limit Range. ON: Outside Positive Software Limit Range.		
	Bit D	Negative Soft Limit (Negative Software Limit) (N_SOT) OFF: In Negative Software Limit Range. ON: Outside Negative Software Limit Range.		

(13) SERVOPACK Information

IW□□2D Servo Alarm Code		Setting Range	Setting Unit	
		–32768 to 32767 (-2^{31} to $2^{31}-1$)	—	
Description	Stores the alarm code (leftmost 2 digits) from the SERVOPACK. Example: The code for a communication error that occurs in an SGDS SERVOPACK is E6. Refer to the manual for the SERVOPACK for details on alarms.			

(14) SERVOPACK I/O Monitor

Stores I/O information of the SERVOPACK.

IW□□2E Network Servo I/O Monitor		Setting Range	Setting Unit	
		—	—	
Description	Bit 0	Positive Drive Prohibited Input (P_OT) OFF: OFF ON: ON		
	Bit 1	Negative Drive Prohibited Input (N_OT) OFF: OFF ON: ON		
	Bit 2	Zero Point Return Deceleration Limit Switch Input (DEC) OFF: OFF ON: ON		
	Bit 3	Encoder Phase-A Input (PA) OFF: OFF ON: ON		
	Bit 4	Encoder Phase-B Input (PB) OFF: OFF ON: ON		
	Bit 5	Encoder Phase-C Input (PC) OFF: OFF ON: ON		
	Bit 6	First External Latch Input (EXT1) OFF: OFF ON: ON		
	Bit 7	Second External Latch Input (EXT2) OFF: OFF ON: ON		
	Bit 8	Third External Latch Input (EXT3) OFF: OFF ON: ON		
	Bit 9	Brake Output (BRK) OFF: OFF ON: ON		
	Bit C	CN1 Input Signal (IO12) selected in parameter Pn81E.0 OFF: OFF ON: ON		
	Bit D	CN1 Input Signal (IO13) selected in parameter Pn81E.1 OFF: OFF ON: ON		
	Bit E	CN1 Input Signal (IO14) selected in parameter Pn81E.2 OFF: OFF ON: ON		
	Bit F	CN1 Input Signal (IO15) selected in parameter Pn81E.3 OFF: OFF ON: ON		

(15) SERVOPACK User Monitor Information

The Monitor Selection made by the user when using a SERVOPACK for MECHATROLINK communication is stored in this parameter.

IW□□2F Network Servo User Monitor Information		Setting Range	Setting Unit	
		—	—	
Description	Bit 0 to Bit 3	Monitor 1		
	Bit 4 to Bit 7	Monitor 2		
	Bit 8 to Bit B	Monitor 3		
	Bit C to Bit F	Monitor 4		

(16) Servo Driver Information 2

IL□□30 Servo User Monitor 2	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	—	
Description	Stores the result of the selected monitor. This parameter stores the result of the monitor selected for Monitor 2 in the Servo User Monitor (setting parameter OW□□4E, bits 4 to 7). This parameter can be used when the communication method is MECHATROLINK-I or MECHATROLINK-II, 17-byte Mode and bit 0 of OW□□02 is set to 1 (1: Enabled).		

IL□□32 Servo User Monitor 3	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	—	
Description	Used by the system.		

IL□□34 Servo User Monitor 4	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	—	
Description	Stores the result of the selected monitor. This parameter stores the result of the monitor selected for Monitor 4 of the Servo User Monitor (setting parameter OW□□4E, bits C to F).		

IW□□36 Servo Constant Number	Setting Range	Setting Unit	
	0 to 65535	—	
Description	Stores the number of the parameter being processed. This parameter stores the number of the SERVOPACK parameter being read or written using the MECHATROLINK command area. Refer to *Chapter 7 Motion Commands* for details.		

IW□□37 Auxiliary Servo User Constant Number	Setting Range	Setting Unit	
	0 to 65535	—	
Description	Stores the number of the parameter being processed. This parameter stores the number of the SERVOPACK parameter being read or written using the MECHATROLINK subcommand area. Refer to *Chapter 7 Motion Commands* for details.		

IL□□38 Servo User Constant	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	—	
Description	Stores the data of the parameter being read. This parameter stores the data of the SERVOPACK parameter read using the MECHATROLINK command area. Refer to *Chapter 7 Motion Commands* for details.		

IL□□3A Auxiliary Servo User Constant	Setting Range	Setting Unit	
	-2^{31} to $2^{31}-1$	—	
Description	Stores the data of the parameter being read. This parameter stores the data of the SERVOPACK parameter read using the MECHATROLINK subcommand area. Refer to *Chapter 7 Motion Commands* for details.		

IW□□3F Motor type	Setting Range	Setting Unit	
	0, 1	—	
Description	Stores the type of motor that is actually connected. 0 : Rotary motor 1 : Linear motor		

IL□□40 R Feedback Speed		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	Depends on speed unit.
Description	Stores the feedback speed. The value is determined by the moving average time constant (fixed parameter 42) and unit set from the difference with the Machine Coordinate Feedback Position (monitoring parameter IL□□16) in each scan. • The setting unit for this parameter depends on the Speed Units (OW□□03, bits 0 to 3), but the result of applying the speed unit setting is not shown here.		

IL□□42 R Torque (Thrust) Reference Monitor		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	Depends on the Torque Unit (OW□□03 bits C to F).
Description	Stores the value of the torque reference. The Torque (Thrust) Reference Monitor is achieved using the Servo command expansion area and can be executed only with the MECHATROLINK-II, 32-byte Mode communication method. • The setting unit for this parameter depends on the Torque Unit Selection (OW□□03, bits C to F), but the result of applying the torque unit setting is not shown here.		

(17) Supplemental Information

IL□□56 R Fixed Parameter Monitor		Setting Range	Setting Unit	
		-2^{31} to $2^{31}-1$	—	
Description	Stores the data of the specified fixed parameter number. This parameter stores the data of the fixed parameter when the Read Fixed Parameter (FIXPRM-RD) is selected in the Motion Subcommand (setting parameter OW□□0A).			

(18) Absolute Infinite Length Axis Position Control Information

IL□□5E Absolute Position at Power OFF (Lower 2 words)		Setting Range	Setting Unit	
		-2^{31} to $2^{31}-1$	pulse	
Description	Stores information used for infinite length axis position control when an absolute encoder is used. The encoder position is normally stored in 4 words.			
IL□□60 Absolute Position at Power OFF (Upper 2 words)		Setting Range	Setting Unit	
		-2^{31} to $2^{31}-1$	pulse	
Description	Same as for IL□□5E.			
IL□□62 Modularized Position at Power OFF (Lower 2 words)		Setting Range	Setting Unit	
		-2^{31} to $2^{31}-1$	pulse	
Description	Stores information used for infinite length axis position control when an absolute encoder is used. These parameters store the axis position managed by the Machine Controller in pulses in 4 words.			
IL□□64 Modularized Position at Power OFF (Upper 2 words)		Setting Range	Setting Unit	
		-2^{31} to $2^{31}-1$	pulse	
Description	Same as for IL□□62.			

(19) Transparent Command Mode

IW□□70 to IW□□7E Response Buffer for Transparent Command Mode		Setting Range	Setting Unit	
		–	–	
Description	This area is used for response data when MECHATROLINK Servo commands are specified directly. ・MECHATROLINK-I and MECHATROLINK-II, 17-byte Mode: Data area = OW□□70 to OW□□77 ・MECHATROLINK-II, 32-byte Mode: Data area = IW□□70 to IW□□7E			

6.5 Example of Setting Motion Parameters for the Machine

Set the following seven motion parameters to enable motion control that suits the machine's specifications.

- Reference unit
- Electronic gear
- Axis Type
- Position Reference
- Speed Reference
- Acceleration/Deceleration Settings
- Acceleration/Deceleration Filter Settings

The following tables provide details of setting examples for the above items.

6.5.1 Reference Unit

Pulses, millimeters, degrees, or inches can be used as the reference unit for motion control. The reference unit is specified in Command Unit (motion fixed parameter 4).
The minimum reference unit that can be specified is determined by the setting of Number of Decimal Places (motion fixed parameter 5).

Motion Fixed Parameter 5: Number of Decimal Places R	Motion Fixed Parameter 4: Command Unit (Reference Unit) R			
	0: pulse	1: mm	2: deg	3: inch
0: 0 digits	1 pulse	1 mm	1 deg	1 inch
1: 1 digits	1 pulse	0.1 mm	0.1 deg	0.1 inch
2: 2 digits	1 pulse	0.01 mm	0.01 deg	0.01 inch
3: 3 digits	1 pulse	0.001 mm	0.001 deg	0.001 inch
4: 4 digits	1 pulse	0.0001 mm	0.0001 deg	0.0001 inch
5: 5 digits	1 pulse	0.00001 mm	0.00001 deg	0.0001 inch

Minimum reference unit

6.5.2 Electronic Gear

In contrast to the reference unit input to the Machine Controller, the moving unit in the mechanical system is called the "output unit." The electronic gear converts position or speed units from reference units to output units for the mechanical system without going through an actual mechanism, such as a gear.
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 enabled when the following settings are made:

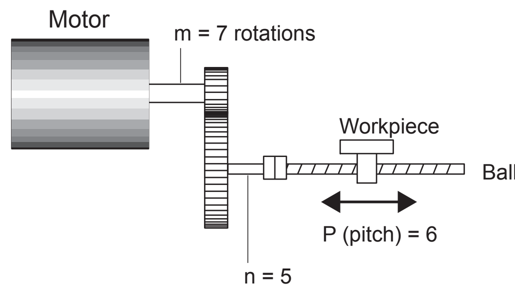
- Fixed Parameter 6: Command Unit per Revolution R
- Fixed Parameter 8: Gear Ratio [MOTOR] R
- Fixed Parameter 9: Gear Ratio [LOAD] R

♦ The electronic gear is disabled when pulse is specified as the Command Unit.

The following setting example uses ball screw and rotating table workpieces.

(1) Parameter Setting Example Using Ball Screw

- Machine specifications: Ball screw axis rotates 5 times for each 7 rotations of the motor axis (Refer to the following figure.)
- Reference unit: 0.001 mm

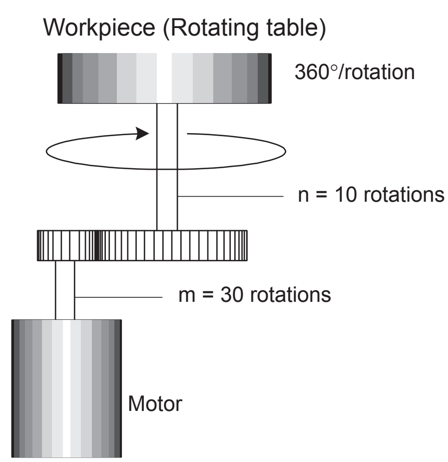


To move the workpiece 0.001 mm for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for fixed parameters 6, 8, and 9.

- Fixed Parameter 6: Travel distance per machine rotation = 6 mm/0.001 mm = 6000 (reference units)
- Fixed Parameter 8: Gear ratio at Servomotor = m = 7
- Fixed Parameter 9: Gear ratio at load = n = 5
  - Set the SERVOPACK gear ratio to 1:1.

(2) Parameter Setting Example Using Rotating Table

- Machine specifications: Rotating table axis rotates 10 times for each 30 rotations of the motor axis (Refer to the following figure.)
- Reference unit: 0.1°



To rotate the table 0.1° for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for fixed parameters 6, 8, and 9.

- Fixed Parameter 6: Travel distance per machine rotation = 360°/0.1° = 3600 (reference units)
- Fixed Parameter 8: Gear ratio at Servomotor = m = 30
- Fixed Parameter 9: Gear ratio at load = n = 10
  - The gear ratio for fixed parameters 8 and 9 (m/n) may be constant, e.g., m = 3 and n = 1.
  - Set the SERVOPACK gear ratio to 1:1.

6.5.3 Axis Type Selection

There are two types of position control: Finite length position control for return and other operations that are performed only within a specified range, and infinite length position control, which is used for moving in one direction only. Infinite length position control can reset the position to 0 after one rotation, e.g, belt conveyors, or move in one direction only, without resetting position after one rotation. The axis type selection sets which of these types of position control is to be used.
The details of the Axis Type Selection are listed in the following table.

Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Motion Fixed Parameters	No. 1, bit 0 R	Function Selection 1, Axis Type	Specify the position control method for the controlled axis. 0: Finite Length Axis Set a finite length axis if control is performed within a limited length or for an axis that uses infinite length control in one moving direction only without resetting the position every rotation. 1: Infinite Length Axis Set an infinite length axis for an axis that uses infinite length control while resetting the position every rotation.	0
	No. 10 R	Maximum Value of Rotary Counter (POSMAX)	Set the reset position of the position data when an infinite length axis has been set for the axis type using the reference unit.	360000

6.5.4 Position Reference

The target position value for position control is set for the Position Reference Setting (motion setting parameter OL□□1C). There are two methods that can be set for using the Position Reference Setting: Directly setting the coordinate of the target position value as an absolute value or adding the moving amount from the previous command position as a incremental value.
The following table lists the parameter details relating to position references.

Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Motion Setting Parameters	OB□□095 R	Position Reference Type	Specify the type of position data. 0: Incremental Addition Mode Adds the present moving amount value to the previous value of OL□□1C and sets the result in OL□□1C. 1: Absolute Mode Sets the coordinate of the target position in OL□□1C. ♦ Always set to 0 when using a motion program. ♦ Always set to 0 when using an infinite length axis.	0
	OL□□1C R	Position Reference Setting	Set the position data. • Incremental Addition Mode (OB□□095 = 0) The moving amount (incremental distance) specified this time will be added to the previous value of OL□□1C. OL□□1C ← Previous OL□□1C + Incremental distance Example: If a travel distance of 500 is specified and the previous value of OL□□1C is 1000, the following will occur: OL□□1C ← 1000 + 500 = 1500 • Absolute Mode (OB□□095 = 1) The coordinate value of the target position is set. Example: Set 10000 to move to a coordinate value of 10000. OL□□1C ← 10000	0

The following table compares the advantage and disadvantage of incremental addition mode and absolute mode.

Position Reference Type	Advantage	Disadvantage
Incremental Addition Mode	It is not necessary to consider the relationship between OL□□1C and the current position when canceling a move. Incremental addition mode can be used for finite or infinite length axis type.	OL□□1C does not necessarily equal the coordinate value of the target position, so the position reference can be difficult to understand intuitively.
Absolute Mode	The coordinate of the target position is specified directly, making it easy to understand intuitively.	The current position must be set in OL□□1C whenever the power supply is turned ON or a move is canceled. If this is not done, the axis may move suddenly when a move command is started. Absolute mode cannot be used for an infinite length axis type.

6.5.5 Speed Reference

There are two methods of setting the speed reference for the feed speed or other speeds. One method involves using reference units and the other method involves setting the percentage (%) of the rated speed.

The following table shows the parameters relating to speed references.

Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Motion Fixed Parameters	No. 5 R	Number of Decimal Places	Set the number of digits below the decimal point in the reference unit being input. The minimum reference unit is determined by this parameter and the Command Unit (fixed parameter 4). Example: Command Unit = mm, Number of Decimal Places = 3 1 reference unit = 0.001 mm	3
	No. 34 R	Rated Speed	Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.	3000
	No. 36 R	Encoder Resolution	Set the number of pulses (the value after multiplication) per motor rotation. Example: For a 16-bit encoder, set 2^{16} = 65536.	65536
Motion Setting Parameters	OW□□03 Bit 0 to 3 R	Speed Units	Set the unit for reference speeds. 0: Reference unit/s 1: 10^n reference units/min (n: Number of Decimal Places) 2: 0.01% 3: 0.0001%	1
	OL□□10 R	Speed Reference	Set the feed speed. The unit for this parameter is set in OW□□03, bits 0 to 3. Example: When the Number of Decimal Places is set to 3, units are as follows for the setting of the Speed Unit: • Speed Unit Set to 0: Reference units/s Pulse unit: 1 = 1 pulse/s mm unit: 1 = 0.001 mm/s Deg unit: 1 = 0.001 deg/s Inch unit: 1 = 0.001 inch/s • Speed Unit Set to 1: 10^n reference units/min Pulse unit: 1 = 1000 pulse/min mm unit: 1 = 1 mm/min Deg unit: 1 = 1 deg/min Inch unit: 1 = 1 inch/min • Speed Unit Set to 2: 0.01% Set as a percentage of the rated speed (1 = 0.01%) unrelated to the reference unit setting.	3000
	OW□□18	Speed Override	Setting an output ratio (%) for the setting allows the positioning speed to be changed without changing the Speed Reference setting. Setting unit: 1 = 0.01%	10000

(1) Speed Reference (OL□□10) Setting Examples

- No. 5: Number of digits below decimal point = 3
- No. 34: Rated speed = 3000 R/min
- No. 36 = Number of pulses per rotation = 65536

The following table shows examples of settings for Speed Reference (OL□□10) to obtain the target feed speed (reference speed).

Speed Unit Setting	Command Unit Setting	Reference Speed	Speed Reference Parameter Settings (OL□□10) Method
0 Reference unit/s	pulse	• 500 R/s	500 (R/s) × 65536 (pulse/R) = 37268000 (pulse/s)
		• 1500 R/min	1500 (R/min) × 65536 (pulse/R) ÷ 60 (s/min) = 1638400 (pulse/s)
	mm	• Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	500 (mm/s)÷ 0.001 = 500000 (mm/s) • Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 ÷ 60 (s/min) = 15000 (mm/s) * Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
1 10^n reference units/ min (n: Number of digits below decimal point) (= 3)	pulse	• 500 R/s	500 (R/s) × 65536 (pulse/R) ÷ 1000* × 60 (s/min) = 1966080 (1000 pulse/min) • "1000" = 10^n
		• 1500 R/min	1500 (R/min) × 65536 (pulse/R) ÷ 1000* = 98304 (1000 pulse/min) • "1000"= 10^n
	mm	• Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	500 (mm/s) ÷ 0.001 × 1000 × 60 (s/min) = 30000 (1000 mm/s) • Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 × 1000 = 900 (1000 mm/min) • Determined by feed speed, regardless of machine configuration.
2 0.01%	–	• 1500 R/min	1500 (R/min) ÷ 3000 (R/min) × 100(%) ÷ 0.01 = 5000 (0.01%) • Determined by what percentage the feed speed is of the rated speed.

(2) Speed Override (OW□□18) Setting Example

The Speed Override parameter (OW□□18) can set the speed as a percentage (output ratio) of the target feed speed, in 0.001% units. Speed Override is set independently of Command Unit, Number of Decimal Places, and other parameters.

- Speed Override cannot be set for SVR (Virtual Motion Module).

A typical example of a Speed Override setting is shown below.

Setting Example

Output ratio 25%: 25 ÷ 0.01 = 2500
50%: 50÷0.01 = 5000
75%: 75÷0.01 = 7500
100%: 100÷0.01 = 10000

6.5.6 Acceleration/Deceleration Settings

The acceleration/deceleration can be set to either the rate of acceleration/deceleration or the time required to reach the rated speed from 0. The settings method used depends on the related parameter settings.
The parameters related to acceleration/deceleration settings are listed in the following table.

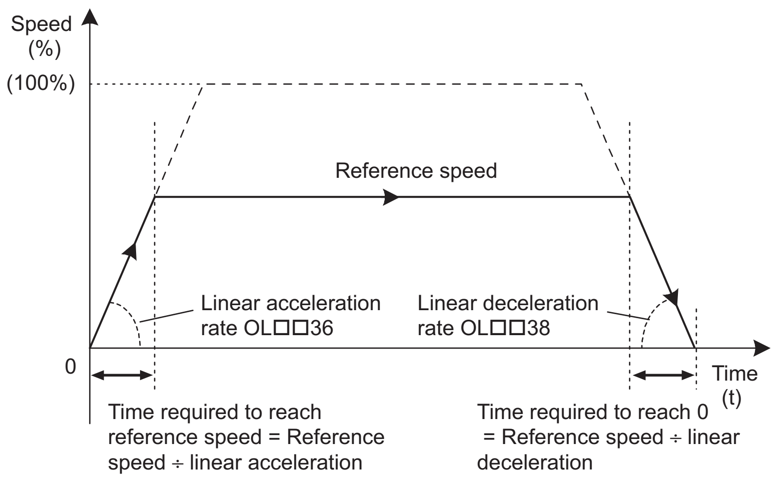
<table>
<tr><th>Parameter Type</th><th>Parameter No. (Register No.)</th><th>Name</th><th>Description</th><th>Default Value</th></tr>
<tr><td rowspan="3">Motion Fixed Parameters</td><td>No. 5 R</td><td>Number of Decimal Places</td><td>Set the number of digits below the decimal point in the input reference unit. The minimum reference unit is determined by this parameter and the Command Unit (fixed parameter 4).
Example:
Command Unit = mm, Number of Decimal Places = 3
1 reference unit = 0.001 mm</td><td></td></tr>
<tr><td>No. 34 R</td><td>Rated Speed</td><td>Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.</td><td>3000</td></tr>
<tr><td>No. 36 R</td><td>Encoder Resolution</td><td>Set the number of pulses (the value after multiplication) per motor rotation.
Example:
For a 16-bit encoder, set 2^{16} = 65536.</td><td>65536</td></tr>
<tr><td rowspan="3">Motion Setting Parameters</td><td>OW□□03
Bit 4 to 7 R</td><td>Acceleration/ Deceleration Units</td><td>Set the unit for acceleration/deceleration.
0: Reference units/s^2
1: ms</td><td>1</td></tr>
<tr><td>OL□□36 R</td><td>Linear Acceleration Time</td><td>Set the rate of acceleration or acceleration time constant according to the setting of OW□□03, bits 4 to 7.
• Acceleration/Deceleration Units is set to 0 (Reference units/s^2), set the rate of acceleration.
Pulse unit: 1 = 1 pulse/s^2
mm unit: 1 = 1 reference unit/s^2
deg unit: 1 = 1 reference unit/s^2
Inch unit: 1 = 1 reference unit/s^2
Example: Number of Decimal Places = 3
mm unit: 1 = 0.001 mm/s^2
deg unit: 1 = 0.001 deg/s^2
Inch unit: 1 = 0.001 inch/s^2
• When Acceleration/Deceleration Units is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.</td><td>0</td></tr>
<tr><td>OL□□38 R</td><td>Linear Deceleration Time</td><td>Set the rate of deceleration or deceleration time constant according to the setting of OW□□03, bits 4 to 7.
• Acceleration/Deceleration Units is set to 0 (Reference units/s^2),
set the rate of deceleration.
Pulse unit: 1 = 1 pulse/s^2
mm unit: 1 = 1 reference unit/s^2
deg unit: 1 = 1 reference unit/s^2
Inch unit: 1 = 1 reference unit/s^2
• When Acceleration/Deceleration Units is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.</td><td>0</td></tr>
</table>

(1) Acceleration/Deceleration Units and Speed Changes Over Time

The Linear Acceleration Time (OL□□36) and Linear Deceleration Time (OL□□38) settings change depending on the Acceleration/Deceleration Unit (OW□□03) setting as shown in the following figure.

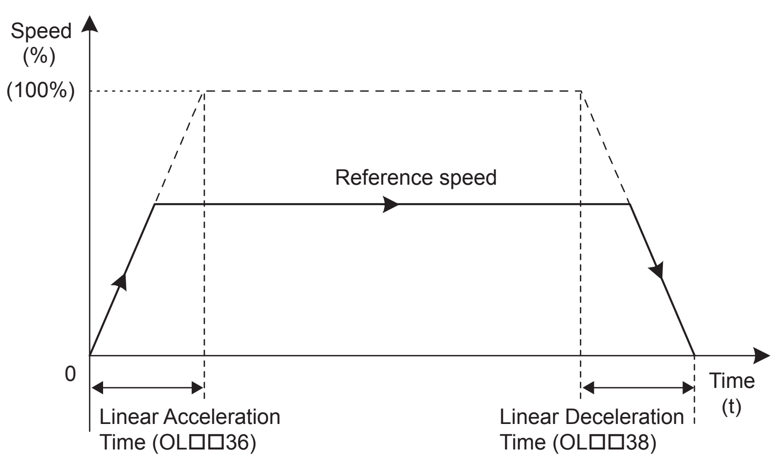
■ When the Acceleration/Deceleration Unit (OW□□03, Bits 4 to 7) Set to 0: Reference Unit/s²

Linear Acceleration and Linear Deceleration Time settings are handled as the linear acceleration rate and linear deceleration rate.



■ When the Acceleration/Deceleration Unit (OW□□03, Bits 4 to 7) Set to 1: ms

Linear Acceleration Time is handled as the linear acceleration time constant required to reach rated speed from zero using linear acceleration. Linear Deceleration Time is handled as the linear deceleration time constant required to reach zero from the rated speed using linear deceleration.

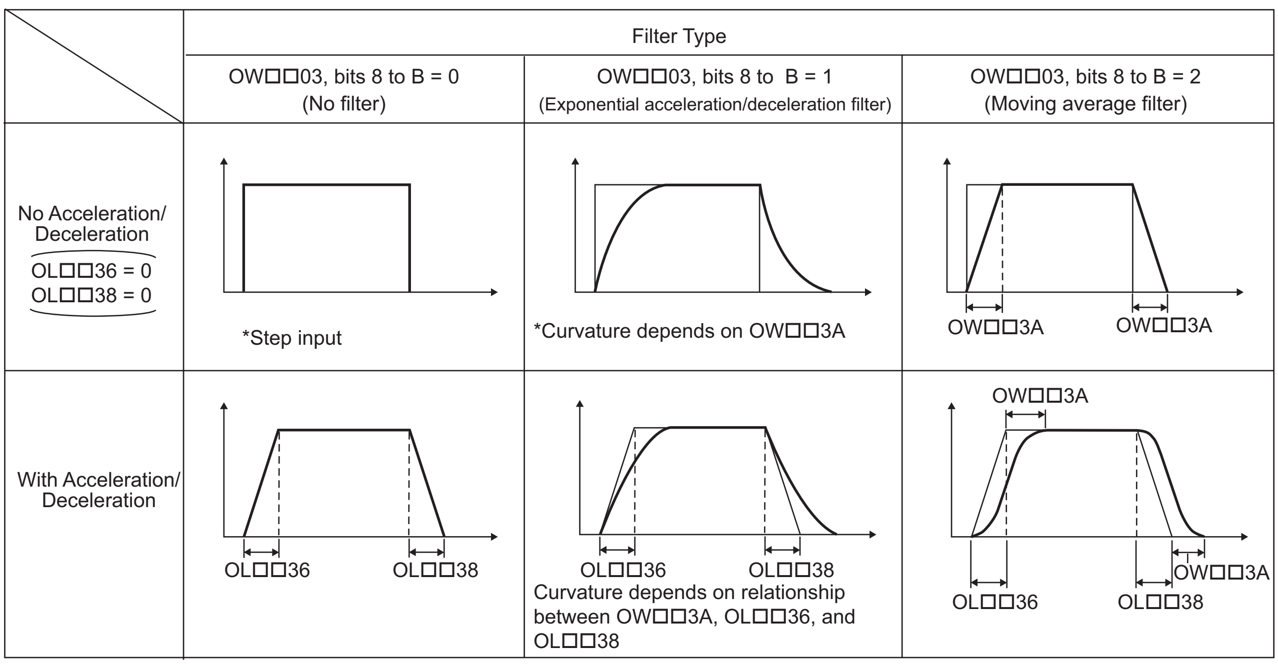


6.5.7 Acceleration/Deceleration Filter Settings

There are two types of acceleration/deceleration filter: **The exponential acceleration/deceleration filter** and **the moving average filter**. These filter settings can be used to set non-linear acceleration/deceleration curves. The parameters related to the acceleration/deceleration filter settings are listed in the following table.

Parameter Type	Parameter No. (Register No.)	Name	Description	Default Value
Motion Setting Parameters	OW□□03 Bit 8 to B R	Filter Type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter ♦ The Change Filter Type command (OW□□08 = 13) must be executed in advance to enable the Filter Type.	0
	OW□□3A R	S-curve Acceleration Time	Sets the acceleration/deceleration filter time constant. Always make sure that pulse distribution has been completed (i.e., that monitoring parameter IW□□0C, bit 0 is ON (1)) before changing the time constant.	0

The following figure shows the relationship between acceleration/deceleration patterns and each parameter.



MEMO

7

Motion Commands

This chapter explains each motion command's operation, related parameters, and timing charts.

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7.1 Motion Commands

7.1.1 Motion Command Table

This table shows the motion commands that are supported by the MP2300. Refer to the page in the Table under Details for additional command information.

Command Code		Command	Name	Description	Reference Page
0	R	NOP	No command	—	—
1	R	POSING	Positioning	Positions to the specified position using the specified acceleration/deceleration times and the specified speed.	7-5
2	R	EX_POSING	External Positioning	Positions by moving the external positioning travel distance from the point an external positioning signal was input when already performing a positioning operation.	7-11
3	R	ZRET	Zero Point Return	Returns to the zero point in the machine coordinate system. When using an incremental encoder, there are 17 different zero point return methods that can be used.	7-16
4	R	INTERPOLATE	Interpolation	Performs interpolation feeding using positioning data distributed consecutively from the CPU Module.	7-36
5			Reserved		
6	R	LATCH	Latch	Memorizes the current position when the latch signal is input during an interpolation feed operation.	7-40
7	R	FEED	JOG Operation	Moves the axis at the specified speed in the specified direction until the command is canceled.	7-44
8	R	STEP	STEP Operation	Positions the specified travel distance in the specified direction at the specified speed.	7-48
9	R	ZSET	Zero Point Setting	Sets the zero point in the machine coordinate system and enables the software limit function.	7-52
10		ACC	Change Linear Acceleration Time Constant	Changes the acceleration time for linear acceleration/ deceleration.	7-54
11		DCC	Change Linear Deceleration Time Constant	Changes the deceleration time for linear acceleration/ deceleration.	7-56
12		SCC	Change Filter Time Constant	Changes the time constant for a moving average filter for acceleration/deceleration.	7-58
13		CHG_FILTER	Change Filter Type	Changes the acceleration/deceleration filter type.	7-60
14		KVS	Change Speed Loop Gain	Changes the speed loop gain.	7-62
15		KPS	Change Position Loop Gain	Changes the position loop gain.	7-64
16		KFS	Change Feed Forward	Changes the feed forward control gain.	7-66
17		PRM_RD	Read SERVOPACK Parameter	Reads a SERVOPACK parameter.	7-68
18		PRM_WR	Write SERVOPACK Parameter	Write a SERVOPACK parameter.	7-70
19		ALM_MON	Monitor SERVOPACK Alarms	Monitors SERVOPACK alarms.	7-72
20		ALM_HIST	Monitor SERVOPACK Alarm History	Monitors SERVOPACK alarm history.	7-73
21		ALMHIST_CLR	Clear SERVOPACK Alarm History	Clears SERVOPACK alarm history data.	7-75
22		ABS_RST	Reset Absolute Encoder	Initializes an absolute encoder.	7-77
23	R	VELO	Speed Reference	Operates with speed control mode.	7-80
24	R	TRQ	Torque Reference	Operates with torque control mode.	7-84
25	R	PHASE	Phase Reference	Operates with phase control mode.	7-89
26		KIS	Change Position Loop Integration Time Constant	Changes the integration time constant for the position loop.	7-93

- Commands in the table displaying an R are supported by the Virtual Motion Module (SVR).
- Refer to *3.2.4 SVR Virtual Motion Module* on page 3-11 for details on the Virtual Motion Module (SVR).

7.1.2 Motion Commands Supported by SERVOPACK Models

The following table shows the motion commands supported by each model of SERVOPACK.
A Motion Command Setting Error warning will occur if an unsupported command is specified.

Motion Command		SERVOPACK					
		SGD-□□□N SGDB-□□AN	SGDH-□□□E +NS100	SGDH-□□□E +NS115		SGDS-□□□1□□	
				M-I	M-II	M-I	M-II
Main Command (OW□□08)	NOP	○	○	○	○	○	○
	POSING	○	○	○	○	○	○
	EX_POSING	○	○	○	○	○	○
	ZRET	○	○	○	○	○	○
	INTERPOLATE	○	○	○	○	○	○
	ENDOF_INTERPOLATE	○	○	○	○	○	○
	LATCH	○	○	○	○	○	○
	FEED	○	○	○	○	○	○
	STEP	○	○	○	○	○	○
	ZSET	○	○	○	○	○	○
	ACC	○	○	○	○	○	○
	DCC	×	○	○	○	○	○
	SCC	○	○	○	○	○	○
	CHG_FILTER	○	○	○	○	○	○
	KVS	○	○	○	○	○	○
	KPS	○	○	○	○	○	○
	KFS	○	○	○	○	○	○
	PRM_RD	○	○	○	○	○	○
	PRM_WR	○	○	○	○	○	○
	ALM_MON	○	○	○	○	○	○
	ALM_HIST	○	○	○	○	○	○
	ALMHIST_CLR	○	○	○	○	○	○
	ABS_RST	×	○	○	○	○	○
	VELO	×	×	×	○	×	○
	TRQ	×	×	×	○	×	○
	PHASE	×	○	○	○	○	○
	KIS	×	○	○	○	○	○
Subcommand (OW□□0A)	NOP	○	○	○	○	○	○
	PRM_RD	×	×	×	△	×	△
	PRM_WR	×	×	×	△	×	△
	SMON	×	×	×	△	×	△
	FIXPRM_RD	○	○	○	○	○	○

- M-I: MECHATROLINK-I
  M-II: MECHATROLINK-II
- Σ-II, -III Analog SERVOPACKs: SGD-□□□S, SGDB-□□, SGDM, SGDH, and SGDS-□□□01□/□□□02□
- ○: Can be specified. ×: Cannot be specified. △ : Can be specified in 32-byte mode only.

7.2 Motion Command Details

The following describes the procedure for executing motion commands.

- All the following command names and items in the Parameter List displaying an R are supported by the Virtual Motion Module (SVR).

7.2.1 Positioning (POSING) R

The POSING command positions the axis to the target position using the specified target position and speed. Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Speed Reference: OL□□10
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01

- The speed reference can be changed during operation.
- An override of between 0% to 327.67% can be set for the speed reference.

3. Set OW□□08 to 1 to execute the POSING motion command.

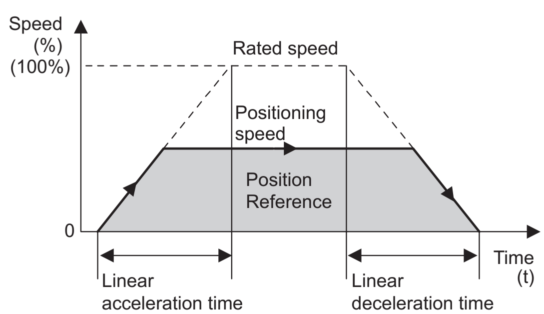
4. Set the target position (OL□□1C).

Positioning will start. IW□□08 will be 1 during the positioning.
IB□□0C3 will turn ON when the axis approaches the target position.
IB□□0C1 will turn ON when the axis reaches the target position and the positioning has been completed.

- If the Position Reference Type (OB□□095) is set for an absolute mode, the target position can be set before executing the command.
- The target position can be changed during operation.
- When the target position is changed so that there is not sufficient deceleration distance or after the new target position has already been passed, the system will first decelerate to a stop and then reposition according to the new target position.

5. Set OW□□08 to 0 to execute the NOP motion command to complete the positioning operation.

POSING Operating Pattern



■ Terminology: Command execution

When a command code is stored in the motion command register (OW☐☐08), execution of the motion command corresponding to that code is started. Used in describing motion command operations.

(2) Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command Pause bit (OB☐☐090) to 1.

- Set the Command Pause bit (OB☐☐090) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command Hold Completed bit (IB☐☐091) will turn ON.
- Reset the Command Pause bit (OB☐☐090) to 0. The command hold status will be cleared and the remaining portion of the positioning will be restarted.

(3) Aborting

Axis travel can be stopped during command execution and the remaining travel canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB☐☐091) to 1.

- Set the Command Abort bit (OB☐☐091) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the remain travel will be canceled and the Positioning Completed bit (IB☐☐0C1) will turn ON.
- The positioning will restart if the Command Abort bit (OB☐☐091) is reset to 0 during abort processing.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

Parameter	Name	Setting	SVR
OB☐☐000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command (OW☐☐08) to 1.	R
OB☐☐013	Speed Loop P/PI Switch	Switch the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW☐☐03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW☐☐08	Motion Command	The positioning starts when this parameter is set to 1. The operation will be canceled if this parameter is set to 0 during POSING command execution.	R
OB☐☐090	Command Pause	The axis will decelerate to a stop if this bit is set to 1 during POSING command execution. The positioning will restart if this bit is reset to 0 when a command is being held.	R
OB☐☐091	Command Abort	The axis will decelerate to a stop if this bit is set to 1 during POSING command execution. When this bit is reset to 0 after decelerating to a stop, the operation depends on the setting of the Position Reference Type (OB☐☐095).	R
OB☐☐095	Position Reference Type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this bit before setting the Motion Command (OW☐☐08) to 1.	R

(cont'd)

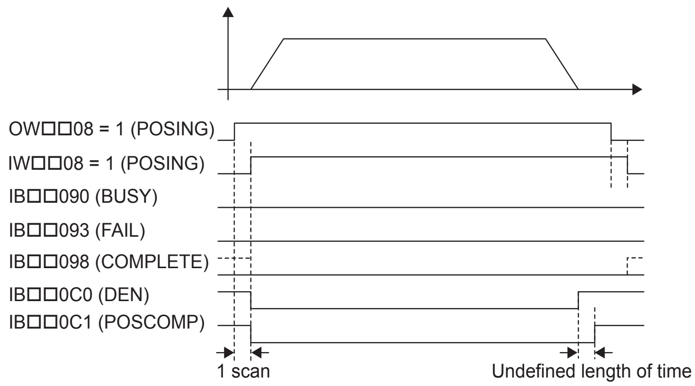
Parameter	Name	Setting	SVR
OL□□10	Speed Reference	Specify the speed for the positioning. This setting can be changed during operation. The unit depends on the Function 1 setting (OW□□03).	R
OW□□18	Speed Override	This parameter allows the positioning speed to be changed without changing the Speed Reference (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000	–
OL□□1C	Position Reference Setting	Set the target position for positioning. This setting can be changed during operation. The meaning of the setting depends on the status of the Position Reference Type bit OB□□095.	R
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	–
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	–
OL□□36	Linear Acceleration Time	Set the rate of acceleration or acceleration time constant for positioning.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in the Function 1 bit (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

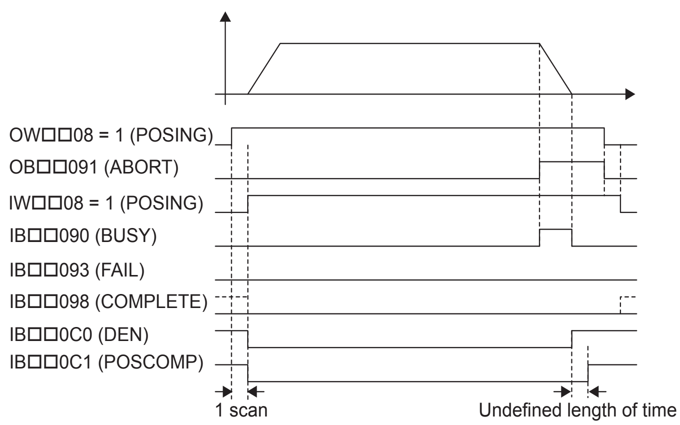
Parameter	Name	Monitor Contents	SVR
IB☐☐001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL☐☐02	Warning	Stores the most current warning.	R
IL☐☐04	Alarm	Stores the most current alarm.	R
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 1 during POSING command execution.	R
IB☐☐090	Command Executing	Turns ON when abort processing is being performed for POSING command. Turns OFF when abort processing has been completed.	R
IB☐☐091	Command Hold Completed	Turns ON when a deceleration to a stop has been completed as the result of setting the Command Pause (OB☐☐090) bit to 1 during POSING command execution.	R
IB☐☐093	Command Error End	Turns ON if an error occurs during POSING command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB☐☐098	Command Execution Completed	Always OFF for POSING command. Use the Positioning Completed bit (IB☐☐0C1) to confirm completion of this command.	R
IB☐☐0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.	R
IB☐☐0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB☐☐0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL☐☐20). OL☐☐20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL☐☐20≠0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R

(5) Timing Charts

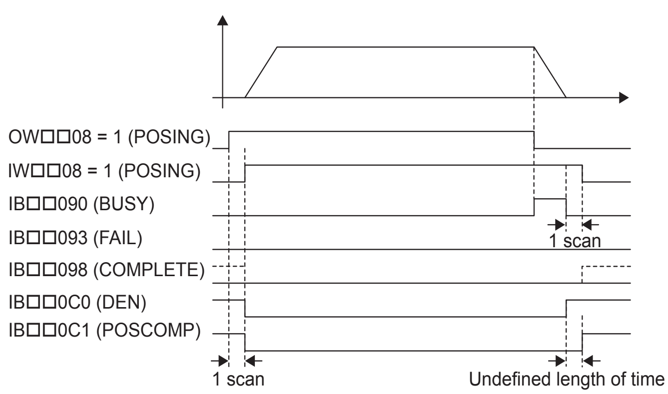
[a] Normal Execution



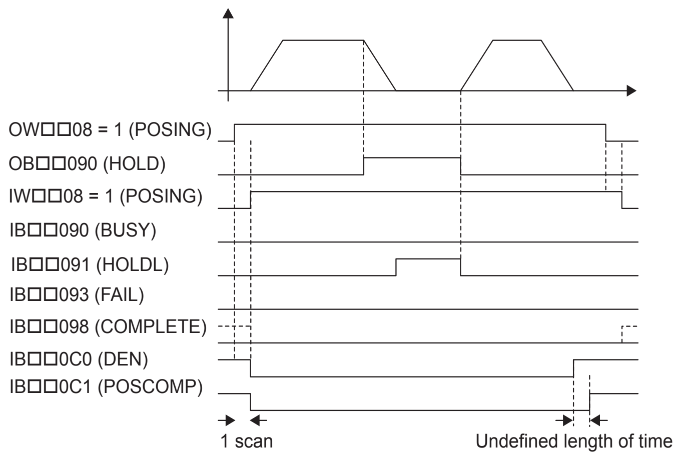
[b] Execution when Aborted



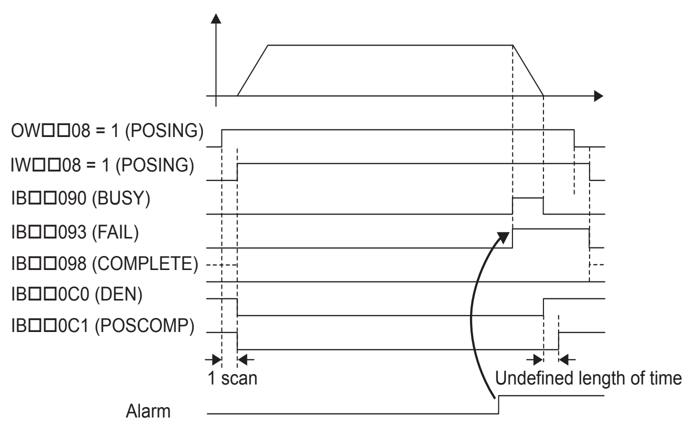
[c] Execution when Aborting by Changing the Command



[d] Command Hold



[e] Execution when an Alarm Occurs



7.2.2 External Positioning (EX_POSING) R

The EX_POSING command positions the axis to the target position using the specified target position and speed. Parameters related to acceleration and deceleration are set in advance.
If the external positioning signal turns ON during axis movement, the axis will move the distance specified for the External Positioning Move Distance from the point at which the external positioning signal turned ON, and then stop. If the external positioning signal does not turn ON, positioning will be completed to the original target position.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL☐☐02 and IL☐☐04 are 0.
2	The Servo ON condition.	IB☐☐001 is ON.
3	Motion command execution has been completed.	IW☐☐08 is 0 and IB☐☐090 is OFF.

2. Set the following motion setting parameters.

External Positioning Move Distance: OL☐☐46
External Positioning Signal: OW☐☐04
Speed Reference: OL☐☐10
Acceleration/Deceleration Filter Type: OW☐☐03
Speed Loop P/PI Switch: OW☐☐01
Target Position: OL☐☐1C

- The positioning speed (speed reference) can be changed during operation.
- An override of between 0% to 327.67% can be set for the positioning speed.
- The target position can be changed while the axis is moving. The target position cannot be changed after the external positioning signal is input.
- A latch zone can be set as long as it is supported by the SERVOPACK being used.

3. Set OW☐☐08 to 2 to execute the EX_POSING motion command to use the preceding settings in the same scan.

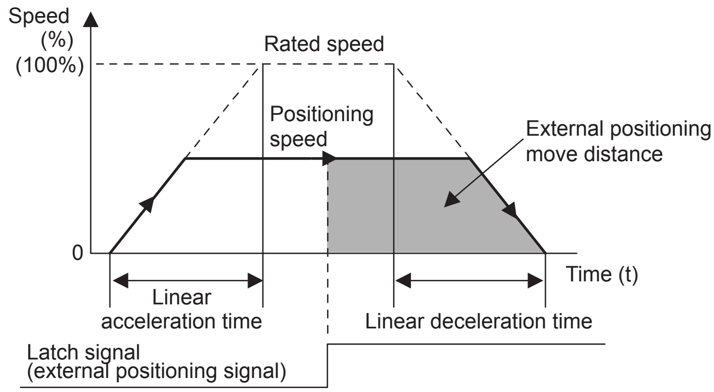
4. Turn ON the external positioning signal.

The axis will be moved the External Positioning Move Distance and decelerate to a stop.
IB☐☐098 will turn ON when the axis stops and external positioning has been completed.

5. Set OW☐☐08 to 0 to execute the NOP motion command to complete the external

positioning operation.

EX_POSING Operating Pattern



(2) Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command Pause bit (OB□□090) to 1.

- Set the Command Pause bit (OB□□090) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command Hold Completed bit (IB□□091) will turn ON.
- Reset the Command Pause bit (OB□□090) to 0.
  The command hold status will be cleared and the remaining portion of the positioning will be restarted.

(3) Aborting

Axis travel can be stopped during command execution and the remaining travel canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the remain travel will be canceled and the Positioning Completed bit (IB□□0C1) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

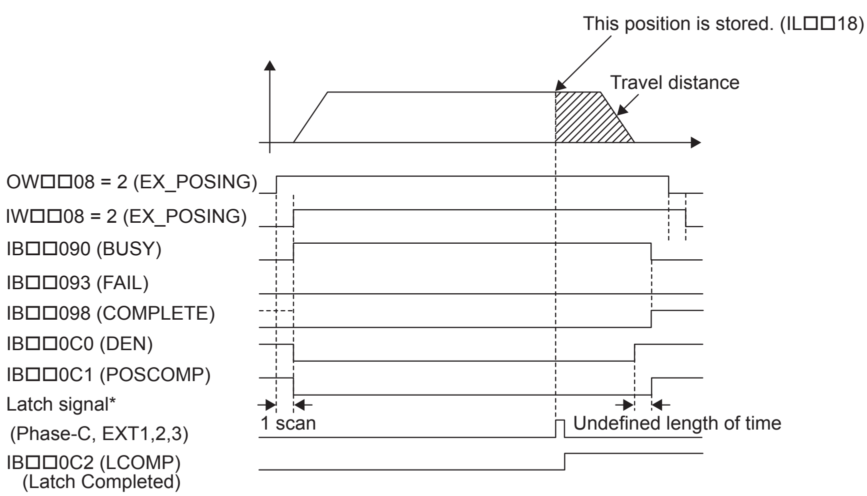
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command (OW□□08) to 2.	R
OB□□013	Speed Loop P/PI Switch	Switch the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□04	Function 2	Set the external positioning signal. 2: phase-C pulse, 3: /EXT1, 4: /EXT2, 5: /EXT3	R
OW□□08	Motion Command	The positioning starts when this parameter is set to 2. The operation will be canceled if this parameter is set to 0 during EX_POSING command execution.	R
OB□□090	Command Pause	The axis will decelerate to a stop if this bit is set to 1 during execution of EX_POSING command execution. The positioning will restart if this bit is reset to 0 when a command is being held.	R
OB□□091	Command Abort	The axis will decelerate to a stop if this bit is set to 1 during EX_POSING command execution.	R
OB□□094	Latch Zone Enabled	Enable or disable the area where the external positioning signal is valid. If the latch zone is enabled, the external positioning signal will be ignored if it is input outside of the latch zone. 0: Disable, 1: Enable	–
OB□□095	Position Reference Type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this parameter before setting the Motion Command (OW□□08) to 2.	R
OL□□10	Speed Reference	Specify the speed for the positioning. This setting can be changed during operation. The unit depends on the Function 1 setting (OW□□03).	R
OW□□18	Speed Override	This parameter allows the positioning speed to be changed without changing the Speed Reference (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01%	–
OL□□1C	Position Reference Setting	Set the target position for positioning. This setting can be changed during operation. The meaning of the setting depends on the status of the Position Reference Type bit OB□□095.	R
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	–
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	–
OL□□2A	Latch Zone Lower Limit	Set the boundary in the negative direction of the area in which the external positioning signal is to be valid.	–
OL□□2C	Latch Zone Upper Limit	Set the boundary in the positive direction of the area in which the external positioning signal is to be valid.	–
OL□□36	Linear Acceleration Time	Set the rate of acceleration or acceleration time constant for positioning.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in OW□□03. Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R
OL□□46	External Positioning Move Distance	Set the moving amount to move after the external positioning signal is input.	–

[b] Monitoring Parameters

Parameter	Name	Monitor Contents	SVR
IB☐☐001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL☐☐02	Warning	Stores the most current warning.	R
IL☐☐04	Alarm	Stores the most current alarm.	R
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 2 during EX_POSING command execution.	R
IB☐☐090	Command Executing	The Command Executing bit will turn ON during EX_POSING command execution and then turn OFF when command execution has been completed.	R
IB☐☐091	Command Hold Completed	Turns ON when a deceleration to a stop has been completed as the result of setting the Command Pause bit to 1 (OB☐☐090 to 1) during EX_POSING command execution (IW☐☐08 = 2).	R
IB☐☐093	Command Error End	Turns ON if an error occurs during EX_POSING command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB☐☐098	Command Execution Completed	Turns ON when EX_POSING command execution has been completed.	R
IB☐☐0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB☐☐0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB☐☐0C2	Latch Completed	This bit turns OFF when a new latch command is executed and turns ON when the latch has been completed. The latched position is stored as the Machine Coordinate Latch Position (monitoring parameter IL☐☐18).	–
IB☐☐0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL☐☐20). OL☐☐20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL☐☐20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R
IL☐☐18	Machine Coordinate Latch Position	Stores the current position in the machine coordinate system when the latch signal turned ON.	–

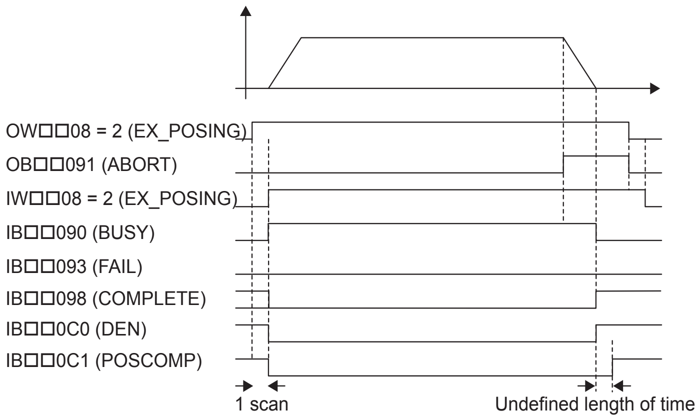
(5) Timing Charts

[a] Normal Execution

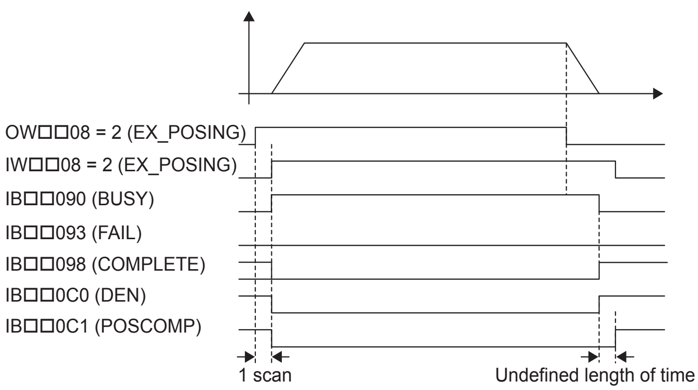


* Latch signal: Phase-C pulse, EXT1, EXT2, or EXT3 signal

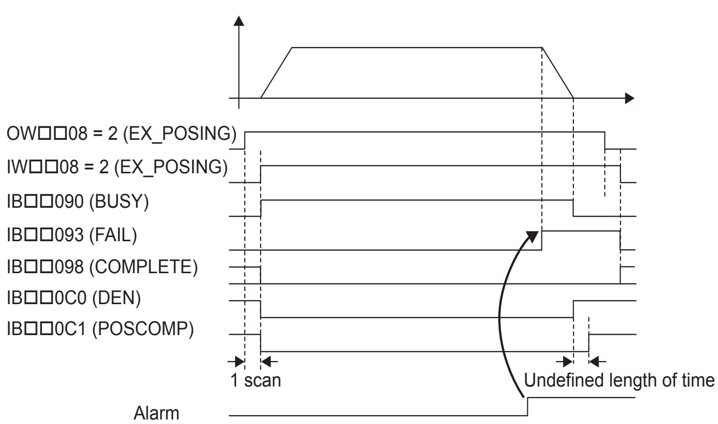
[b] Execution when Aborted



[c] Execution when Aborting by Changing the Command



[d] Execution when an Alarm Occurs



7.2.3 Zero Point Return (ZRET) R

When the Zero Point Return command (ZRET) is executed, the axis will return to the zero point of the machine coordinate system.
The operation to detect the position of the zero point is different between an absolute encoder and an incremental encoder.

- The SVR supports only absolute encoders.

With an absolute encoder, positioning is performed to the zero point of the machine coordinate system and command execution is completed.
With an incremental encoder, there are 13 different methods (see below) that can be performed for the zero point return operation.

(1) Selecting the Zero Point Return Method (with an Incremental Encoder)

When an incremental encoder is selected for the Encoder Type by fixed parameter No. 30 to 0, the coordinate system data will be lost when the power supply is turned OFF. This command must be executed when the power supply is turned ON again to establish a new coordinate system.
The following table lists the 13 zero point return methods that are supported by the MP2300. Select the best method for the machine according to the setting parameters. Refer to the page in the Table under Details for additional command information.

Setting Parameter OW□□3C	Name	Method	Signal Meaning	Reference Page
0	DEC1 + Phase-C	Applies a 3-step deceleration method using the deceleration limit switch and phase-C pulse.	DEC1 signal: SERVOPACK DEC signal	7-20
1	ZERO signal	Uses the ZERO signal.	ZERO signal: SERVOPACK EXT1 signal	7-22
2	DEC 1 + ZERO signal	Applies a 3-step deceleration method using the deceleration limit switch and ZERO signal.	DEC1 signal: SERVOPACK DEC signal ZERO signal: SERVOPACK EXT1 signal	7-23
3	Phase-C	Uses the phase-C pulse.	–	7-24
4 to 10	Not used	–	–	–
11	C pulse Only	Uses only the phase-C pulse.	–	7-25
12	POT & C pulse	Uses the positive overtravel signal and phase-C pulse.	POT: SERVOPACK P-OT signal	7-26
13	POT Only	Uses only the positive overtravel signal.	POT: SERVOPACK P-OT signal This method must not be used if repeat accuracy is required.	7-27
14	Home LS & C pulse	Uses the home signal and phase-C pulse.	HOME: SERVOPACK EXT1 signal	7-28
15	Home LS Only	Uses only the home signal.	HOME: SERVOPACK EXT1 signal	7-30
16	NOT & C pulse	Uses the negative overtravel signal and phase-C pulse.	NOT: SERVOPACK N-OT signal	7-31
17	NOT Only	Uses only the negative overtravel signal.	NOT: SERVOPACK N-OT signal This method must not be used if repeat accuracy is required.	7-32
18	INPUT & C pulse	Uses the INPUT signal and phase-C pulse.	INPUT: Setting parameter OB□□05B	7-33
19	INPUT Only	Uses only the INPUT signal.	With this method, a zero point return can be performed without connecting an external signal using setting parameter OB□□05B. This method must not be used if repeat accuracy is required.	7-35

■ Terminology: Pulse distribution

Pulse distribution transfers reference values from the MP2300 registers to the SERVOPACK registers every scan. Used in describing motion command operation.

(2) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. When an incremental encoder is selected for the Encoder Type by setting fixed parameter No. 30 to 0, set the zero point return method that will be used in the Home Return Type (motion setting parameter OW□□3C) as described on the previous page.

- The software limit function will be enabled after the zero point return operation has been completed.

3. Refer to *7.2.3 (7) Zero Point Return Operation and Parameters* on page 7-20 and set the required parameters.

4. Set OW□□08 to 3 to execute the ZRET motion command.

The zero point return operation will start. IW□□08 will be 3 during the operation.
IB□□0C5 will turn ON when the axis reaches the zero point and zero point return has been completed.

5. Set OW□□08 to 0 to execute the NOP motion command and then complete the zero point return operation.

(3) Holding

Holding execution is not possible during zero point return operation. The Command Pause bit (OB□□090) is ignored.

(4) Aborting

The zero point return can be canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop.
- When the axis has decelerated to a stop the remain travel will be canceled and the Positioning Completed bit (IB□□0C1) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

(5) Related Parameters

[a] Setting Parameters

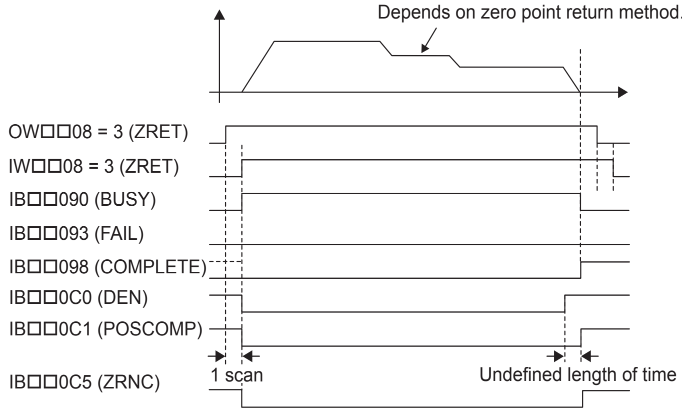
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command (OW□□08) to 3.	R
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	Positioning starts when this parameter is set to 3. The operation will be canceled if this parameter is set to 0 during ZRET command execution.	R
OB□□091	Command Abort	The axis will decelerate to a stop if this bit is set to 1 during ZRET command execution.	R
OB□□095	Position Reference Type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this parameter before setting the Motion Command (OW□□08) to 3.	R
OL□□36	Linear Acceleration Time	Set the rate of acceleration or acceleration time constant for positioning.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in OW□□03. Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R
OW□□3D	Home Window	Set the width in which the Zero Point Position bit (IB□□0C4) will turn ON.	R

[b] Monitoring Parameters

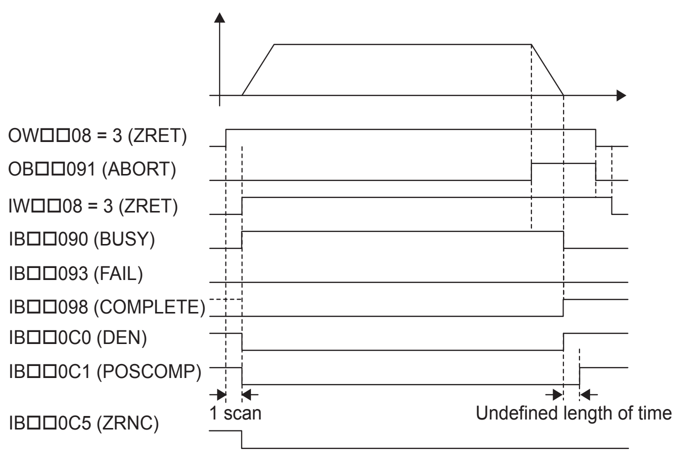
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 3 during ZRET command execution.	R
IB□□090	Command Executing	The Command Executing bit will turn ON during ZRET command execution and then turn OFF when command execution has been completed.	R
IB□□091	Command Hold Completed	Always OFF for ZRET command.	R
IB□□093	Command Error End	Turns ON if an error occurs during ZRET command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Turns ON when ZRET command execution has been completed.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R
IB□□0C4	Zero Point Position	Turns ON if the current position after the zero point return operation has been completed is within the Zero Point Position Output Wide from the zero point position. Otherwise, it turns OFF.	R
IB□□0C5	Zero Point Return Completed	Turns ON when the zero point return has been completed.	R

(6) Timing Charts

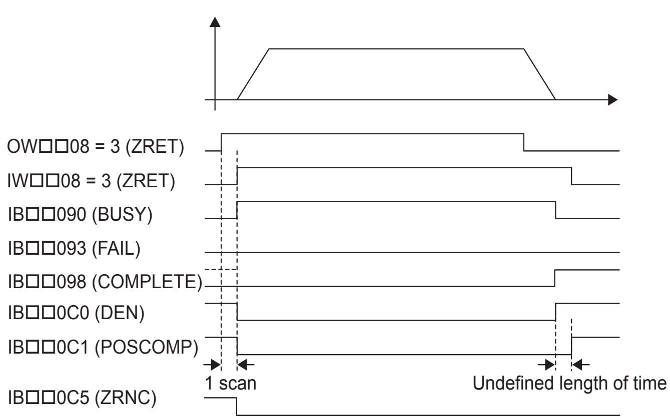
[a] Normal Execution



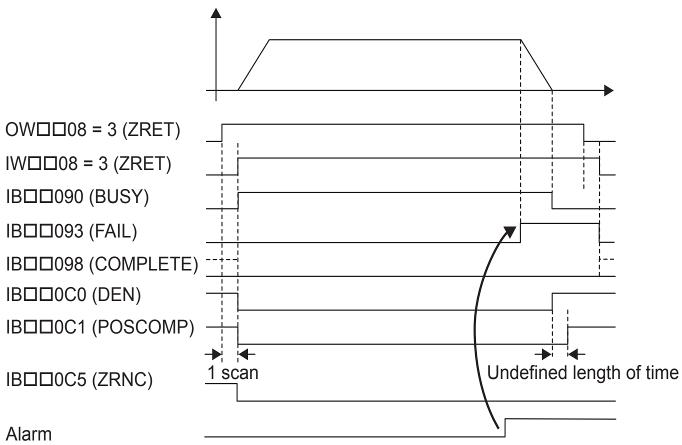
[b] Execution when Aborted



[c] Execution when Aborting by Changing the Command



[d] Execution when an Alarm Occurs



(7) Zero Point Return Operation and Parameters

With an incremental encoder, there are 13 different methods that can be performed for the zero point return operation. This section explains the operation that occurs after starting a zero point return and the parameters that need to be set before executing the command.

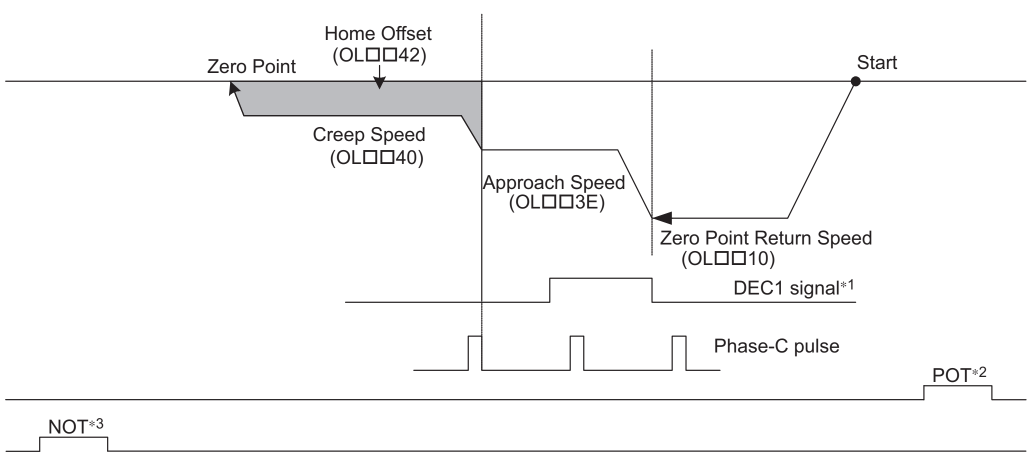
- None of the methods shown here are available with the SVR because it only supports absolute encoders.

[a] DEC1 + Phase-C Method (OW☐☐3C = 0)

● Operation after Zero Point Return Starts

Travel is started at the zero point return speed in the direction specified in the parameters.
When the rising edge of the DEC1 signal is detected, the speed is reduced to the approach speed.
When the first phase-C pulse is detected after passing the DEC1 signal at the approach speed, the speed is reduced to the creep speed and positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset (OL☐☐42).
- If an OT signal is detected during the zero point return operation, an OT alarm will occur.



* 1. The SERVOPACK DEC signal.
* 2. The SERVOPACK P-OT signal.
* 3. The SERVOPACK N-OT signal.

● Setting Parameters

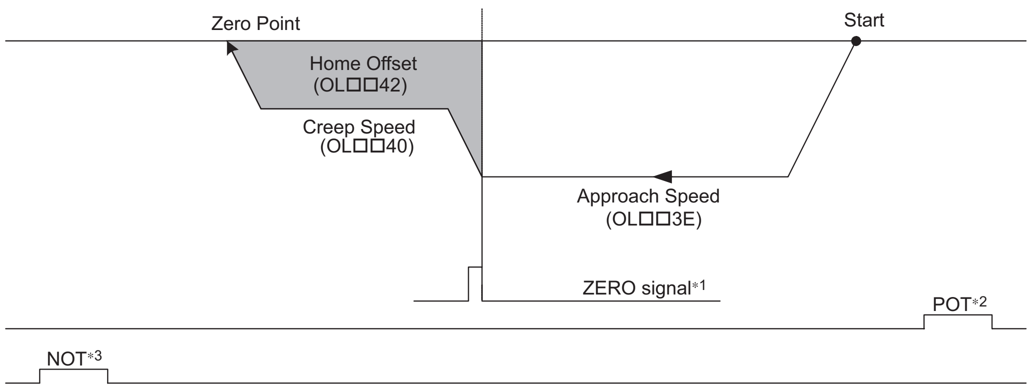
Parameter	Name	Setting
OW□□3C	Home Return Type	0: DEC1 + Phase-C
OB□□093	Home Direction	Set the zero point return direction.
OL□□10	Speed Reference	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.
OW□□18	Speed Override	This parameter allows the Zero Point Return speed to be changed without changing the Speed Reference (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000
OL□□3E	Approach Speed	Set the speed to use after detecting the DEC1 signal. Only a positive value can be set; a negative value will result in an error.
OL□□40	Creep Speed	Set the speed to use after detecting the first phase-C pulse after passing the DEC1 signal. Only a positive value can be set; a negative value will result in an error.
OL□□42	Home Offset	Set the travel distance from the point where the first phase-C pulse is detected after passing the DEC1 signal. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.

[b] ZERO Signal Method (OW□□3C = 1)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the direction specified in the parameters.
When the rising edge of the ZERO signal is detected, the speed is reduced to the creep speed and positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the ZERO signal is detected is set in the Home Offset (OL□□42).
- If an OT signal is detected during the zero point return operation, an OT alarm will occur.



* 1. The SERVOPACK EXT1 signal.
* 2. The SERVOPACK P-OT signal.
* 3. The SERVOPACK N-OT signal.

● Setting Parameters

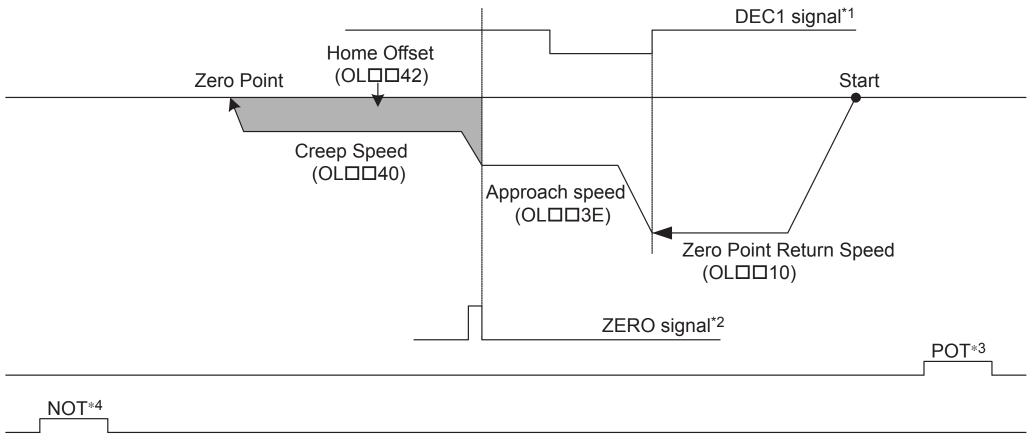
Parameter	Name	Setting
OW□□3C	Home Return Type	1: ZERO Signal Method
OB□□093	Home Direction	Set the zero point return direction.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.
OL□□40	Creep Speed	Set the speed to use after detecting the ZERO signal. Only a positive value can be set; a negative value will result in an error.
OL□□42	Home Offset	Set the travel distance from the point where the ZERO signal is detected. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.

[c] DEC1 + ZERO Signal Method (OW☐☐3C = 2)

● Operation after Zero Point Return Starts

Travel is started at the zero point return speed in the direction specified in the parameters.
When the rising edge of the DEC1 signal is detected, the speed is reduced to the approach speed.
When the rising edge of the ZERO signal is detected after passing the DEC1 signal at the approach speed, the speed is reduced to the creep speed and positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the ZERO signal is detected is set in the Home Offset (OL☐☐42).
- If an OT signal is detected during the zero point return operation, an OT alarm will occur.



* 1. The SERVOPACK DEC signal.
* 2. The SERVOPACK EXT1 signal.
* 3. The SERVOPACK P-OT signal.
* 4. The SERVOPACK N-OT signal.

● Setting Parameters

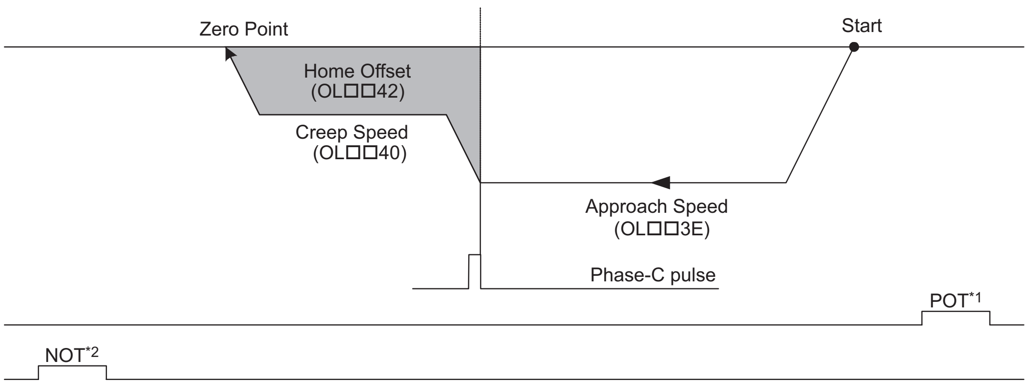
Parameter	Name	Setting
OW☐☐3C	Home Return Type	2: DEC1 + ZERO Signal Method
OB☐☐093	Home Direction	Set the zero point return direction.
OL☐☐10	Speed Reference	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.
OW☐☐18	Speed Override	This parameter allows the Zero Point Return speed to be changed without changing the Speed Reference (OL☐☐10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000
OL☐☐3E	Approach Speed	Set the speed to use after detecting the DEC1 signal. Only a positive value can be set; a negative value will result in an error.
OL☐☐40	Creep Speed	Set the speed to use after detecting the ZERO signal after passing the DEC1 signal. Only a positive value can be set; a negative value will result in an error.
OL☐☐42	Home Offset	Set the travel distance from the point where the ZERO signal is detected after passing the DEC1 signal. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.

[d] Phase-C Method (OW☐☐3C = 3)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the direction specified in the parameters.
When the rising edge of the phase-C pulse is detected, the speed is reduced to the creep speed and positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset (OL☐☐42).
- If an OT signal is detected during the zero point return operation, an OT alarm will occur.



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.

● Setting Parameters

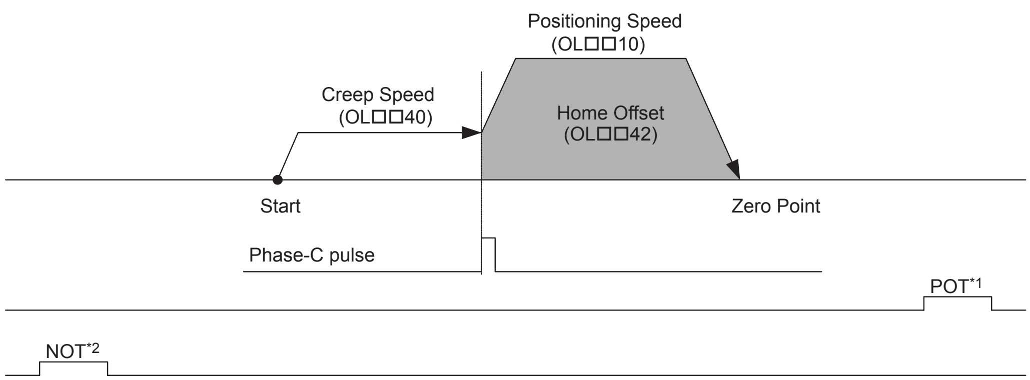
Parameter	Name	Setting
OW☐☐3C	Home Return Type	3: Phase-C Method
OB☐☐093	Home Direction	Set the zero point return direction.
OL☐☐3E	Approach Speed	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.
OL☐☐40	Creep Speed	Set the speed to use after detecting the phase-C pulse. Only a positive value can be set; a negative value will result in an error.
OL☐☐42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.

[e] C Pulse Only Method (OW□□3C = 11)

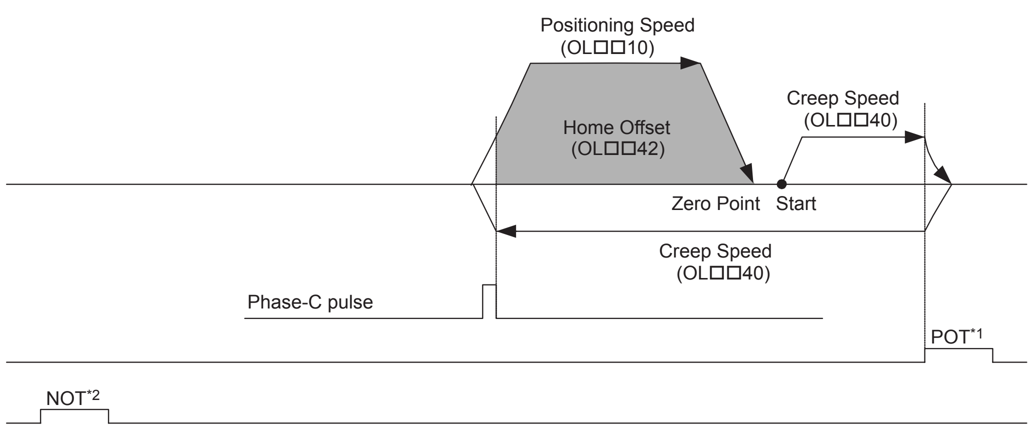
● Operation after Zero Point Return Starts

Travel is started at the creep speed in the direction specified by the sign of the creep speed. When the rising edge of the phase-C pulse is detected, positioning is performed at the positioning speed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If an OT signal is detected during creep speed operation, an OT alarm will not occur, the direction will be reversed, and a search will be made for the phase-C pulse.
- If an OT signal is detected during positioning speed operation, an OT alarm will occur.



OT Signal Detected during Creep Speed Operation



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.
- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

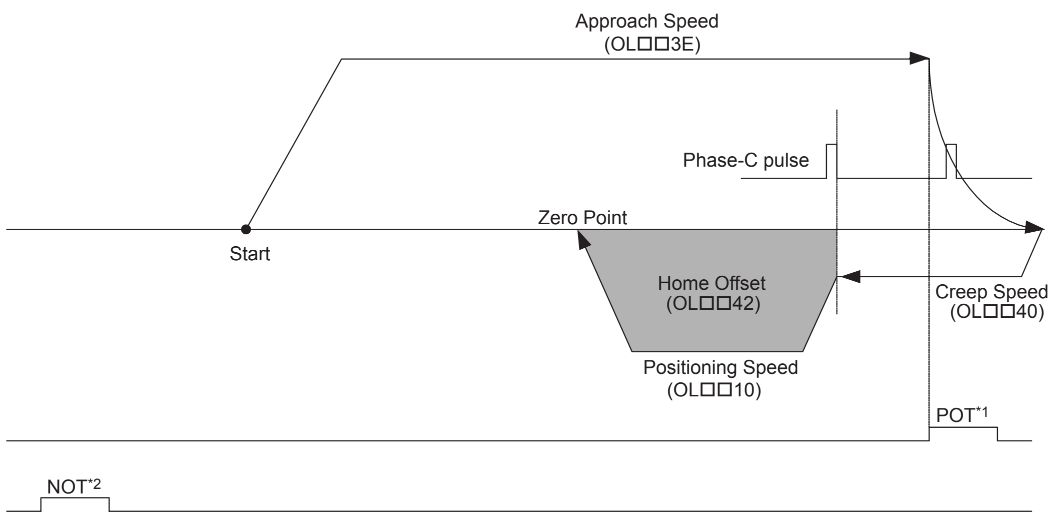
Parameter	Name	Setting
OW□□3C	Home Return Type	11: C Pulse Only Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the phase-C pulse. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□40	Creep Speed	Set the speed to use when starting a zero point return. The travel direction will depend on the sign of the creep speed.
OL□□42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. The travel direction will depend on the sign.

[f] POT & C Pulse Method (OW□□3C = 12)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the positive direction until the stroke limit is reached.
When the POT signal is detected, the direction is reversed to return at creep speed.
When the phase-C pulse is detected during the return after passing the POT signal, the positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If a negative value is set for the approach speed, the command will end in an error.
- If an OT signal is detected during the positioning speed operation, an OT alarm will occur.



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.
- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

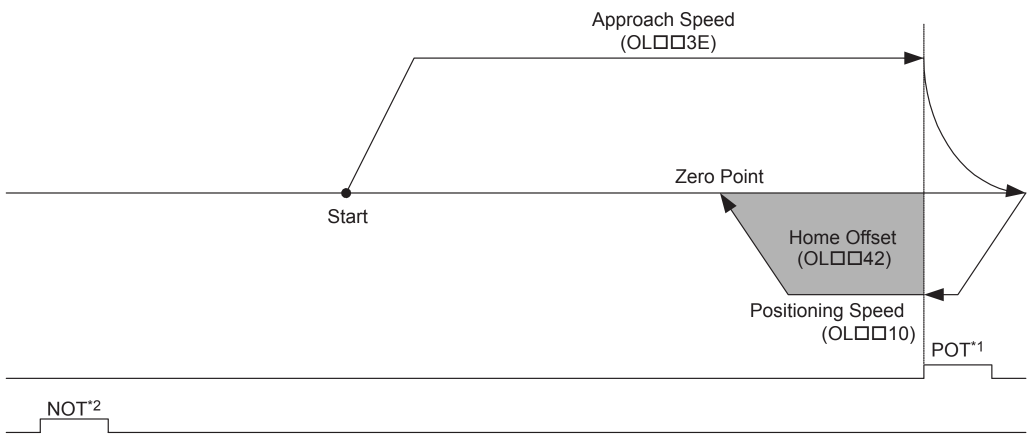
Parameter	Name	Setting
OW□□3C	Home Return Type	12: POT & C pulse method
OL□□10	Speed Reference	Set the positioning to use after detecting the phase-C pulse. The sign is ignored. The zero point return direction will depend on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. Add a sign so that the travel direction will be positive.
OL□□40	Creep Speed	Set the reverse speed to use at after detecting the POT signal. The sign is ignored. The travel direction will be negative.
OL□□42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. The travel direction will depend on the sign.

[g] POT Signal Method (OW□□3C = 13)

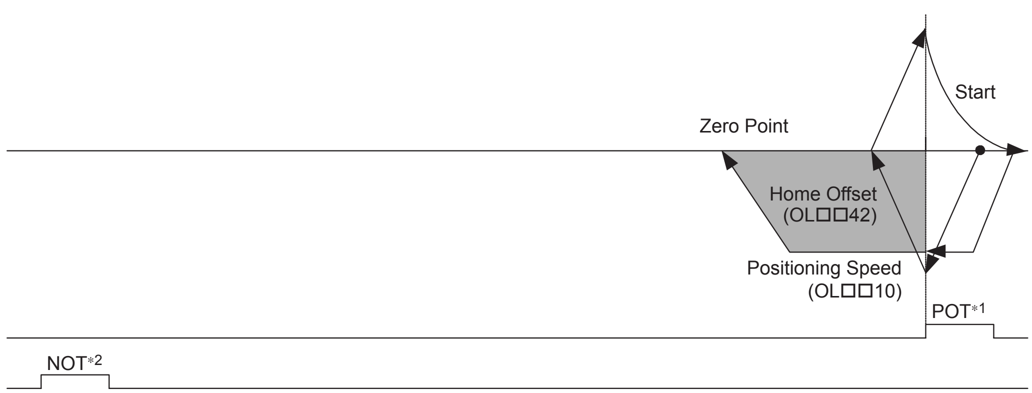
● Operation after Zero Point Return Starts

Travel is started at the approach speed in the positive direction until the stroke limit is reached.
When the POT signal is detected, the direction is reversed to return at Positioning speed.
When a change in the POT signal status from ON to OFF is detected during the return, the positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after a change in the POT signal status is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If a negative value is set for the approach speed, the command will end in an error.
- If an OT signal is detected during the positioning speed operation, an OT alarm will occur.
- Detecting the change in the OT signal status is performed using software processing. The position where positioning is completed will depend on the high-speed scan setting, positioning speed, etc. Do not use this method if repeat accuracy is required in the position where the zero point return operation is completed.



Starting on the Positive Stroke Limit (POT)



* 1. The SERVOPACK P-OT signal.

* 2. The SERVOPACK N-OT signal.

- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

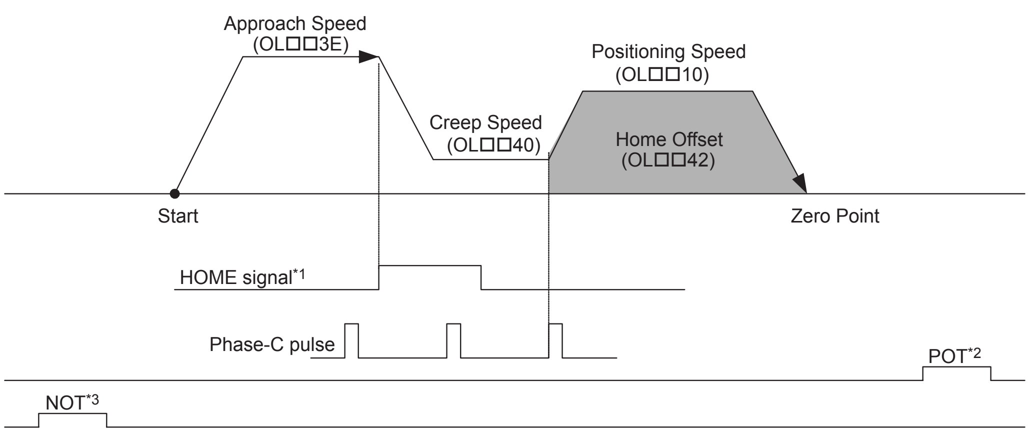
Parameter	Name	Setting
OW□□3C	Home Return Type	13: POT Only Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the POT signal. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. Add a sign so that the travel direction will be positive.
OL□□42	Home Offset	Set the travel distance from the point where the POT signal is detected. The travel direction will depend on the sign.

[h] HOME LS & Phase-C Pulse Method (OW□□3C = 14)

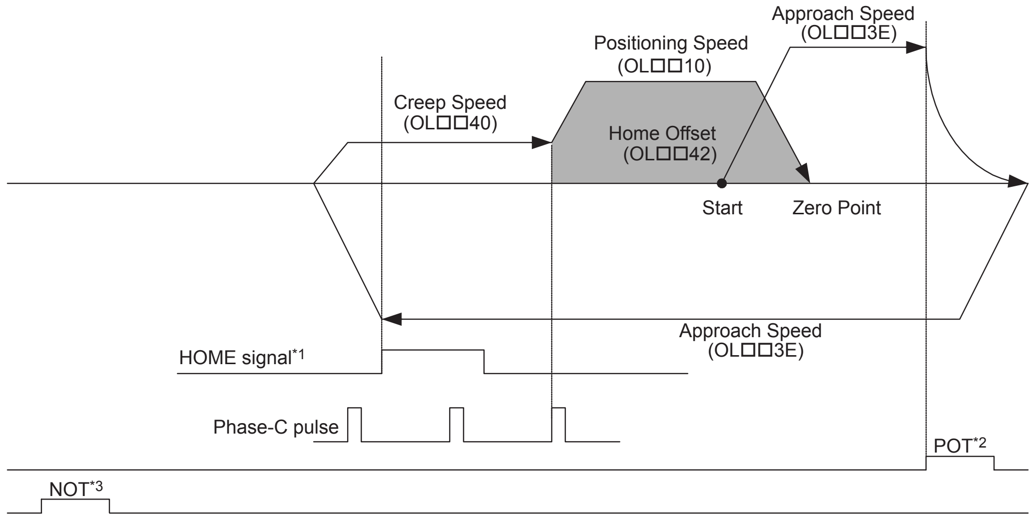
● Operation after Zero Point Return Starts

Travel is started at the approach speed in the direction specified by the sign of the approach speed.
When the rising edge of the home signal is detected, the speed is reduced to creep speed.
When the first phase-C pulse is detected after the falling edge of the home signal, the positioning is performed at positioning speed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If an OT signal is detected during approach speed operation, an alarm will not occur, the direction will be reversed, and a search will be made for the home signal.
- If an OT signal is detected during positioning speed operation, an OT alarm will occur.



Detecting the OT Signal during Approach Speed Movement



* 1. The SERVOPACK EXT1 signal.
* 2. The SERVOPACK P-OT signal.
* 3. The SERVOPACK N-OT signal.
- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

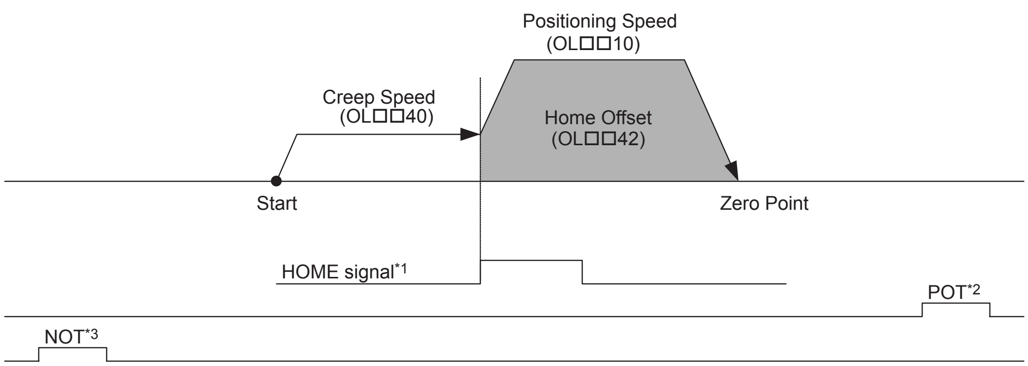
Parameter	Name	Setting
OW□□3C	Home Return Type	14: HOME LS & C pulse method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the phase-C pulse. The sign is ignored. The travel direction depends on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. The travel direction will depend on the sign of the approach speed.
OL□□40	Creep Speed	Set the speed to use after detecting the home signal and the travel direction (sign).
OL□□42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. The travel direction will depend on the sign.

[i] HOME LS Signal Method (OW□□3C = 15)

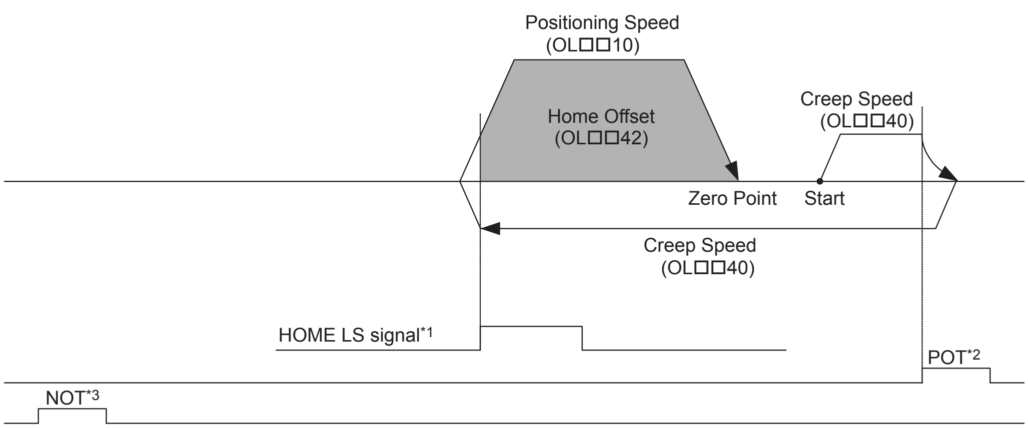
● Operation after Zero Point Return Starts

Travel is started at the creep speed in the direction specified by the sign of the creep speed.
When the rising edge of the home signal is detected, positioning is performed at the positioning speed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the rising edge of the home signal is detected is set in the Home Offset. The positioning speed is set in the Speed Reference Setting.
- If an OT signal is detected during creep speed operation, an alarm will not occur, the direction will be reversed, and a search will be made for the home signal.
- If an OT signal is detected during positioning speed operation, an OT alarm will occur.



Detecting the OT Signal during Creep Speed Movement



* 1. The SERVOPACK EXT1 signal.
* 2. The SERVOPACK P-OT signal.
* 3. The SERVOPACK N-OT signal.

- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

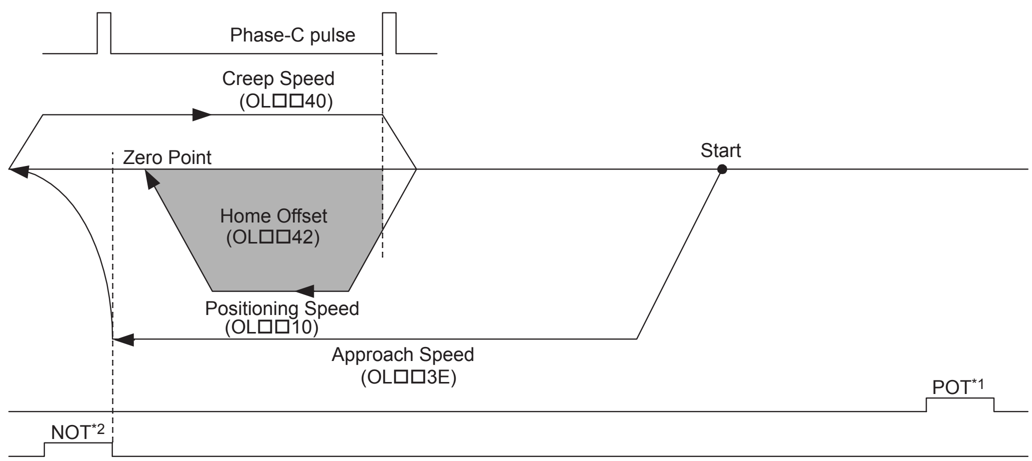
Parameter	Name	Setting
OW□□3C	Home Return Type	15: HOME LS Only Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the home signal. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□40	Creep Speed	Set the speed and the travel direction (sign) to use when starting a zero point return.
OL□□42	Home Offset	Set the travel distance from the point where the home signal is detected. The travel direction will depend on the sign.

[j] NOT & Phase-C Pulse Method (OW□□3C = 16)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the negative direction until the stroke limit is reached.
When the NOT signal is detected, the direction is reversed to return at the creep speed.
When the phase-C pulse is detected during the return after passing the NOT signal, the positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If a positive value is set for the approach speed, the command will end in an error.
- If an OT signal is detected during the positioning speed operation, an OT alarm will occur.



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.

- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

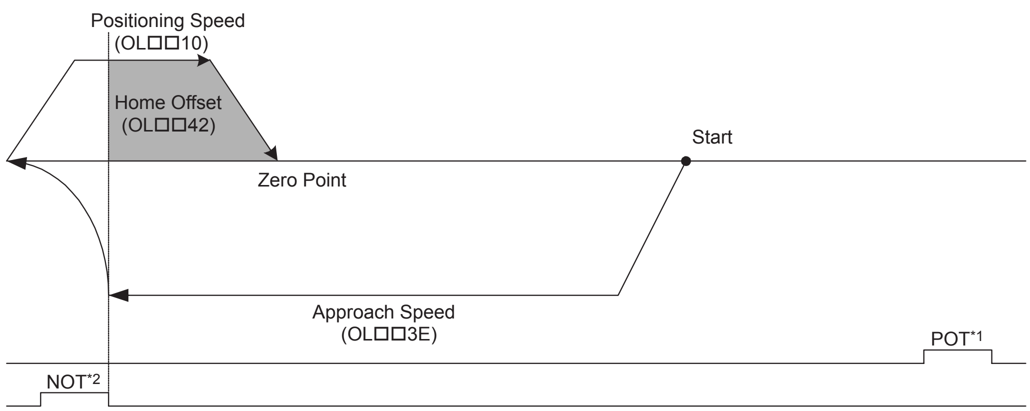
Parameter	Name	Setting
OW□□3C	Home Return Type	16: NOT & C pulse Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the phase-C pulse. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. Add a sign so that the travel direction will be negative.
OL□□40	Creep Speed	Set the speed to use after detecting the NOT signal. The travel direction will be positive.
OL□□42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. The travel direction will depend on the sign.

[k] NOT Signal Method (OW□□3C = 17)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the negative direction until the stroke limit is reached.
When the NOT signal is detected, the direction is reversed to return at the positioning speed.
When a change in the NOT signal status from ON to OFF is detected during the return, the positioning is performed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the change of the NOT signal status is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If a positive value is set for the approach speed, the command will end in an error.
- If an OT signal is detected during the positioning speed operation, an OT alarm will occur.
- Detecting the change in the OT signal status is performed using software processing. The position where positioning is completed will depend on the high-speed scan setting, positioning speed, etc. Do not use this method if repeat accuracy is required in the position where the zero point return operation is completed.



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.
- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

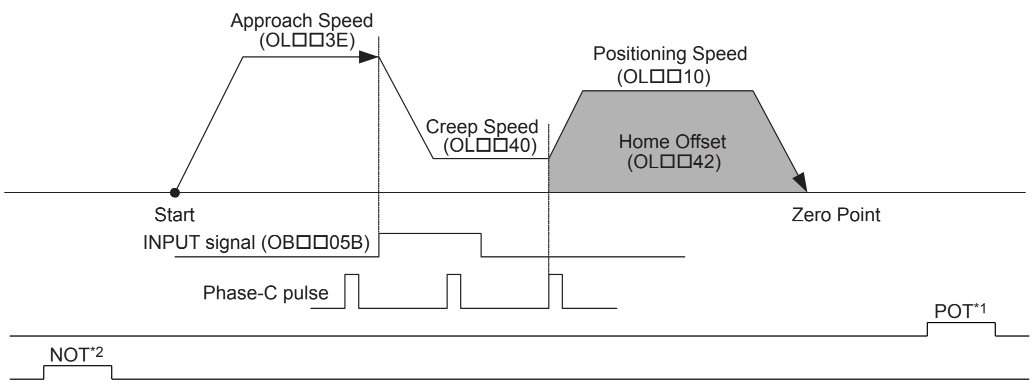
Parameter	Name	Setting
OW□□3C	Home Return Type	17: NOT Only Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the NOT signal. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. Add a sign so that the travel direction will be negative.
OL□□42	Home Offset	Set the travel distance from the point where the NOT signal is detected. The travel direction will depend on the sign.

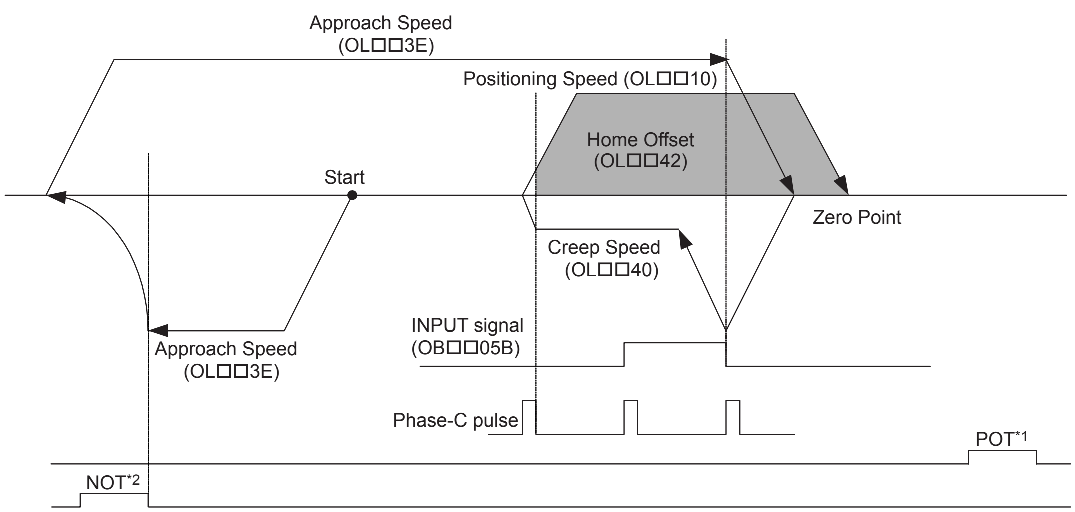
[l] INPUT & Phase-C Pulse Method (OW□□3C = 18)

● Operation after Zero Point Return Starts

Travel is started at the approach speed in the direction specified by the sign of the approach speed.
When the rising edge of the INPUT signal is detected, the speed is reduced to the creep speed.
When the first phase-C pulse is detected after the falling edge of the INPUT signal, the positioning is performed at positioning speed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the phase-C pulse is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If an OT signal is detected during approach speed operation, an OT alarm will not occur, the direction will be reversed, and a search will be made for the INPUT signal.
- If an OT signal is detected during positioning speed operation, an OT alarm will occur.





* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.
- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

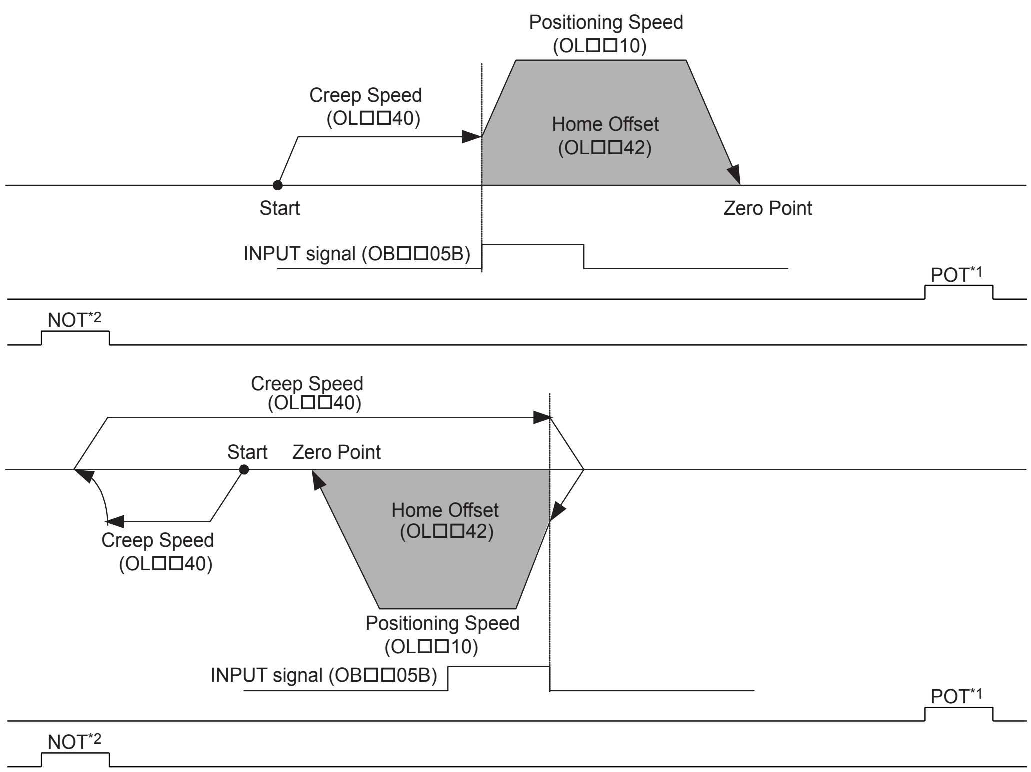
Parameter	Name	Setting
OW□□3C	Home Return Type	18: INPUT & C pulse Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the phase-C pulse. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□3E	Approach Speed	Set the speed to use when starting a zero point return. The travel direction will depend on the sign of the approach speed.
OL□□40	Creep Speed	Set the speed and the travel direction (sign) to use after detecting the INPUT signal.
OL□□42	Home Offset	Set the travel distance from the point where a phase-C pulse is detected. The travel direction will depend on the sign.
OB□□05B	INPUT Signal for Zero Point Return	This signal must be turned ON from the ladder program.

[m] INPUT Signal Method (OW□□3C = 19)

● Operation after Zero Point Return Starts

Travel is started at the creep speed in the direction specified by the sign of the creep speed.
When the rising edge of the INPUT signal is detected, the positioning is performed at the positioning speed.
When the positioning has been completed, a machine coordinate system is established with the final position as the zero point.

- The moving amount after the rising edge of the INPUT signal is detected is set in the Home Offset. The positioning speed is set in the Speed Reference.
- If an OT signal is detected during creep speed operation, an OT alarm will not occur, the direction will be reversed, and a search will be made for the INPUT signal.
- If an OT signal is detected during positioning speed operation, an OT alarm will occur.
- The INPUT signal is allocated to the motion setting parameter OB□□05B, allowing the zero point return operation to be performed without actually wiring a signal. This method can thus be used to temporarily set the zero point during trial operation.
- Detecting the rising edge of the INPUT signal is performed using software processing. The position where positioning is completed will depend on the high-speed scan setting, positioning speed, etc. Do not use this method if repeat accuracy is required in the position where the zero point return operation is completed.



* 1. The SERVOPACK P-OT signal.
* 2. The SERVOPACK N-OT signal.

- The stopping method when the OT signal is detected depends on the setting of SERVOPACK parameters.

● Setting Parameters

Parameter	Name	Setting
OW□□3C	Home Return Type	19: INPUT Only Method
OL□□10	Speed Reference	Set the positioning speed to use after detecting the INPUT signal. The sign is ignored. The travel direction will depend on the sign of the Home Offset.
OL□□40	Creep Speed	Set the speed and the travel direction (sign) to use when starting a zero point return.
OL□□42	Home Offset	Set the distance to travel from the point the INPUT signal is detected. The travel direction will depend on the sign.
OB□□05B	INPUT Signal for Zero Point Return	This signal must be turned ON from the ladder program.

7.2.4 Interpolation (INTERPOLATE) R

The INTERPOLATE command positions the axis according to the target position that changes in sync with the high-speed scan. The positioning data is generated by a ladder program.

- Speed feed forward compensation can be applied.
- Torque feed forward gain can be used when interpolation commands (INTERPOLATE) are sent using SGDS SERVOPACKs.
  Torque feed forward gain is set in Torque/Thrust Reference (setting parameter OL□□0C). The required conditions are as follows:
  - SERVOPACK parameter Pn002.0 = 2
  - SGDS communication interface version 8 or later

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Target Position: OL□□1C
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01
Speed Feed Forward Compensation: OW□□30

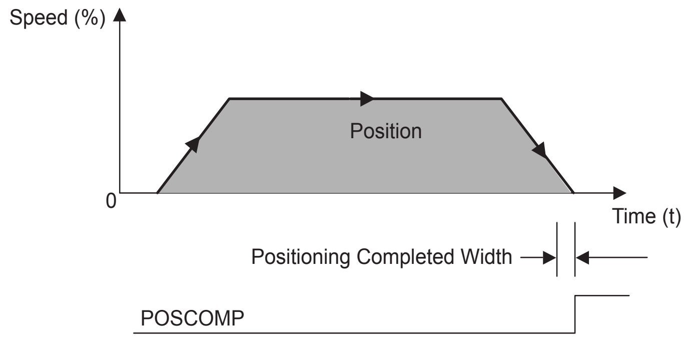
3. Set OW□□08 to 4 to execute the INTERPOLATE motion command.

Positioning will start. The travel speed is calculated automatically.
IW□□08 will be 4 during the positioning.
The Target Position (OL□□1C) will be updated every high-speed scan.
IB□□0C1 will turn ON when the axis reaches the target position and the positioning has been completed.

4. Set OW□□08 to 0 to execute the NOP motion command and then complete the

positioning operation.

INTERPOLATE Operating Pattern



(2) Holding and Aborting

The axis will decelerate to a stop if there is no change in the target position each high-speed scan. The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used. Change a motion command to stop the interpolation execution.

(3) Related Parameters

[a] Setting Parameters

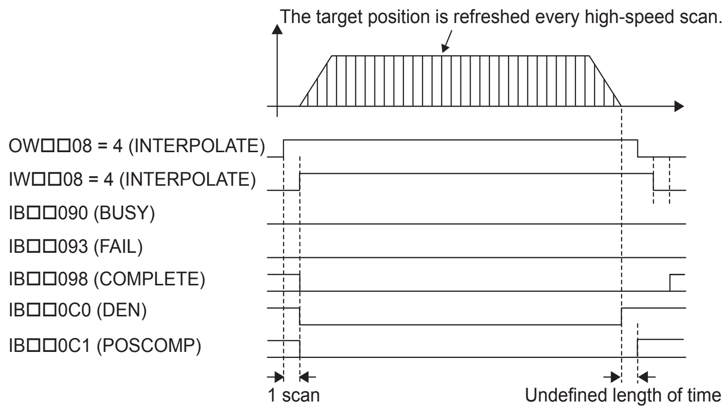
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turns the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON this bit before setting the Motion Command (OW□□08) to 4.	R
OW□□03	Function 1	Sets the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	The positioning starts when this parameter is set to 4.	R
OB□□095	Position Reference Setting	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this parameter before setting the Motion Command (OW□□08) to 4.	R
OL□□1C	Position Reference Setting	Set the target position for positioning. The setting can be updated every high-speed scan.	R
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	R
OW□□31	Speed Amends	Set the feed forward amount as a percentage of the rated speed. The setting unit for this parameter is 0.01% (fixed).	R
OW□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning. Used for deceleration stops when an alarm has occurred.	
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in the Function 1 (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

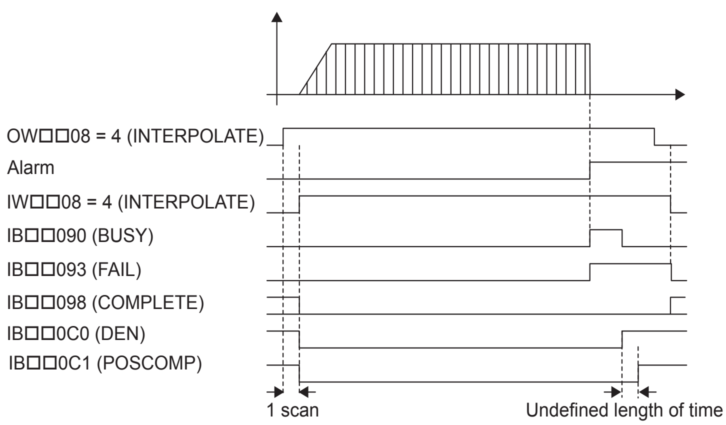
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 4 during INTERPOLATE command execution.	R
IB□□090	Command Executing	Always OFF for INTERPOLATE command.	R
IB□□091	Command Hold Completed	Always OFF for INTERPOLATE command.	R
IB□□093	Command Error End	Turns ON if an error occurs during INTERPOLATE command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for INTERPOLATE command.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB□□0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R

(4) Timing Charts

[a] Normal Execution



[b] Execution when an Alarm Occurs



7.2.5 Latch (LATCH) R

The LATCH command saves in a register the current position when the latch signal is detected during interpolation positioning.
The latch signal type is set in setting register OW□□04 and can be set to the phase-C pulse, /EXT1 signal, /EXT2 signal, or /EXT3 signal.

- Speed feed forward compensation can be applied.
- When executing the LATCH command more than once after latching the current position by the LATCH command, change the Motion Command to NOP for at least one scan before executing LATCH again.
- Torque feed forward gain can be used when LATCH commands are sent using SGDS SERVO-PACKs.
  Torque feed forward gain is set in Torque/Thrust Reference (setting parameter OL□□0C). The required conditions are as follows:
  - SERVOPACK parameter Pn002.0 = 2
  - SGDS communication interface version 8 or later

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Target Position: OL□□1C
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01
Speed Feed Forward Compensation: OW□□30
Latch Signal Selection: OW□□04

3. Set OW□□08 to 6 to execute the LATCH motion command.

Positioning will start. The travel speed will be calculated automatically.
IW□□08 will be 6 during the positioning.
The Target Position (OL□□1C) will be updated every high-speed scan.
When the latch signal turns ON, the current position will be saved and stored in OW□□08.
IB□□0C1 will turn ON when the axis reaches the target position and the positioning has been completed.

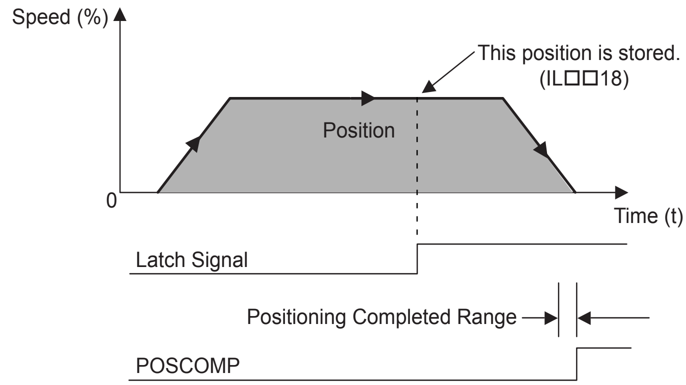
- Take into consideration the latch processing time obtained from the following equation when sending the LATCH command.

  Latch processing time = 2 scans + MECHATROLINK communication cycle + SERVOPACK processing time (4 ms max.)

4. Set OW□□08 to 0 to execute the NOP motion command and then complete the

positioning operation.

LATCH Operating Pattern



(2) Holding and Aborting

The axis will decelerate to a stop if there is no change in the target position each high-speed scan. The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used. Change a motion command to stop the interpolation execution.

(3) Related Parameters

[a] Setting Parameters

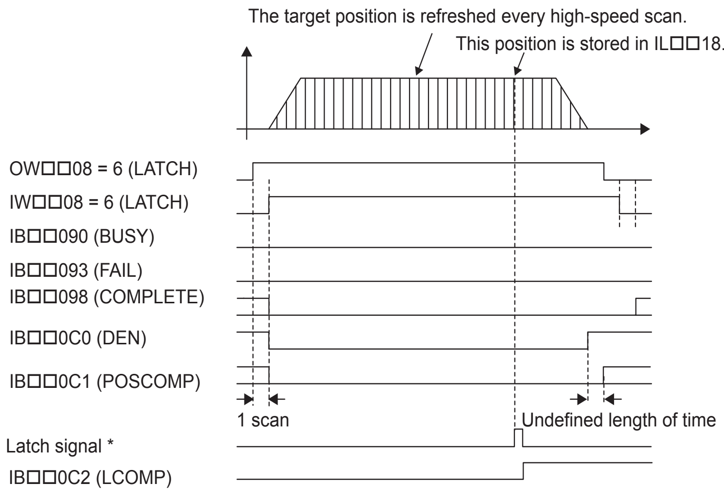
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Set this bit to 1 before setting the Motion Command (OW□□08) to 6.	R
OW□□03	Function 1	Sets the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□04	Function 2	Set the latch signal type.	–
OW□□08	Motion Command	The positioning starts when this parameter is set to 6.	R
OB□□095	Position Reference Type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this parameter before setting the Motion Command (OW□□08) to 6.	R
OL□□1C	Position Reference Setting	Set the target position for positioning. The setting can be updated every high-speed scan.	R
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	–
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	–
OW□□31	Speed Amends	Set the feed forward amount as a percentage of the rated speed. The setting unit for this parameter is 0.01% (fixed).	R
OW□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning. Used for deceleration stops when an alarm has occurred.	–
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in OW□□03. Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
I□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates any alarms that have occurred during execution. The response code is 6 during LATCH operation.	R
IB□□090	Command Executing	Always OFF for LATCH operation.	R
IB□□091	Command Hold Completed	Always OFF for LATCH operation.	R
IB□□093	Command Error End	Turns ON if an error occurs during LATCH operation. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for LATCH operation.	R
IB□□0C0	Distribution Completed	Turns ON when distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB□□0C2	Latch Completed	This bit turns OFF when a new latch command is executed and turns ON when the latch has been completed. The latched position is stored as the Machine Coordinate Latch Position (monitoring parameter IL□□18).	–
IB□□0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R
IL□□18	Machine Coordinate Latch Position	Stores the current position in the machine coordinate system when the latch signal turned ON.	–

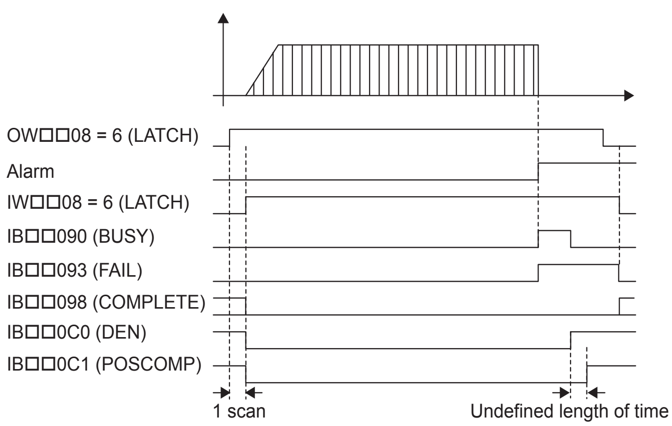
(4) Timing Charts

[a] Normal Execution



* Latch signal: Phase-C pulse, /EXT1, /EXT2, or /EXT3 signal

[b] Execution when an Alarm Occurs



7.2.6 JOG Operation (FEED) R

The FEED command starts movement in the specified travel direction at the specified travel speed. Execute the NOP motion command to stop the operation.
Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Travel Direction: OB□□092
Speed Reference: OL□□10
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01

- The speed reference can be changed during operation.

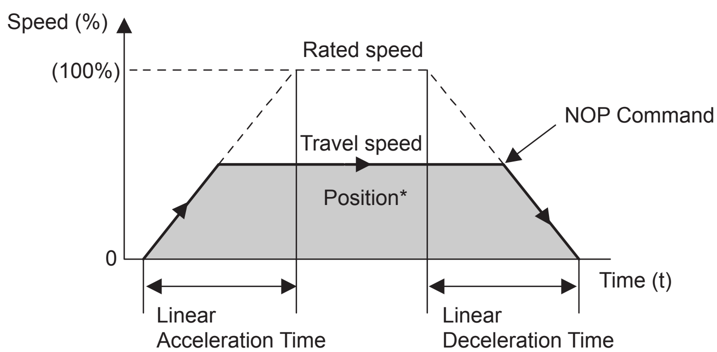
3. Set OW□□08 to 7 to execute the FEED motion command.

JOG operation will start. IW□□08 will be 7 during the execution.

4. Set OW□□08 to 0 to execute the NOP motion command.

IB□□0C1 turns ON and the JOG operation has been completed.

FEED Operating Pattern



(2) Holding

Holding execution is not possible during FEED command execution. The Command Pause bit (OB□□090) is ignored.

(3) Aborting

Axis travel can be stopped during FEED command execution by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Positioning Completed bit (IB□□0C1) will turn ON.
- The JOG operation will restart if the Command Abort bit (OB□□091) is reset to 0 during abort processing.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

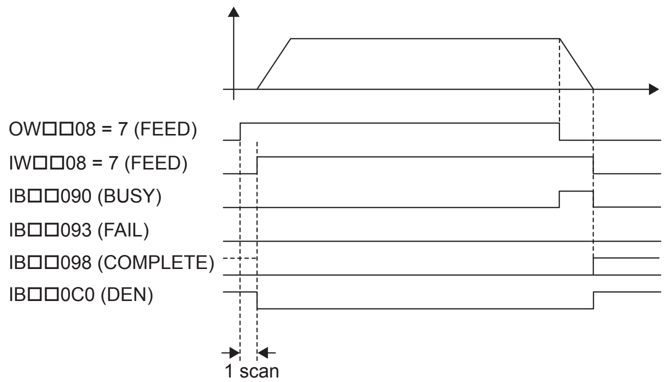
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command (OW□□08) to 7.	R
OB□□013	Speed Loop P/PI Switch	Switches the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	The JOG operation starts when this parameter is set to 7. The axis is decelerated to a stop and the JOG operation is completed if this parameter is set to 0 during the execution of a FEED command.	R
OB□□091	Command Abort	The axis is decelerated to a stop if this bit is set to 1 during JOG operation.	R
OB□□092	JOG/STEP Direction	Set the travel direction for JOG operation. 0: Positive direction, 1: Negative direction	R
OL□□10	Speed Reference	Specify the speed for the positioning operation. This setting can be changed during operation. The unit depends on the Function 1 setting (OW□□03).	R
OW□□18	Speed Override	This parameter allows the feed speed to be changed without changing the Speed Reference (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000	–
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	–
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	–
OL□□36	Linear Acceleration Time	Set the rate of acceleration of the acceleration time constant for JOG operation.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration of the deceleration time constant for JOG operation.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in the Function 1 (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

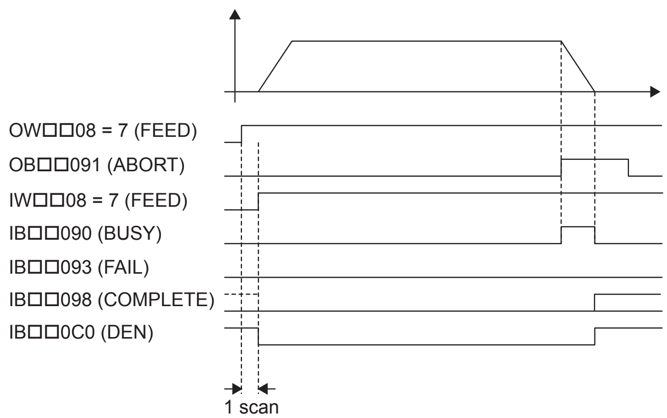
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 7 during FEED command execution.	R
IB□□090	Command Executing	Turns ON when abort processing is being performed for FEED command. Turns OFF when abort processing has been completed.	R
IB□□091	Command Hold Completed	Always OFF for FEED command.	R
IB□□093	Command Error End	Turns ON if an error occurs during FEED command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for FEED command.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB□□0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R

(5) Timing Charts

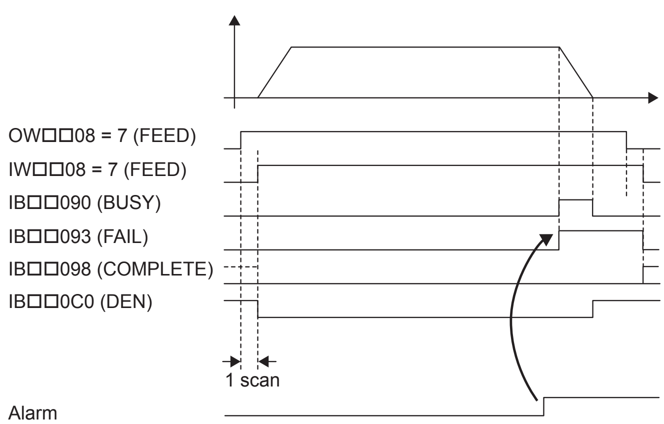
[a] Normal Execution



[b] Execution when Aborted



[c] Execution when an Alarm Occurs



7.2.7 STEP Operation (STEP) R

The STEP command executes a positioning for the specified travel direction, moving amount, and travel speed.
Parameters related to acceleration and deceleration are set in advance.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Step Distance: OL□□44
Travel Direction: OB□□092
Speed Reference: OL□□10
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01

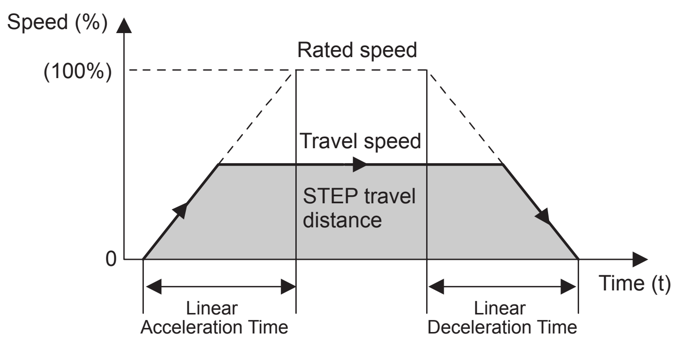
- The speed reference bit OL□□10 can be changed during operation.
- An override of between 0% to 327.67% can be set for the travel speed.

3. Set OW□□08 to 8 to execute the STEP motion command.

STEP operation will start. IW□□08 will be 8 during execution.
IB□□03 will turn ON when the axis reaches the target position.
IB□□0C1 will turn ON when the axis reaches the target position and the positioning has been completed.

4. Set OW□□08 to 0 to execute the NOP motion command and then complete the STEP operation.

STEP Operating Pattern



(2) Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command Pause (OB□□090) bit to 1.

- Set the Command Pause bit (OB□□090) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command Hold Completed bit (IB□□091) will turn ON.
- Turn OFF the Command Pause bit (OB□□090).
  The command hold status will be cleared and the remaining portion of the positioning will be restarted.

(3) Aborting

Axis travel can be stopped during command execution and the remaining travel canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Positioning Completed bit (IB□□0C1) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

(4) Related Parameters

[a] Setting Parameters

Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command (OW□□08) to 8.	R
OB□□013	Speed Loop P/PI Switch	Switch the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	The STEP operation starts when this parameter is set to 8. The axis will decelerate to a stop and the JOG operation is completed if this parameter is set to 0 during STEP command execution.	R
OB□□090	Command Pause	The axis will decelerate to a stop if this bit is set to 1 during STEP operation. The operation will restart if this bit is turned OFF when a command is being held.	R
OB□□091	Command Abort	The axis will decelerate to a stop if this bit is set to 1 during the positioning. The operation depends on the setting of the Position Reference Type (OB□□095) when turning ON after decelerating to a stop.	R
OB□□092	JOG/STEP Direction	Set the travel direction for STEP operation. 0: Positive direction, 1: Negative direction	R
OB□□095	Position Reference Type	Switch the type of position reference. 0: Incremental addition mode, 1: Absolute mode Set this parameter before setting the Motion Command (OW□□08) to 8.	R
OL□□10	Speed Reference	Specify the speed for the positioning operation. This setting can be changed during operation. The unit depends on the setting of the Function 1 (OW□□03).	R
OW□□18	Speed Override	This parameter allows the travel speed to be changed without changing the Speed Reference (OL□□10). Set the value as a percentage of the Speed Reference. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000	–
OL□□1E	Positioning Completed Width	Set the width in which to turn ON the Positioning Completed bit (IB□□0C1).	–

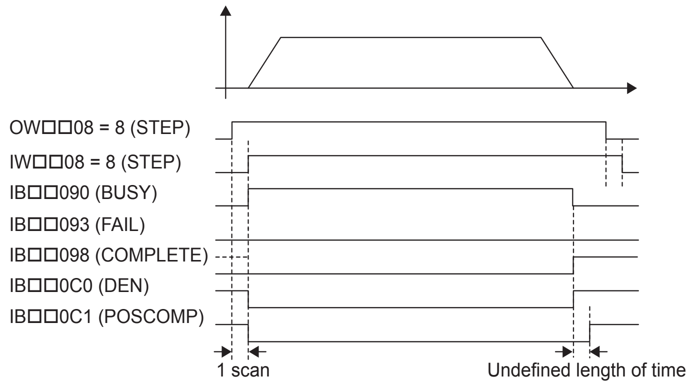
OL□□20	Positioning Completed Width 2	Set the range in which the Position Proximity bit (IB□□0C3) will turn ON. The Position Proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	–
OL□□36	Linear Acceleration Time	Set the rate of acceleration or acceleration time constant for positioning.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time constant for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in the Function 1 (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R
OL□□44	Step Distance	Set the moving amount for STEP operation.	–

[b] Monitoring Parameters

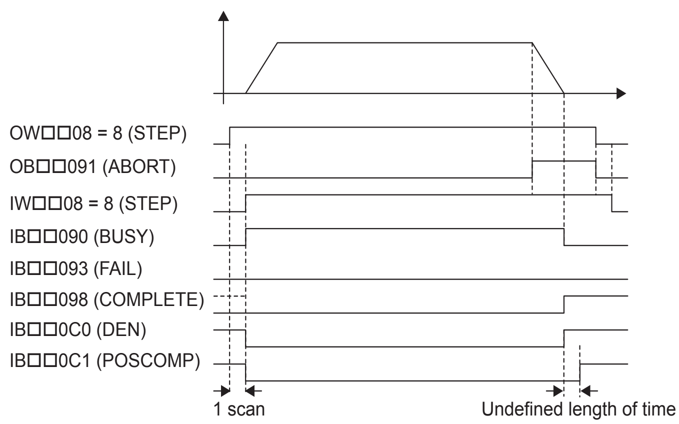
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 8 during STEP command execution.	R
IB□□090	Command Executing	The Command Executing bit will turn ON during STEP command execution and then turn OFF when STEP command execution has been completed.	R
IB□□091	Command Hold Completed	Turns ON when a deceleration to a stop has been completed as the result of setting the Command Pause (OB□□090) bit to 1 during STEP command execution (IW□□08 = 8).	R
IB□□093	Command Error End	Turns ON if an error occurs during STEP command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Turns ON when STEP command execution has been completed.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width. OFF in all other cases.	R
IB□□0C3	Position Proximity	The operation depends on the setting of the Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Proximity Setting even if pulse distribution has not been completed. OFF in all other cases.	R

(5) Timing Charts

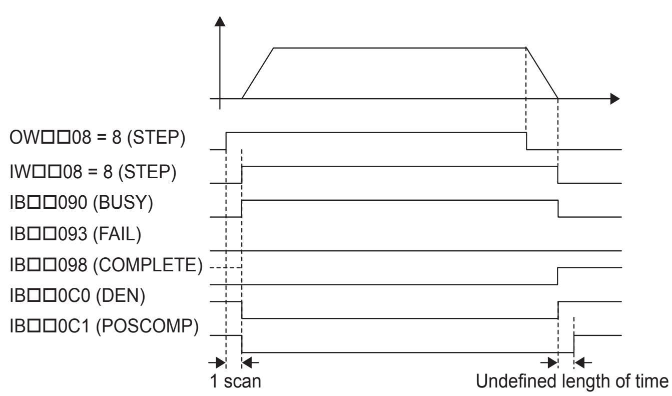
[a] Normal Execution



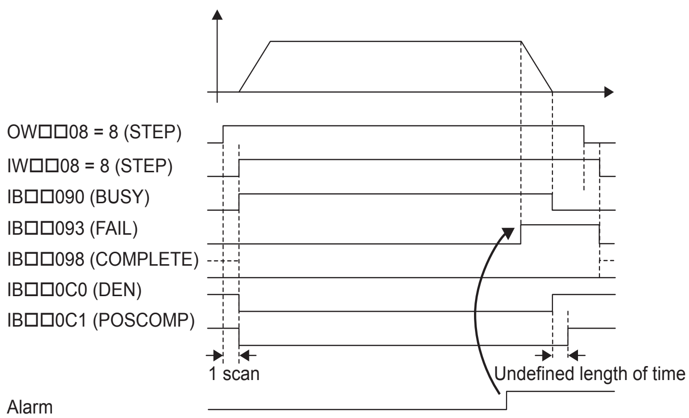
[b] Execution when Aborted



[c] Execution when Aborting by Changing the Command



[d] Execution when an Alarm Occurs



7.2.8 Zero Point Setting (ZSET) R

The ZSET command sets the current position as the zero point of the machine coordinate system. This enables setting the zero point without performing a zero point return operation.

- When using software limits, always execute the zero point or zero point return operation. The software limit function will be enabled after the zero point setting operation has been completed.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 9 to execute the ZSET motion command.

A new machine coordinate system will be established with the current position as the zero point. IW□□08 will be 9 during the zero point setting operation. IB□□0C5 will turn ON when zero point setting has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the zero point setting.

(2) Holding and Aborting

The Command Pause bit (OB☐☐090) and the Command Abort bit (OB☐☐091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

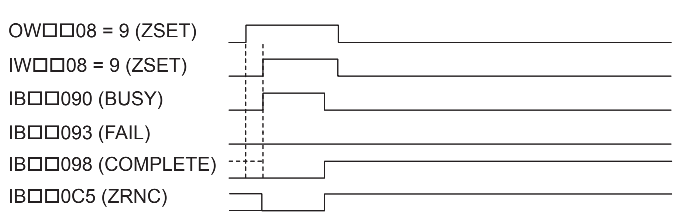
Parameter	Name	Setting	SVR
OW☐☐08	Motion Command	Set to 9 for ZSET command.	R
OB☐☐090	Command Pause	This parameter is ignored for ZSET command.	R
OB☐☐091	Command Abort	This parameter is ignored for ZSET command.	R
OL☐☐48	Zero Point Offset	Sets the position offset from the zero point in the machine coordinate system after the setting of the zero point has been completed.	R

[b] Monitoring Parameters

Parameter	Name	Monitor Contents	SVR
IL☐☐02	Warning	Stores the most current warning.	R
IL☐☐04	Alarm	Stores the most current alarm.	R
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 9 during ZSET command execution.	R
IB☐☐090	Command Executing	Turns ON during ZSET command execution and turns OFF when ZSET command execution has been completed.	R
IB☐☐091	Command Hold Completed	Always OFF for ZSET command.	R
IB☐☐093	Command Error End	Turns ON if an error occurs during ZSET command execution. Turns OFF when another command is executed.	R
IB☐☐098	Command Execution Completed	Turns ON when ZSET command execution has been completed.	R
IB☐☐0C5	Zero Point Return (Setting) Completed	Turns ON when the setting of the zero point has been completed.	R

(4) Timing Charts

[a] Normal Execution



7.2.9 Change Linear Acceleration Time Constant (ACC)

The ACC command transfers the setting of the Linear Acceleration Time (motion setting parameter OL□□36) to the Second-step Linear Acceleration Time Constant in the SERVOPACK and enables the setting.

- For the SGD-□□□N and SGDB-□□AN SERVOPACKs, the deceleration time constant will be the same as the acceleration time constant.
- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the ACC command with this function. For details, refer to bit A (User Constants Self-writing Function) in the *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Pulse distribution has been completed for the SERVOPACK.	IB□□0C0 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 10 to execute the ACC motion command.

The ACC command will transfer the setting of the Linear Acceleration Time (motion setting parameter OL□□36) to the Second-step Linear Acceleration Time Constant in the SERVOPACK and enable the setting.
IW□□08 will be 10 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the linear acceleration time constant.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

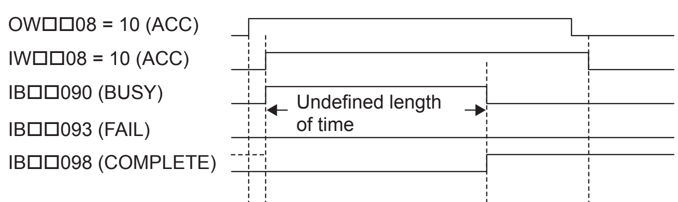
Parameter	Name	Setting
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.
OW□□08	Motion Command	The linear acceleration time constant is changed when this parameter is set to 10.
OB□□090	Command Pause	This parameter is ignored for ACC command.
OB□□091	Command Abort	This parameter is ignored for ACC command.
OL□□36	Linear Acceleration Time	Set the acceleration time for feeding as the acceleration time.

[b] Monitoring Parameters

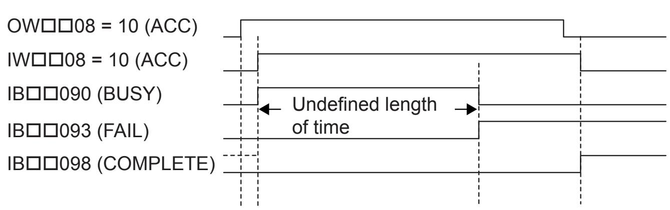
Parameter	Name	Monitor Contents
IL☐☐02	Warning	Stores the most current warning.
IL☐☐04	Alarm	Stores the most current alarm.
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 10 during ACC command execution.
IB☐☐090	Command Executing	Turns ON during ACC command execution and turns OFF when execution has been completed.
IB☐☐091	Command Hold Completed	Always OFF for ACC command.
IB☐☐093	Command Error End	Turns ON if an error occurs during ACC command execution. Turns OFF when another command is executed.
IB☐☐098	Command Execution Completed	Turns ON when ACC command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.10 Change Linear Deceleration Time Constant (DCC)

The DCC command transfers the setting of the Linear Deceleration Time (motion setting parameter OL□□38) to the Second-step Linear Deceleration Time Constant in the SERVOPACK and enables the setting.

- For the SGD-□□□N and SGDB SERVOPACKs, this command cannot be used because these SERVOPACKs does not have the parameters for setting the deceleration time constant.
- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the DCC command with this function. For details, refer to bit A (User Constants Self-writing Function) in the *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Pulse distribution has been completed for the SERVOPACK.	IB□□0C0 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 11 to execute the DCC motion command.

The DCC command will transfer the setting of the Linear Deceleration Time (motion setting parameter OL□□38) to the Second-step Linear Deceleration Time Constant in the SERVOPACK and enables the setting.
IW□□08 will be 11 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the processing has been completed.

3. Set OWxx08 to 0 to execute the NOP motion command and then complete the change of the linear deceleration time constant.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

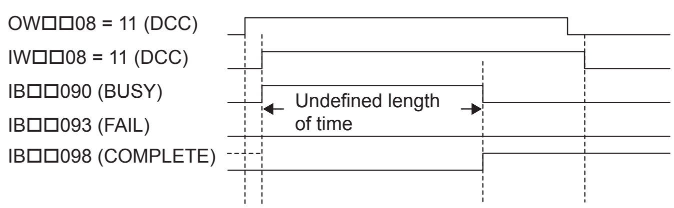
Parameter	Name	Setting
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.
OW□□08	Motion Command	The linear deceleration time constant is changed when this parameter is set to 11.
OB□□090	Command Pause	This parameter is ignored for DCC command.
OB□□091	Command Abort	This parameter is ignored for DCC command.
OL□□38	Linear Deceleration Time	Set the deceleration for feeding as the deceleration time.

[b] Monitoring Parameters

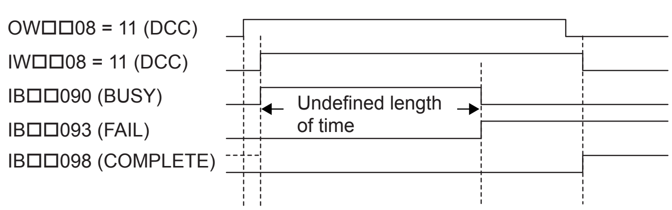
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 11 during DCC command execution.
IB□□090	Command Executing	Turns ON during DCC command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for DCC command.
IB□□093	Command Error End	Turns ON if an error occurs during DCC command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when DCC command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.11 Change Filter Time Constant (SCC)

The SCC command transfers the setting of the S-Curve Acceleration Time (motion setting parameter OW□□3A) to the Moving Average Time in the SERVOPACK and enables the setting.

- Always execute the CHG_FILTER command before executing the SCC command.
- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the SCC command with this function. For details, refer to bit A (User Constants Self-Writing Function) in *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Pulse distribution has been completed for the SERVOPACK.	IB□□0C0 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 12 to execute the SCC motion command.

The SCC command will transfer the setting of the S-Curve Acceleration Time (motion setting parameter OW□□3A) to the Moving Average Time in the SERVOPACK and enables the setting.
IW□□08 will be 12 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the linear deceleration time constant.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

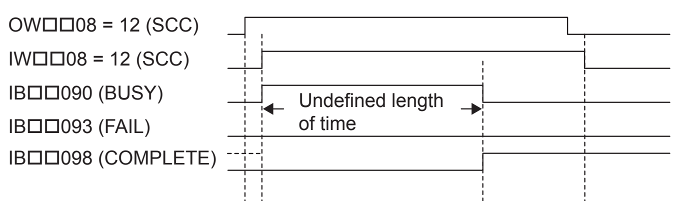
Parameter	Name	Setting
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.
OW□□08	Motion Command	The filter time constant is changed when this parameter is set to 12.
OB□□090	Command Pause	This parameter is ignored for SCC command.
OB□□091	Command Abort	This parameter is ignored for SCC command.
OW□□3A	S-Curve Acceleration Time	Set the filter time constant for acceleration/deceleration.

[b] Monitoring Parameters

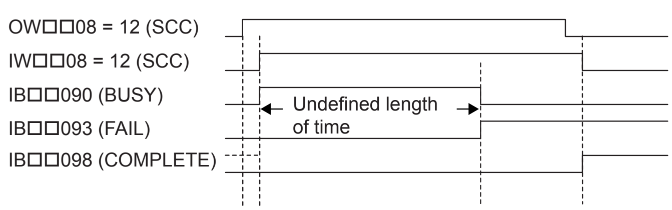
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 12 during SCC command execution.
IB□□090	Command Executing	Turns ON during SCC command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for SCC command.
IB□□093	Command Error End	Turns ON if an error occurs during SCC command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when SCC command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.12 Change Filter Type (CHG_FILTER)

The CHG_FILTER command enables the current setting of the Filter Type (motion setting parameter OW□□03) for execution of the following motion commands with the movement: POSING, EX_POSING, ZRET, INTERPOLATE, LATCH, FEED, and STEP.

- Always execute the CHG_FILTER command after changing the setting of OW□□03.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Pulse distribution has been completed for the SERVOPACK.	IB□□0C0 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 13 to execute the CHG_FILTER motion command.

The Filter Type (motion setting parameter OW□□03) will be enabled.
IW□□08 will be 13 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the filter type.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

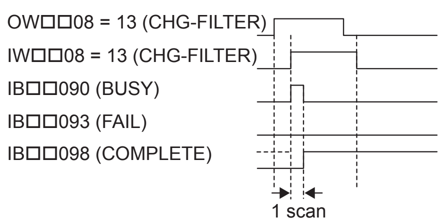
Parameter	Name	Setting
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.
OW□□08	Motion Command	The filter type is changed when this parameter is set to 13.
OB□□090	Command Pause	This parameter is ignored for CHG_FILTER command.
OB□□091	Command Abort	This parameter is ignored for CHG_FILTER command.

[b] Monitoring Parameters

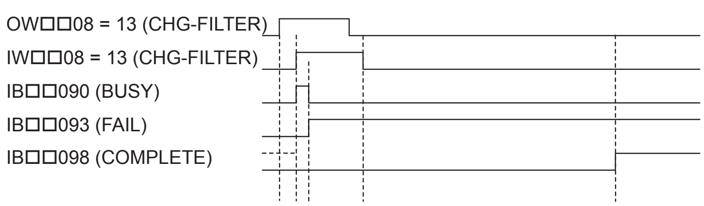
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 13 during CHG_FILTER command execution.
IB□□090	Command Executing	Turns ON during CHG_FILTER command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for CHG_FILTER command.
IB□□093	Command Error End	Turns ON if an error occurs during CHG_FILTER command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when CHG_FILTER command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.13 Change Speed Loop Gain (KVS)

The KVS command transfers the setting of the Speed Loop Gain (motion setting parameter OW□□2F) to the Speed Loop Gain in the SERVOPACK and enables the setting.

- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the KVS command with this function. For details, refer to bit A (User Constants Self-Writing Function) in *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 14 to execute the KVS motion command.

The KVS command will transfer the setting of the Speed Loop Gain (motion setting parameter OW□□2F) to the Speed Loop Gain in the SERVOPACK and enables the setting.
IW□□08 will be 14 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the speed loop gain.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

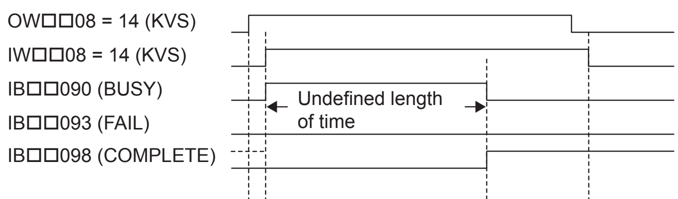
Parameter	Name	Setting
OW□□08	Motion Command	The speed loop gain is changed when this parameter is set to 14.
OB□□090	Command Pause	This parameter is ignored for KVS command.
OB□□091	Command Abort	This parameter is ignored for KVS command.
OW□□2F	Speed Loop Gain	Set the gain for the SERVOPACK speed control loop.

[b] Monitoring Parameters

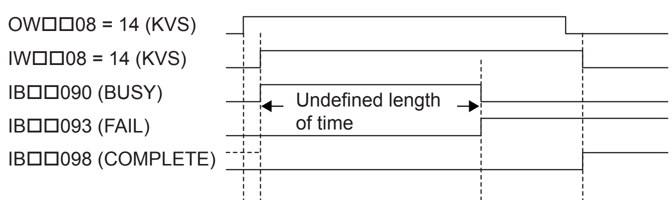
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 14 during KVS command execution.
IB□□090	Command Executing	Turns ON during KVS command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for KVS command.
IB□□093	Command Error End	Turns ON if an error occurs during KVS command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when KVS command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.14 Change Position Loop Gain (KPS)

The KPS command transfers the setting of the Position Loop Gain (motion setting parameter OW☐☐2E) to the Position Loop Gain in the SERVOPACK and enables the setting.

- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the KPS command with this function. For details, refer to bit A (User Constants Self-Writing Function) in *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL☐☐02 and IL☐☐04 are 0.
2	Motion command execution has been completed.	IW☐☐08 is 0 and IB☐☐090 is OFF.

2. Set OW☐☐08 to 15 to execute the KPS motion command.

The KPS command will transfer the setting of the Position Loop Gain (motion setting parameter OW☐☐2E) to the Position Loop Gain in the SERVOPACK and enables the setting.
IW☐☐08 will be 15 during command execution.
IB☐☐090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW☐☐08 to 0 to execute the NOP motion command to change the position loop gain.

(2) Holding and Aborting

The Command Pause bit (OB☐☐090) and the Command Abort bit (OB☐☐091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

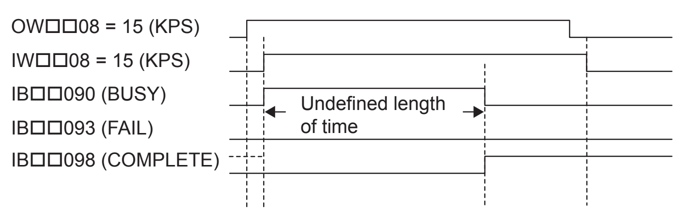
Parameter	Name	Setting
OW☐☐08	Motion Command	The position loop gain is changed when this parameter is set to 15.
OB☐☐090	Command Pause	This parameter is ignored for KPS command.
OB☐☐091	Command Abort	This parameter is ignored for KPS command.
OW☐☐2E	Position Loop Gain	Set the gain for the SERVOPACK position control loop.

[b] Monitoring Parameters

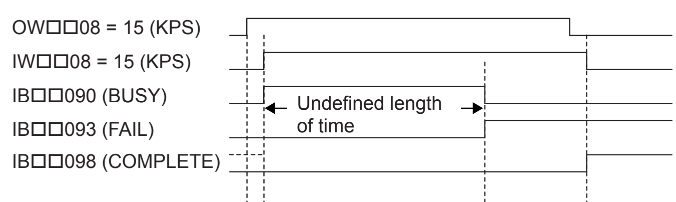
Parameter	Name	Monitor Contents
IL☐☐02	Warning	Stores the most current warning.
IL☐☐04	Alarm	Stores the most current alarm.
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code is 15 during KPS command execution.
IB☐☐090	Command Executing	Turns ON during KPS command execution and turns OFF when execution has been completed.
IB☐☐091	Command Hold Completed	Always OFF for KPS command.
IB☐☐093	Command Error End	Turns ON if an error occurs during KPS command execution. Turns OFF when another command is executed.
IB☐☐098	Command Execution Completed	Turns ON when KPS command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.15 Change Feed Forward (KFS)

The KFS command transfers the setting of the Speed Feed Forward Compensation (motion setting parameter OW□□30) to the Feed Forward in the SERVOPACK and enables the setting.

- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the KFS command with this function. For details, refer to bit A (User Constants Self-Writing Function) in *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 16 to execute the KFS motion command.

The KFS command will transfer the setting of the Speed Feed Forward Compensation (motion setting parameter OW□□30) to the Feed Forward in the SERVOPACK and enables the setting.
IW□□08 will be 16 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the feed forward.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

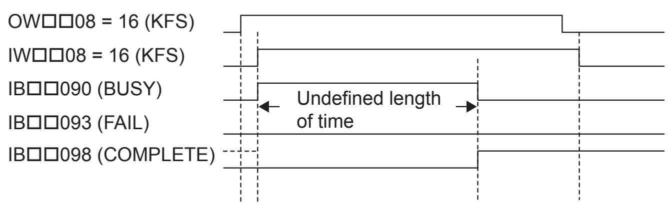
Parameter	Name	Setting
OW□□08	Motion Command	The feed forward value is changed when this parameter is set to 16.
OB□□090	Command Pause	This parameter is ignored for KFS command.
OB□□091	Command Abort	This parameter is ignored for KFS command.
OW□□30	Speed Feed Forward Compensation	Set the amount of Servo feed forward (%).

[b] Monitoring Parameters

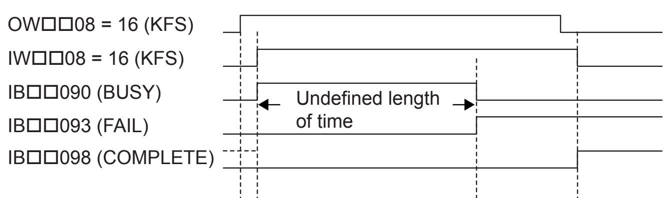
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 16 during KFS command execution.
IB□□090	Command Executing	Turns ON during KFS command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for KFS command.
IB□□093	Command Error End	Turns ON if an error occurs during KFS command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when KFS command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.16 Read SERVOPACK Parameter (PRM_RD)

The PRM_RD command reads the setting of the SERVOPACK parameter with the specified parameter number and parameter size. It stores the parameter number in Servo Constant Number (monitoring parameter IW☐☐36) and the setting in Servo User Constant (monitoring parameter IL☐☐38).

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL☐☐02 and IL☐☐04 are 0.
2	Motion command execution has been completed.	IW☐☐08 is 0 and IB☐☐090 is OFF.

2. Set OW☐☐08 to 17 to execute the PRM_RD motion command.

The PRM_RD command will store the specified parameter number in the Servo Constant Number (monitoring parameter IW☐☐36) and the parameter setting in Servo User Constant (monitoring parameter IL☐☐38).
IW☐☐08 will be 17 during command execution.
IB☐☐090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW☐☐08 to 0 to execute the NOP motion command and then complete the reading operation.

(2) Holding and Aborting

The Command Pause bit (OB☐☐090) and the Command Abort bit (OB☐☐091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

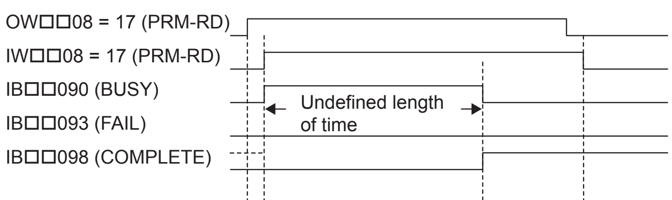
Parameter	Name	Setting
OW☐☐08	Motion Command	The SERVOPACK parameter is read when this parameter is set to 17.
OB☐☐090	Command Pause	This parameter is ignored for PRM_RD command.
OB☐☐091	Command Abort	This parameter is ignored for PRM_RD command.
OW☐☐50	Servo Constant Number	Set the number of the SERVOPACK parameter to be read.
OW☐☐51	Servo Constant Number Size	Set the size of the SERVOPACK parameter to be read. Set the size as the number of words. Example: For 4 bytes, set "2."

[b] Monitoring Parameters

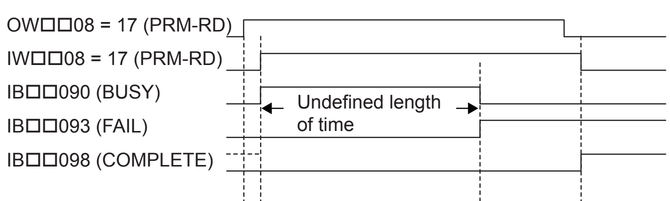
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 17 during PRM_RD command execution.
IB□□090	Command Executing	Turns ON during PRM_RD command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for PRM_RD command.
IB□□093	Command Error End	Turns ON if an error occurs during PRM_RD command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when PRM_RD command execution has been completed.
IW□□36	Servo Constant Number	Stores the number of the SERVOPACK parameter that was read.
IL□□38	Servo User Constant	Stores the data of the SERVOPACK parameter that was read.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.17 Write SERVOPACK Parameter (PRM_WR)

The PRM_WR command writes the setting value the relevant SERVOPACK parameter using the specified SERVOPACK parameter number, parameter size, and setting data.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL☐☐02 and IL☐☐04 are 0.
2	Motion command execution has been completed.	IW☐☐08 is 0 and IB☐☐090 is OFF.

2. Set OW☐☐08 to 18 to execute the PRM_WR motion command.

The SERVOPACK parameter will be written.
IW☐☐08 will be 18 during command execution.
IB☐☐090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW☐☐08 to 0 to execute the NOP motion command and then complete the writing operation.

(2) Holding and Aborting

The Command Pause bit (OB☐☐090) and the Command Abort bit (OB☐☐091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

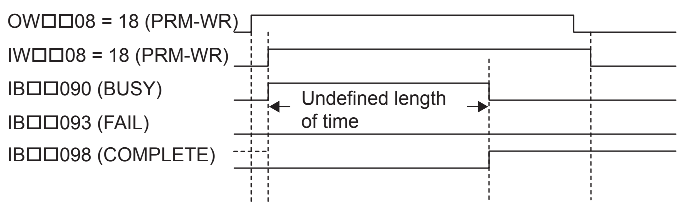
Parameter	Name	Setting
OW☐☐08	Motion Command	The SERVOPACK parameter is written when this parameter is set to 18.
OB☐☐090	Command Pause	This parameter is ignored for PRM_WR command.
OB☐☐091	Command Abort	This parameter is ignored for PRM_WR command.
OW☐☐50	Servo Constant Number	Set the number of the SERVOPACK parameter to be written.
OW☐☐51	Servo Constant Size	Set the size of the SERVOPACK parameter to be written. Set the size as the number of words. Example: For 4 bytes, set "2."
OL☐☐52	Servo User Constant	Set the data to be set to the SERVOPACK parameter to be written.

[b] Monitoring Parameters

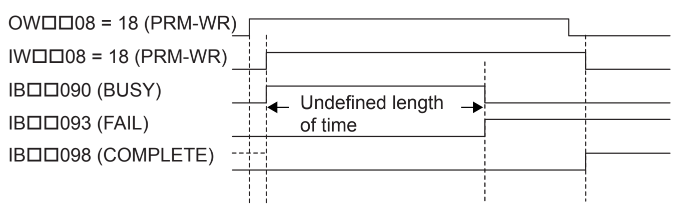
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 18 during PRM_WR command execution.
IB□□090	Command Executing	Turns ON during PRM_WR command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for PRM_WR command.
IB□□093	Command Error End	Turns ON if an error occurs during PRM_WR command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when PRM_WR command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.18 Monitor SERVOPACK Alarms (ALM_MON)

The ALM_MON command reads the alarm or warning that has occurred in the SERVOPACK and stores it in Servo Alarm Code (monitoring parameter IW☐☐2D).

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion command execution has been completed.	IW☐☐08 is 0 and IB☐☐090 is OFF.

2. Set OW☐☐08 to 19 to execute the ALM_MON motion command.

The ALM_MON command will read the alarm or warning that has occurred in the SERVOPACK and store it in Servo Alarm Code (monitoring parameter IW☐☐2D).
IW☐☐08 will be 19 during command execution.
IB☐☐090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW☐☐08 to 0 to execute the NOP motion command and then complete the monitoring operation.

(2) Holding and Aborting

The Command Pause bit (OB☐☐090) and the Command Abort bit (OB☐☐091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

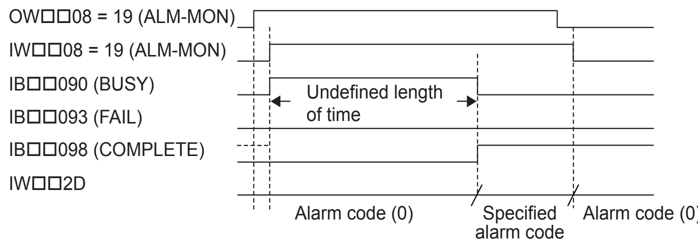
Parameter	Name	Setting
OW☐☐08	Motion Command	Alarms are monitored when this parameter is set to 19.
OB☐☐090	Command Pause	This parameter is ignored for ALM_MON command.
OB☐☐091	Command Abort	This parameter is ignored for ALM_MON command.
OW☐☐4F	Servo Alarm Monitor Number	Set the number of the alarm to be monitored.

[b] Monitoring Parameters

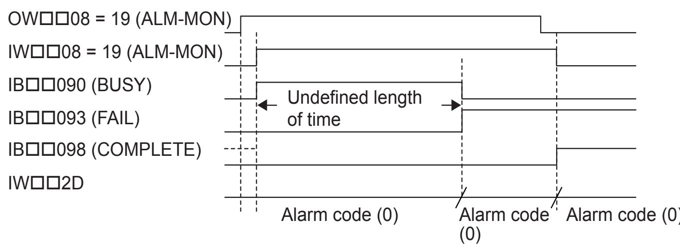
Parameter	Name	Monitor Contents
IL☐☐02	Warning	Stores the most current warning.
IL☐☐04	Alarm	Stores the most current alarm.
IW☐☐08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 19 during ALM_MON command execution.
IB☐☐090	Command Executing	Turns ON during ALM_MON command execution and turns OFF when execution has been completed.
IB☐☐091	Command Hold Completed	Always OFF for ALM_MON command.
IB☐☐093	Command Error End	Turns ON if an error occurs during ALM_MON command execution. Turns OFF when another command is executed.
IB☐☐098	Command Execution Completed	Turns ON when ALM_MON command execution has been completed.
IW☐☐2D	Servo Alarm Code	Stores the SERVOPACK alarm or warning code that was read.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.19 Monitor SERVOPACK Alarm History (ALM_HIST)

The ALM_HIST command reads the alarm history that is stored in the SERVOPACK and stores it in Servo Alarm Code (monitoring parameter IW□□2D).

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 20 to execute the ALM_HIST motion command.

The ALM_HIST command will read the alarm history that is stored in the SERVOPACK and store it in Servo Alarm Code (monitoring parameter IW□□2D).
IW□□08 will be 20 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the monitoring operation.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

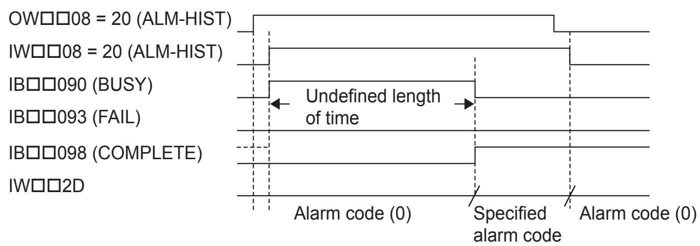
Parameter	Name	Setting
OW□□08	Motion Command	The alarm history is monitored when this parameter is set to 20.
OB□□090	Command Pause	This parameter is ignored for ALM_HIST command.
OB□□091	Command Abort	This parameter is ignored for ALM_HIST command.
OW□□4F	Servo Alarm Monitor Number	Set the number of the alarm to be monitored.

[b] Monitoring Parameters

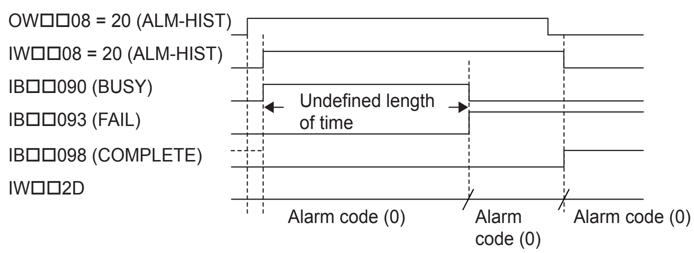
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 20 during ALM_HIST command execution.
IB□□090	Command Executing	Turns ON during ALM_HIST command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for ALM_HIST command.
IB□□093	Command Error End	Turns ON if an error occurs during ALM_HIST command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when ALM_HIST command execution has been completed.
IW□□2D	Servo Alarm Code	Stores the SERVOPACK alarm code that was read.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.20 Clear SERVOPACK Alarm History (ALMHIST_CLR)

The ALMHIST_CLR command clears the alarm history in the SERVOPACK.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 21 to execute the ALMHIST_CLR motion command.

The ALMHIST_CLR command will clear the alarm history stored in the SERVOPACK.
IW□□08 will be 21 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then clear the alarm history.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

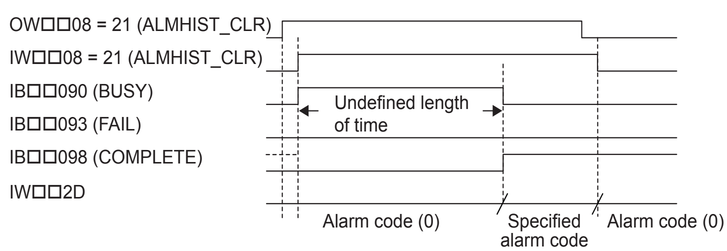
Parameter	Name	Setting
OW□□08	Motion Command	The alarm history is cleared when this parameter is set to 21.
OB□□090	Command Pause	This parameter is ignored for ALMHIST_CLR command.
OB□□091	Command Abort	This parameter is ignored for ALMHIST_CLR command.

[b] Monitoring Parameters

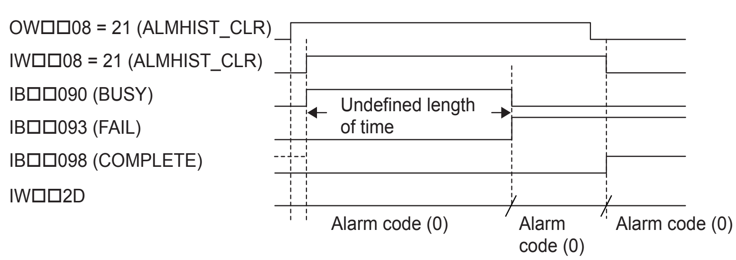
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 21 during ALMHIST_CLR command execution.
IB□□090	Command Executing	Turns ON during ALMHIST_CLR command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for ALMHIST_CLR command.
IB□□093	Command Error End	Turns ON if an error occurs during ALMHIST_CLR command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when ALMHIST_CLR command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.21 Reset Absolute Encoder (ABS_RST)

The ABS_RST command resets the multiturn data in the absolute encoder to 0. If an Encoder Backup Alarm (A.810) or Encoder Checksum Alarm (A.820) occurs when the ABS_RST command is executed, the encoder will be reset.
The ABS_RST command can be executed to reset the multiturn data in the absolute encoder to 0 when these alarms occur or when the machine is being used for the first time.

- The ABS_RST command is valid for Σ-II and Σ-III Series SERVOPACKs. A command error will occur if the ABS_RST command is executed for a Σ Series SERVOPACK. A command error will also occur if the ABS_RST command is executed when an incremental encoder is being used (even if it is being used as an absolute encoder).

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Communication with the SERVOPACK must be synchronized.	IB□□000 is ON.
2	The Servo OFF condition.	IB□□001 is OFF.
3	Motion command execution has been completed.	IW□□08 is 0, and IB□□090 is OFF.

2. Set OW□□08 to 22 to execute the ABS_RST motion command.

The ABS_RST command will clear any alarms that have occurred and resets the multiturn data in the absolute encoder to 0.
IW□□08 will be 22 and IBxx090 will turn ON during command processing.
IB□□090, IB□□093, and IB□□000 will turn OFF and IB□□097 will turn ON when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command to initialize the absolute encoder.

- When the absolute encoder has been reset, communication will be disconnected between the Machine Controller and the SERVOPACK. The zero point setting completed and zero point return completed status will thus be cleared. Use the Clear Alarm bit (0B□□00F) after executing the ABS_RST command, re-establish communication, and then execute the ZRET or ZSET command.
- If the ABS_RST command is executed while an A.81 alarm occurs, the alarm clear operation will have to be performed twice before communication can be synchronized again.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.
Processing will be canceled if a communication error occurs while the command is being executed and a command error end will occur.

(3) Related Parameters

[a] Setting Parameters

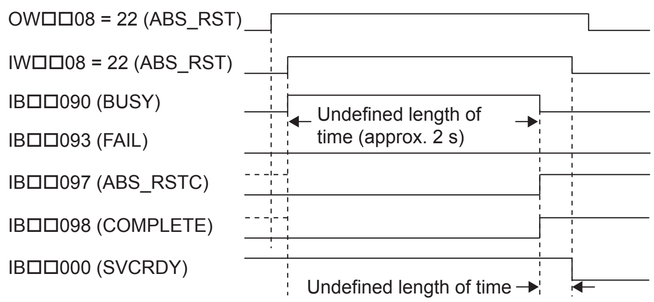
Parameter	Name	Setting
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor; 0: Power OFF to Servomotor Turn OFF the power before setting the Motion Command (OW□□08) to 22.
OW□□08	Motion Command	Starts resetting the absolute encoder when this parameter is set to 22. Even if this parameter is set to 0 during command processing, it will be ignored and execution will be continued.
OB□□090	Command Pause	This parameter is ignored for the ABS_RST command.
OB□□091	Command Abort	This parameter is ignored for the ABS_RST command.

[b] Monitoring Parameters

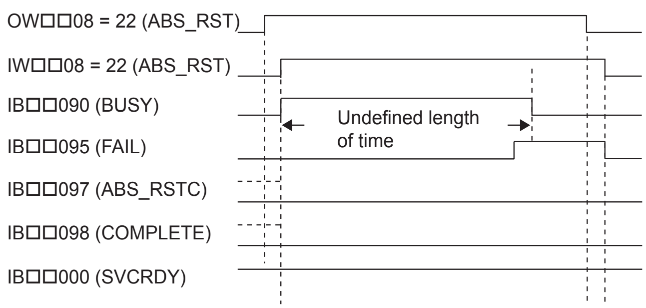
Parameter	Name	Monitor Contents
IB□□000	Motion Controller Operation Ready	Indicates the communication status between the Machine Controller and SERVOPACK. ON: Communication synchronized, OFF: Communication disconnected
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 22 during ABS_RST command execution.
IB□□090	Command Executing	Turns ON during ABS_RST command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for the ABS_RST command.
IB□□093	Command Error Occurrence	Turns ON if an error, such as a communication error, occurs during ABS_RST command execution. Command execution will be canceled.
IB□□097	Absolute Encoder Reset Completed	Turns ON when resetting the absolute encoder has been completed.
IB□□098	Command Execution Completed	Turns ON when ABS_RST command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.2.22 Speed Reference (VELO) R

With the MECHATROLINK-II, the VELO command is used to operate the SERVOPACK in the speed control mode for the same type of operation as when using the analog speed reference input of the SERVOPACK.

- The VELO command is stipulated in MECHATROLINK-II command specifications and cannot be used for MECHATROLINK-I.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Speed Reference setting: OL□□10
Torque Limit setting: OL□□14
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01

- The speed reference bit OL□□10 can be changed during operation.
- An override of between 0% to 327.67% can be set for the reference speed.

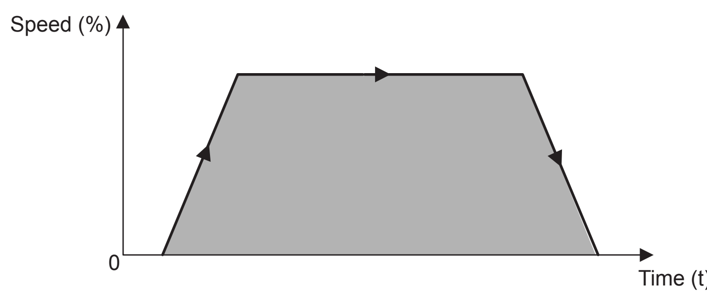
3. Set OW□□08 to 23 to execute the VELO motion command.

The control mode in the SERVOPACK will be switched to speed control.
IW□□08 will be 23 during command execution.

- This command can be executed even when the Servo is OFF.
- Position management using the position feedback is possible during operation with speed control mode.

4. Execute another motion command to cancel the speed control mode.

VELO Operating Pattern



(2) Holding

Holding execution is not possible during VELO command operation. The Command Pause bit (OB□□090) is ignored.

(3) Aborting

The speed control mode can be canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop. The abort processing will be completed when the axis has decelerated to a stop.
- The speed control mode operation will restart if the Command Abort bit (OB□□091) is reset to 0 during abort processing.
- This type of operation will also be performed if the motion command is changed during operation with speed control mode.

(4) Related Parameters

[a] Setting Parameters

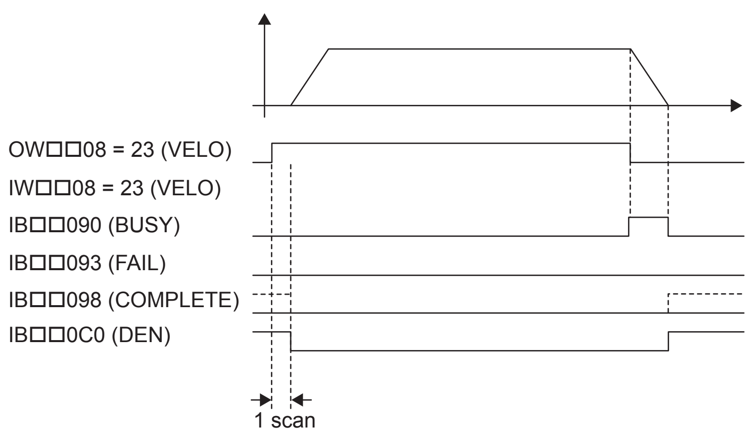
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Moter will start to rotate when this bit is set to 1 under the speed control data mode.	R
OB□□013	Speed Loop P/PI Switch	Switch the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	The mode is changed to speed control mode when this parameter is set to 23.	R
OB□□090	Command Pause	The axis will decelerate to a stop if this bit is set to 1 during speed command operation. The positioning operation will restart if this bit is set to 0 while the command is being held.	R
OB□□091	Command Abort	The axis will decelerate to a stop if this bit is set to 1 during operation.	R
OL□□10	Speed Reference	Specify the speed. This setting can be changed during operation. The unit depends on the setting of the Function 1 (OW□□03).	R
OL□□14	Positive Side Limiting Torque Setting at the Speed Reference	Set the torque limit for the speed reference. The same value is used for both the positive and negative directions.	–
OW□□18	Speed Override	This parameter allows the motor speed to be changed without changing the Speed Reference (OL□□10). Set the speed as a percentage of the Speed Reference Setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% Example: Setting for 50%: 5000	–
OL□□36	Linear Acceleration Time	Set the rate of acceleration or acceleration time for positioning.	R
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in the Function 1 (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

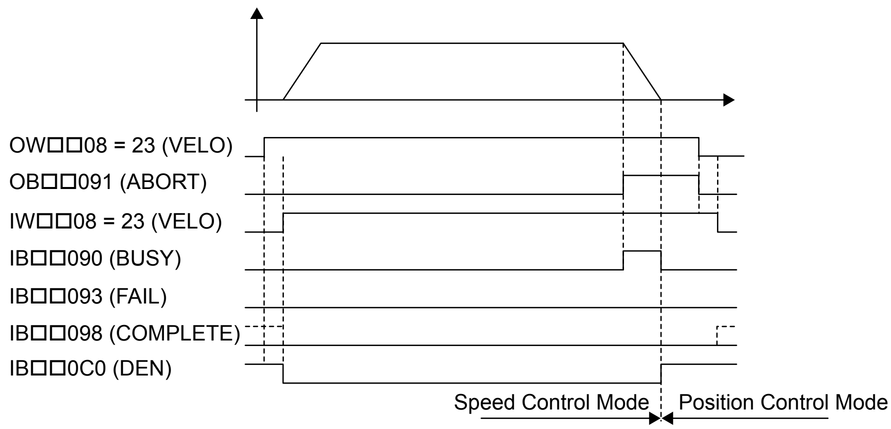
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 23 during VELO command execution.	R
IB□□090	Command Executing	Turns ON when abort processing is being performed for VELO command. Turns OFF when abort processing has been completed.	R
IB□□091	Command Hold Completed	Always OFF for VELO command.	R
IB□□093	Command Error End	Turns ON if an error occurs during VELO command execution. The axis will decelerate to a stop if it is operating. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for VELO command.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the positioning completed width. OFF in all other cases.	R
IB□□0C3	Position Proximity	The operation of this bit depends on the setting of Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Completed Width 2, even if pulse distribution has not been completed. OFF in all other cases.	R

(5) Timing Charts

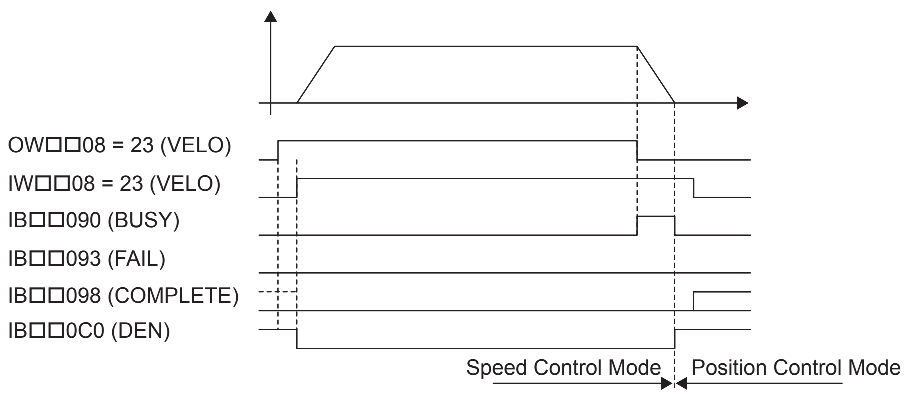
[a] Normal Execution



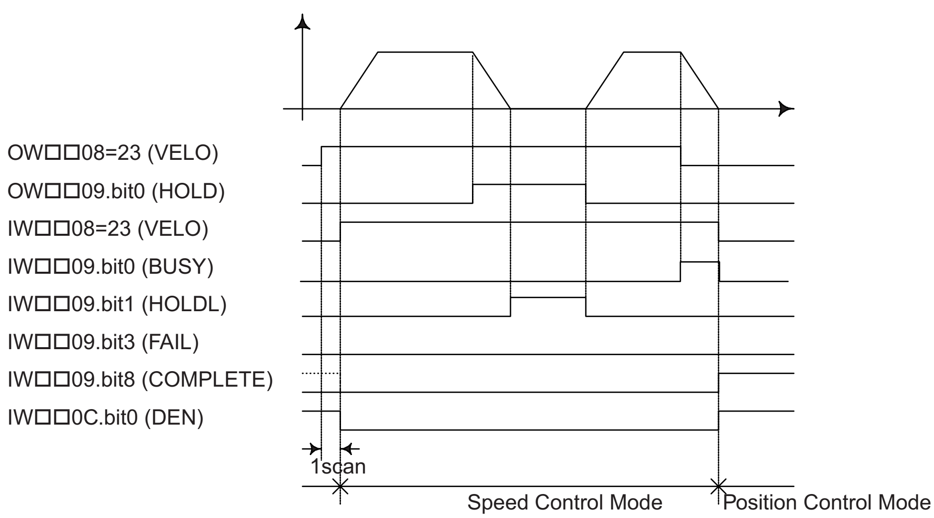
[b] Execution when Aborted



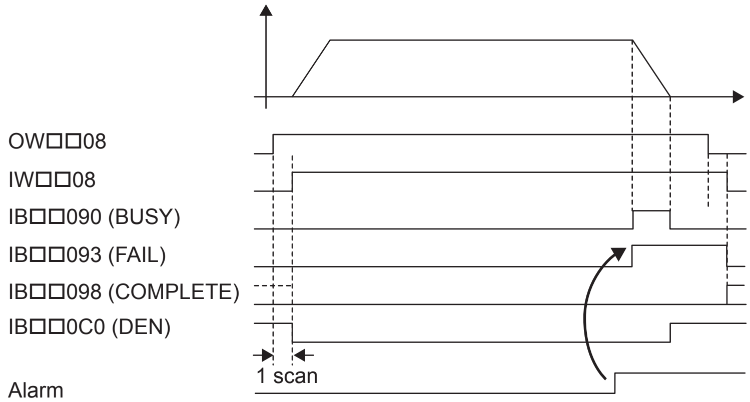
[c] Execution when Aborting by Changing the Command



[d] Command Hold



[e] Execution when an Alarm Occurs



7.2.23 Torque Reference (TRQ) R

With the MECHATROLINK-II, the TRQ command is used to operate the SERVOPACK in the torque control mode for the same type of operation as when using the analog torque reference input of the SERVOPACK.

- The TRQ command is stipulated in MECHATROLINK-II command specifications and cannot be used for MECHATROLINK-I.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Torque/Thrust Reference Setting: OL□□0C
Speed Limit Setting: OL□□0E
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01

- The torque/thrust reference bit OL□□0C can be changed during operation.

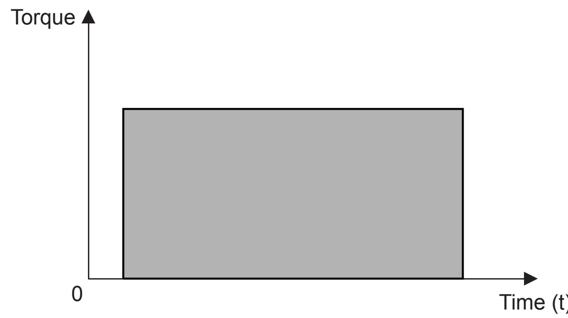
3. Set OW□□08 to 24 to execute the TRQ motion command.

The control mode in the SERVOPACK will be changed to torque control.
IW□□08 will be 24 during command execution.

- This command can be executed even when the Servo is OFF.
- Position management using the position feedback is possible during operation with torque control mode.

4. Execute another motion command to cancel the torque control mode.

TRQ Operating Pattern



(2) Holding

Holding execution is not possible during TRQ command operation. The Command Pause bit (OB□□090) is ignored.

(3) Aborting

The torque control mode can be canceled by aborting execution of a command. A command is aborted by setting the Command Abort bit (OB□□091) to 1.

- Set the Command Abort bit (OB□□091) to 1. The axis will decelerate to a stop. The abort processing will be completed when the axis has decelerated to a stop.
- The torque control mode operation will restart if the Command Abort bit (OB□□091) is reset to 0 during abort processing.
- This type of operation will also be performed if the motion command is changed during operation with torque control mode.

(4) Related Parameters

[a] Setting Parameters

Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turn the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Motor torque will start to rotate when the Servo is turned ON after switching to Torque Control Mode.	R
OB□□013	Speed Loop P/PI Switch	Switch the speed control loop between PI control and P control. 0: PI control, 1: P control	–
OW□□03	Function 1	Set the speed unit, acceleration/deceleration unit, and filter type.	R
OW□□08	Motion Command	The mode is changed to torque control when this parameter is set to 24.	R
OB□□090	Command Pause	The axis will decelerate to a stop if this bit is set to 1 during speed command operation. The positioning operation will restart if this bit is set to 0 while the command is being held.	R
OB□□091	Command Abort	A deceleration stop is performed when this bit set to 1 during operation.	R
OL□□0C	Torque Reference	Set the torque reference. This setting can be changed during operation. The unit depends on the Function 1 (OW□□03).	R
OL□□0E	Speed Limit at Torque Reference	Set the speed limit for torque references. The speed limit is set as a percentage of the rated speed.	–
OL□□38	Linear Deceleration Time	Set the rate of deceleration or deceleration time for positioning.	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/ deceleration or a moving average filter can be selected in the Function 1 (OW□□03). Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

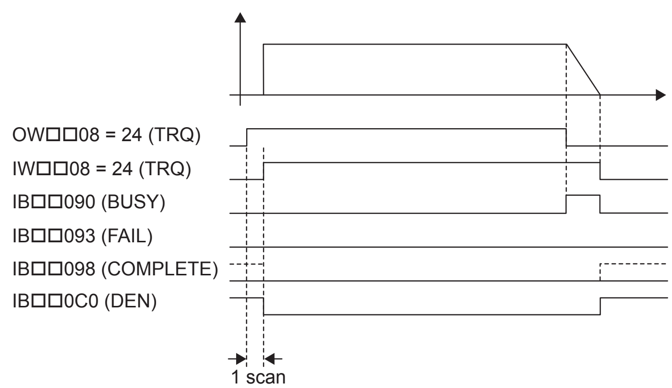
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 24 during TRQ command execution.	R
IB□□090	Command Executing	Turns ON when abort processing is being performed for TRQ command. Turns OFF when abort processing has been completed.	R
IB□□091	Command Hold Completed	Always OFF for TRQ command.	R
IB□□093	Command Error End	Turns ON if an error occurs during TRQ command execution. The axis will decelerate to a stop if it is operating. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for TRQ command.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the positioning completed width. OFF in all other cases.	R

(cont'd)

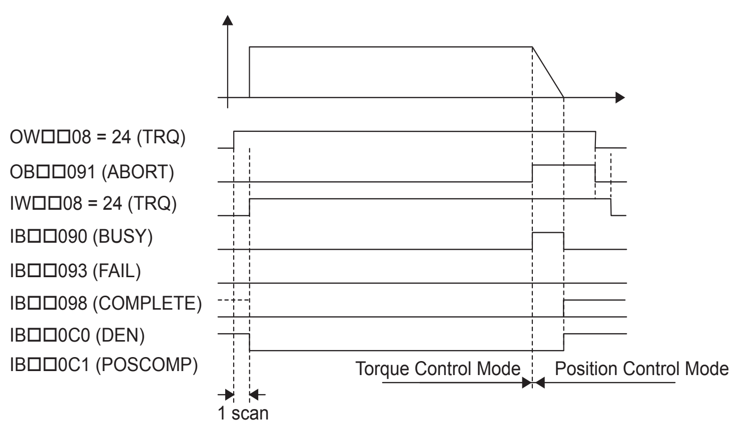
Parameter	Name	Monitor Contents	SVR
IB□□0C3	Position Proximity	The operation of this bit depends on the setting of Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Completed Width 2, even if pulse distribution has not been completed. OFF in all other cases.	R

(5) Timing Charts

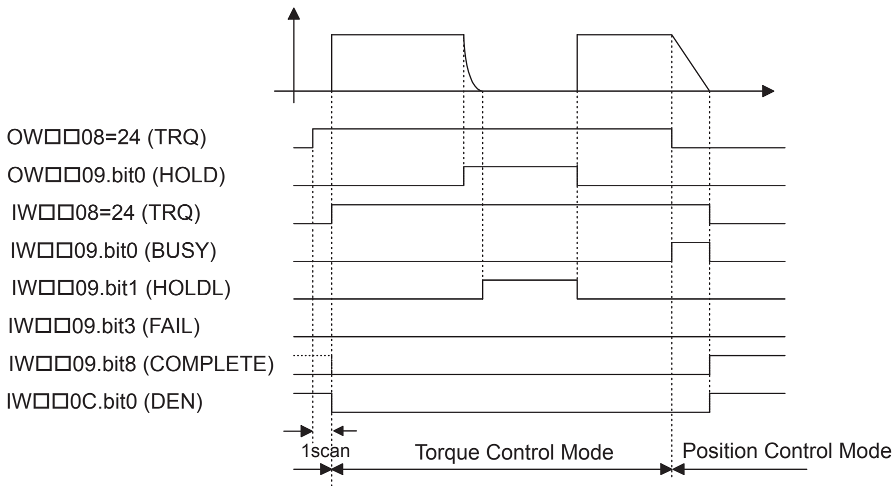
[a] Normal Execution



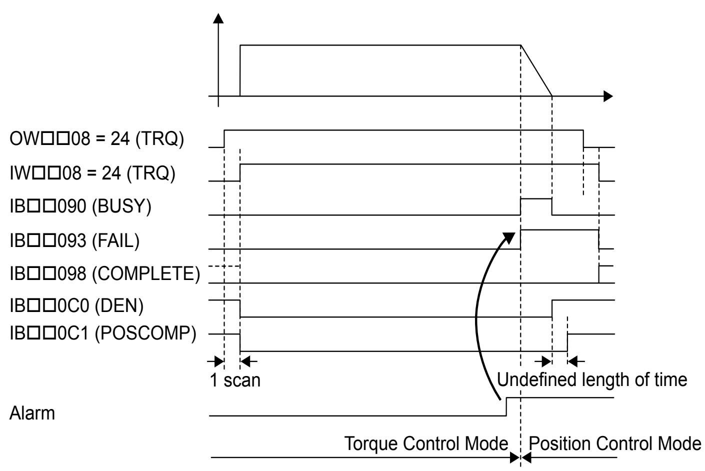
[b] Executed when Aborted



[c] Command Hold



[d] Execution when an Alarm Occurs



7.2.24 Phase References (PHASE) R

The PHASE command is used for the synchronized operation of multiple axes under phase control mode, using the specified speed, phase bias, and speed compensation value.

- Speed feed forward control cannot be used for the SGD-N or SGDB-N SERVOPACK, so the PHASE command cannot be used.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	The Servo ON condition.	IB□□001 is ON.
3	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set the following motion setting parameters.

Speed Reference Setting: OL□□10
Acceleration/Deceleration Filter Type: OW□□03
Speed Loop P/PI Switch: OW□□01
Phase Bias Setting: OL□□28
Speed Amends: OW□□31

- The speed reference bit OL□□10 can be changed during operation.
- Offset in the sync between the axes can be compensated from the Phase Compensation bit 0L□□28.

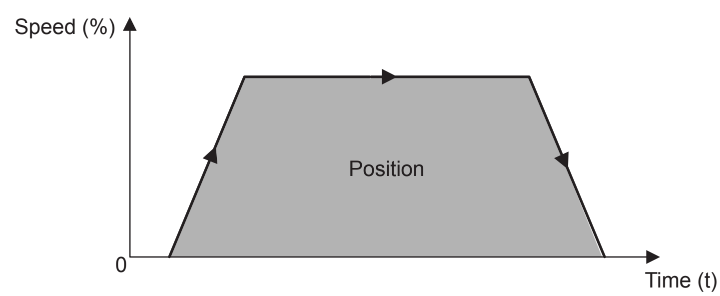
3. Set OW□□08 to 25 to execute the PHASE motion command.

Sync operation using phase control will start.
IW□□08 will be 25 during the execution.

- A command can be executed while the servo is ON.
- Position management using the position feedback is possible during operation with torque control mode.

4. Execute another motion command to cancel the phase control mode.

PHASE Operating Pattern



(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

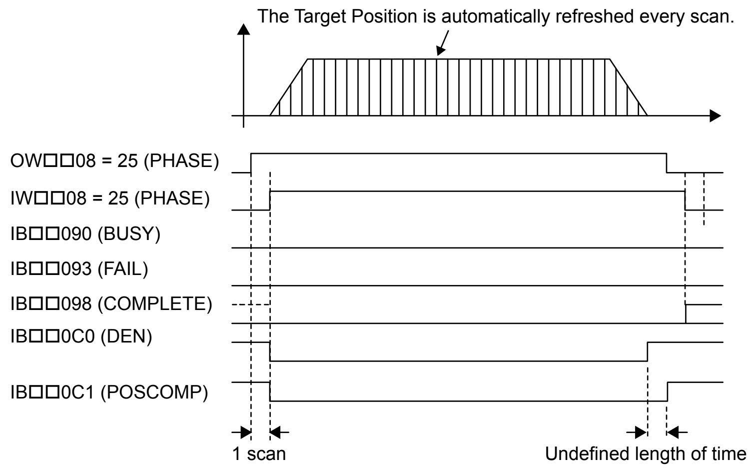
Parameter	Name	Setting	SVR
OB□□000	Servo ON	Turns the power to the Servomotor ON and OFF. 1: Power ON to Servomotor, 0: Power OFF to Servomotor Turn ON the power before setting the Motion Command Code (OW□□08) to 25.	R
OW□□03	Function 1	Sets the speed unit, acceleration/deceleration unit, and filter type.	R
OB□□051	Disable Phase Reference Generation	Disables/enables phase reference generation processing when executing phase reference commands. This parameter enables setting processing appropriate to an electronic shaft or electronic cam. ♦ Enable this processing when an electronic shaft is being used, and disable it when an electronic cam is being used.	–
OW□□08	Motion Command	Phase control operation is started when this parameter is set to 25.	R
OL□□10	Speed Reference	Set the speed reference. The setting can be changed during operation. The unit depends on the Function 1 setting (OW□□03).	R
OL□□16	Secondary Speed Compensation	Set the speed feed forward amount for the Phase Reference command (PHASE). The setting unit for Speed Amends (setting parameter OW□□31) is 0.01% (fixed).The unit for this parameter, however, can be selected by the user. When used at the same time as OW□□31, speed compensation can be performed twice.	R
OL□□28	Phase Compensation	Set the phase compensation in reference units. • Set the number of pulses for phase compensation in pulses when an electronic shaft is being used. • Use the incremental addition mode to calculate the cam pattern target position when an electronic cam is being used.	–
OW□□31	Speed Amends	Set the speed feed forward gain as a percentage of the rated speed. The setting units for this parameter is 0.01% (fixed).	R
OW□□3A	S-Curve Acceleration Time	Set the acceleration/deceleration filter time constant. Exponential acceleration/deceleration or a moving average filter can be selected in OW□□03. Change the setting only after pulse distribution has been completed for the command (IB□□0C0 is ON).	R

[b] Monitoring Parameters

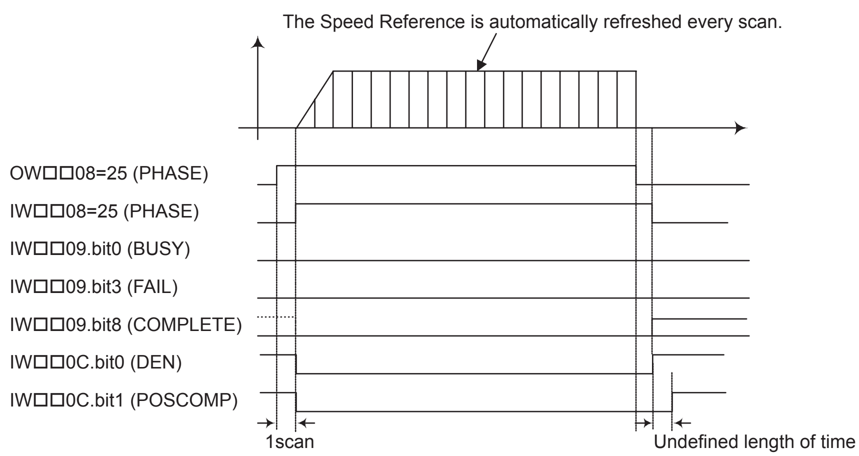
Parameter	Name	Monitor Contents	SVR
IB□□001	Servo ON	Indicates the Servo ON status. ON: Power supplied to Servomotor, OFF: Power not supplied to Servomotor	R
IL□□02	Warning	Stores the most current warning.	R
IL□□04	Alarm	Stores the most current alarm.	R
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 25 during PHASE command execution.	R
IB□□090	Command Executing	Always OFF for PHASE command.	R
IB□□091	Command Hold Completed	Always OFF for PHASE command.	R
IB□□093	Command Error End	Turns ON if an error occurs during PHASE command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.	R
IB□□098	Command Execution Completed	Always OFF for PHASE command.	R
IB□□0C0	Distribution Completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of a move command.	R
IB□□0C1	Positioning Completed	Turns ON when pulse distribution has been completed and the current position is within the positioning completed width. OFF in all other cases.	R
IB□□0C3	Position Proximity	The operation of this bit depends on the setting of Positioning Completed Width 2 (setting parameter OL□□20). OL□□20 = 0: Turns ON when pulse distribution has been completed (DEN = ON). Otherwise, it turns OFF. OL□□20 ≠ 0: Turns ON when the absolute value of the difference between MPOS and APOS is less than the Position Completed Width 2, even if pulse distribution has not been completed. OFF in all other cases.	R

(4) Timing Charts

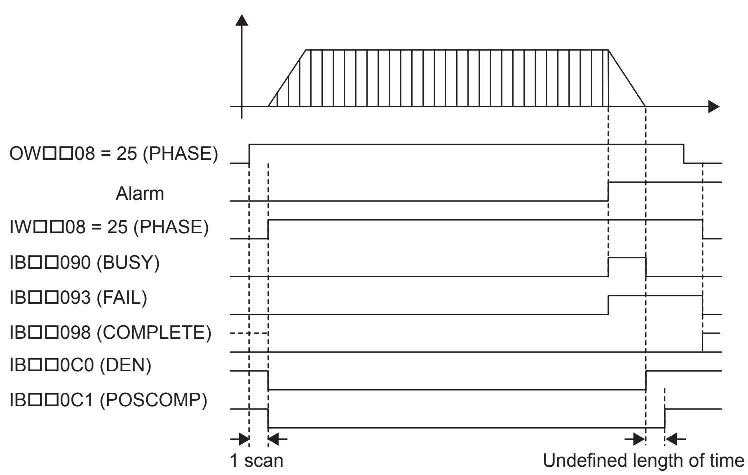
[a] Normal Execution



[b] Execution when Aborted



[c] Execution when an Alarm Occurs



7.2.25 Change Position Loop Integration Time Constant (KIS)

The KIS command transfers the setting of the Position Integration Time Constant (motion setting parameter OW□□32) to the Position Loop Integration Time Constant in the SERVOPACK and enables the setting.

- MECHATROLINK-II has a function that automatically updates setting parameters if a parameter changes. There is no need to execute the KIS command with this function. For details, refer to bit A (User Constants Self-Writing Function) in *6.4.1 (2) Function Selection 1* on page 6-18.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both IL□□02 and IL□□04 are 0.
2	Motion command execution has been completed.	IW□□08 is 0 and IB□□090 is OFF.

2. Set OW□□08 to 26 to execute the KIS motion command.

The KIS command will transfer the setting of the Position Integration Time Constant (motion setting parameter OW□□32) to the Position Loop Integration Time Constant in the SERVOPACK and enables the setting.
IW□□08 will be 26 during command execution.
IB□□090 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□08 to 0 to execute the NOP motion command and then complete the change of the position loop integration time.

(2) Holding and Aborting

The Command Pause bit (OB□□090) and the Command Abort bit (OB□□091) cannot be used.

(3) Related Parameters

[a] Setting Parameters

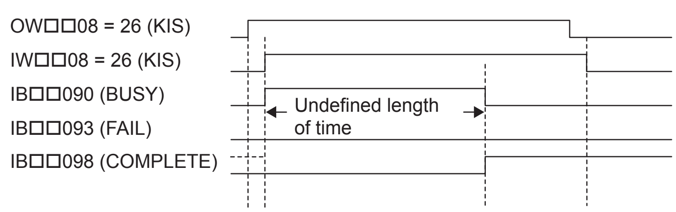
Parameter	Name	Setting
OW□□08	Motion Command	The feed forward is changed when this parameter is set to 26.
OB□□090	Command Pause	This parameter is ignored for KIS command.
OB□□091	Command Abort	This parameter is ignored for KIS command.
OW□□32	Position Integration Time Constant	Set the integration time constant for the position loop in milliseconds.

[b] Monitoring Parameters

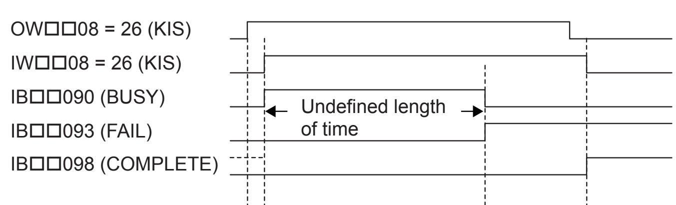
Parameter	Name	Monitor Contents
IL□□02	Warning	Stores the most current warning.
IL□□04	Alarm	Stores the most current alarm.
IW□□08	Servo Command Type Response	Indicates the motion command that is being executed. The response code will be 26 during KIS command execution.
IB□□090	Command Executing	Turns ON during KIS command execution and turns OFF when execution has been completed.
IB□□091	Command Hold Completed	Always OFF for KIS command.
IB□□093	Command Error End	Turns ON if an error occurs during KIS command execution. Turns OFF when another command is executed.
IB□□098	Command Execution Completed	Turns ON when KIS command execution has been completed.

(4) Timing Charts

[a] Normal End



[b] Error End



7.3 Motion Subcommands

7.3.1 Motion Sub-command Table

This table shows the motion subcommands that are supported by the MP2300. Refer to the page in the Table under Details for additional command information.

Command Code		Command	Name	Function	Reference Page
0	R	NOP	No Command	This is a null command. When a subcommand is not being specified, set this "no command" code.	7-96
1	–	PRM_RD	Read SERVOPACK Parameter	Reads the specified SERVOPACK parameter and stores it in the monitoring parameters.	7-97
2	–	PRM_WR	Write SERVOPACK Parameter	Changes the specified SERVOPACK parameter's set value.	7-98
3	–	Reserved	Reserved by system.	–	–
4	–	SMON	Monitor Status	Stores the servo driver's status in the monitoring parameters.	7-100
5	R	FIXPRM_RD	Read Fixed Parameters	Reads the specified fixed parameter's current value and stores it in the monitoring parameters.	7-102

- Commands in the table displaying an R are supported by the Virtual Motion Module (SVR).

7.3.2 Motion Subcommand Settings

It may not be possible to execute some subcommands, depending on the motion command and motion subcommand combination being used. Refer to *Appendix A Switching Motion Commands and Subcommands* on page A-2 for details on which command combinations are allowed.
In addition, some motion subcommands can not be executed with the MECHATROLINK-I and MECHATROLINK-II communication. (See the following table.)

Communication method / Subcommand	MECHATROLINK-I	MECHATROLINK-II (17-byte)	MECHATROLINK-II (32-byte)
No Command (NOP) R	Executable	Executable	Executable
Read SERVOPACK Parameter (PRM_RD)	Not executable	Not executable	Executable
Write SERVOPACK Parameter (PRM_WR)	Not executable	Not executable	Executable
Monitor Status (SMON)	Not executable	Not executable	Executable
Read Fixed Parameters (FIXPRM_RD) R	Executable	Executable	Executable

7.4 Motion Subcommand Details

The following provides a detailed description of the types of motion subcommands that are available.

- All the following command names and items in the Parameter List displaying an R are supported by the Virtual Motion Module (SVR).

7.4.1 No Command (NOP) R

Set this command when a subcommand is not being specified.

When the MECHATROLINK-II 32-byte Mode communication method is being used, User Monitor 4 can be used, just as with the Monitor Status (SMON) subcommand. Refer to *7.4.3 Monitor Status (SMON)* on page 7-100 for details.

(1) Related Parameters

[a] Setting Parameters

Parameter	Name	Setting Contents	SVR
OW□□0A	Motion Subcommand	Set to 0 to specify no command (NOP).	R
OW□□4E	Servo User Monitor	Set the information to manage the servo driver that will be monitored.	–

[b] Monitoring Parameters

Parameter	Name	Monitoring Contents	SVR
IW□□0A	Motion Subcommand Response Code	Indicates the motion subcommand that is being executed. The response code is 0 during NOP command execution.	R
IB□□0B0	Command Executing	Turns ON during NOP command execution and turns OFF when execution has been completed.	R
IB□□0B3	Command Error End	Turns ON if an error occurs during NOP command execution. Turns OFF when another command is executed.	R
IB□□0B8	Command Execution Completed *	Turns ON when NOP command execution has been completed.	R
IW□□2F	Servo Driver User Monitor Information	Stores either the data actually being monitored in the user monitor or the monitor selection.	–
IL□□34	Servo User Monitor 4	Stores the result of the selected monitor.	–

* The NOP command's subcommand status stored in Command Execution Completed (COMPLETE) is not defined.

7.4.2 Read SERVOPACK Parameter (PRM_RD)

The PRM_RD command reads the setting of the parameter with the specified parameter number and parameter size from SERVOPACK RAM. It stores the parameter number in the Auxiliary Servo User Constant Number (monitoring parameter IW□□37) and the setting in the Auxiliary Servo User Constant (monitoring parameter IL□□3A)

- This command will end with a Command Error End if it is executed with a communication method other than MECHATROLINK-II 32-byte Mode.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion subcommand execution has been completed.	IW□□0A is 0 and IB□□0B0 is OFF.

2. Set OW□□0A to 1 to execute the PRM_RD motion subcommand.

The PRM_RD command will read the SERVOPACK parameter and store it in the monitoring parameters.
IW□□0A will be 1 during command execution.
IB□□0B0 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□0A to 0 to execute the NOP motion command and then complete the reading operation.

(2) Related Parameters

[a] Setting Parameters

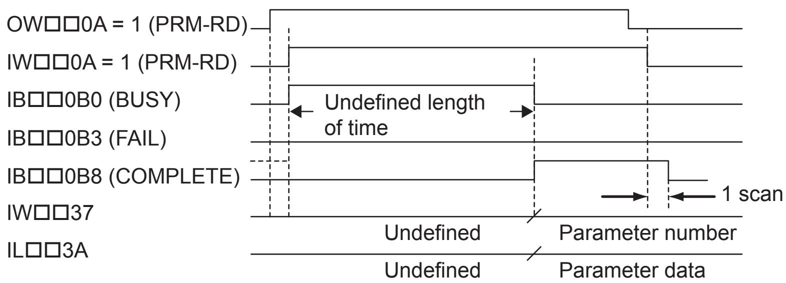
Parameter	Name	Setting Contents
OW□□0A	Motion Subcommand	The SERVOPACK parameter is read when this parameter is set to 1.
OW□□54	Auxiliary Servo User Constant Number	Set the parameter number of the SERVOPACK parameter to be read.
OW□□55	Auxiliary Servo Constant Number Size	Set the size of the SERVOPACK parameter to be read. Set the size in words. • The SERVOPACK's user manual lists the size in bytes, so those values must be converted to words.

[b] Monitoring Parameters

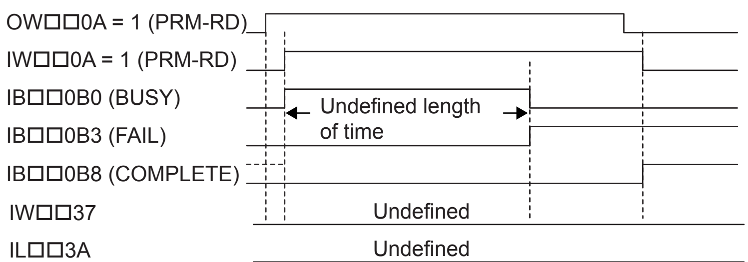
Parameter	Name	Monitoring Contents
IW□□0A	Motion Subcommand Response Code	Indicates the motion subcommand that is being executed. The response code is 1 during PRM_RD command execution.
IB□□0B0	Command Executing	Turns ON during PRM_RD command execution and turns OFF when execution has been completed.
IB□□0B3	Command Error End	Turns ON if an error occurs during PRM_RD command execution. Turns OFF when another command is executed.
IB□□0B8	Command Execution Completed	Turns ON when PRM_RD command execution has been completed.
IW□□37	Auxiliary Servo User Constant Number	Stores the parameter number of the SERVOPACK parameter being read.
IL□□3A	Auxiliary Servo User Constant	Stores the SERVOPACK parameter data that was read.

(3) Timing Charts

[a] Normal End



[b] Error End



(4) Write SERVOPACK Parameter (PRM_WR)

The PRM_WR command writes the setting of the SERVOPACK parameter using the specified parameter number, parameter size, and setting data. The write destination is in the SERVOPACK's RAM.

- This command will end with a Command Error End if it is executed with a communication method other than MECHATROLINK-II 32-byte Mode.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion subcommand execution has been completed.	IW□□0A is 0 and IB□□0B0 is OFF.
2	The OW□□54, OW□□55, and OL□□57 settings have been completed. • Refer to *[a] Setting Parameters* below for details.	–

2. Set OW□□0A to 2 to execute the PRM_WR motion subcommand.

The PRM_WR command will write the SERVOPACK parameter.
IW□□0A will be 2 during command execution.
IB□□0B0 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□0A to 0 to execute the NOP motion command and then complete the writing operation.

(2) Related Parameters

[a] Setting Parameters

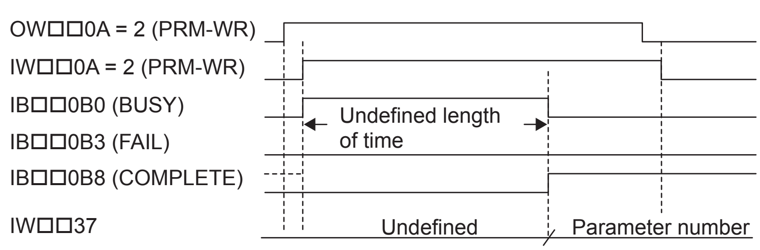
Parameter	Name	Setting Contents
OW□□0A	Motion Subcommand	The SERVOPACK parameter is written when this parameter is set to 2.
OW□□54	Auxiliary Servo User Constant Number	Set the number of the SERVOPACK parameter to be written.
OW□□55	Auxiliary Servo Constant Number Size	Set the size of the SERVOPACK parameter to be written. Set the size in words. • The SERVOPACK's user manual lists the size in bytes, so those values must be converted to words.
OL□□56	Auxiliary Servo User Constant	Set the set value for the SERVOPACK parameter to be written.

[b] Monitoring Parameters

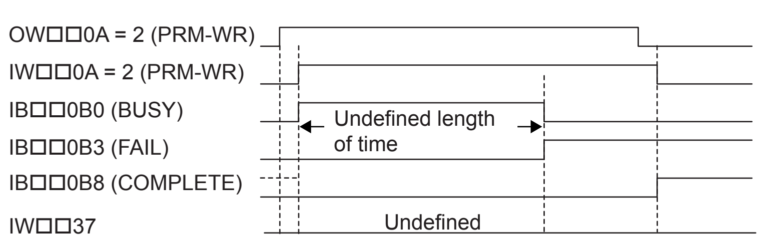
Parameter	Name	Monitoring Contents
IW□□0A	Motion Subcommand Response Code	Indicates the motion subcommand that is being executed. The response code is 2 during PRM_WR command execution.
IB□□0B0	Command Executing	Turns ON during PRM_WR command execution and turns OFF when execution has been completed.
IB□□0B3	Command Error End	Turns ON if an error occurs during PRM_WR command execution. Turns OFF when another command is executed.
IB□□0B8	Command Execution Completed	Turns ON when PRM_WR command execution has been completed.
IW□□37	Auxiliary Servo User Constant Number	Stores the parameter number of the SERVOPACK parameter that was written.

(3) Timing Charts

[a] Normal End



[b] Error End



7.4.3 Monitor Status (SMON)

The SMON command stores, the data specified in Monitor 4 of the Servo User Monitor is stored in Servo User Monitor 4 (monitoring parameter IL☐☐34).

- This command will end with a Command Error End if it is executed with a communication method other than MECHATROLINK-II 32-byte Mode.

The following table shows the data that can be specified in the User Monitor.

Set Value	Name	Contents
0	POS	Reference coordinate system's reference position (after reference filter)
1	MPOS	Machine coordinate system's reference position
2	PERR	Following error
3	APOS	Machine coordinate system's feedback position
4	LPOS	Machine coordinate system's feedback latch position
5	IPOS	Reference coordinate system's reference position (before reference filter)
6	TPOS	Reference coordinate system's target position
7	—	—
8	FSPD	Feedback Speed
9	CSPD	Reference speed
A	TSPD	Target speed
B	TRQ	Torque reference (Rated torque is 100%.)
C	—	—
D	—	—
E	OMN1	Optional monitor 1 (Actual content set in parameters.)
F	OMN2	Optional monitor 2 (Actual content set in parameters.)

- Refer to your SERVOPACK's users manual for details on the monitored data.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion subcommand execution has been completed.	IW☐☐0A is 0 and IB☐☐0B0 is OFF.

2. Set OW☐☐0A to 3 to execute the SMON motion subcommand.

The SMON command will read the information managed by the Servo Driver and store the code in the monitoring parameter.
IW☐☐0A will be 3 during command execution.
IB☐☐0B0 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW☐☐0A to 0 to execute the NOP motion command and then complete the monitoring operation.

(2) Related Parameters

[a] Setting Parameters

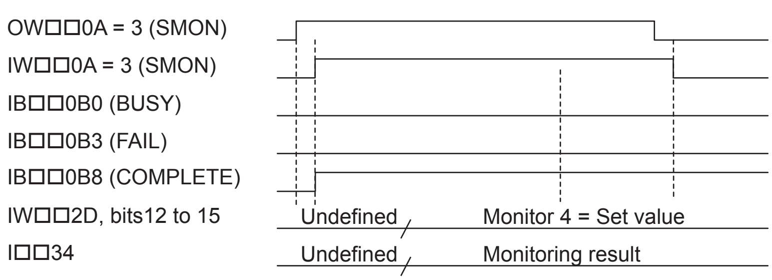
Parameter	Name	Setting Contents
OW□□0A	Motion Subcommand	The Monitor Status command is executed when this parameter is set to 3.
OW□□4E	Servo User Monitor	Set the information managed by the Servo Driver to be monitored.

[b] Monitoring Parameters

Parameter	Name	Monitoring Contents
IW□□0A	Motion Subcommand Response Code	Indicates the motion subcommand that is being executed. The response code is 3 during SMON command execution.
IB□□0B0	Command Executing	Turns ON during SMON command execution and turns OFF when execution has been completed.
IB□□0B3	Command Error End	Turns ON if an error occurs during SMON command execution. Turns OFF when another command is executed.
IB□□0B8	Command Execution Completed	Turns ON when SMON command execution has been completed.
IW□□2F	Servo Driver User Monitor Information	Stores either the data actually being monitored in the user monitor or the monitor selection.
IL□□34	Servo User Monitor 4	Stores the result of the selected monitor operation.

(3) Timing Charts

[a] Normal End



7.4.4 Read Fixed Parameters (FIXPRM_RD) R

The FIXPRM_RD command reads the current value of the specified fixed parameter and stores the value in the Fixed Parameter Monitor monitoring parameter.

(1) Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	Motion subcommand execution has been completed.	IW□□0A is 0 and IB□□0B0 is OFF.

2. Set OW□□0A to 5 to execute the FIXPRM_RD motion subcommand.

The FIXPRM_RD will read the specified fixed parameter's current value and store the code in the monitoring parameter.
IW□□0A will be 5 during command execution.
IB□□0B0 will turn ON during the command processing and will turn OFF when the command processing has been completed.

3. Set OW□□0A to 0 to execute the NOP motion command and then complete the monitoring operation.

(2) Related Parameters

[a] Setting Parameters

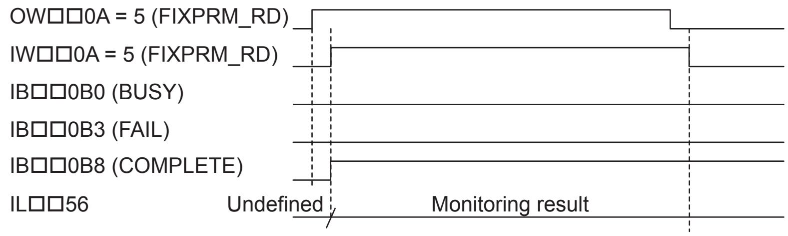
Parameter	Name	Setting Contents	SVR
OW□□0A	Motion Subcommand	The Read Fixed Parameter subcommand is executed when this parameter is set to 5.	R
OW□□5C	Fixed Parameter Number	Set the parameter number of the fixed parameter to be read.	R

[b] Monitoring Parameters

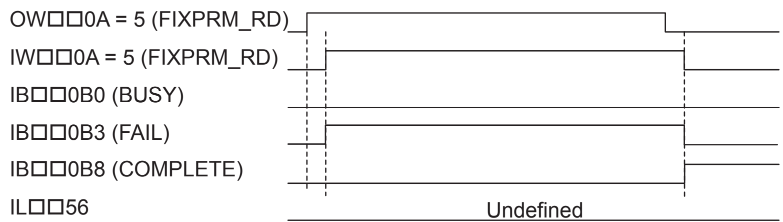
Parameter	Name	Monitoring Contents	SVR
IW□□0A	Motion Subcommand Response Code	Indicates the motion subcommand that is being executed. The response code is 5 during FIXPRM_RD command execution.	R
IB□□0B0	Command Executing	Turns ON during FIXPRM_RD command execution and turns OFF when execution has been completed.	R
IB□□0B3	Command Error End	Turns ON if an error occurs during FIXPRM_RD command execution. Turns OFF when another command is executed.	R
IB□□0B8	Command Execution Completed	Turns ON when FIXPRM_RD command execution has been completed.	R
IL□□56	Fixed Parameter Monitor	Stores the data of the specified fixed parameter number.	R

(3) Timing Charts

[a] Normal End



[b] Error End



8

Control Block Diagrams

This chapter explains the control block diagrams.

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8.2 Phase Control 8-6
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8.3 Torque Control 8-10
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8.4.2 Control Block Diagram for Speed Control 8-16

8.1 Position Control

8.1.1 Motion Parameters for Position Control

- (grey box) : These parameters are ignored.

(1) Fixed Parameters

No.	Name	Setting Unit	Default Value	Setting Range
0	Run Mode	–	1	0 to 5
1	Function Selection 1	–	0000h	Bit setting
2	Function Selection 2	–	0000h	Bit setting
4	Command Unit	–	0	0 to 3
5	Number of Decimal Places	–	3	0 to 5
6	Command Units per Revolution	Reference unit	10000	1 to 2^{31}-1
8	Gear Ratio (Motor)	–	1	1 to 65535
9	Gear Ratio (Load)	–	1	1 to 65535
10	Maximum Value of Rotary Counter (POSMAX)	Reference unit	360000	1 to 2^{31}–1
12	Forward Software Limit	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
14	Reverse Software Limit	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
16	Backlash Compensation	Reference unit	0	–2^{31} to 2^{31}–1
30	Encoder Type	–	0	0 to 3
34	Rated Speed	min^{-1}	3000	1 to 32000
36	Encoder Resolution	pulse	65536	1 to 2^{31}–1
38	Max. Revolution of Absolute Encoder Turns	Rev	65534	0 to 2^{31}–1
42	Feedback Speed Moving Average Time Constant	ms	10	0 to 32

(2) Setting Parameters

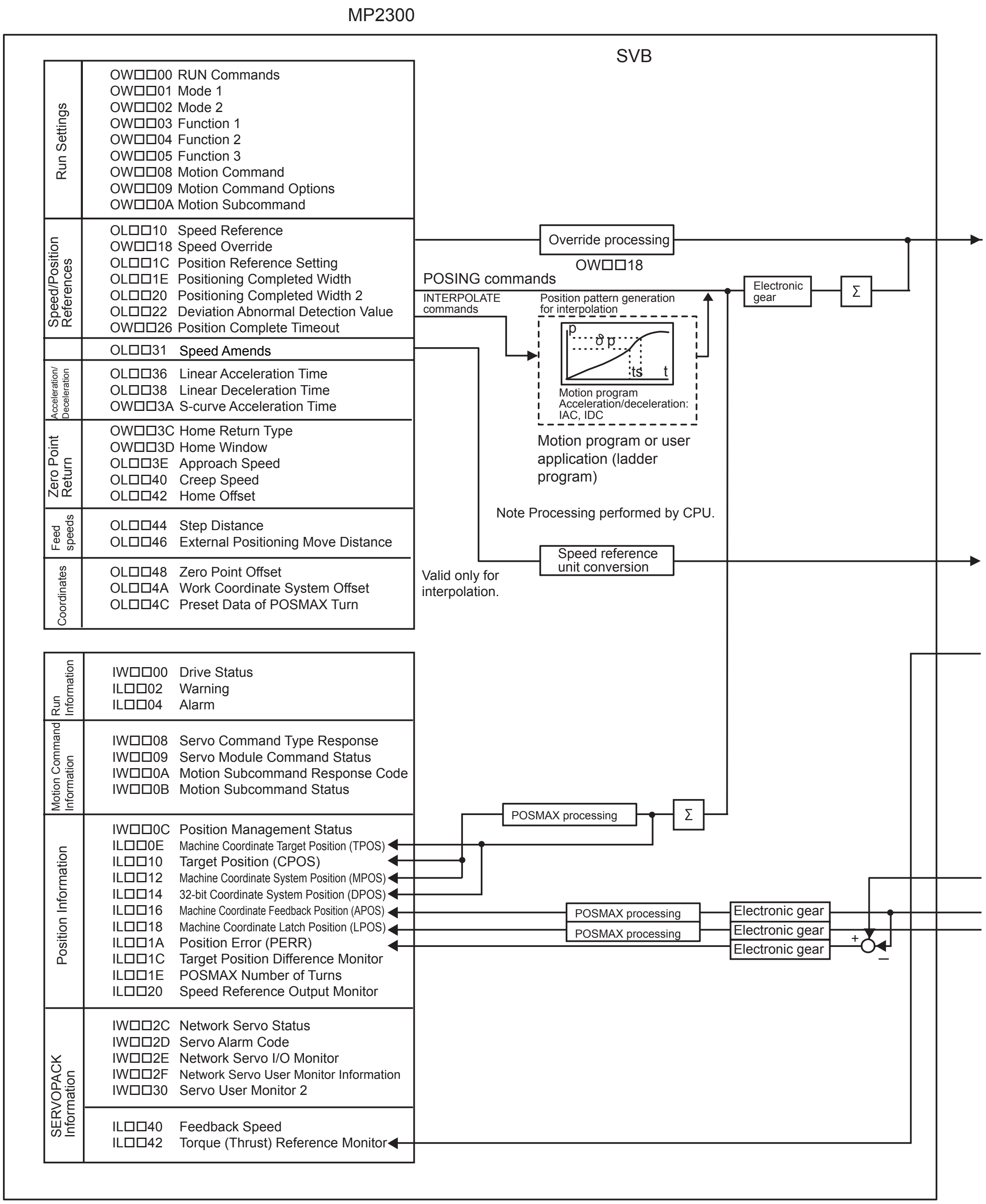
No.	Name	Setting Unit	Default Value	Setting Range
OW□□00	RUN Commands	–	0000h	Bit setting
OW□□01	Mode 1	–	0000h	Bit setting
OW□□02	Mode 2	–	0000h	Bit setting
OW□□03	Function 1	–	0011h	Bit setting
OW□□04	Function 2	–	0033h	Bit setting
OW□□05	Function 3	–	0000h	Bit setting
OW□□08	Motion Command	–	0	0 to 26
OW□□09	Motion Command Options	–	0000h	Bit setting
OW□□0A	Motion Subcommand	–	0	0 to 65535
OL□□0C	Torque Reference	Depends on torque unit.	0	–2^{31} to 2^{31}–1
OW□□0E	Speed Limit at Torque Reference	0.01%	15000	–32768 to 32767
OL□□10	Speed Reference	Depends on speed unit.	3000	–2^{31} to 2^{31}–1
OL□□14	Positive Side Limiting Torque Setting at the Speed Reference	Depends on torque unit.	30000	–2^{31} to 2^{31}–1
OL□□16	Secondary Speed Compensation	Depends on speed unit.	0	–2^{31} to 2^{31}–1
OW□□18	Speed Override	0.01%	10000	0 to 32767
OL□□1C	Position Reference Setting	Reference unit	0	–2^{31} to 2^{31}–1
OL□□1E	Positioning Completed Width	Reference unit	100	0 to 65535
OL□□20	Positioning Completed Width 2	Reference unit	0	0 to 65535
OL□□22	Deviation Abnormal Detection Value	Reference unit	2^{31}–1	0 to 2^{31}–1
OW□□26	Position Complete Timeout	ms	0	0 to 65535
OL□□28	Phase Compensation	Reference unit	0	–2^{31} to 2^{31}–1
OL□□2A	Latch Zone Lower Limit (for External Positioning)	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
OL□□2C	Latch Zone Upper Limit (for External Positioning)	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
OW□□2E	Position Loop Gain	0.1/s	300	0 to 32767
OW□□2F	Speed Loop Gain	Hz	40	1 to 2000
OW□□30	Speed Feed Forward Compensation	0.01%	0	0 to 32767
OW□□31	Speed Amends	0.01%	0	–32768 to 32767
OW□□32	Position Integration Time Constant	ms	0	0 to 32767
OW□□34	Speed Integration Time Constant	0.01 ms	2000	15 to 65535
OL□□36	Linear Acceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OL□□38	Linear Deceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OW□□3A	S-curve Acceleration Time	0.1 ms	0	0 to 65535
OW□□3C	Home Return Type	–	0	0 to 19
OW□□3D	Home Window	Reference unit	100	0 to 65535

No.	Name	Setting Unit	Default Value	Setting Range
OL□□3E	Approach Speed	Depends on speed unit.	1000	-2^{31} to $2^{31}-1$
OL□□40	Creep Speed	Depends on speed unit.	500	-2^{31} to $2^{31}-1$
OL□□42	Home Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□44	Step Distance	Reference unit	1000	0 to $2^{31}-1$
OL□□46	External Positioning Move Distance	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□48	Zero Point Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4A	Work Coordinate System Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4C	Preset Data of POSMAX Turn	Rev	0	-2^{31} to $2^{31}-1$
OW□□4E	Servo User Monitor	–	0E00H	Bit setting
OW□□4F	Servo Alarm Monitor Number	–	0	0 to 10
OW□□50	Servo Constant Number	–	0	0 to 65535
OW□□51	Servo Constant Number Size	–	1	1, 2
OL□□52	Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□54	Auxiliary Servo User Constant Number	–	0	0 to 65535
OW□□55	Auxiliary Servo Constant Number Size	–	1	1, 2
OL□□56	Auxiliary Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□5C	Fixed Parameter Number	–	0	0 to 65535
OL□□5E	Absolute Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□60	Absolute Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□62	Modularized Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□64	Modularized Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$

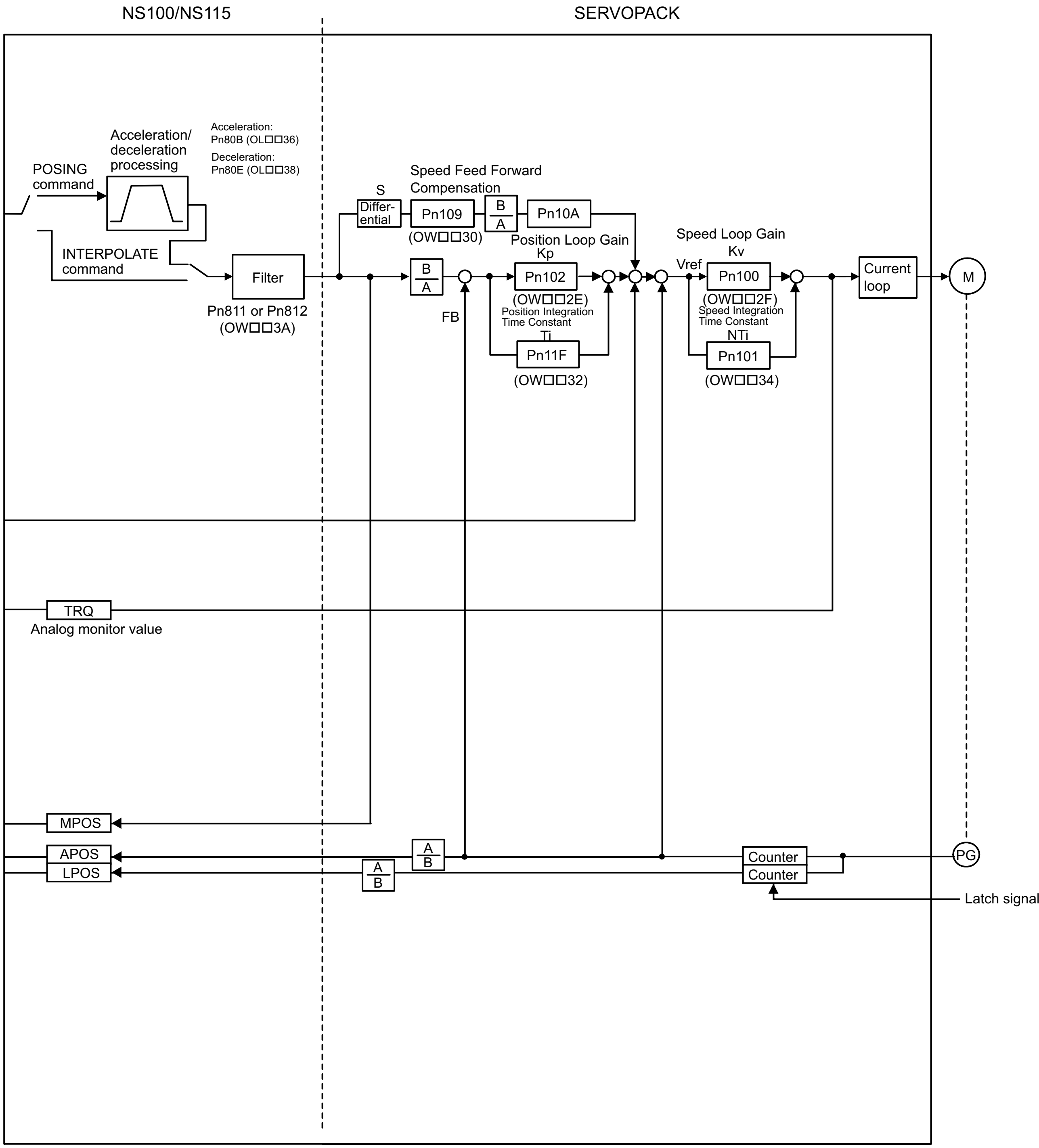
(3) Monitoring Parameters

No.	Name	Unit	Default Value	Range
IW□□00	Drive Status	–	–	Bit setting
IW□□01	Over Range Parameter Number	–	–	0 to 65535
IL□□02	Warning	–	–	Bit setting
IL□□04	Alarm	–	–	Bit setting
IW□□08	Servo Command Type Response	–	–	0 to 65535
IW□□09	Servo Module Command Status	–	–	Bit setting
IW□□0A	Motion Subcommand Response Code	–	–	0 ~ 65535
IW□□0B	Motion Subcommand Status	–	–	Bit setting
IW□□0C	Position Management Status	–	–	Bit setting
IL□□0E	Machine Coordinate Target Position (TPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□10	Target Position (CPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□12	Machine Coordinate System Position (MPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□16	Machine Coordinate Feedback Position (APOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□18	Machine Coordinate Latch Position (LPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1A	Position Error (PERR)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1C	Target Position Difference Monitor	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1E	POSMAX Number of Turns	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□20	Speed Reference Output Monitor	pulse/s	–	-2^{31} to $2^{31}-1$
IW□□2C	Network Servo Status	–	–	Bit setting
IW□□2D	Servo Alarm Code	–	–	–32768 to 32767
IW□□2E	Network Servo I/O Monitor	–	–	Bit setting
IW□□2F	Network Servo User Monitor Information	–	–	Bit setting
IL□□30	Servo User Monitor 2	–	–	-2^{31} to $2^{31}-1$
IL□□34	Servo User Monitor 4	–	–	-2^{31} to $2^{31}-1$
IW□□36	Servo Constant Number	–	–	0 to 65535
IW□□37	Auxiliary Servo User Constant Number	–	–	0 to 65535
IL□□38	Servo User Constant	–	–	-2^{31} to $2^{31}-1$
IL□□3A	Auxiliary Servo User Constant	–	–	-2^{31} to $2^{31}-1$
IW□□3F	Motor Type	–	–	0, 1
IL□□40	Feedback Speed	Depends on speed unit.	–	-2^{31} to $2^{31}-1$
IL□□42	Torque (Thrust) Reference Monitor	Depends on torque unit.	–	-2^{31} to $2^{31}-1$
IL□□56	Fixed Parameter Monitor	–	–	-2^{31} to $2^{31}-1$
IL□□5E	Absolute Position at Power OFF (Low Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□60	Absolute Position at Power OFF (High Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□62	Modularized Position at Power OFF (Low Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□64	Modularized Position at Power OFF (High Value)	pulse	–	-2^{31} to $2^{31}-1$

8.1.2 Control Block Diagram for Position Control



(continued on next page)


NS100/NS115
SERVOPACK
POSING command
Acceleration/ deceleration processing
Acceleration: Pn80B (OL□□36)
Deceleration: Pn80E (OL□□38)
INTERPOLATE command
Filter
Pn811 or Pn812 (OW□□3A)
S
Differ- ential
Speed Feed Forward Compensation
Pn109
(OW□□30)
B
A
Pn10A
Position Loop Gain Kp
Pn102
(OW□□2E)
FB
Position Integration Time Constant Ti
Pn11F
(OW□□32)
Speed Loop Gain Kv
Vref
Pn100
(OW□□2F)
Speed Integration Time Constant NTi
Pn101
(OW□□34)
Current loop
M
TRQ
Analog monitor value
MPOS
APOS
LPOS
Counter
Counter
PG
Latch signal

8.2 Phase Control

8.2.1 Motion Parameters for Phase Control

- ▒ : These parameters are ignored.

(1) Fixed Parameters

No.	Name	Setting Unit	Default Value	Setting Range
0	Run Mode	–	1	0 to 5
1	Function Selection 1	–	0000h	Bit setting
2	Function Selection 2	–	0000h	Bit setting
4	Command Unit	–	0	0 to 3
5	Number of Decimal Places	–	3	0 to 5
6	Command Units per Revolution	Reference unit	10000	1 to 2^{31}–1
8	Gear Ratio (Motor)	–	1	1 to 65535
9	Gear Ratio (Load)	–	1	1 to 65535
10	Maximum Value of Rotary Counter (POSMAX)	Reference unit	360000	1 to 2^{31}–1
12	Forward Software Limit	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
14	Reverse Software Limit	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
16	Backlash Compensation	Reference unit	0	–2^{31} to 2^{31}–1
30	Encoder Type	–	0	0 to 3
34	Rated Speed	min^{-1}	3000	1 to 32000
36	Encoder Resolution	pulse	65536	1 to 2^{31}–1
38	Max. Revolution of Absolute Encoder	Rev	65534	0 to 2^{31}–1
42	Feedback Speed Moving Average Time Constant	ms	10	0 to 32

(2) Setting Parameters

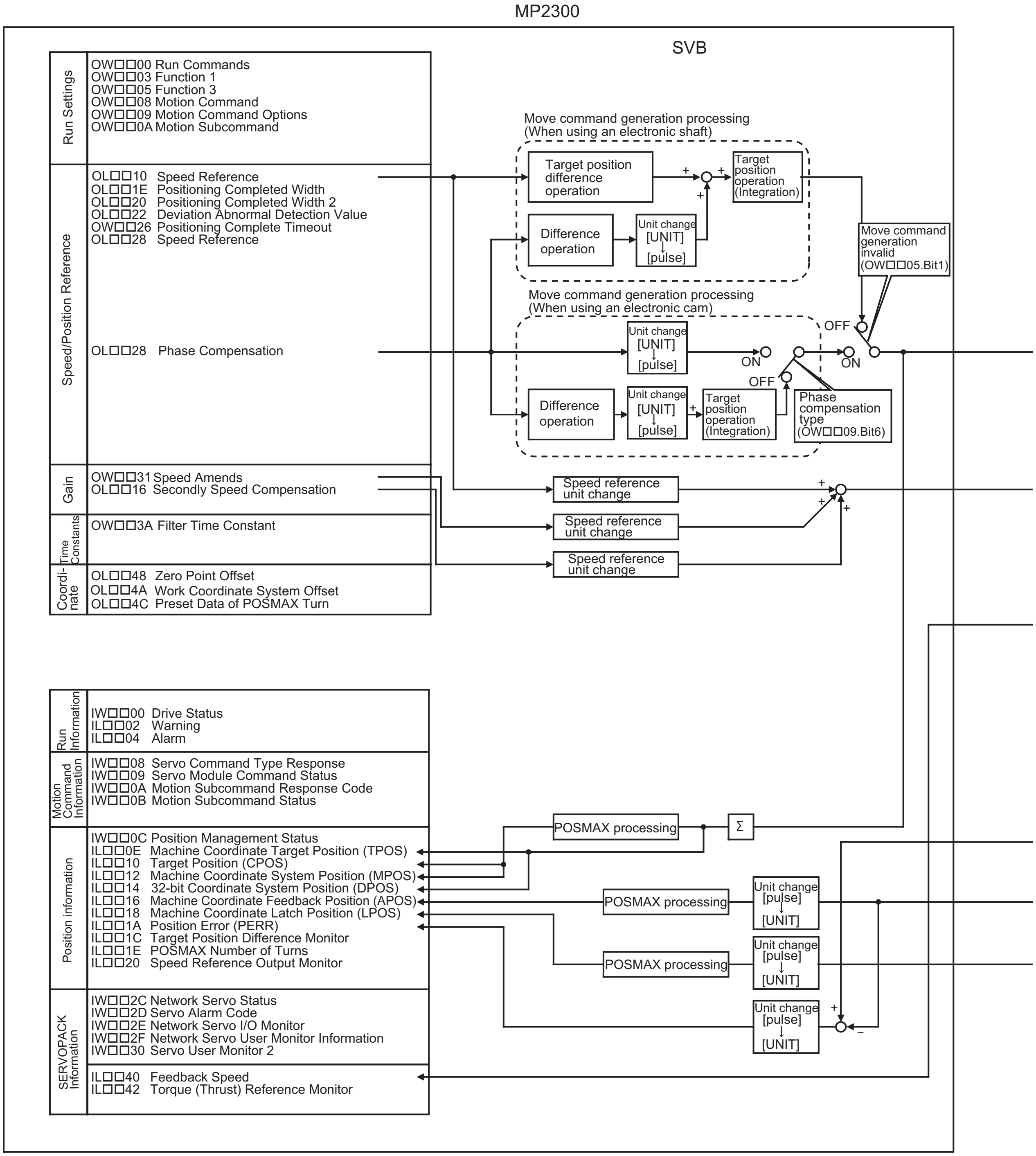
No.	Name	Setting Unit	Default Value	Setting Range
OW□□00	RUN Commands	–	0000h	Bit setting
OW□□01	Mode 1	–	0000h	Bit setting
OW□□02	Mode 2	–	0000h	Bit setting
OW□□03	Function 1	–	0011h	Bit setting
OW□□04	Function 2	–	0033h	Bit setting
OW□□05	Function 3	–	0000h	Bit setting
OW□□08	Motion Command	–	0	0 to 26
OW□□09	Motion Command Options	–	0000h	Bit setting
OW□□0A	Motion Subcommand	–	0	0 to 65535
OL□□0C	Torque Reference	Depends on torque unit.	0	–2^{31} to 2^{31}–1
OW□□0E	Speed Limit at Torque Reference	0.01%	15000	–32768 ～ 32767
OL□□10	Speed Reference	Depends on speed unit.	3000	–2^{31} to 2^{31}–1
OL□□14	Positive Side Limiting Torque Setting at the Speed Reference	Depends on torque unit.	30000	–2^{31} to 2^{31}–1
OL□□16	Secondary Speed Compensation	Depends on speed unit.	0	–2^{31} to 2^{31}–1
OW□□18	Speed Override	0.01%	10000	0 to 32767
OL□□1C	Position Reference Setting	Reference unit	0	–2^{31} to 2^{31}–1
OL□□1E	Positioning Completed Width	Reference unit	100	0 to 65535
OL□□20	Positioning Completed Width 2	Reference unit	0	0 to 65535
OL□□22	Deviation Abnormal Detection Value	Reference unit	2^{31}–1	0 to 2^{31}–1
OW□□26	Position Complete Timeout	ms	0	0 to 65535
OL□□28	Phase Compensation	Reference unit	0	–2^{31} to 2^{31}–1
OL□□2A	Latch Zone Lower Limit (for External Positioning)	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
OL□□2C	Latch Zone Upper Limit (for External Positioning)	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
OW□□2E	Position Loop Gain	0.1/s	300	0 to 32767
OW□□2F	Speed Loop Gain	Hz	40	1 to 2000
OW□□30	Speed Feed Forward Compensation	0.01%	0	0 to 32767
OW□□31	Speed Amends	0.01%	0	–32768 to 32767
OW□□32	Position Integration Time Constant	ms	0	0 to 32767
OW□□34	Speed Integration Time Constant	0.01 ms	2000	15 to 65535
OL□□36	Linear Acceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OL□□38	Linear Deceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OW□□3A	S-curve Acceleration Time	0.1 ms	0	0 to 65535
OW□□3C	Home Return Type	–	0	0 to 19
OW□□3D	Home Window	Reference unit	100	0 to 65535

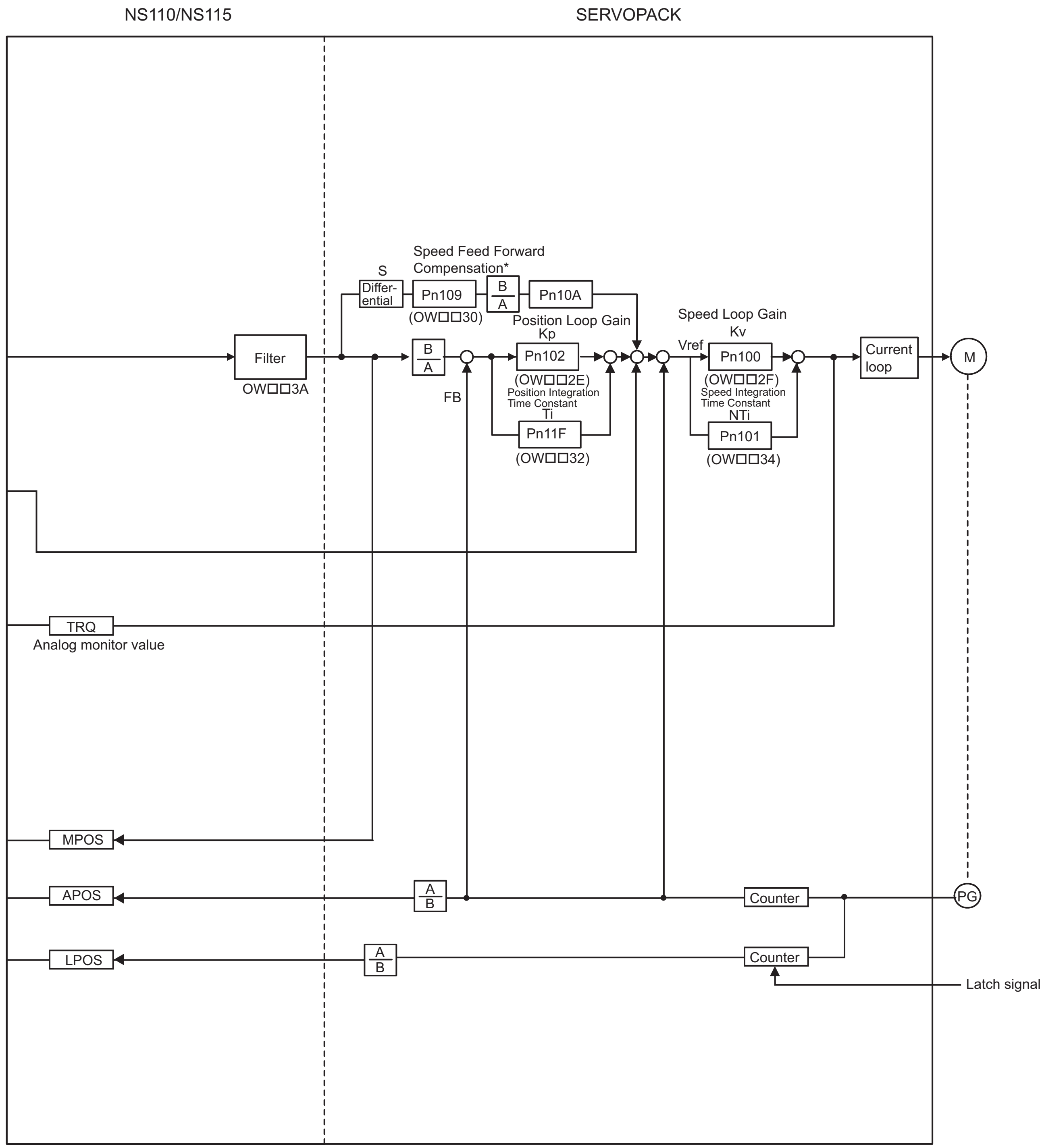
No.	Name	Setting Unit	Default Value	Setting Range
OL□□3E	Approach Speed	Depends on speed unit.	1000	-2^{31} to 2^{31}-1
OL□□40	Creep Speed	Depends on speed unit.	500	-2^{31} to 2^{31}-1
OL□□42	Home Offset	Reference unit	0	-2^{31} to 2^{31}-1
OL□□44	Step Distance	Reference unit	1000	0 to $2^{31}-1$
OL□□46	External Positioning Move Distance	Reference unit	0	-2^{31} to 2^{31}-1
OL□□48	Zero Point Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4A	Work Coordinate System Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4C	Preset Data of POSMAX Turn	Rev	0	-2^{31} to $2^{31}-1$
OW□□4E	Servo User Monitor	—	0E00H	Bit setting
OW□□4F	Servo Alarm Monitor Number	—	0	0 to 10
OW□□50	Servo Constant Number	—	0	0 to 65535
OW□□51	Servo Constant Number Size	—	1	1, 2
OL□□52	Servo User Constant	—	0	-2^{31} to $2^{31}-1$
OW□□54	Auxiliary Servo User Constant Number	—	0	0 to 65535
OW□□55	Auxiliary Servo Constant Number Size	—	1	1, 2
OL□□56	Auxiliary Servo User Constant	—	0	-2^{31} to $2^{31}-1$
OW□□5C	Fixed Parameter Number	—	0	0 to 65535
OL□□5E	Absolute Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□60	Absolute Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□62	Modularized Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□64	Modularized Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$

(3) Monitoring Parameters

No.	Name	Unit	Default Value	Range
IW□□00	Drive Status	—	—	Bit setting
IW□□01	Over Range Parameter Number	—	—	0 to 65535
IL□□02	Warning	—	—	Bit setting
IL□□04	Alarm	—	—	Bit setting
IW□□08	Servo Command Type Response	—	—	0 to 65535
IW□□09	Servo Module Command Status	—	—	Bit setting
IW□□0A	Motion Subcommand Response Code	—	—	0 to 65535
IW□□0B	Motion Subcommand Status	—	—	Bit setting
IW□□0C	Position Management Status	—	—	Bit setting
IL□□0E	Machine Coordinate Target Position (TPOS)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□10	Target Position (CPOS)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□12	Machine Coordinate System Position (MPOS)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□16	Machine Coordinate Feedback Position (APOS)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□18	Machine Coordinate Latch Position (LPOS)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□1A	Position Error (PERR)	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□1C	Target Position Difference Monitor	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□1E	POSMAX Number of Turns	Reference unit	—	-2^{31} to $2^{31}-1$
IL□□20	Speed Reference Output Monitor	pulse/s	—	-2^{31} to $2^{31}-1$
IW□□2C	Network Servo Status	—	—	Bit setting
IW□□2D	Servo Alarm Code	—	—	−32768 to 32767
IW□□2E	Network Servo I/O Monitor	—	—	Bit setting
IW□□2F	Network Servo User Monitor Information	—	—	Bit setting
IL□□30	Servo User Monitor 2	—	—	-2^{31} to $2^{31}-1$
IL□□34	Servo User Monitor 4	—	—	-2^{31} to $2^{31}-1$
IW□□36	Servo Constant Number	—	—	0 to 65535
IW□□37	Auxiliary Servo User Constant Number	—	—	0 to 65535
IL□□38	Servo User Constant	—	—	-2^{31} to $2^{31}-1$
IL□□3A	Auxiliary Servo User Constant	—	—	-2^{31} to $2^{31}-1$
IW□□3F	Motor Type	—	—	0, 1
IL□□40	Feedback Speed	Depends on speed unit.	—	-2^{31} to $2^{31}-1$
IL□□42	Torque (Thrust) Reference Monitor	Depends on torque unit.	—	-2^{31} to $2^{31}-1$
IL□□56	Fixed Parameter Monitor	—	—	-2^{31} to $2^{31}-1$
IL□□5E	Absolute Position at Power OFF (Low Value)	pulse	—	-2^{31} to $2^{31}-1$
IL□□60	Absolute Position at Power OFF (High Value)	pulse	—	-2^{31} to $2^{31}-1$
IL□□62	Modularized Position at Power OFF (Low Value)	pulse	—	-2^{31} to $2^{31}-1$
IL□□64	Modularized Position at Power OFF (High Value)	pulse	—	-2^{31} to $2^{31}-1$

8.2.2 Control Block Diagram for Phase Control





* The speed feedback gain is 0 for phase references.

8.3 Torque Control

8.3.1 Motion Parameters for Torque Control

- (grey box) : These parameters are ignored.

(1) Fixed Parameters

No.	Name	Setting Unit	Default Value	Setting Range
0	Run Mode	–	1	0 to 5
1	Function Selection 1	–	0000h	Bit setting
2	Function Selection 2	–	0000h	Bit setting
4	Command Unit	–	0	0 to 3
5	Number of Decimal Places	–	3	0 to 5
6	Command Units per Revolution	Reference unit	10000	1 to 2^{31}–1
8	Gear Ratio (Motor)	–	1	1 to 65535
9	Gear Ratio (Load)	–	1	1 to 65535
10	Maximum Value of Rotary Counter (POSMAX)	Reference unit	360000	1 to 2^{31}–1
12	Forward Software Limit	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
14	Reverse Software Limit	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
16	Backlash Compensation	Reference unit	0	–2^{31} to 2^{31}–1
30	Encoder Type	–	0	0 to 3
34	Rated Speed	min^{-1}	3000	1 to 32000
36	Encoder Resolution	pulse	65536	1 to 2^{31}–1
38	Max. Revolution of Absolute Encoder	Rev	65534	0 to 2^{31}–1
42	Feedback Speed Moving Average Time Constant	ms	10	0 to 32

(2) Setting Parameters

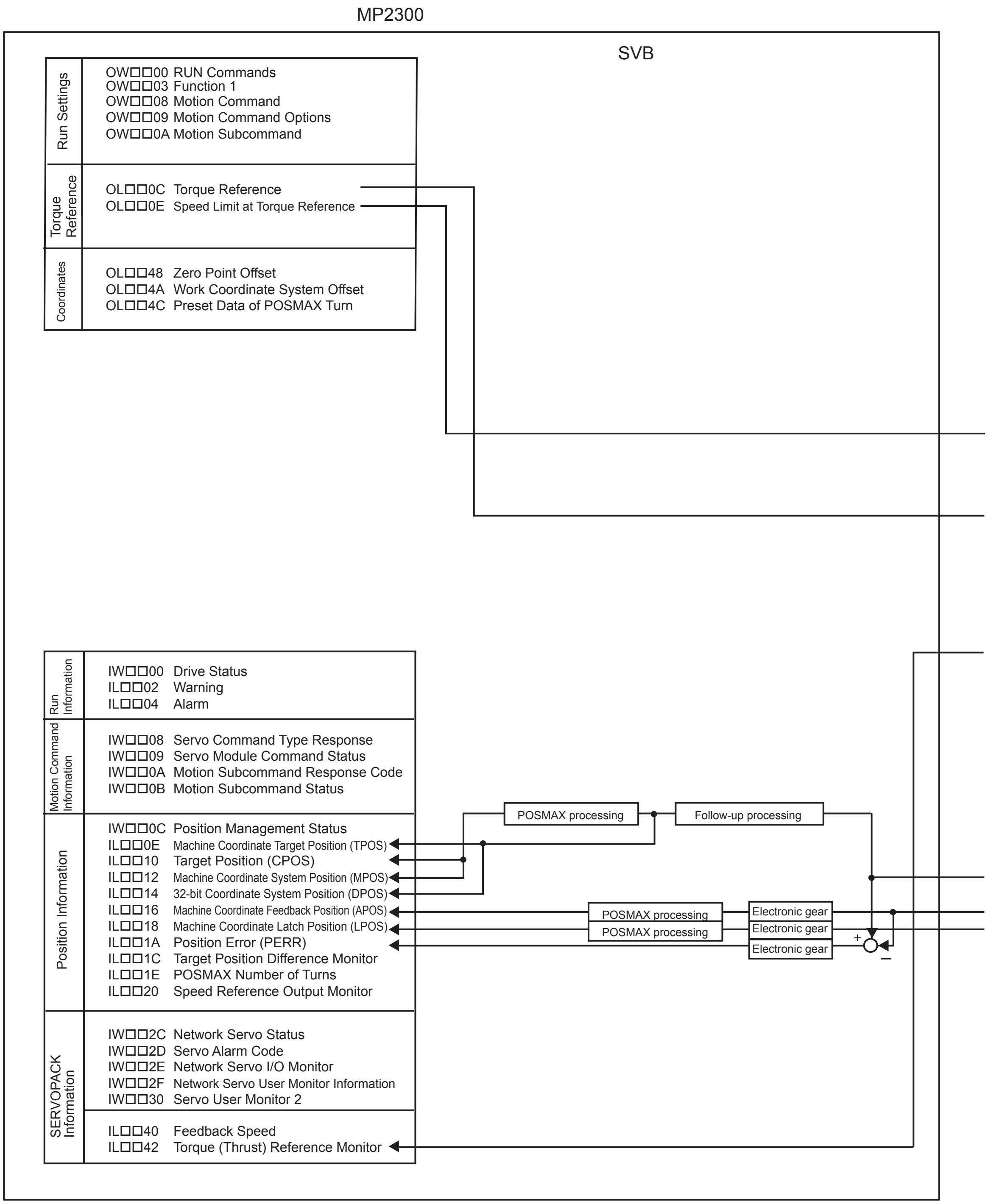
No.	Name	Setting Unit	Default Value	Setting Range
OW☐☐00	RUN Commands	–	0000h	Bit setting
OW☐☐01	Mode 1	–	0000h	Bit setting
OW☐☐02	Mode 2	–	0000h	Bit setting
OW☐☐03	Function 1	–	0011h	Bit setting
OW☐☐04	Function 2	–	0033h	Bit setting
OW☐☐05	Function 3	–	0000h	Bit setting
OW☐☐08	Motion Command	–	0	0 to 26
OW☐☐09	Motion Command Options	–	0000h	Bit setting
OW☐☐0A	Motion Subcommand	–	0	0 to 65535
OL☐☐0C	Torque Reference	Depends on torque unit.	0	–2^{31} to 2^{31}–1
OW☐☐0E	Speed Limit at Torque Reference	0.01%	15000	–32768 to 32767
OL☐☐10	Speed Reference	Depends on speed unit.	3000	–2^{31} to 2^{31}–1
OL☐☐14	Positive Side Limiting Torque Setting at the Speed Reference	Depends on torque unit.	30000	–2^{31} to 2^{31}–1
OL☐☐16	Secondary Speed Compensation	Depends on speed unit.	0	–2^{31} to 2^{31}–1
OW☐☐18	Speed Override	0.01%	10000	0 to 32767
OL☐☐1C	Position Reference Setting	Reference unit	0	–2^{31} to 2^{31}–1
OL☐☐1E	Positioning Completed Width	Reference unit	100	0 to 65535
OL☐☐20	Positioning Completed Width 2	Reference unit	0	0 to 65535
OL☐☐22	Deviation Abnormal Detection Value	Reference unit	2^{31}–1	0 to 2^{31}–1
OW☐☐26	Position Complete Timeout	ms	0	0 to 65535
OL☐☐28	Phase Compensation	Reference unit	0	–2^{31} to 2^{31}–1
OL☐☐2A	Latch Zone Lower Limit (for External Positioning)	Reference unit	–2^{31}	–2^{31} to 2^{31}–1
OL☐☐2C	Latch Zone Upper Limit (for External Positioning)	Reference unit	2^{31}–1	–2^{31} to 2^{31}–1
OW☐☐2E	Position Loop Gain	0.1/s	300	0 to 32767
OW☐☐2F	Speed Loop Gain	Hz	40	1 to 2000
OW☐☐30	Speed Feed Forward Compensation	0.01%	0	0 to 32767
OW☐☐31	Speed Amends	0.01%	0	–32768 to 32767
OW☐☐32	Position Integration Time Constant	ms	0	0 to 32767
OW☐☐34	Speed Integration Time Constant	0.01 ms	2000	15 to 65535
OL☐☐36	Linear Acceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OL☐☐38	Linear Deceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to 2^{31}–1
OW☐☐3A	S-curve Acceleration Time	0.1 ms	0	0 to 65535
OW☐☐3C	Home Return Type	–	0	0 to 19
OW☐☐3D	Home Window	Reference unit	100	0 to 65535

No.	Name	Setting Unit	Default Value	Setting Range
OL□□3E	Approach Speed	Depends on speed unit.	1000	-2^{31} to $2^{31}-1$
OL□□40	Creep Speed	Depends on speed unit.	500	-2^{31} to $2^{31}-1$
OL□□42	Home Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□44	Step Distance	Reference unit	1000	0 to $2^{31}-1$
OL□□46	External Positioning Move Distance	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□48	Zero Point Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4A	Work Coordinate System Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4C	Preset Data of POSMAX Turn	Rev	0	-2^{31} to $2^{31}-1$
OW□□4E	Servo User Monitor	–	0E00H	Bit setting
OW□□4F	Servo Alarm Monitor Number	–	0	0 to 10
OW□□50	Servo Constant Number	–	0	0 to 65535
OW□□51	Servo Constant Number Size	–	1	1, 2
OL□□52	Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□54	Auxiliary Servo User Constant Number	–	0	0 to 65535
OW□□55	Auxiliary Servo Constant Number Size	–	1	1, 2
OL□□56	Auxiliary Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□5C	Fixed Parameter Number	–	0	0 to 65535
OL□□5E	Absolute Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□60	Absolute Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□62	Modularized Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□64	Modularized Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$

(3) Monitoring Parameters

No.	Name	Unit	Default Value	Range
IW□□00	Drive Status	–	–	Bit setting
IW□□01	Over Range Parameter Number	–	–	0 to 65535
IL□□02	Warning	–	–	Bit setting
IL□□04	Alarm	–	–	Bit setting
IW□□08	Servo Command Type Response	–	–	0 to 65535
IW□□09	Servo Module Command Status	–	–	Bit setting
IW□□0A	Motion Subcommand Response Code	–	–	0 to 65535
IW□□0B	Motion Subcommand Status	–	–	Bit setting
IW□□0C	Position Management Status	–	–	Bit setting
IL□□0E	Machine Coordinate Target Position (TPOS)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□10	Target Position (CPOS)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□12	Machine Coordinate System Position (MPOS)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□16	Machine Coordinate Feedback Position (APOS)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□18	Machine Coordinate Latch Position (LPOS)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□1A	Position Error (PERR)	Reference unit	–	-2^{31} to 2^{31}-1
IL□□1C	Target Position Difference Monitor	Reference unit	–	-2^{31} to 2^{31}-1
IL□□1E	POSMAX Number of Turns	Reference unit'	–	-2^{31} to 2^{31}-1
IL□□20	Speed Reference Output Monitor	pulse/s	–	-2^{31} to 2^{31}-1
IW□□2C	Network Servo Status	–	–	Bit setting
IW□□2D	Servo Alarm Code	–	–	−32768 to 32767
IW□□2E	Network Servo I/O Monitor	–	–	Bit setting
IW□□2F	Network Servo User Monitor Information	–	–	Bit setting
IL□□30	Servo User Monitor 2	–	–	-2^{31} to 2^{31}-1
IL□□34	Servo User Monitor 4	–	–	-2^{31} to 2^{31}-1
IW□□36	Servo Constant Number	–	–	0 to 65535
IW□□37	Auxiliary Servo User Constant Number	–	–	0 to 65535
IL□□38	Servo User Constant	–	–	-2^{31} to 2^{31}-1
IL□□3A	Auxiliary Servo User Constant	–	–	-2^{31} to 2^{31}-1
IW□□3F	Motor Type	–	–	0, 1
IL□□40	Feedback Speed	Depends on speed unit.	–	-2^{31} to 2^{31}-1
IL□□42	Torque (Thrust) Reference Monitor	Depends on torque unit.	–	-2^{31} to 2^{31}-1
IL□□56	Fixed Parameter Monitor	–	–	-2^{31} to 2^{31}-1
IL□□5E	Absolute Position at Power OFF (Low Value)	pulse	–	-2^{31} to 2^{31}-1
IL□□60	Absolute Position at Power OFF (High Value)	pulse	–	-2^{31} to 2^{31}-1
IL□□62	Modularized Position at Power OFF (Low Value)	pulse	–	-2^{31} to 2^{31}-1
IL□□64	Modularized Position at Power OFF (High Value)	pulse	–	-2^{31} to 2^{31}-1

8.3.2 Control Block Diagram for Torque Control



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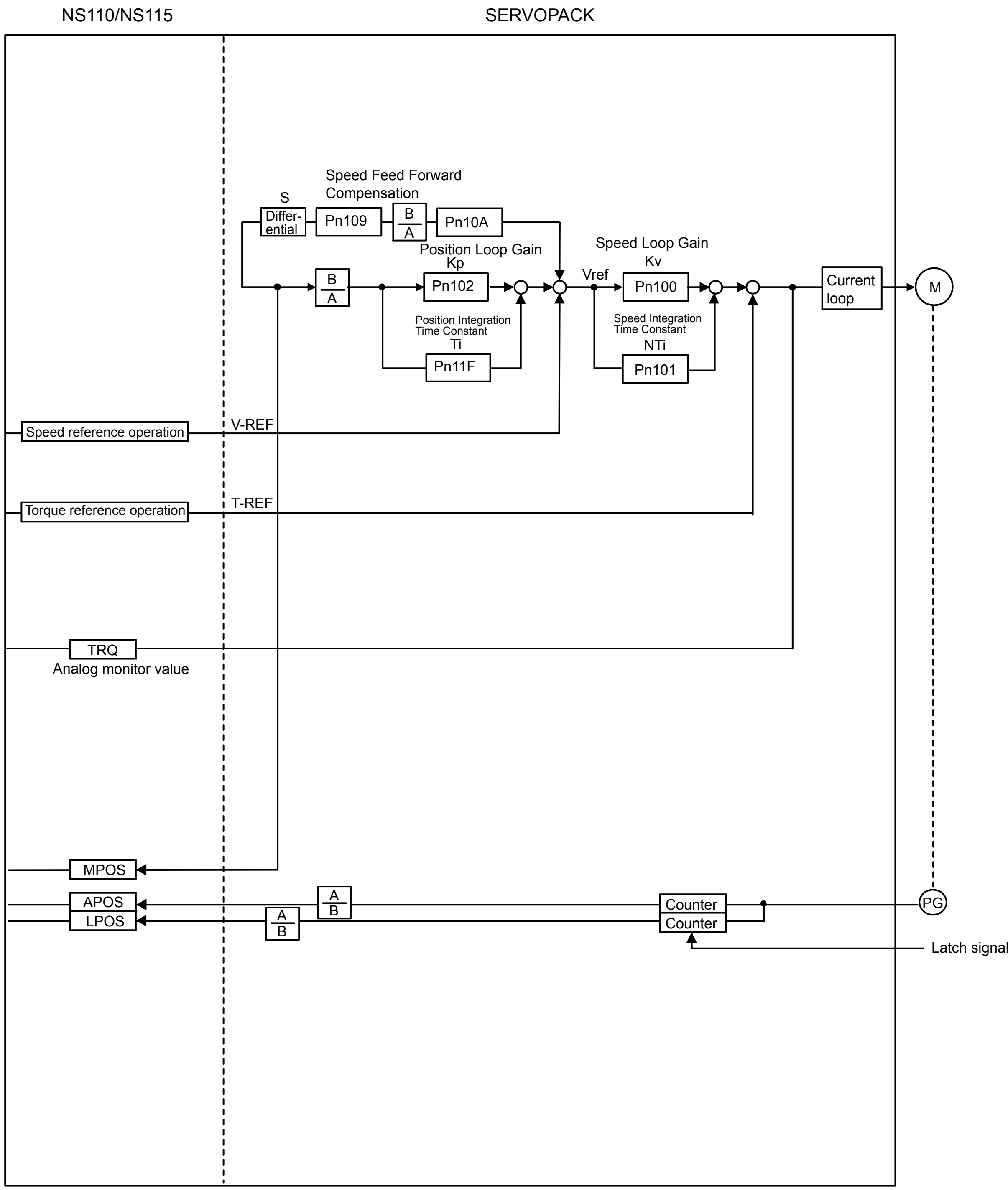

NS110/NS115
SERVOPACK
Speed Feed Forward
Compensation
S
Differ-
ential
Pn109
B
A
Pn10A
Position Loop Gain
Kp
B
A
Pn102
Position Integration
Time Constant
Ti
Pn11F
Speed Loop Gain
Kv
Vref
Pn100
Speed Integration
Time Constant
NTi
Pn101
Current
loop
M
Speed reference operation
V-REF
Torque reference operation
T-REF
TRQ
Analog monitor value
MPOS
APOS
LPOS
A
B
A
B
Counter
Counter
PG
Latch signal

8.4 Speed Control

8.4.1 Motion Parameters for Speed Control

- (grey) : These parameters are ignored.

(1) Fixed Parameters

No.	Name	Setting Unit	Default Value	Setting Range
0	Run Mode	–	1	0 to 5
1	Function Selection 1	–	0000h	Bit setting
2	Function Selection 2	–	0000h	Bit setting
4	Command Unit	–	0	0 to 3
5	Number of Decimal Places	–	3	0 to 5
6	Command Units per Revolution	Reference unit	10000	1 to $2^{31}-1$
8	Gear Ratio (Motor)	–	1	1 to 65535
9	Gear Ratio (Load)	–	1	1 to 65535
10	Maximum Value of Rotary Counter (POSMAX)	Reference unit	360000	1 to $2^{31}-1$
12	Forward Software Limit	Reference unit	$2^{31}-1$	-2^{31} to $2^{31}-1$
14	Reverse Software Limit	Reference unit	-2^{31}	-2^{31} to $2^{31}-1$
16	Backlash Compensation	Reference unit	0	-2^{31} to $2^{31}-1$
30	Encoder Type	–	0	0 to 3
34	Rated Speed	min^{-1}	3000	1 to 32000
36	Encoder Resolution	pulse	65536	1 to $2^{31}-1$
38	Max. Revolution of Absolute Encoder	Rev	65534	0 to $2^{31}-1$
42	Feedback Speed Moving Average Time Constant	ms	10	0 to 32

(2) Setting Parameters

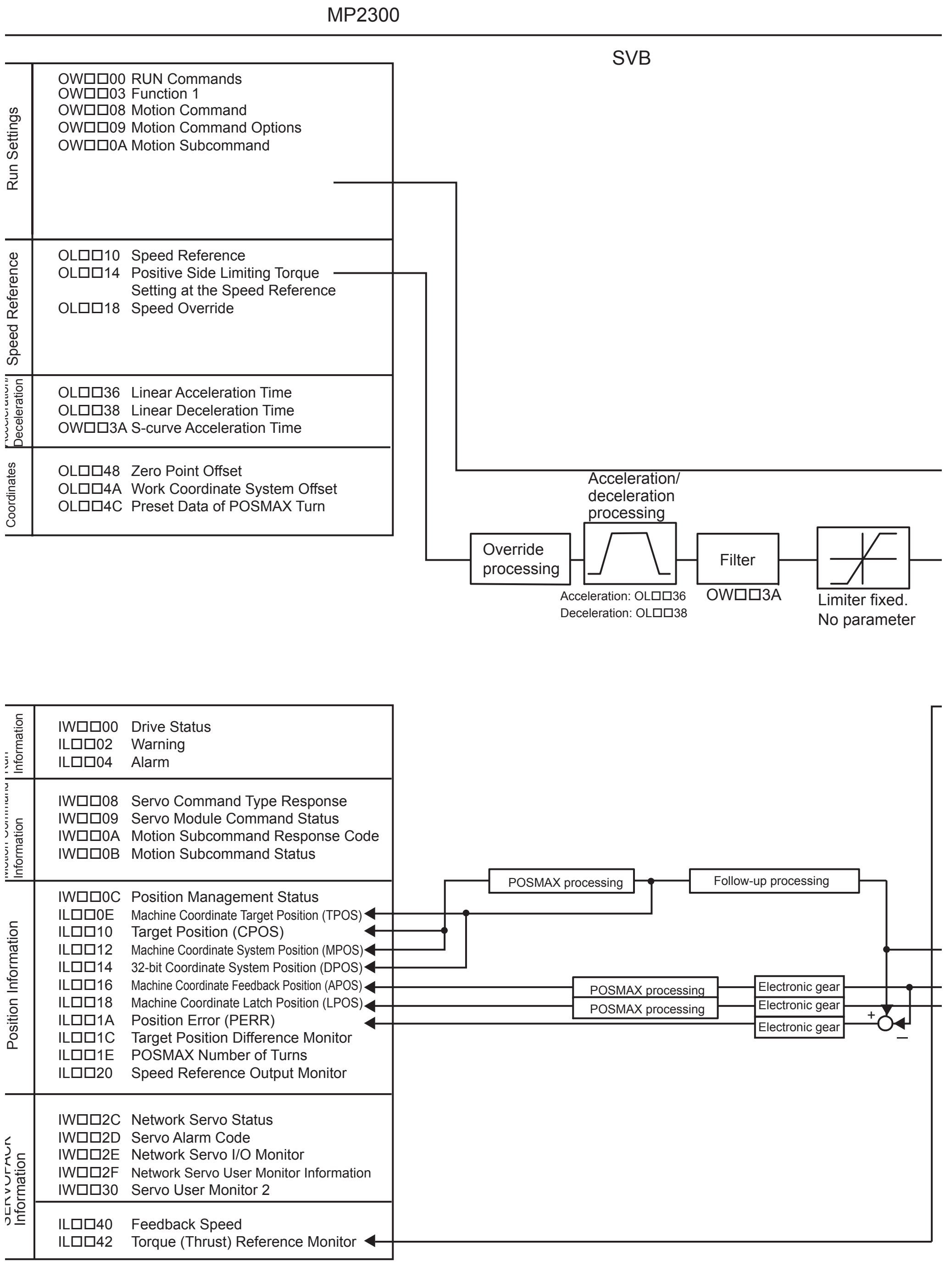
No.	Name	Setting Unit	Default Value	Setting Range
OW□□00	RUN Commands	–	0000h	Bit setting
OW□□01	Mode 1	–	0000h	Bit setting
OW□□02	Mode 2	–	0000h	Bit setting
OW□□03	Function 1	–	0011h	Bit setting
OW□□04	Function 2	–	0033h	Bit setting
OW□□05	Function 3	–	0000h	Bit setting
OW□□08	Motion Command	–	0	0 to 26
OW□□09	Motion Command Options	–	0000h	Bit setting
OW□□0A	Motion Subcommand	–	0	0 to 65535
OL□□0C	Torque Reference	Depends on torque unit.	0	-2^{31} to $2^{31}-1$
OW□□0E	Speed Limit at Torque Reference	0.01%	15000	–32768 to 32767
OL□□10	Speed Reference	Depends on speed unit.	3000	-2^{31} to $2^{31}-1$
OL□□14	Positive Side Limiting Torque Setting at the Speed Reference	Depends on torque unit.	30000	-2^{31} to $2^{31}-1$
OL□□16	Secondary Speed Compensation	Depends on speed unit.	0	-2^{31} to $2^{31}-1$
OW□□18	Speed Override	0.01%	10000	0 to 32767
OL□□1C	Position Reference Setting	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□1E	Positioning Completed Width	Reference unit	100	0 to 65535
OL□□20	Positioning Completed Width 2	Reference unit	0	0 to 65535
OL□□22	Deviation Abnormal Detection Value	Reference unit	$2^{31}-1$	0 to $2^{31}-1$
OW□□26	Position Complete Timeout	ms	0	0 to 65535
OL□□28	Phase Compensation	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□2A	Latch Zone Lower Limit (for External Positioning)	Reference unit	-2^{31}	-2^{31} to $2^{31}-1$
OLx□□2C	Latch Zone Upper Limit (for External Positioning)	Reference unit	$2^{31}-1$	-2^{31} to $2^{31}-1$
OW□□2E	Position Loop Gain	0.1/s	300	0 to 32767
OW□□2F	Speed Loop Gain	Hz	40	1 to 2000
OW□□30	Speed Feed Forward Compensation	0.01%	0	0 to 32767
OW□□31	Speed Amends	0.01%	0	–32768 to 32767
OW□□32	Position Integration Time Constant	ms	0	0 to 32767
OW□□34	Speed Integration Time Constant	0.01 ms	2000	15 to 65535
OLx□□36	Linear Acceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to $2^{31}-1$
OL□□38	Linear Deceleration Time	Depends on acceleration/ deceleration speed unit.	0	0 to $2^{31}-1$
OW□□3A	S-curve Acceleration Time	0.1 ms	0	0 to 65535
OW□□3C	Home Return Type	–	0	0 to 19
OW□□3D	Home Window	Reference unit	100	0 to 65535

No.	Name	Setting Unit	Default Value	Setting Range
OL□□3E	Approach Speed	Depends on speed unit.	1000	-2^{31} to $2^{31}-1$
OL□□40	Creep Speed	Depends on speed unit.	500	-2^{31} to $2^{31}-1$
OL□□42	Home Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□44	Step Distance	Reference unit	1000	0 to $2^{31}-1$
OL□□46	External Positioning Move Distance	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□48	Zero Point Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4A	Work Coordinate System Offset	Reference unit	0	-2^{31} to $2^{31}-1$
OL□□4C	Preset Data of POSMAX Turn	Rev	0	-2^{31} to $2^{31}-1$
OW□□4E	Servo User Monitor	–	0E00H	Bit setting
OW□□4F	Servo Alarm Monitor Number	–	0	0 to 10
OW□□50	Servo Constant Number	–	0	0 to 65535
OW□□51	Servo Constant Number Size	–	1	1, 2
OL□□52	Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□54	Auxiliary Servo User Constant Number	–	0	0 to 65535
OW□□55	Auxiliary Servo Constant Number Size	–	1	1, 2
OL□□56	Auxiliary Servo User Constant	–	0	-2^{31} to $2^{31}-1$
OW□□5C	Fixed Parameter Number	–	0	0 to 65535
OL□□5E	Absolute Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□60	Absolute Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□62	Modularized Position at Power OFF (Low Value)	pulse	0	-2^{31} to $2^{31}-1$
OL□□64	Modularized Position at Power OFF (High Value)	pulse	0	-2^{31} to $2^{31}-1$

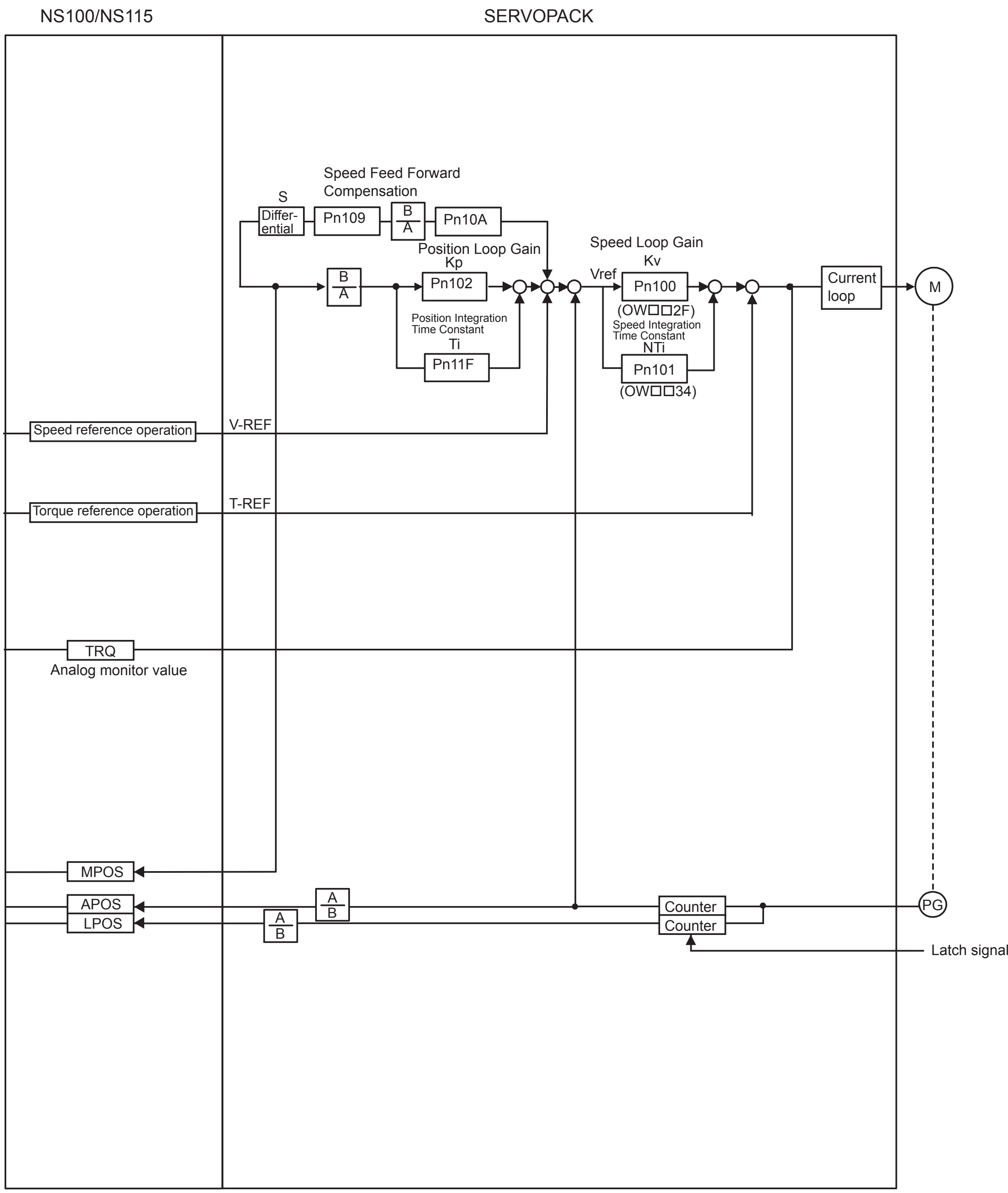
(3) Monitoring Parameters

No.	Name	Unit	Default Value	Range
IW□□00	Drive Status	–	–	Bit setting
IW□□01	Over Range Parameter Number	–	–	0 to 65535
IL□□02	Warning	–	–	Bit setting
IL□□04	Alarm	–	–	Bit setting
IW□□08	Servo Command Type Response	–	–	0 to 65535
IW□□09	Servo Module Command Status	–	–	Bit setting
IW□□0A	Motion Subcommand Response Code	–	–	0 to 65535
IW□□0B	Motion Subcommand Status	–	–	Bit setting
IW□□0C	Position Management Status	–	–	Bit setting
IL□□0E	Machine Coordinate Target Position (TPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□10	Target Position (CPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□12	Machine Coordinate System Position (MPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□16	Machine Coordinate Feedback Position (APOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□18	Machine Coordinate Latch Position (LPOS)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1A	Position Error (PERR)	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1C	Target Position Difference Monitor	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□1E	POSMAX Number of Turns	Reference unit	–	-2^{31} to $2^{31}-1$
IL□□20	Speed Reference Output Monitor	pulse/s	–	-2^{31} to $2^{31}-1$
IW□□2C	Network Servo Status	–	–	Bit setting
IW□□2D	Servo Alarm Code	–	–	–32768 to 32767
IW□□2E	Network Servo I/O Monitor	–	–	Bit setting
IW□□2F	Network Servo User Monitor Information	–	–	Bit setting
IL□□30	Servo User Monitor 2	–	–	-2^{31} to $2^{31}-1$
IL□□34	Servo User Monitor 4	–	–	-2^{31} to $2^{31}-1$
IW□□36	Servo Constant Number	–	–	0 to 65535
IW□□37	Auxiliary Servo User Constant Number	–	–	0 to 65535
IL□□38	Servo User Constant	–	–	-2^{31} to $2^{31}-1$
IL□□3A	Auxiliary Servo User Constant	–	–	-2^{31} to $2^{31}-1$
IW□□3F	Motor Type	–	–	0, 1
IL□□40	Feedback Speed	Depends on speed unit.	–	-2^{31} to $2^{31}-1$
IL□□42	Torque (Thrust) Reference Monitor	Depends on torque unit.	–	-2^{31} to $2^{31}-1$
IL□□56	Fixed Parameter Monitor	–	–	-2^{31} to $2^{31}-1$
IL□□5E	Absolute Position at Power OFF (Low Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□60	Absolute Position at Power OFF (High Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□62	Modularized Position at Power OFF (Low Value)	pulse	–	-2^{31} to $2^{31}-1$
IL□□64	Modularized Position at Power OFF (High Value)	pulse	–	-2^{31} to $2^{31}-1$

8.4.2 Control Block Diagram for Speed Control



(continued on next pag


NS100/NS115
SERVOPACK
Speed Feed Forward
Compensation
S
Differ-
ential
Pn109
B
A
Pn10A
Position Loop Gain
Kp
Pn102
Position Integration
Time Constant
Ti
Pn11F
Speed Loop Gain
Kv
Vref
Pn100
(OW☐☐2F)
Speed Integration
Time Constant
NTi
Pn101
(OW☐☐34)
Current
loop
M
Speed reference operation
V-REF
Torque reference operation
T-REF
TRQ
Analog monitor value
MPOS
APOS
LPOS
Counter
Counter
PG
Latch signal

MEMO

9

Absolute Position Detection

This chapter explains an absolute position detection system that uses an absolute encoder. Be sure to read this chapter carefully when using a Servomotor equipped with an absolute encoder.

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9.1 Absolute Position Detection Function

This section explains the Absolute Position Detection Function in the MP2300.

9.1.1 Outline of the Function

The Absolute Position Detection Function detects the position of the machine (axis) even if the power is turned OFF. This allows it to establish the machine coordinate system automatically and to begin operating automatically without having to execute the zero point return (ZRET) command after power is turned ON.
Absolute position detection is performed using an absolute encoder built into a Servomotor.
The following are features of the system for detection of the absolute position.

- If eliminates the need for a zero point return after the power is turned ON.
- If eliminates the need for a zero point dog and overtravel limit switch.

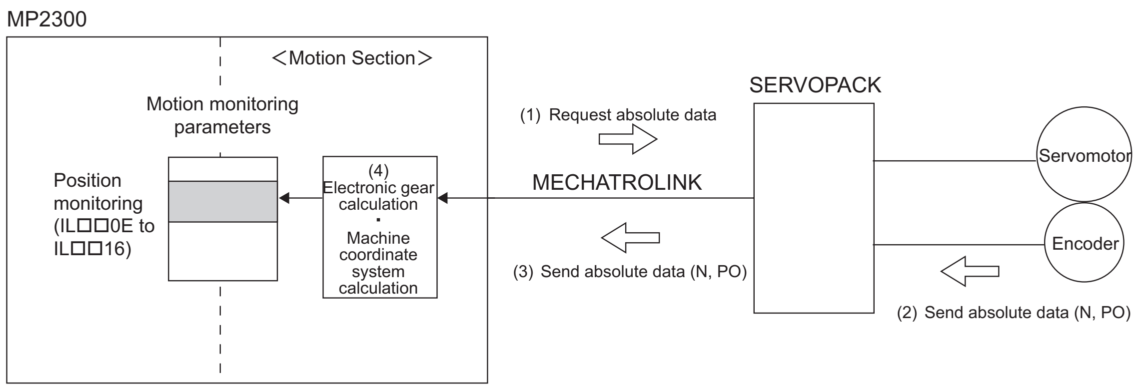
■ Terminology: Absolute Encoder

There are two types of encoders available. An incremental encoder detects position by calculating the zero point difference. An absolute encoder detects the absolute position relative to a reference position.
The absolute encoder uses a battery connected to the battery terminals of the SERVOPACK to maintain absolute data at all times even though power is turned OFF. It also updates absolute data if the position changes while the power is OFF.
The absolute encoder is comprised of a detector that is used to detect absolute position within one rotation and a counter that is used to count the number of rotations.

- After the automatic operation starts, the absolute encoder operates in the same way as an incremental encoder.

9.1.2 Reading Absolute Data

Turn ON the MP2300 and the SERVOPACK at the same time or turn ON the SERVOPACK first to read the absolute data loaded from the absolute encoder to the MP2300.
The following diagram shows an overview of the absolute data read operation.



(1)[*1] The MP2300 sends request to the SERVOPACK for absolute data after MECHATROLINK communications are established.

(2)[*1] The SERVOPACK gets multi-turn data (N) and the initial incremental pulses (PO) from the encoder.

(3) The SERVOPACK sends the multi-turn data (N) and initial incremental pulses (PO) to the MP2300.

(4) The MP2300 calculates the absolute position from the multi-turn data (N) and initial incremental pulses (PO) and then calculates the electronic gear. The MP2300 then adds the data of Zero Point Offset (OL□□48) to the calculation results to automatically set the machine coordinate system[*2].

* 1. The execution order of process ① and ② may be reserved depending on the power-ON procedure.
* 2. Refer to *9.3.2 (1) Calculating the Zero Point of the Machine Coordinate System* on page 9-10 for details on how the MP2300 calculates the machine coordinate system.

This way the absolute machine position can be detected and automatic operation can begin immediately after power is turned ON with an automatic position detection system.

■ Terminology: Absolute Data

Absolute data that is stored in an absolute encoder has two types of data: the absolute reference position (initial incremental pulses; PO) and the number of rotations (multi-turn data; N) from the absolute reference position

The absolute reference position is the phase-C position when the absolute encoder is initialized and is the reference position for absolute-position detection.

Only the number of rotations (N) can be cleared when the absolute encoder is initialized, and the initial incremental pulses will not change.

■ Information: Calculation of Absolute Position

We can determine the absolute position P using the following data.

Data stored in an absolute encoder

- Absolute reference position (initial incremental pulses): PO
- Number of rotations from the absolute reference position (multi-turn data): N

Parameter determined according to the number of bits of servomotor

- Feedback pulses per motor rotation: RP

Equation to calculate the absolute position

- Absolute position (P) = N $\times$ RP + PO

9.1.3 Finite Length/Infinite Length Axes and Absolute Position Detection

There are two types of axes. An infinite length axis resets the current position to a specified value every rotation, and the finite length axis does not.

Set a finite length axis if return and other operations are performed only within a specified range or for an axis that moves in one direction only without resetting the position every rotation.

Set an infinite length axis for conveyor belts and other operations that require the position to be reset every rotation.

There are two types of position control available with an infinite length axis. Simple Absolute Infinite Length position control and Infinite Length position control are available if Simple Absolute Infinite Length position control is not used.

An absolute encoder performs absolute position detection with a finite or infinite length axis depending on the Axis Type setting (fixed parameter 1, bit 0) of the MP2300

Set the MP2300 fixed parameters and SERVOPACK parameters to select the absolute position detection function with an absolute encoder. The setting procedures are different for finite and infinite length axes. Refer to *9.2.1 System Startup Flowchart* on page 9-5 for details.

9.2 Setting Procedure of Absolute Position Detection Function

This section explains the procedure for setting the Absolute Position Detection Function.

9.2.1 System Startup Flowchart

Start up the system using the following procedure.

<table>
<tr><td>1</td><td colspan="3">Check Devices
Check to see if the SERVOPACK, Servomotor, and cables are the right products and models for the absolute encoder.</td></tr>
</table>

↓

<table>
<tr><td>2</td><td colspan="3">Initialize the Absolute Encoder
Follow the setup procedure to set the absolute encoder to default values.
(→ 9.2.2 Initializing the Absolute Encoder on page 9-6, and Appendix C Initializing the Absolute Encoder on page C-2)</td></tr>
</table>

↓

<table>
<tr><td rowspan="3">3</td><td colspan="3">Setting Parameters Related to the MP2300 and the SERVOPACKs
Set all parameters related to the Absolute Position Detection Function of the MP2300 and SERVOPACKs.
The setting procedure for a finite length axis is different from that for an infinite length axis.</td></tr>
<tr><td rowspan="2">When using the axis as a Finite Length Axis
→ 9.3.1 Parameter Settings for Finite Length Axes on page 9-6</td><td colspan="2">When using the axis as an Infinite Length Axis
→ 9.4.1 (2) Conditions to Enable the Simple Absolute Infinite Axis Position Control on page 9-13*</td></tr>
<tr><td>With simple absolute infinite length position control
→ 9.4.2 Parameter Settings for Simple Absolute Infinite Length Position Control on page 9-15</td><td>Without simple absolute infinite length position control*
→ 9.4.5 Infinite Length Position Control without Simple Absolute Positions on page 9-20</td></tr>
</table>

↓

<table>
<tr><td rowspan="2">4</td><td colspan="3">Zero Point Setting
Set the zero point as well as the absolute zero point, that is, the machine coordinate zero point.
The setting procedure for a finite length axis is different from that of an infinite length axis.</td></tr>
<tr><td>When using the axis as a Finite Length Axis
→ 9.3.2 Setting the Zero Point for a Finite Length Axis on page 9-9</td><td>With simple absolute infinite length position control
→ 9.4.3 Setting the Zero Point and Turning ON Power as Simple Absolute Positions on page 9-19</td><td>Without simple absolute infinite length position control*
→9.4.5 (2) Infinite Length Axis Position Control without Simple Absolute Positions on page 9-21</td></tr>
</table>

* If the system does not satisfy the conditions described in *9.4.1 (2) Conditions to Enable the Simple Absolute Infinite Axis Position Control* on page 9-13 when using the axis as an infinite length axis, the MP2300 carries out the operation without using simple absolute length position control.

After the steps 2 to 4 described above are successfully completed, the absolute position detection system will be ready for operation.

- Always perform the startup procedure of the absolute position detection system in the following situations.
  - When starting up the absolute position detection system for the first time
  - When the Servomotor is changed
  - When an absolute encoder-related alarm occurs

9.2.2 Initializing the Absolute Encoder

Absolute encoders can be initialized as follows:

- SERVOPACK Procedure
  - Refer to the manual for the SERVOPACK for details.
- Panel Operator or Digital Operator Procedure
  - Refer to the manual for the SERVOPACK for details.
- ABS_RST Command Procedure
  - Refer to *7.2.21 Reset Absolute Encoder (ABS_RST)* on page 7-77 for details.

For details on the procedure for initializing SERVOPACKS, refer to *Appendix C Initializing the Absolute Encoder* on page C-2.

- Initialize the absolute encoder in the following situations.
  - When the absolute position detection system is started up for the first time
  - When number of rotations from the absolute reference position needs to be initialized to 0
  - When a Servomotor has been left alone with no battery connected to the absolute encoder
  - When an alarm which is related the absolute position detection system occurs

9.3 Absolute Position Detection for Finite Length Axes

This section describes the procedure for setting parameters and precautions on setting zero-point and turning ON the power supply when using the axis as a finite length axis.

9.3.1 Parameter Settings for Finite Length Axes

The following parameters must be set to enable the absolute position detection function when using an axis as a finite length axis.

⚠ CAUTION	• The parameters for which precautions are provided must be set referring to *9.3.1 (3) Detailed Descriptions* on page 9-8. Set these parameters carefully. If they are not set correctly, the current position may not be correct after the power is turned ON. Machine damage may occur.

(1) MP2300 Fixed Parameters for Absolute Position Detection

Parameter No.	Name	Setting/Range	Units	Reference
Fixed Parameter 1, bit 0	Axis Type	0: Finite length axis, 1: Infinite length axis	–	9.3.1 (3) [a]
Fixed Parameter 30	Encoder Type	• Incremental encoder • Absolute encoder • Absolute encoder (used as incremental encoder)	–	9.3.1 (3) [b]
Fixed Parameter 36	Encoder Resolution in Pulses/Revolution	1 to $2^{31}-1$ Set the value after multiplication. (For a 16-bit encoder, set 2^{16} = 65536.)	pulse	9.3.1 (3) [c]
Fixed Parameter 38	Max. Revolution of Absolute Encoder	0 to $2^{31}-1$	1 = 1 rotation	9.3.1 (3) [d]

(2) SERVOPACK Parameters for Absolute Position Detection

SERVOPACK Model	Parameter	Name	Setting Range	Units	Reference
Σ-III Series (SGDS-□□□1□□)	Pn000.0	Direction Selection	0: Sets counterclockwise (CCW) rotation as forward direction. 1: Sets clockwise (CW) rotation as forward direction (reverse rotation mode).	–	
	Pn205	Multiturn Limit Setting	0 to 65535	Rev	9.3.1 (3) [d]
	Pn212	Number of Encoder Pulses	16 to 1073741824	P/Rev	9.3.1 (3) [c]
	Pn002.2	Absolute Encoder Usage	0: Uses absolute encoder as an absolute encoder. 1: Uses absolute encoder as an incremental encoder.	–	9.3.1 (3) [b]
Σ-II Series (SGDH-□□□E + NS100, NS115)	Pn000.0	Direction Selection	0: Sets counterclockwise (CCW) rotation as forward direction. 1: Sets clockwise (CW) rotation as forward direction (reverse rotation mode).	–	–
	Pn201	Number of Encoder Pulses	16 to 16384	P/Rev	9.3.1 (3) [c]
	Pn205	Multiturn Limit Setting	0 to 65535	Rev	9.3.1 (3) [d]
	Pn002.2	Absolute Encoder Usage	0: Uses absolute encoder as an absolute encoder. 1: Uses absolute encoder as an incremental encoder.	–	9.3.1 (3) [b]
Σ-I Series (SGD-□□□N, SGDB-□□AN)	Cn-0001, Bit E	Encoder Selection	0: Incremental encoder 1: Absolute encoder	–	9.3.1 (3) [b]
	Cn-0002, Bit 0	Rotation Direction Selection	0: Sets counterclockwise (CCW) rotation as forward rotation. 1: Sets clockwise (CW) rotation as forward rotation (reverse rotation mode).	–	–
	Cn-0011	Number of Encoder Pulses	513 to 32767	P/Rev	9.3.1 (3) [c]

(3) Detailed Descriptions

[a] Axis Selection (MP2300 Fixed Parameter No.1, Bit 0)

This setting is used to select either an finite or infinite length axis.
Set to 0 when using the axis as a finite length axis.

[b] Encoder Selection and Absolute Encoder Usage

For an axis performing absolute position detection, set the parameters as shown in the following table.

Model	Parameter	Setting
MP2300	Fixed parameter 30 (Encoder Selection)	1: Absolute encoder
Σ-II, Σ-III Series	Parameter: Pn002.2 (Absolute Encoder Usage)	0: Uses absolute encoder as an absolute encoder.
Σ-I Series	Parameter: Cn-0001 Bit E (Encoder Selection)	1: Absolute encoder

- If the above settings are not used, correct motion control will not be performed. Set the parameters carefully.
- Be sure to set both the MP2300 and SERVOPACK parameters.

[c] Number of Encoder Resolution

■ If using the SVB-01 Module or the built-in SVB Module

Refer to the following table and set the fixed parameter 36 (Encoder Resolution in Pulses/Resolution) according to the number of servomotor bits. The settings can be used for all SERVOPACK models.

Number of Bits	MP2300 Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)
12	4096
13	8192
15	32768
16	65536
17	131072
20	1048576

■ If using the SVA-01 Module

The methods of setting the fixed parameters 36 and 22 differ depending on the SERVOPACK used.

- With SERVOPACKs in the Σ series

Number of Bits	MP2300 Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
12	1024	6: Pulse A/B mode (×4)
15	8192	6: Pulse A/B mode (×4)

- With SERVOPACKs in the Σ-II series

Number of Bits	Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
13	2048 *1	6: Pulse A/B mode (×4)

16	16384 *1	6: Pulse A/B mode (×4)
17	16384 *1, *2	6: Pulse A/B mode (×4)

* 1. This value depends on the setting of Pn212 (PG dividing ratio). The values in the table are the maximum values.
* 2. Because the maximum value of Pn201 (PG dividing ratio) is 16384, the maximum value with a 17-bit encoder is also 16384.

• With SERVOPACKs in the Σ-III series

Number of Bits	Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
17	16384 *	6: Pulse A/B mode (×4)
20	262144 *	6: Pulse A/B mode (×4)

* This value depends on the setting of Pn212 (PG dividing ratio). The values in the table are the maximum values.

♦ If the above settings are not used, correct motion control will not be performed. Set the parameters carefully.

[d] Max. Revolution of Absolute Encoder/Multiturn Limit Setting

These parameters determine the maximum value of the number of encoder turns managed by the SERVOPACK and MP2300.
The setting is determined by the SERVOPACK that is used and the type of axis (MP2300 fixed parameter 1, bit 0). Set the parameters as shown in the following table when using an axis as a finite length axis.

Applicable SERVOPACK	MP2300 Fixed Parameter 38 (Max. No. of Absolute Encoder Turns)	SERVOPACK Parameter Pn205 (Multiturn Limit Setting)
Σ-II, Σ-III Series	65535	65535
Σ-I Series	99999	—

♦ If the above settings are not used, the position may be offset. Set the parameters carefully.

9.3.2 Setting the Zero Point for a Finite Length Axis

This section describes the procedure for setting the zero point (i.e., the absolute zero point or the zero point of the machine coordinate system) for a finite length axis. It also describes the procedures for storing the zero point offset.

(1) Calculating the Zero Point of the Machine Coordinate System

The MP2300 calculates the axis position (i.e., current position for the machine coordinate system) as follows when power is turned ON if an absolute encoder is used for positioning.

Current position for the machine coordinate system (monitoring parameter IL□□10[*1] or IL□□16[*1]) = Encoder position when servo power is turned ON[*2] + Zero Point Offset (setting parameter OL□□48)

To make the current position of the machine coordinate system the zero position, set OL□□48 (encoder position when servo power turns ON) to a negative value. In other words, set OL□□48 to the difference between OL□□48 and IL□□10 (or IL□□16).

* 1. Use IL□□10 to select a positive value for the reference position for the machine coordinates, and use IL□□16 to make the current position of the machine coordinates into a positive position.
* 2. The encoder position when servo power is turned ON is as follows: Multiturn data × Number of encoder pulses + initial increment pulses. Refer to your SERVOPACK manual for information on the initial increment pulses.

Example: IL□□10 = 10,000 and OL□□48 = 100

Set the encoder position when servo power is turned ON to a negative value as shown below.

OL□□48 − IL□□10 = 100 − 10000

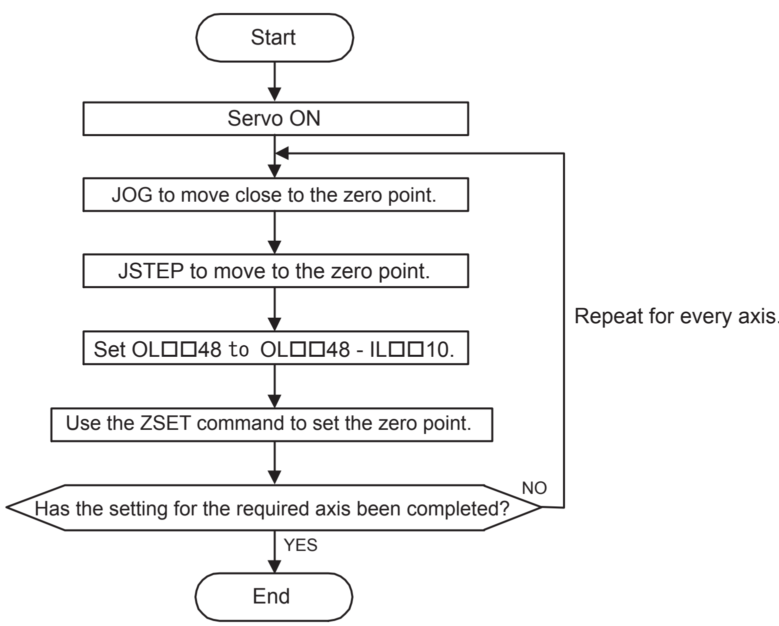
= − 9900

Set OL□□48 to -9900 to make the current position in the machine coordinate system the zero point.

(2) Setting the Zero Point of the Machine Coordinate System

⚠ CAUTION	• OL□□48 is always valid for a finite length axis. Do not change the Zero Point Offset (OL□□48) during the operation of a machine with a finite length axis. Otherwise the machine may be damaged or an accident may occur.

Set the zero point after initializing the absolute encoder to set the zero point of the machine coordinate system and to create the machine coordinate system. The following illustration shows the procedure for setting the zero point for a finite length axis.



(3) Saving OL□□48 Values before Power OFF

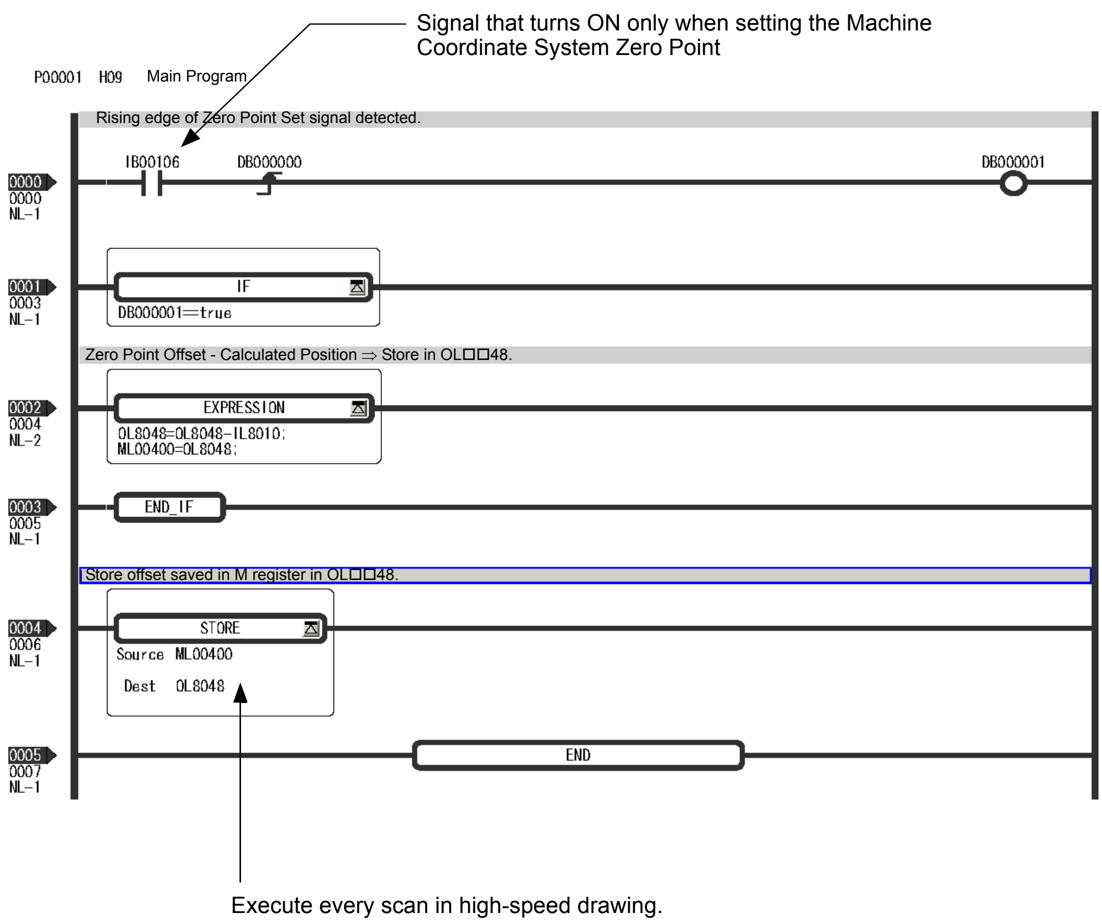
After having set the zero point, save the value of OL□□48 before turning OFF the power of MP2300 so that the value will be written in OL□□48 the next time the power is turned ON.
There are two ways to save the Zero Point Offset (OL□□48) value. It can be saved through a ladder program in an M Register backed up by battery or from the MPE720 Parameter Window. These ways are described below.

■ Method 1: Saving in an M Register with Ladder Program

After setting the zero point, subtract the Calculated Position in the Machine Coordinate System (IL□□10) from the Machine Coordinate System Zero Point Offset (OL□□48) and save the result in an M register when it is stored in setting parameter OL□□48. Store the contents saved in the M register in Machine Coordinate System Zero Point Offset (setting parameter OL□□48) every scan. This way the value of OL□□48 can be remained unchanged as long as another zero point setting is not executed.

<Program Example>

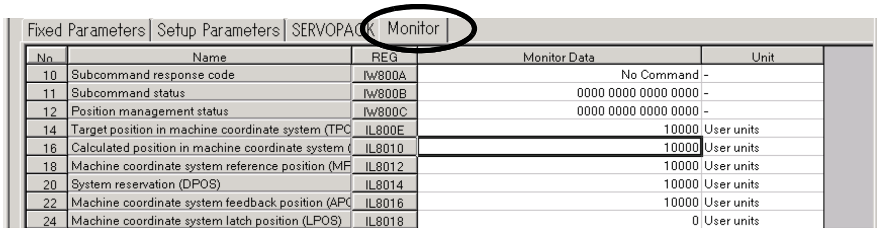
The following diagram shows an example of ladder program to store the offset value of axis 1.
In a ladder program for an actual application, select a register with a different address for each axis.



■ Method 2: Saving the Zero Point Offset (OL☐☐48) from the MPE720 Parameter Window

Open the Parameter Window for the specified axis on the MPE720 and use the following procedure to save the Zero Point Offset.

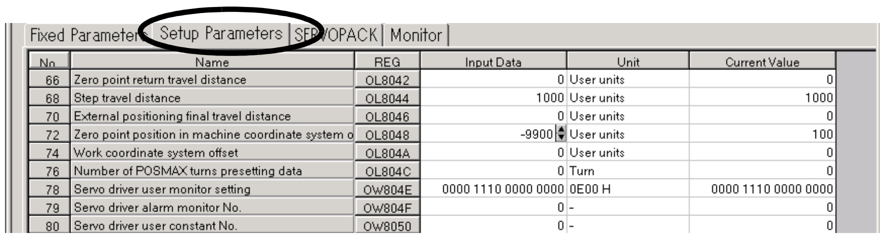
1. Check the value in IL☐☐10 in the Monitor Tab Page.



Fixed Parameters | Setup Parameters | SERVOPACK | Monitor

No.	Name	REG	Monitor Data	Unit
10	Subcommand response code	IW800A	No Command	-
11	Subcommand status	IW800B	0000 0000 0000 0000	-
12	Position management status	IW800C	0000 0000 0000 0000	-
14	Target position in machine coordinate system (TPC	IL800E	10000	User units
16	Calculated position in machine coordinate system (	IL8010	10000	User units
18	Machine coordinate system reference position (MF	IL8012	10000	User units
20	System reservation (DPOS)	IL8014	10000	User units
22	Machine coordinate system feedback position (APC	IL8016	10000	User units
24	Machine coordinate system latch position (LPOS)	IL8018	0	User units

2. Check the current value in OL☐☐48 in the Setup Parameters Tab Page. Subtract the Calculated Position (IL☐☐10) from the Zero Point Offset (OL☐☐48) and save the result in OL☐☐48.



Fixed Parameters | Setup Parameters | SERVOPACK | Monitor

No.	Name	REG	Input Data	Unit	Current Value
66	Zero point return travel distance	OL8042	0	User units	0
68	Step travel distance	OL8044	1000	User units	1000
70	External positioning final travel distance	OL8046	0	User units	0
72	Zero point position in machine coordinate system o	OL8048	-9900	User units	100
74	Work coordinate system offset	OL804A	0	User units	0
76	Number of POSMAX turns presetting data	OL804C	0	Turn	0
78	Servo driver user monitor setting	OW804E	0000 1110 0000 0000	0E00 H	0000 1110 0000 0000
79	Servo driver alarm monitor No.	OW804F	0	-	0
80	Servo driver user constant No.	OW8050	0	-	0

3. Check to see if the setting and current value in OL☐☐48 are the same. If they are the same, select ***File - Save*** and save the setting to the MP2300.

4. Return to Module Configuration Window and select ***Save - Save to Flash*** to save the setting in the flash memory.

5. Execute the setting with the ZSET command.

When the power is turned ON, the value that was saved will be stored automatically for Zero Point Offset (OL☐☐48).

9.3.3 Turning ON the Power after Setting the Zero Point of Machine Coordinate System

The Zero Point Return (Setting) Completed bit (IB□□0C5) will turn OFF when the power supply to the MP2300 is turned OFF and ON, the communication are interrupted by turning OFF and ON the power supply to the SERVOPACK after the zero point has been set. The Zero Point Return (Setting) Completed bit must therefore be turned ON when the power supply is restored.
Use the following procedure.

1. Turn ON the power supply to the MP2300 (or clear alarms to restart communication).

   The offset saved in the M register is stored to OL□□48.

2. Check to see if communication has been synchronized.

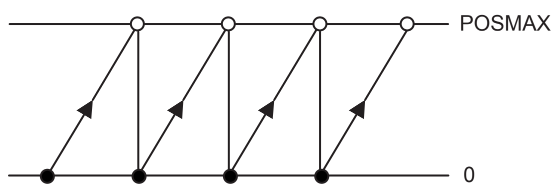
   Check to see if the Motion Controller Operation Ready bit (SVCRDY) (IB□□000) is ON.

3. Execute the Zero Point Setting (ZSET) motion command by setting OW□□08 to 9.

   - Use this procedure only to turn ON the Zero Point Return (Setting) Completed bit (IB□□0C5). It cannot be used to set the Zero point of the Machine Coordinate System OL□□48.

9.4 Absolute Position Detection for Infinite Length Axes

Infinite length axis positioning is a function that automatically resets the machine position, program position (absolute values in the program coordinate system), and current position at regular intervals according to the Maximum Value of Rotary Counter (POSMAX) (fixed parameter 10). This function can be used for repeated positioning in one direction.



9.4.1 Simple Absolute Infinite Length Position Control

(1) Overview

The Simple Absolute Infinite Length Position Control is a position control method that can be used for infinite length axes and has the following features.

- The coordinate system can be created simply by setting the machine coordinate system zero point position offset when the power is turned ON (when the communication is restarted).
- No ladder program for position control is required.

For the system that satisfies the conditions to enable the Simple Absolute Infinite Length Position Control (described in the following section), select the Simple Absolute Infinite Length Position Control.

(2) Conditions to Enable the Simple Absolute Infinite Axis Position Control

Set the Max. Revolution of Absolute Encoder (fixed parameter 38) to a value that satisfies the following equation to enable the Simple Absolute Infinite Axis Position Control.

$$\frac{\text{(No.38: Max. Revolution of absolute encoder +1)}}{\text{Reset number of turns}} = \text{An integer (remainder = 0)}$$

The reset number of turns will differ depending on whether the command unit is set to pulse or millimeters/degrees/inches as shown below.

When the Reference Unit is Pulses	When the Reference Unit is mm, deg, or inch
$\frac{\text{No. 10 Infinite length axis rest position}}{\text{No.36: Number of pulses per motor rotation}}$	$\frac{\text{No. 10: Infinite length axis reset position} \times \text{No. 8: Motor gear ratio}}{\text{No. 6: Command units per machine rotation} \times \text{No. 9 Machine gear ratio}}$

The settings above can be used to enable Simple Absolute Infinite Axis Position Control with a ∑-II or ∑-III SERVOPACK.

- Simple Absolute Infinite Length Position Control cannot be used by the ∑-I SERVOPACK.

■ System That Does Not Satisfy the Above Condition

The system that does not satisfy the above condition cannot use the Simple Absolute Infinite Length Position Control. Prepare the ladder program for position control. Refer to *9.4.5 Infinite Length Position Control without Simple Absolute Positions* on page 9-20 for details.

9.4.2 Parameter Settings for Simple Absolute Infinite Length Position Control

Set the following parameters to use the Simple Absolute Infinite Length Position Control for an infinite length axis.

CAUTION	• The parameters for which precautions are provided must be set referring to *9.3.1 (3) Detailed Descriptions* on page 9-8. Set these parameters carefully. If they are not set correctly, the current position may not be correct after the power is turned ON. Machine damage may occur.

(1) Parameters Settings for Simple Absolute Infinite Length Position Control

Set the fixed parameters No.1 bit 0 and bit 9, and No. 30 as follows to set the Simple Absolute Infinite Length Position Control for an infinite length axis.

Parameter	Fixed Parameter No. 1, Bit 0 (Axis Type)	Fixed Parameter No. 1, Bit 9 (Simple ABS Infinite Axis)	Fixed Parameter No. 30 (Encoder Type)
Setting	1: Infinite length axis	1: Enabled	1: Absolute encoder

(2) MP2300 Fixed Parameters for Absolute Position Detection

Fixed Parameter No.	Name	Setting/Range	Units	Reference
No. 4	Reference Unit Setting	0: pulse 1: mm 2: deg 3: inch (Electric gear is disabled when pulse is selected.)	–	–
No. 6	Reference Units per Revolution	1 to 2^{31}–1	1 = 1 reference unit	–
No. 8	Gear Ratio (Motor)	1 to 65535	1 = 1 rotation	–
No. 9	Gear Ratio (Load)	1 to 65535	1 = 1 rotation	–
No. 10	Reset position of Infinite Length	1 to 2^{31}–1	Reference unit	–
No. 36	Encoder Resolution in Pulses/ Revolution	1 to 2^{31}–1 (Set the value after multiplication. For example, set 2^{16} = 65536 when using a 16-bit encoder)	pulse	9.3.1 (1) [c]
No. 38	Max. Revolutions of Absolute Encoder	0 to 2^{31}–1	1 = 1 rotation	9.3.1 (1) [d]

(3) SERVOPACK Parameters for Absolute Position Detection

SERVOPACK Model	Parameter	Name	Setting Range	Units	Reference
Σ-III Series (SGDS-□□□1□□)	Pn000.0	Direction Selection	0: Sets counterclockwise (CCW) rotation as forward direction. 1: Sets clockwise (CW) rotation as forward direction (reverse rotation mode).	–	–
	Pn205	Multiturn Limit Setting	0 to 65535	Rev	9.3.1 (3) [d]
	Pn212	Number of Encoder Pulses	16 to 1073741824	P/Rev	9.3.1 (3) [c]
	Pn002.2	Absolute Encoder Usage	0: Uses absolute encoder as an absolute encoder. 1: Uses absolute encoder as an incremental encoder.	–	9.3.1 (3) [b]
Σ-II Series (SGDH-□□□E + NS100, NS115)	Pn000.0	Direction Selection	0: Sets counterclockwise (CCW) rotation as forward direction. 1: Sets clockwise (CW) rotation as forward direction (reverse rotation mode).	–	–
	Pn201	Number of Encoder Pulses	16 to 16384	P/Rev	9.3.1 (3) [c]
	Pn205	Multiturn Limit Setting	0 to 65535	Rev	9.3.1 (3) [d]
	Pn002.2	Absolute Encoder Usage	0: Uses absolute encoder as an absolute encoder. 1: Uses absolute encoder as an incremental encoder.	–	9.3.1 (3) [b]
Σ-I Series (SGD-□□□N, SGDB-□□AN)	Cn-0001, Bit E	Encoder Selection	0: Incremental encoder 1: Absolute encoder	–	9.3.1 (3) [b]
	Cn-0002, Bit 0	Rotation Direction Selection	0: Sets counterclockwise (CCW) rotation as forward rotation. 1: Sets clockwise (CW) rotation as forward rotation (reverse rotation mode).	–	–
	Cn-0011	Number of Encoder Pulses	513 to 32767	P/Rev	9.3.1 (3) [c]

(4) Detailed Descriptions

[a] Encoder Type/Encoder Selection/ Absolute Encoder Usage

For an axis performing absolute position detection, set the parameters as shown in the table below.

Model	Parameter	Setting
MP2300	Fixed parameter 30: Encoder Type	1: Absolute encoder
Σ-II and Σ-III Series SERVOPACK	Parameter Pn002.2: Absolute Encoder Usage	0: Uses absolute encoder as an absolute encoder
Σ-I Series SERVO-PACK	Parameter Cn-0001, Bit E: Encoder Selection	1: Absolute encoder

- If the abos settings are not used, correct motion control will not be performed. Set the parameters carefully.
- Be sure to set both the MP2300 and SERVOPACK parameters.

[b] Number of Encoder Resolution

■ If using the SVB-01 Module or the built-in SVB Module

Refer to the following table and set the fixed parameter 36 (Encoder Resolution in Pulses/Resolution) according to the number of servomotor bits. The settings can be used for all SERVOPACK models.

Number of Bits	MP2300 Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)
12	4096
13	8192
15	32768
16	65536
17	131072
20	1048576

■ If using the SVA-01 Module

The methods of setting the fixed parameters 36 and 22 differ depending on the SERVOPACK used.

- With SERVOPACKs in the Σ series

Number of Bits	MP2300 Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
12	1024	6: Pulse A/B mode (×4)
15	8192	6: Pulse A/B mode (×4)

- With SERVOPACKs in the Σ-II series

Number of Bits	Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
13	2048 [*1]	6: Pulse A/B mode (×4)
16	16384 [*1]	6: Pulse A/B mode (×4)
17	16384 [*1, *2]	6: Pulse A/B mode (×4)

* 1. This value depends on the setting of Pn212 (PG dividing ratio). The values in the table are the maximum values.
* 2. Because the maximum value of Pn201 (PG dividing ratio) is 16384, the maximum value with a 17-bit encoder is also 16384.

- With SERVOPACKs in the Σ-III series

Number of Bits	Fixed Parameter 36 (Encoder Resolution in Pulses/Resolution)	Fixed Parameter 22 (Pulse Counting Mode)
17	16384 *	6: Pulse A/B mode (×4)
20	262144 *	6: Pulse A/B mode (×4)

* This value depends on the setting of Pn212 (PG dividing ratio). The values in the table are the maximum values.

- If the above settings are not used, correct motion control will not be performed. Set the parameters carefully.

[c] Max. Revolution of Absolute Encoder/Multiturn Limit Setting

These parameters determine the maximum value of the number of encoder turns managed by the SERVOPACK and MP2300.

For an infinite length axis, set the parameters as shown in the table below.

Applicable SERVOPACK	MP2300 Fixed Parameter 38 (Max. No. of Absolute Encoder Turns)	SERVOPACK Parameter Pn205 (Multiturn Limit Setting)
Σ-II and Σ-III Series	Set the same value as Pn205 *	65534 max. *
Σ-I Series	99999	—

* If the MP2300 fixed parameter 38 is set to 65535 when using a Σ-II series SERVOPACK for an infinite axis, a fixed parameter setting error will occur.

- Set the parameters correctly as shown in the above table. Otherwise, correct motion control will not be performed resulting in position error.

9.4.3 Setting the Zero Point and Turning ON Power as Simple Absolute Positions

(1) Calculating the Zero Point of the Machine Coordinate System

If using the simple absolute infinite length position control, the MP2300 calculates the axis position (i.e., current position for the machine coordinate system) as follows when the power is turned ON.

Current position for the machine coordinate system (monitoring parameter IL□□10[*1] or IL□□16[*1]) = Encoder position when servo power is turned ON[*2] + Zero Point Offset (setting parameter OL□□48)

To assign the current position of the machine coordinate system as the zero position, set the OL□□48 (encoder position when servo power turns ON) to a negative value. In other words, set OL□□48 to the difference between OL□□48 and IL□□10 (or IL□□16).

* 1. Use the IL□□10 to make the machine coordinate reference position a positive value, and IL□□16 to make a negative value.
* 2. The encoder position when the servo power is turned ON is calculated with the following equation: Multiturn data × Number of encoder pulses + initial increment pulses. Refer to your SERVOPACK manual for information on the initial increment pulses.

Example: IL□□10 = 10,000 and OL□□48 = 100

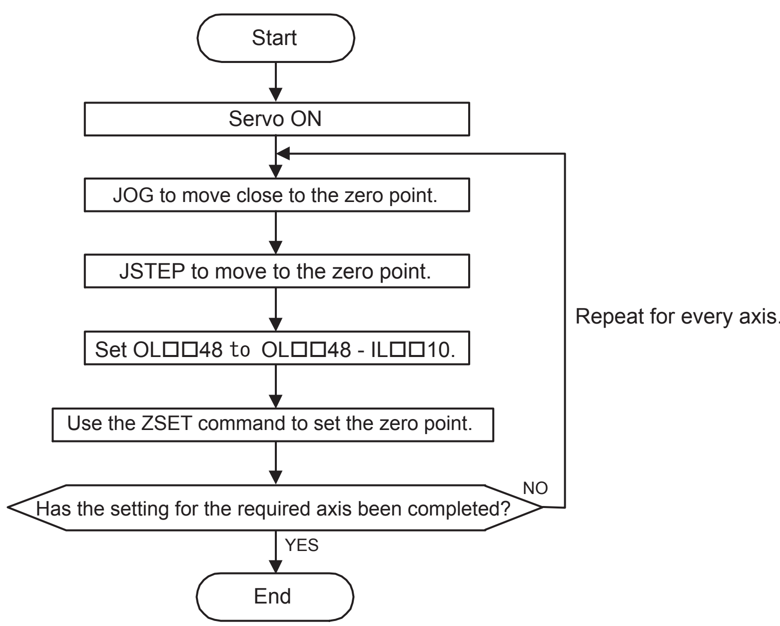
Set the encoder position when servo power is turned ON to a negative value as shown below.

OL□□48 − IL□□10 = 100 − 10000
= − 9900

Set OL□□48 to -9900 to assign the current position in the machine coordinate system as the zero point.

(2) Setting the Zero Point for Simple Absolute Infinite Axis Position Control

The procedure to set the zero point for a simple absolute infinite axis position control is shown below.



(3) Saving OL□□48 Values at Power OFF

After having set the zero point, save the value of OL□□48 before turning OFF the power of MP2300 so that the value will be written in OL□□48 the next time the power is turned ON.
There are two ways to save the Zero Point Offset (OL□□48) value. It can be saved through a ladder program in an M Register backed up by battery or from the MPE720 Parameter Window. These ways are described below.
Refer to ■ *Method 1: Saving in an M Register with Ladder Program* on page 9-11 and ■ *Method 2: Saving the Zero Point Offset (OL□□48) from the MPE720 Parameter Window* on page 9-12 for more details.

9.4.4 Turning ON the Power after Setting the Zero Point

The Zero Point Return (Setting) Completed bit (IB□□0C5) will turn OFF when the power supply to the MP2300 is turned OFF and ON, the communication are interrupted by the power OFF to the SERVOPACK, or communication are interrupted in any other reason after the zero point has been set. The Zero Point Return (Setting) Completed bit must therefore be turned back ON when the power supply is restored.
Use the following procedure.

1. Turn ON the power supply to the MP2300 (or clear alarms to restart communication).

The offset saved in the M register is stored in OL□□48.

2. Check to see if communication has been synchronized.

Check to see if the Motion Controller Operation Ready bit (SVCRDY) (IB□□000) is ON.

3. Execute the Zero Point Setting (ZSET) motion command by setting OW□□08 to 9.

- Use this procedure only to turn ON the Zero Point Return (Setting) Completed bit (IB□□0C5). It cannot be used to set the zero point of the machine coordinate system (OL□□48).

9.4.5 Infinite Length Position Control without Simple Absolute Positions

(1) Parameter Settings for Infinite Length Position Control without Simple Absolute Positions

Set the infinite length position control without simple absolute positions by setting the fixed parameters No. 1 bit 0 and bit 9, and No. 30 as shown in the table below when the simple absolute infinite length position control function cannot be used.

Parameter	Fixed Parameter No.1, Bit 0 (Axis Type)	Fixed Parameter No. 1, Bit 9 (Simple ABS Infinite Axis)	Fixed Parameter No. 30 (Encoder Type)
Setting	1: Infinite length axis	0: Disabled	1: Absolute encoder

(2) Infinite Length Axis Position Control without Simple Absolute Positions

The MP2300 performs the following infinite length position control when the Simple Absolute Infinite Length Position Control Function is not used.
The modularized position and absolute position are always stored as paired information in backup memory. This information is used the next time power is turned ON as the modularized position and the absolute position at shutdown to find the relative encoder position in pulses.

- Modularized position = Modularized position at power OFF + (Absolute position - Absolute position at power OFF)*

  * The portion in parentheses ( ) represents the moving amount while the power is OFF.

■ Terminology: Absolute position

Absolute encoder position information (Multiturn data × Number of encoder pulses + Initial increment pulses)

■ Terminology: Modularized Position

The position information from the MP2300 converted to pulses

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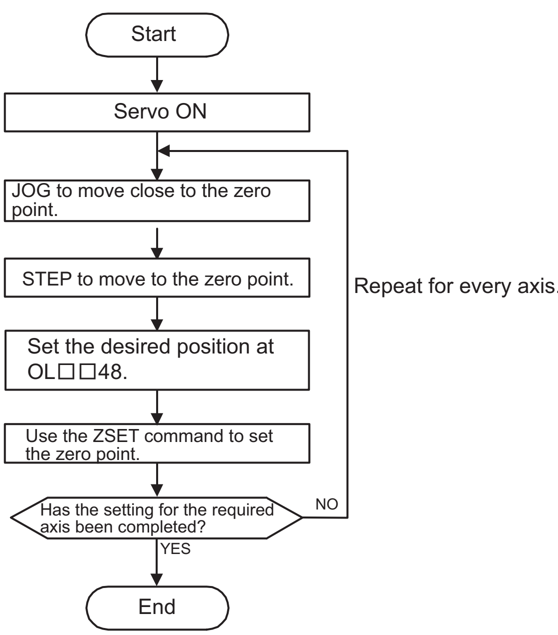
(3) Setting the Zero Point for an Infinite Length Axis without Simple Absolute Positions



Perform the procedure shown in the figure on the left to set the zero point for infinite length position control without simple absolute positions.
The OL□□48 value (information of the zero point) does not have to be stored in an M register with this method. Set a desired position in OL□□48 and execute the ZSET command to set the zero point . With this setting, the current position of the machine coordinate system will be set.
Example:
To set the current position of the machine coordinate system to 0 when executing the ZSET command, set OL□□48 to 0.

(4) Ladder Program for Infinite Length Axis Position Control

If the Simple Absolute Infinite Length Position Control Function is not used, a special ladder program is needed for normal operation and for operation when system power is turned ON.

[a] Normal Operation

1. Check the status of the Zero Point Return (Setting) Completed bit.

Check to see if the Zero Point Return (Setting) Completed bit (monitoring parameter IW□□0C, bit 5) is ON. If it is, go to step 2.
If it is not, it means that the pulse position at power OFF, encoder position at power OFF and all position data was not settled. In that case, restart the system and set up the position data again or execute the ZSET (zero point setting) motion command to settle the position data all over from the start.

2. Save the modularized position at power OFF and absolute position at power OFF.

Use the ladder program to save the following monitoring parameters with high-speed scan timing at an M register backed up by battery.

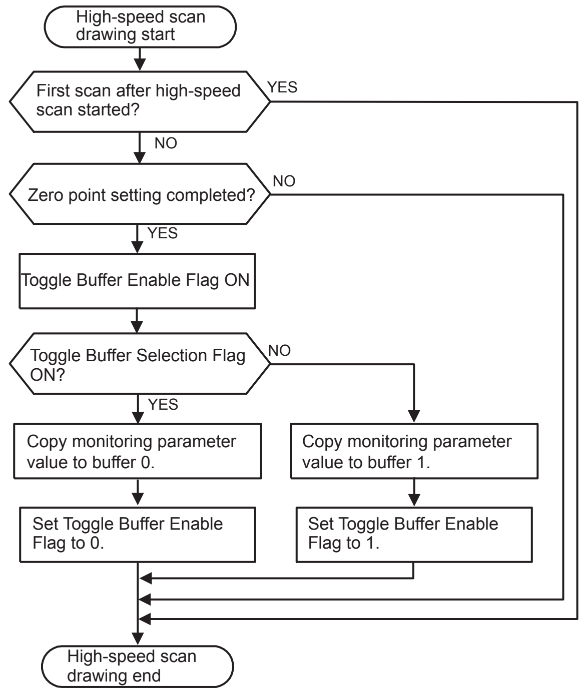
- Monitoring Parameter: Absolute Position at Power OFF (All four words at IL□□5E to IL□□60)
- Monitoring Parameter: Modularized Position at Power OFF (All four words at IL□□62 to IL□□64)

The M register that is used to save the above monitoring parameters is structured as shown below.

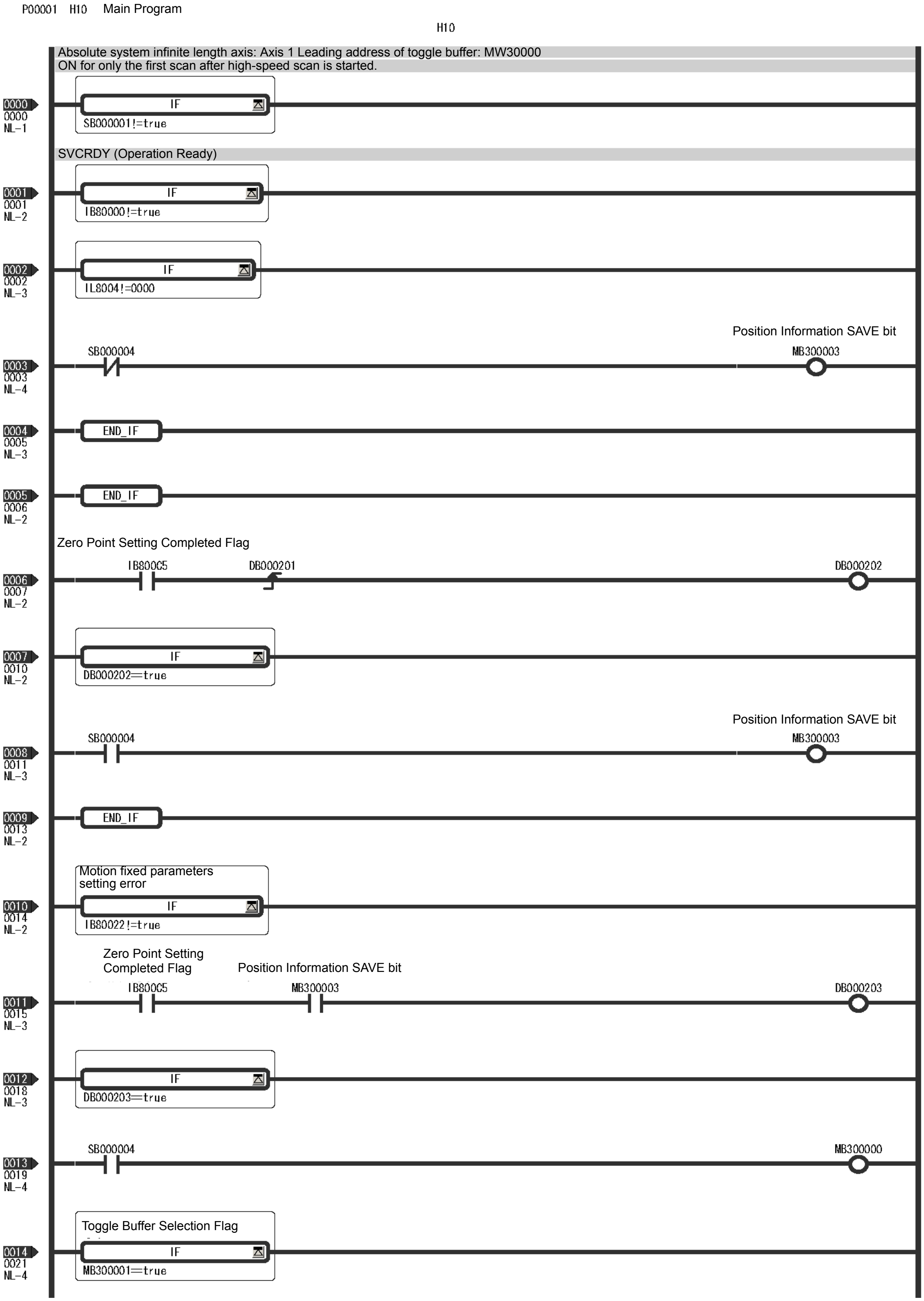
<table>
<tr><td rowspan="3">MW□□□□□</td><td>Bit 0</td><td colspan="2">Toggle Buffer Enabled Flag (OFF: Disabled, ON: Enabled)</td></tr>
<tr><td>Bit 1</td><td colspan="2">Toggle Buffer Selection Flag (OFF: Buffer 0, ON: Buffer 1)</td></tr>
<tr><td>Bit 2</td><td colspan="2">Position Data Re-setup Request Flag (OFF: Complete, ON: Request)</td></tr>
<tr><td>MW□□□□□ +1</td><td colspan="3">Not used</td></tr>
<tr><td rowspan="2">ML□□□□□ +2
ML□□□□□ +4</td><td rowspan="4">Buffer 0</td><td rowspan="2">Monitoring Parameter:
Absolute Position at Power OFF</td><td>Lower-place two words (IL□□5E)</td></tr>
<tr><td>Upper-place two words (IL□□60)</td></tr>
<tr><td rowspan="2">ML□□□□□ +6
ML□□□□□ +8</td><td rowspan="2">Monitoring Parameter:
Modularized Position at Power OFF</td><td>Lower-place two words (IL□□62)</td></tr>
<tr><td>Upper-place two words (IL□□64)</td></tr>
<tr><td rowspan="2">ML□□□□□ +10
ML□□□□□ +12</td><td rowspan="4">Buffer 1</td><td rowspan="2">Monitoring Parameter:
Absolute Position at Power OFF</td><td>Lower-place two words (IL□□5E)</td></tr>
<tr><td>Upper-place two words (IL□□60)</td></tr>
<tr><td rowspan="2">ML□□□□□ +14
ML□□□□□ +16</td><td rowspan="2">Monitoring Parameter:
Modularized Position at Power OFF</td><td>Lower-place two words (IL□□62)</td></tr>
<tr><td>Upper-place two words (IL□□64)</td></tr>
</table>

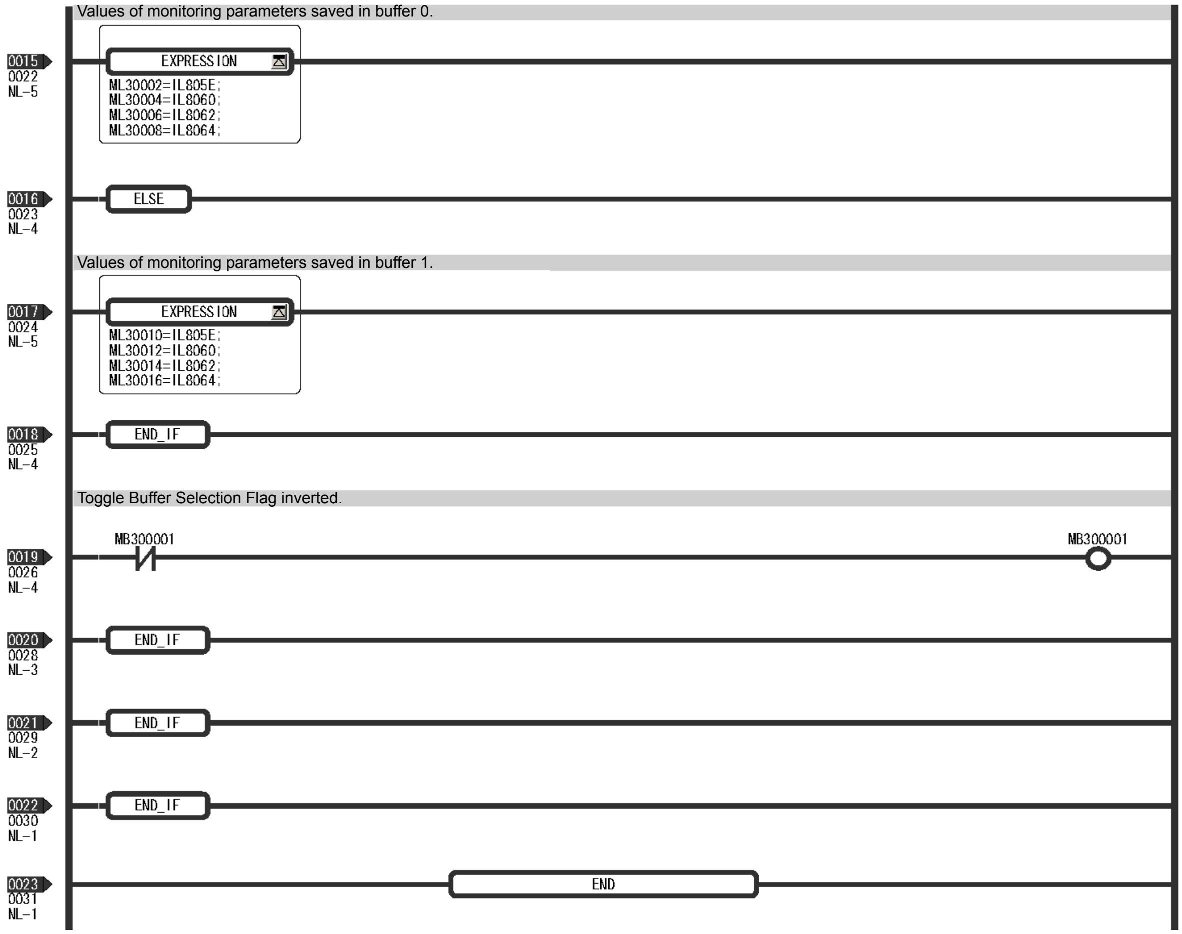
- Two buffers are needed to save the absolute position and the modularized position at power OFF because the program may be exited without settling position data at all four words if power is turned OFF during the high-speed scan.

Use the following flowchart to store values in buffers.



The following programming example (ladder program) is for the flowchart shown on the previous page. The axis used here is axis 1 of circuit number 1. Change the motion parameter register number if the circuit and axis numbers are different.




Values of monitoring parameters saved in buffer 0.
0015
0022
NL-5
EXPRESSION
ML30002=IL805E;
ML30004=IL8060;
ML30006=IL8062;
ML30008=IL8064;
0016
0023
NL-4
ELSE
Values of monitoring parameters saved in buffer 1.
0017
0024
NL-5
EXPRESSION
ML30010=IL805E;
ML30012=IL8060;
ML30014=IL8062;
ML30016=IL8064;
0018
0025
NL-4
END_IF
Toggle Buffer Selection Flag inverted.
0019
0026
NL-4
MB300001
MB300001
0020
0028
NL-3
END_IF
0021
0029
NL-2
END_IF
0022
0030
NL-1
END_IF
0023
0031
NL-1
END

[b] Turning the System Back ON (Turning the Servo Back ON)

Set up position data again from the ladder program using high-speed scan timing as shown below. This is done when MP2300 power or servo power is turned ON.

1. Store Modularized Position at Power OFF and Absolute Position at Power OFF to setting parameters.

Store the Modularized Position at Power OFF and Absolute Position at Power OFF values saved in M register to the following setting parameters.

- Setting parameter: Absolute Position at Power OFF (All four words at OL□□5E to OL□□60)
- Setting parameter: Modularized Position at Power OFF (All four words at OL□□62 to OL□□64)

Store the contents of the buffer selected by the Toggle Buffer Selection Flag.

2. Infinite Length Axis Position Information LOAD

Reset the Infinite Length Axis Position Information LOAD bit (setting parameter OW□□00, bit 7) to 0, 1 and 0 again. This will allow all position data to be settled. The following monitoring parameters will then be enabled and the Zero Point Return (Setting) Completed bit (monitoring parameter IW□□0C bit 5) will turn ON.

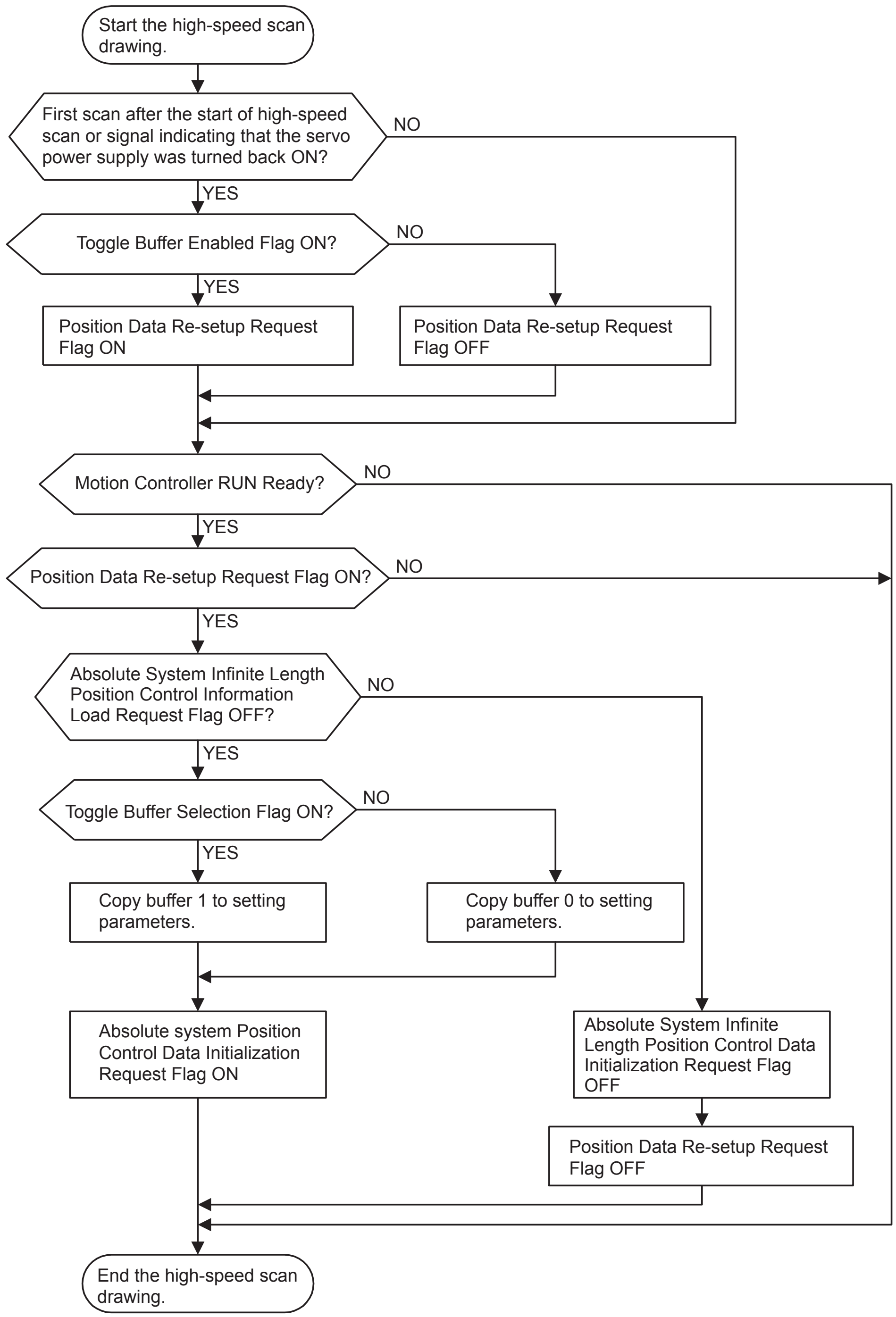
- Monitoring Parameter: Absolute Position at Power OFF (All four words at IL□□5E to IL□□60)
- Monitoring Parameter: Modularized Position at Power OFF (All four words at IL□□62 to IL□□64)

The system will create position data using the following equation when Infinite Length Axis Position Information LOAD is requested.

- Modularized position = modularized position at power OFF + (absolute position – absolute position at power OFF)*

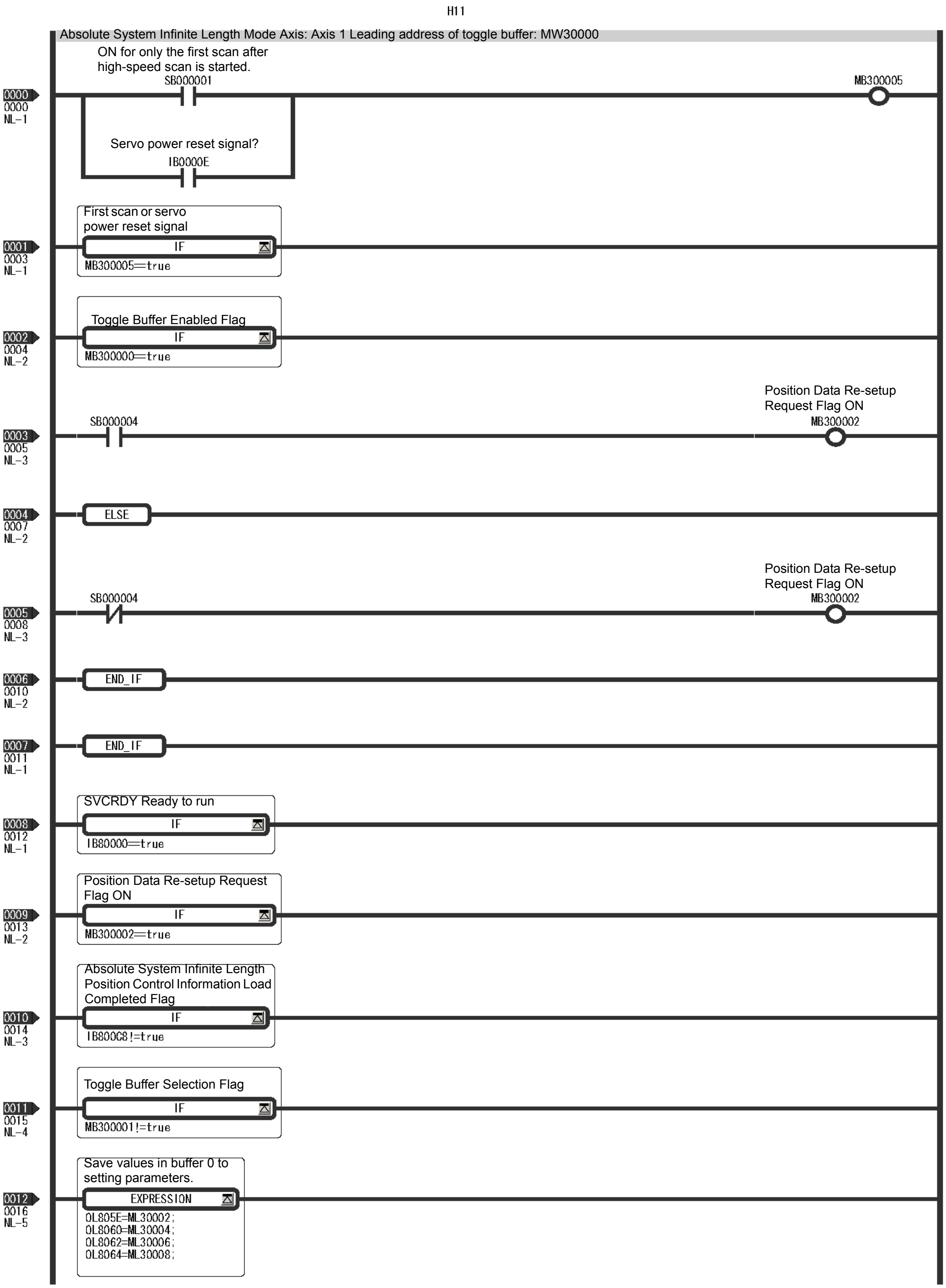
* The portion in parentheses ( ) represents the moving amount while power is OFF.

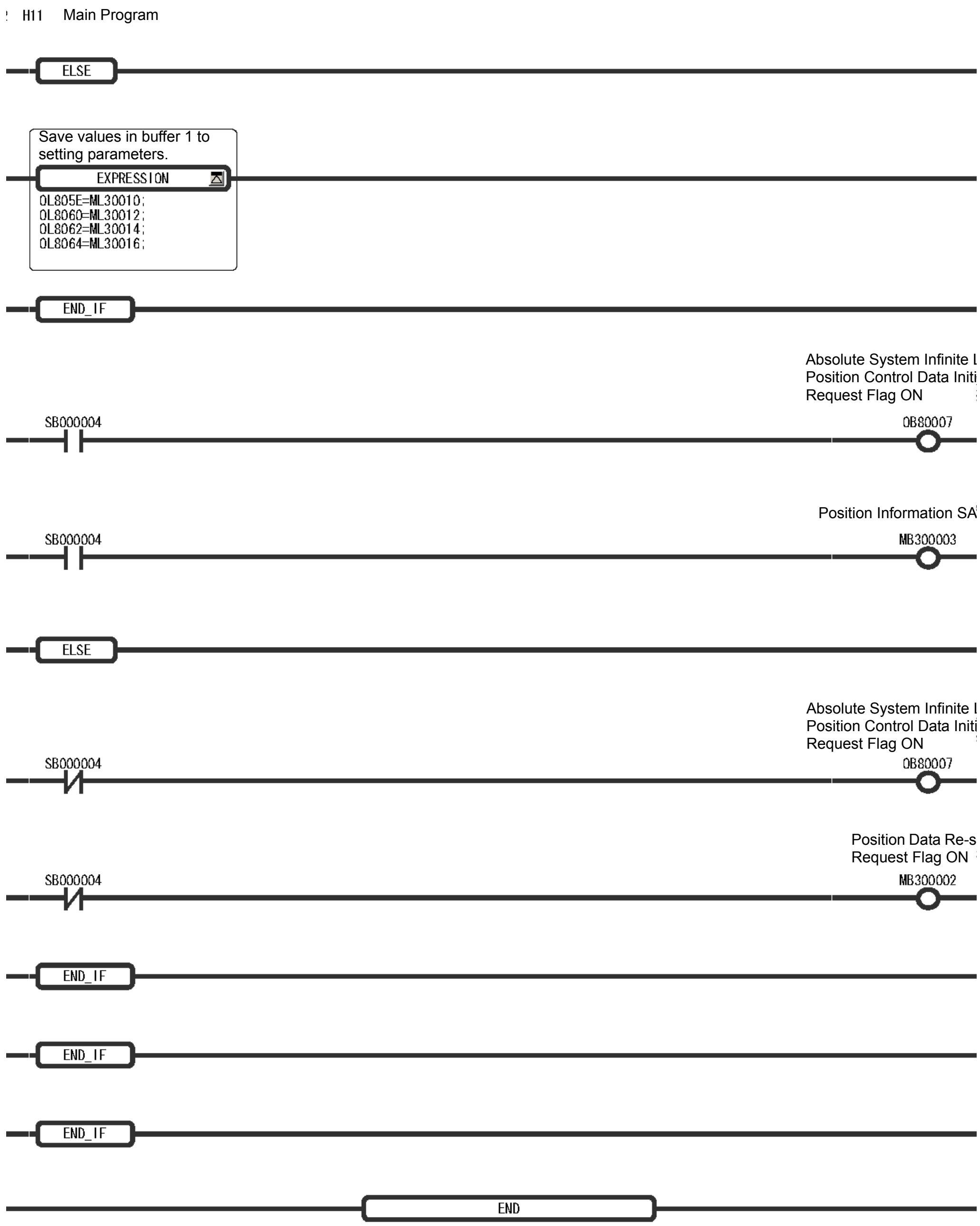
Use the following flowchart for storing parameters in registers and for Infinite Length Axis Position Information LOAD requests.



The following programming example (ladder program) is for the flowchart shown above. The axis used here is axis 1 of circuit number 1. Change the motion parameter register number if the circuit and axis numbers are different.

P00001 H11 Main Program





- There are no restrictions in the executing order for ladder programs H10 and H11 when an absolute encoder is used for a finite length axis.

10

Utility Functions

This chapter describes MP2300 and SERVOPACK utility functions like vertical axis control, overtravel, and software limits.

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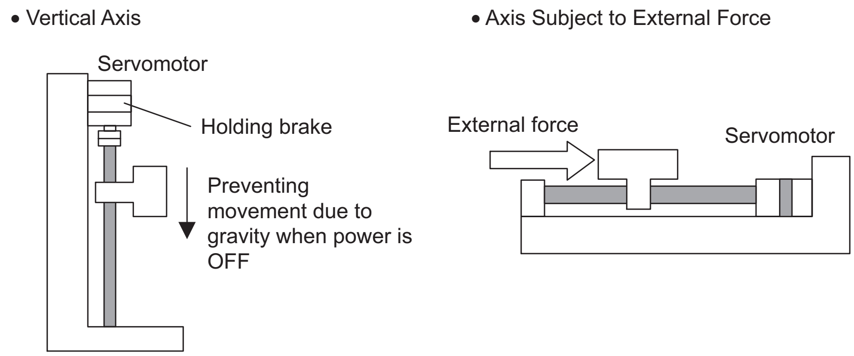
10.1 Controlling Vertical Axes

This section explains connection methods and parameter settings required to use the SERVOPACK to control a vertical axis.

10.1.1 Holding Brake Function of the SERVOPACK

When using a SERVOPACK to control a vertical axis or an axis to which an external force is being applied, a Servomotor with a brake must be used to prevent the axis from dropping or moving due to gravity or the external force when the system power is turned OFF.



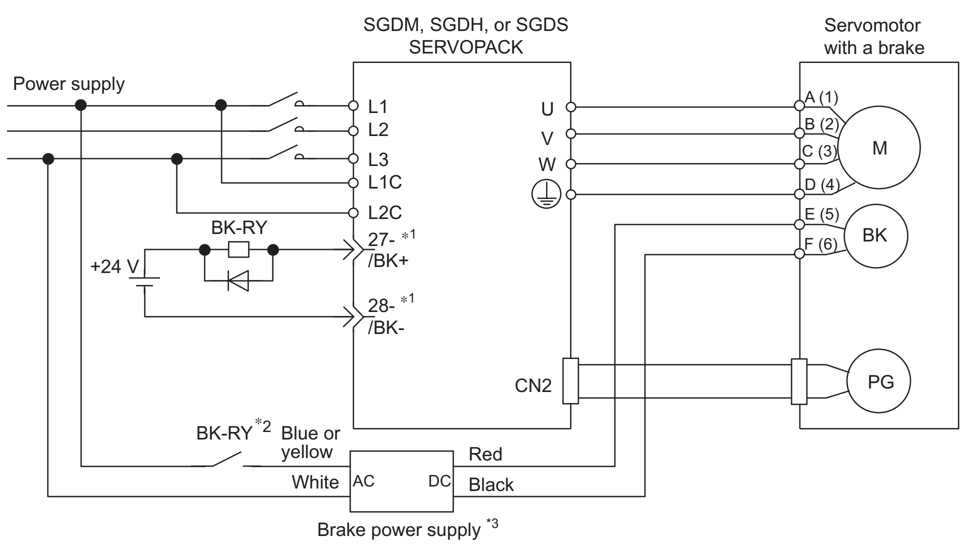
The holding brake of the Servomotor is controlled through the brake interlock output (/BK) signal from the SERVOPACK. The brake is not controlled from the MP2300.

- The brake built into a Servomotor with a brake uses non-excitation operation and is for use as a holding brake only. It cannot be used to control or stop axis movement. Use the holding brake only to hold the axis in a stopped state after the motor has stopped. The torque of the brake is 100% or higher of the rated torque of the motor.

10.1.2 Connections to Σ-II/III SGDH or SGDS SERVOPACK

(1) Example of a Brake ON and OFF Circuit

A circuit is configured to turn the brake ON and OFF using the /BK contact output signal from the SERVOPACK and a brake power supply. The following diagram shows the standard connections.



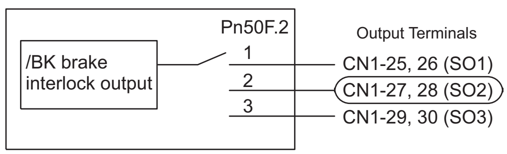
* 1. The output terminal is allocated using parameter Pn50F.2. Output terminal 1 (terminal numbers 1and 2) is selected in the example above.
* 2. Brake control relay contact
* 3. There are 200-V and 100-V brake power supplies.

(2) Parameter Settings

The SERVOPACK parameters related to control the holding brake are described below.

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Pn50F.2	Output Signal Selection 2	—	0: Brake not used 1: Terminal numbers 1 and 2 2: Terminal numbers 23 and 24 3: Terminal numbers 25 and 26	1	Speed, torque, position control

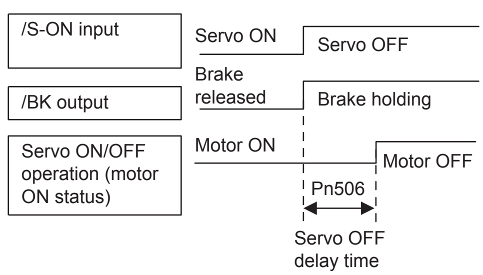
Details
The following parameter determines which CN1 pin (0 to 3 above) will be used to output the /BK signal.



- Do not allocate more than one signal per output circuit. Otherwise, a logical OR operation will be performed on all allocated signals.
- Set unused signals to 0 (brake not used).

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Pn506	Brake ON Timing after Motor Stops	10 ms	0 to 50	0	Speed, torque, position control

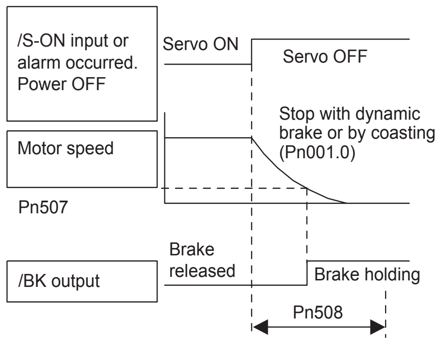
Details
This parameter adjusts the delay time from /BK Signal Output until Servo OFF (stopping Servomotor output), and it is used to be set when the machine moves slightly due to gravity or other factors after turning the brake ON.



- This parameter is used to set the timing when the motor is stopped. Brake operation while the motor is running is set in Pn507 and Pn508.
- For the standard settings, the Servo will turn OFF simultaneously with the /BK output (Brake Operation). If gravity causes the machine to move slightly at this time due to machine configuration or brake characteristics, turning OFF the Servo can be delayed to reduce the movement.

Parameter	Name	Unit	Setting/RangeSetting Range	Default	Control Mode
Pn507	Brake ON Timing when Motor Running	min^{-1}	0 to 10000	100	Speed, torque, position control
Pn508		10 ms	0 to 100	50	Speed, torque, position control

Details
Pn507: Speed Level for BK Signal Output when Motor Running
Pn508: Timing of BK Signal Output when Motor Running
These settings are used to set the timing for applying the brake when the Servo turns OFF due to an /S-ON input signal or alarm.

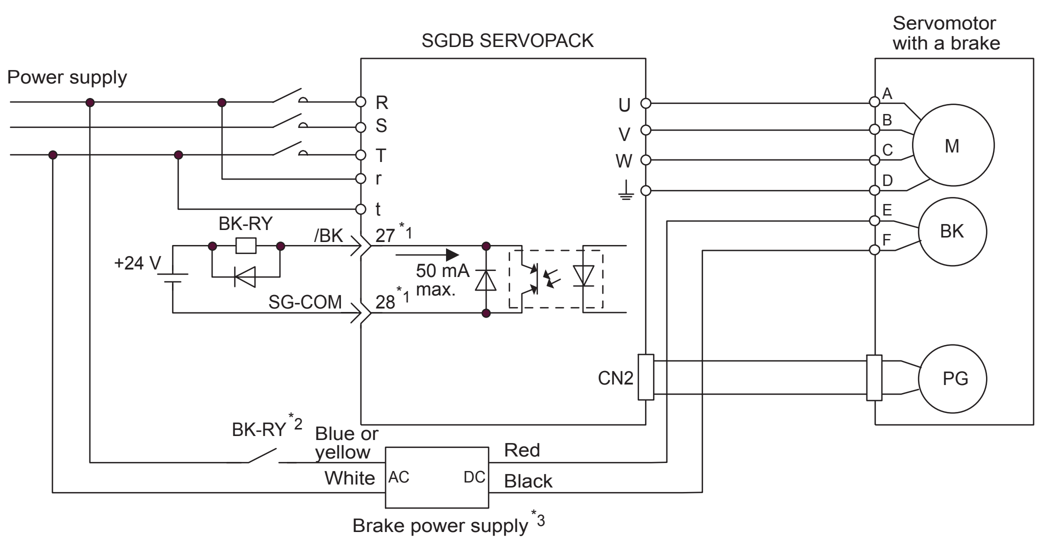


- The brake on the Servomotor is designed as a holding brake and it must be applied only after the motor has stopped. Adjust this parameter while observing machine operation.

10.1.3 Connections to Σ-I Series SGDB SERVOPACK

(1) Example of a Brake ON and OFF Circuit

A circuit is configured to turn the brake ON and OFF using the /BK contact output signal from the SERVOPACK and a brake power supply. The following diagram shows the standard connections.



* 1. The terminal is allocated using parameter Cn-2D. In the example above, /BK signal 4 is set in the 2nd digit.
* 2. Brake control relay contact
* 3. There are 200-V and 100-V brake power supplies.

(2) Parameter Settings

The SERVOPACK parameters related to control the holding brake are described below.

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Cn-2D	OUTSEL Output Signal Selection	—	110 to 666	210	Speed, torque, position control

Details

The following parameter determines which pin of the 1CN will be used to output the /BK signal (4 on the lower right column). In the figure above, 4 is allocated to the 2s digit and the setting is □4□.

Allocation

1st digit: CN1-25, 26 (Factory setting: 0)
2nd digit: CN1-27, 28 (Factory setting: 1)
3rd digit: CN1-29, 30 (Factory setting: 2)

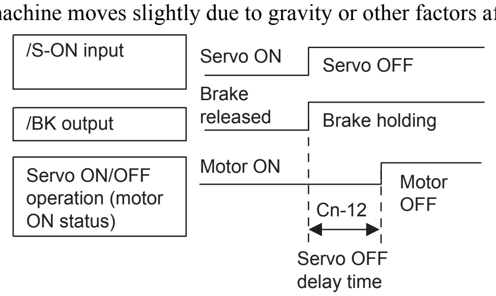
Set Value and Function

0: /COIN/ /V-CMP (Valid only at the 1st digit.)
1: /TGON
2: /S-RDY
3: /CLT
4: /BK
5: OL warning
6: OL alarm

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Cn-12	Brake ON Timing after Motor Stops	10 ms	0 to 50	0	Speed, torque, position control

Details

This parameter adjusts the Delay Time from /BK Signal Output until Servo OFF (stopping Servomotor output), and it is used to be set when the machine moves slightly due to gravity or other factors after turning the brake ON.



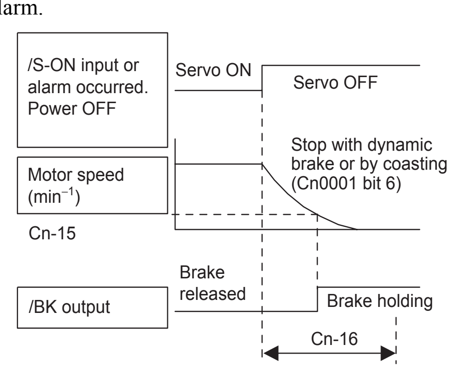
- This parameter is used to set the timing when the motor is stopped. Brake operation while the motor is running is set in Cn-15 and Cn-16.
- For the standard settings, the Servo will turn OFF simultaneously with the /BK output (Brake Operation). If gravity causes the machine to move slightly at this time due to machine configuration or brake characteristics, turning OFF the Servo can be delayed to reduce the movement.

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Cn-15	Brake ON Timing when Motor Running	min^{-1}	0 to max. speed	100	Speed, torque, position control
Cn-16		10 ms	0 to 100	50	Speed, torque, position control

Details

Cn-15: Speed Level for BK Signal Output when Motor Running
Cn-16: Timing of BK Signal Output when Motor Running

These settings are used to set the timing for applying the brake when the Servo turns OFF due to an /S-ON input signal or alarm.

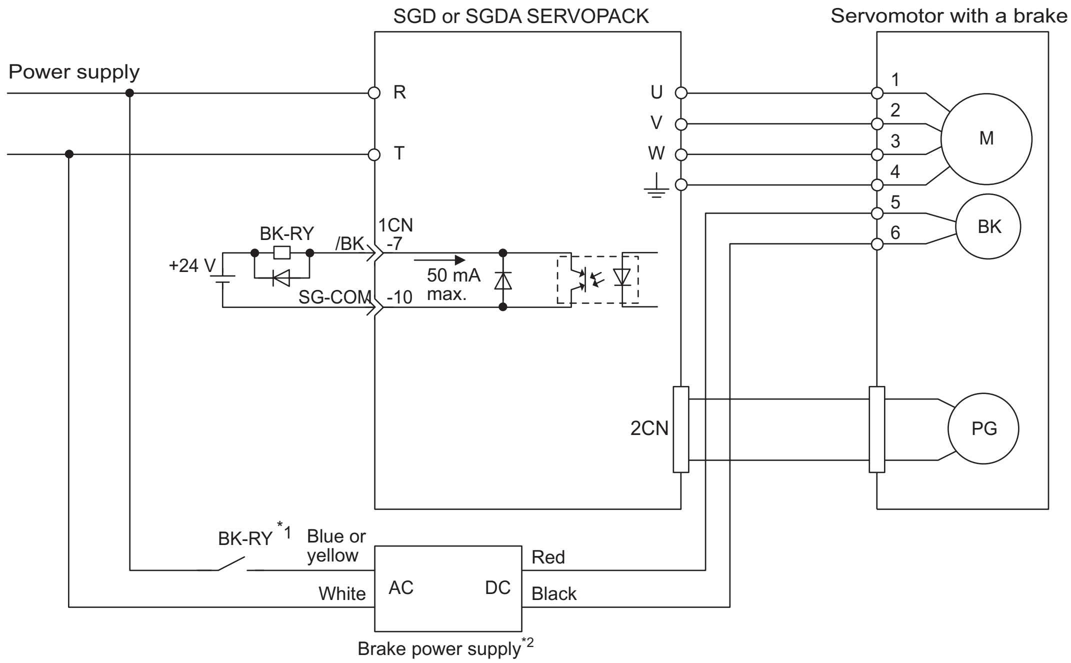


- The brake on the Servomotor is designed as a holding brake and it must be applied only after the motor has stopped. Adjust this parameter while observing machine operation.

10.1.4 Connections to Σ-I Series SGD SERVOPACK

(1) Brake ON and OFF Circuit Example

A circuit is configured to turn the brake ON and OFF using the /BK contact output signal from the SERVOPACK and a brake power supply. The standard connections are shown in the following diagram.



* 1. Brake control relay contact
* 2. There are 200-V and 100-V brake power supplies.

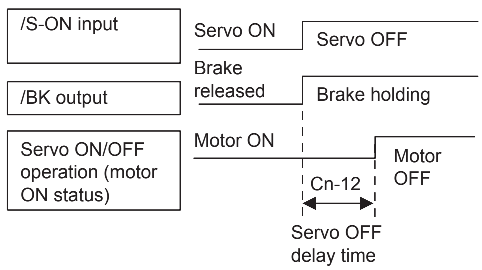
(2) Parameter Settings

The SERVOPACK parameters related to controlling the brake are described below.

Parameter	Name	Unit	Setting/Range	Default	Control Mode
Cn-12	Brake ON Timing after Motor Stops	10 ms	0 to 50	0	Speed, torque, position control

Details

This parameter adjusts the Delay Time from /BK Signal Output until Servo OFF (stopping Servomotor output), and it is used to be set when the machine moves slightly due to gravity or other factors after turning the brake ON.



- This parameter is used to set the timing when the motor is stopped. Brake operation while the motor is running is set in Cn-15 and Cn-16.
- For the standard settings, the Servo will turn OFF simultaneously with the /BK output (Brake Operation). If gravity causes the machine to move slightly at this time due to machine configuration or brake characteristics, turning OFF the Servo can be delayed to reduce the movement.

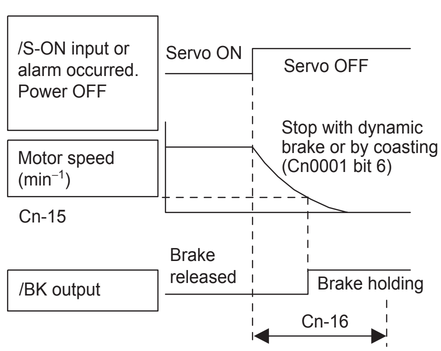
Parameter	Name	Unit	Setting/Range	Default	Control Mode
Cn-15	Brake ON Timing when Motor Running	min^{-1}	0 to max. speed	100	Speed, torque, position control
Cn-16		10 ms	0 to 100	50	Speed, torque, position control

Details

Cn-15: Speed Level for BK Signal Output when Motor Running

Cn-16: Timing of BK Signal Output when Motor Running

These settings are used to set the timing for applying the brake when the Servo turns OFF due to an /S-ON input signal or alarm.



- The brake on the Servomotor is designed as a holding brake and it must be applied only after the motor has stopped. Adjust this parameter while observing machine operation.

10.2 Overtravel Function

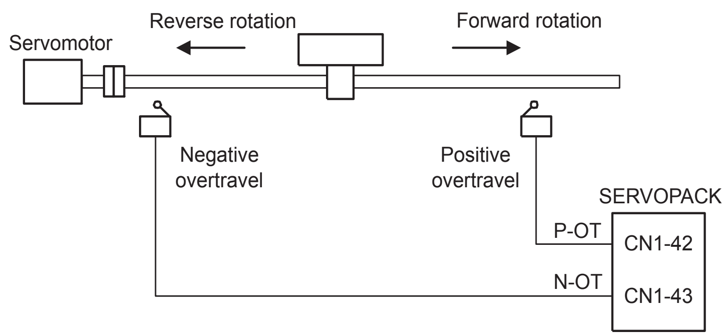
The overtravel function forces the machine to stop when the moving part of the machine exceeds the range of movement. With the MP2300, processing for stopping as a result of overtravel is achieved by using SERVOPACK functions.
The SERVOPACK connections and parameter setting depend on the model of SERVOPACK. The connections and parameter settings are described in the following sections.

10.2.1 Connections to Σ-II/III Series SGDH or SGDS SERVOPACK

The following parameters must be set to ensure the overtravel input signals are connected correctly for the overtravel function.

(1) Overtravel Input Signal Connections

Correctly connect the input signals for the overtravel limit switches shown below to the corresponding pins on the SERVOPACK CN1 or 1CN connector.



P-OT	When ON CN1-42 (1CN-16) is low.	Forward drive enabled. Normal operating condition
	When OFF CN1-42 (1CN-16) is high.	Forward drive disabled. (Reverse movement possible.)
N-OT	When ON CN1-43 (1CN-17) is low.	Reverse drive enabled. Normal operating condition
	When OFF CN1-43 (1CN-17) is high.	Reverse drive disabled. (Forward movement possible.)

(2) Parameter Settings

[a] Use/Not Use Overtravel Input Signals

The following parameters are used to enable and disable the overtravel input signals.

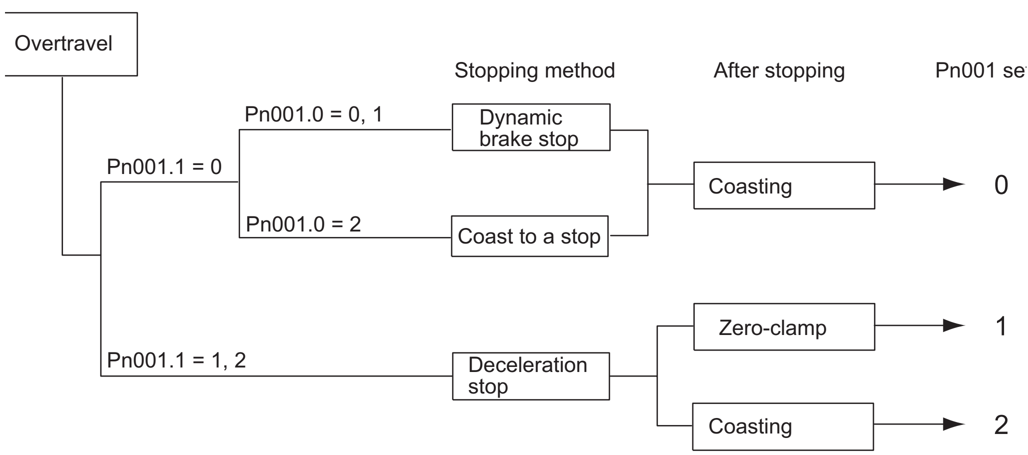
Parameter	Name	Set Value	Item	Default
Pn50A.3	P-OT Signal Mapping	2 (Recommended)	Enables use of Positive Prohibit Input Signal (P-OT). (Forward rotation prohibited when open, allowed for 0 V.)	2
		8	Disables the P-OT signal.	
Pn50B.0	N-OT Signal Mapping	3 (Recommended)	Enables use of Negative Prohibit Input Signal (N-OT). (Reverse rotation prohibited when open, allowed for 0 V.)	3
		8	Disables the N-OT signal.	

- These parameters are disabled by executing a self-configuration command.

[b] Selecting Motor Stopping Methods for Overtravel

When using the overtravel function has been enabled, the following parameters are used to set the methods for stopping the motor. Select the methods for stopping when the P-OT or N-OT is input during motor running.

Parameter	Name	Set Value	Item	Default
Pn001.1	Overtravel Stop Mode	0 (Recommended)	Stops the motor according to Pn001.0 setting (dynamic brake or coasting) when overtravel is detected.	0
		1	Decelerates the motor to a stop by applying the torque specified in Pn406 (Emergency Stop Torque) when overtravel is detected, and then sets it to zero clamp (servolock) mode.	
		2	Decelerates the motor to a stop by applying the torque specified in Pn406 (Emergency Stop Torque) when overtravel is detected, and then sets it to coast (servo OFF) mode.	
Pn001.0	Servo OFF Stop Mode	0 (Recommended)	Stops the motor by applying dynamic brake (DB) and then holds the DB.	0
		1	Stops the motor by applying dynamic brake (DB) and then releases the DB.	
		2	Makes the motor coast to a stop. Current is not supplied to the motor and the machine stops due to friction.	



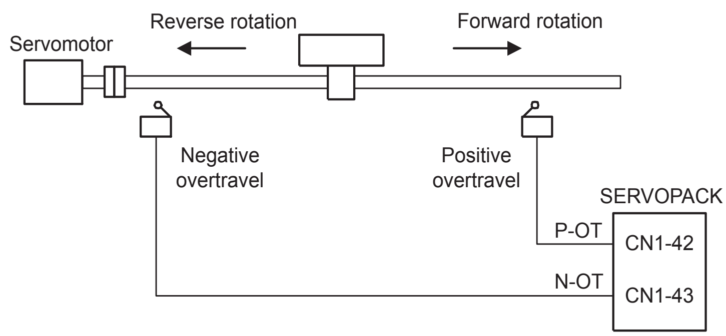
10.2.2 Connections to Σ-I Series SGDB or SGD SERVOPACK

The following parameters must be set to ensure the overtravel input signals are connected correctly for the overtravel function.

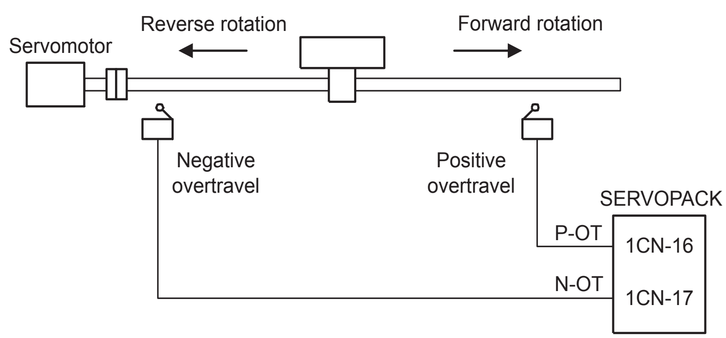
(1) Overtravel Input Signal Connections

Connect the input signals for the overtravel limit switches to the corresponding pins on the SERVOPACK CN1 or 1CN connector as shown below.

■ Connections to SGDB SERVOPACK



■ Connections to SGD SERVOPACK



P-OT	When ON CN1-42 (1CN-16) is low.	Forward drive enabled. Normal operating condition
	When OFF CN1-42 (1CN-16) is high.	Forward drive disabled. (Reverse movement possible.)
N-OT	When ON CN1-43 (1CN-17) is low.	Reverse drive enabled. Normal operating condition
	When OFF CN1-43 (1CN-17) is high.	Reverse drive disabled. (Forward movement possible.)

(2) Parameter Settings

[a] Use/Not Use Overtravel Input Signals

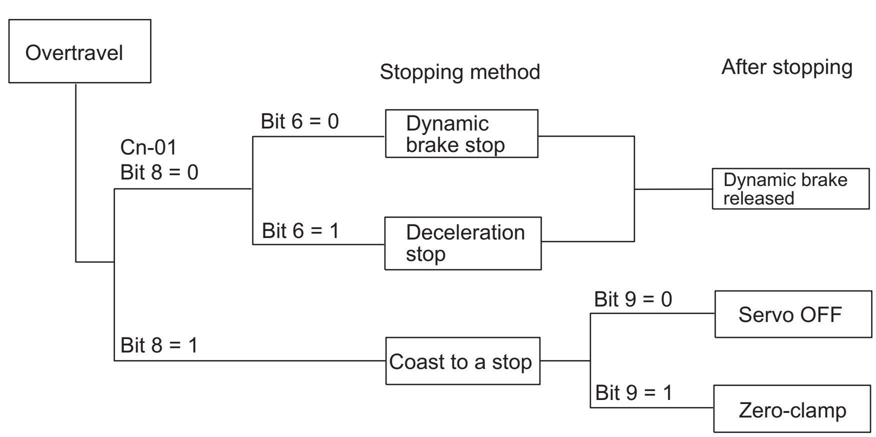
The following parameters are used to enable and disable the overtravel input signals.

Parameter	Name	Set Value	Item	Default
Cn-01 Bit 2	Use/Not Use P-OT Input Signal	0 (Recommended)	Enables use of Positive Prohibit Input Signal (P-OT). (Forward rotation prohibited when open, allowed for 0 V.)	0
		1	Disables use of Positive Prohibit Input Signal (P-OT). (Forward rotation always allowed.)	
Cn-01 Bit 3	Use/Not Use N-OT Input Signal	0 (Recommended)	Enables use of Negative Prohibit Input Signal (N-OT). (Reverse rotation prohibited when open, allowed for 0 V.)	0
		1	Disables use of Negative Prohibit Input Signal (N-OT). (Reverse rotation always allowed.)	

[b] Selecting Motor Stopping Methods for Overtravel

When using the overtravel function has been enabled, the following parameters are used to set the methods for stopping the motor. Select the methods for stopping when the P-OT or N-OT is input during motor running.

Parameter	Name	Set Value	Item	Default
Cn-01 Bit 8	Selection of stopping method for overtravel	0 (Recommended)	Uses the same stopping method as for Servo OFF. Stops the motor according to Cn-01 bit 6 setting (dynamic brake or coasting) when overtravel is detected.	0
		1	Decelerates the motor to a stop by applying the torque specified in Cn-06 (EMGTRQ Emergency Stop Torque) when overtravel is detected.	
Cn-01 Bit 9	Selection of processing after stopping for overtravel	0 (Recommended))	Decelerates the motor to a stop and then turns OFF the Servo.	0
		1	Decelerates the motor to a stop and then sets it in the zero-clamp mode.	
Cn-01 Bit 6	Selection of stopping method for motor when servo turns OFF	0	Stops the motor by applying dynamic brake (DB).	0
		1	Makes the motor coast to a stop. Current is not supplied to the motor and the machine stops due to friction.	
Cn-01 Bit 7	Selection of processing after stopping for overtravel	0	Stops the motor by applying dynamic brake (DB) and then releases the DB.	0
		1	Stops the motor by applying dynamic brake (DB) and then holds the DB.	

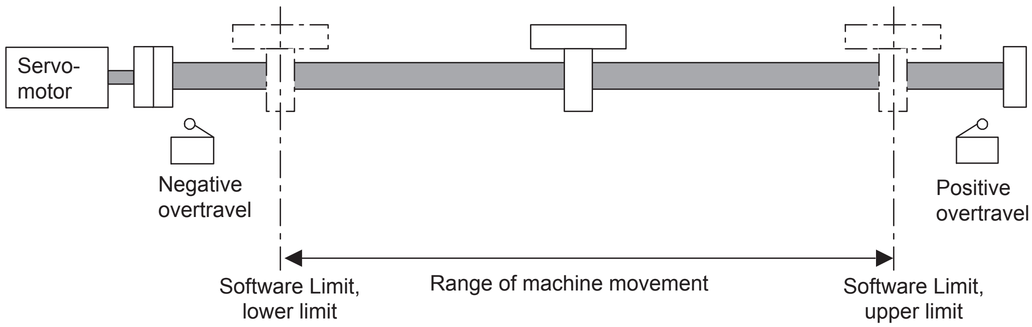


10.3 Software Limit Function

The software limit function is used to set upper and lower limits for the range of machine movement in fixed parameters so the MP2300 can constantly monitor the operating range of the machine. The function can be used to help prevent machine runaway or damage due to incorrect operation as well as incorrect references in a motion program.

Disable the software limits in the SERVOPACK to use the MP2300 for position control in the machine coordinate system.

- Refer to your SERVOPACK manual for the procedure on disabling software limits.



10.3.1 Fixed Parameter Settings

The following fixed parameters must be set in order to use the software limit function.

Fixed Parameter Number	Name	Unit	Setting/Range
1	Function Selection 1 Bit 1: Forward Soft Limit Enabled (Forward Software Limit Enabled) Bit 2: Reverse Soft Limit Enabled (Reverse Software Limit Enabled)	–	0: Disable, 1: Enable 0: Disable, 1: Enable
12	Forward Software Limit	Reference unit	–2147483648 to 2147483647
14	Reverse Software Limit	Reference unit	–2147483648 to 2147483647

- The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation.
If any fixed parameters are changed and saved or the power is turned ON, the Zero Point Return or Zero Point Setting operation must be performed again.

10.3.2 Effects of the Software Limit Function

If a position command that exceeds the positive and negative software limit is executed with the software limit function enabled, an alarm will occur and the MP2300 will stop the axis. The type that the axis stops depends on the motion command as shown below.

Motion Command	Stop Operation
POSING EX_POSING FEED STEP	The axis will start decelerating before the software limit position and stop at the software limit position.
INTERPOLATE ENDOF_INTERPOLATE LATCH	The pulse distribution command will stop executing at the software limit position. The Servo will perform an emergency stop.
VELO TRQ PHASE	The axis will start decelerating the software limit position and stop beyond the software limit position.

- The software limit settings is disabled for ZRET operation.

10.3.3 Processing after an Alarm Occurs

(1) Monitoring Alarms

If an axis exceeds a software limit, a Positive/Negative Soft Limit (Positive/Negative Software Limit) alarm will occur. This alarm can be monitored in the Alarm monitoring parameter (IL☐☐04).

Name	Register Number	Meaning	
Alarm	IL☐☐04	Bit 3:	Positive Software Limit
		Bit 4:	Negative Software Limit

(2) Clearing Software Limit Alarms

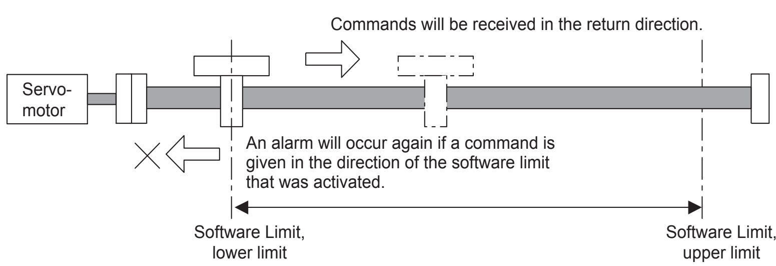
Clear software limit alarms using the procedure below.

1. Set the Alarm Clear bit to 1 in the RUN Commands (OW☐☐00 bit F) to clear the alarm.

The alarm (IL☐☐04) will be cleared.

Name	Register Number	Meaning	
RUN Commands	OW☐☐00	Bit F:	Clear Alarm

2. Use the FEED or STEP command to return past the software limit.



11

Precautions for Using the MP2300

This chapter describes items users need to know to use the MP2300 system correctly. They include parameters that may be automatically updated and settings that, if changed, may affect saving data.

11.1 Parameters That Are Automatically Updated 11-2

11.1.1 Parameters Updated when a MECHATROLINK Connection Is Established (1) (User Constants Self-Writing Function Enabled) 11-2

11.1.2 Parameters Updated when a MECHATROLINK Connection Is Established (2) (Regardless of the User Constants Self-Writing Function) 11-3

11.1.3 Parameters Updated when a Setting Parameter Is Changed (MECHATROLINK-II Operating at 10 Mbps in 32-byte Mode with User Constants Self-Writing Function Enabled) 11-3

11.1.4 Parameters Updated when a Motion Command Is Executed (Regardless of User Constants Self-Writing Function Setting and MECHATROLINK Connection) 11-4

11.1.5 Parameters Updated during Self-configuration 11-5

11.2 Precautions When Setting or Changing User Definition Files and Scan Times 11-8

11.2.1 Setting or Changing User Definition Files 11-7

11.2.2 Setting or Changing Module Configuration Definition Files 11-7

11.2.3 Setting and Changing the Scan Time 11-8

11.3 SERVOPACK Parameter Data Flow 11-9

11.3.1 Operations and Parameter Data Flow 11-9

11.3.2 Precautions When Saving SERVOPACK Parameters 11-16

11.1 Parameters That Are Automatically Updated

Some of the parameters stored in SERVOPACK RAM may be overwritten automatically under certain conditions or as a result of self-configuration. This includes MP2300 setting parameters and fixed parameters, as well as fixed value SERVOPACK parameters. Some SERVOPACK parameters are also written to setting parameters automatically during self-configuration. The parameters that are updated automatically under specific conditions are listed in the following tables.

- Refer to *Chapter 6 Motion Parameters* for details on MP2300 parameters. Refer to your SERVOPACK manual for details on SERVOPACK parameters.

11.1.1 Parameters Updated when a MECHATROLINK Connection Is Established (1) (User Constants Self-Writing Function Enabled)

The MP2300 parameter settings in the left table below are automatically written to the SERVOPACK parameters given in the right table below when a connection is established between the MP2300 and the SERVOPACK. This occurs after power is turned ON or alarms are cleared following a communication interruption. The parameters are written only when automatic updating of parameters is enabled when bit A of fixed parameter 1 in the MP2300 is set to 0.

MP2300				SERVOPACK Parameter				Remarks
				SGD-N, SGDB-N	NS100	NS115	SGDS	
Setting parameters	Position Completed Width	OL□□1E	→	–	–	Pn500*	Pn522*	* Settings are written only when using a MECHATROLINK-II operating at 10 Mbps in 32-byte mode.
	Position Loop Gain	OW□□2E	→	–	–	Pn102*		
	Speed Loop Gain	OW□□2F	→	–	–	Pn100*		
	Speed Feed Forward Compensation	OW□□30	→	–	–	Pn109*		
	Position Loop Integration Time Constant	OW□□32	→	–	–	Pn11F*		
	Speed Loop Integration Time Constant	OW□□34	→	–	–	Pn101*		
	Linear Acceleration Time	OL□□36	→	Cn-0020	Pn80B			–
	Linear Deceleration Time	OL□□38	→	–	Pn80E			–
	S-curve Acceleration Time	OW□□3A	→	Cn-0026	Pn812			–
	Filter Type	OW□□03 Bits 8 to B	→	Settings are automatically enabled only when using MECHATROLINK-II operating at 10 Mbps in 32-byte mode.				

11.1.2 Parameters Updated when a MECHATROLINK Connection Is Established (2) (Regardless of the User Constants Self-Writing Function)

The MP2300 parameter settings in the left table below are automatically written to the SERVOPACK parameters in the right table below when a connection is established between the MP2300 and the SERVOPACK. The parameters are written regardless of whether automatic updating of parameters is enabled or disabled at bit A of fixed parameter 1 in the MP2300.

MP2300				SERVOPACK Parameter				Remarks
				SGD-N, SGDB-N	NS100	NS115	SGDS	
Fixed parameters	Backlash Compensation	No.16		–	–	Pn81B	Pn214	–
Fixed values	65535		→	Cn-001E	–			Excessive Position Error Area
	32767		→	–	Pn505		–	Overflow Level
	2^{30} -1		→	–	–		Pn520	Excessive Position Error Alarm Detection Level
	100		→	–	Pn51E			Excessive Position Error Warning Detection Level
	Pn820 and Pn822 are set to the same value.			–	–	Pn820 -> Pn822		Processing to disable the latch zone
	0002			–	Pn0003		Pn824	Set the Torque Reference from the Option Monitor.

11.1.3 Parameters Updated when a Setting Parameter Is Changed (MECHATROLINK-II Operating at 10 Mbps in 32-byte Mode with User Constants Self-Writing Function Enabled)

When automatic updating of parameters is enabled at bit A of fixed parameter 1 in the MP2300, the parameters shown in the right table below are automatically updated every time the MP2300 setting parameters in the left table below are updated. Updating occurs on all SERVOPACKs connected to a MECHATROLINK-II operating at 10 Mbps in 32-byte mode.

MP2300				SERVOPACK				Remarks
				SGD-N, SGDB-N	NS100	NS115	SGDS	
Setting parameters	Position Completed Width	OL□□1E	→	–	–	Pn500	Pn522	–
	Position Loop Gain	OW□□2E	→	–	–	Pn102		–
	Speed Loop Gain	OW□□2F	→	–	–	Pn100		–
	Speed Feed Forward Compensation	OW□□30	→	–	–	Pn109		–
	Position Loop Integration Time Constant	OW□□32	→	–	–	Pn11F		–
	Speed Loop Integration Time Constant	OW□□34	→	–	–	Pn101		–
	Accel/Accel Time Constant*	OL□□36	→	–	–	Pn80B		* Also updated automatically when bits 4 to 7 of OW□□03 (Acceleration/Deceleration Unit) are changed.
	Decel/Decel Time Constant*	OL□□38	→	–	–	Pn80E		

- Settings are not written when using MECHATROLINK-II operating at 10 Mbps in 17-byte mode.

11.1.4 Parameters Updated when a Motion Command Is Executed (Regardless of User Constants Self-Writing Function Setting and MECHATROLINK Connection)

The MP2300 parameter settings in the left table below are automatically written to the SERVOPACK parameters in the right table below when the MP2300 starts executing a motion command.

<table>
<tr><th colspan="3" rowspan="2">MP2300</th><th rowspan="2"></th><th colspan="4">SERVOPACK</th><th rowspan="2">Trigger Command</th></tr>
<tr><th>SGD-N, SGDB-N</th><th>NS100</th><th>NS115</th><th>SGDS</th></tr>
<tr><td rowspan="12">Setting parameters</td><td>Latch Zone Lower Limit Setting</td><td>OL□□2A</td><td>→</td><td>–</td><td>–</td><td colspan="2">Pn822</td><td>EX_POSING</td></tr>
<tr><td>Latch Zone Upper Limit Setting</td><td>OL□□2C</td><td>→</td><td>–</td><td>–</td><td colspan="2">Pn820</td><td>EX_POSING</td></tr>
<tr><td>Linear Acceleration Time</td><td>OL□□36</td><td>→</td><td>Cn-0020</td><td colspan="3">Pn80B*</td><td rowspan="2">POSING, EX_POSING, ZRET, FEED, STEP</td></tr>
<tr><td>Linear Deceleration Time Constant</td><td>OL□□38</td><td>→</td><td>–</td><td colspan="3">Pn80E*</td></tr>
<tr><td>S-curve Acceleration Time</td><td>OW□□3A</td><td>→</td><td>Cn-0026</td><td colspan="3">Pn812*</td><td>POSING, EX_POSING, ZRET, FEED, STEP
• Only when DEN = ON (when pulse distribution has been completed)</td></tr>
<tr><td>Approach Speed</td><td>OL□□3E</td><td>→</td><td>Cn-0022</td><td colspan="3">Pn817</td><td>ZRET</td></tr>
<tr><td>Creep Speed</td><td>OL□□40</td><td>→</td><td>Cn-0023</td><td colspan="3">Pn818</td><td>ZRET</td></tr>
<tr><td>Home Offset</td><td>OL□□42</td><td>→</td><td>Cn-0028</td><td colspan="3">Pn819</td><td>ZRET</td></tr>
<tr><td>External Positioning Move Distance</td><td>OL□□46</td><td>→</td><td>Cn-002B</td><td colspan="3">Pn814</td><td>EX_POSING and ZRET</td></tr>
<tr><td>Forward External Torque Limit Input</td><td>OW□□00, bits 8 and 9</td><td>→</td><td colspan="5" rowspan="2">The settings are enabled when the Servo is turned ON or a move command is sent.</td></tr>
<tr><td>Reverse External Torque Limit Input</td><td>OW□□00, bits 8 and 9</td><td>→</td></tr>
</table>

* The parameters are written when automatic updating of parameters is enabled at bit A of fixed parameter 1 in the MP2300.

11.1.5 Parameters Updated during Self-configuration

(1) Motion Parameters

The motion parameters for each axis are set as shown below according to information from each SERVOPACK when self-configuration is executed. Some parameters are written to the SERVOPACK's RAM.

[a] Motion Fixed Parameters

■ SERVOPACK to MP2300

MP2300 Fixed parameters No.	MP2300 Fixed parameters Name		SERVOPACK SGD-N, SGDB-N	SERVOPACK SGDH + NS100	SERVOPACK SGDH+NS115	SERVOPACK SGDS
	Servomotor Type*	←	Depends on the specifications of the connected Servomotor.			
30	Encoder Type	←	Depends on the specifications of the connected Servomotor.			
34	Rated Speed	←	Depends on the specifications of the connected Servomotor.			
36	Encoder Resolution	←	Depends on the specifications of the connected Servomotor.			
38	Max. Revolutions of Absolute Encoder	←		Pn205		

- The above processing is not performed when the axis has been set.
- The default settings are used for all those parameters not listed above.
- * The *Servo Type* is written to the *Motor Type* on the upper right of the SVB Definition Window.

■ MP2300 to SERVOPACK (RAM)

MP2300 Fixed parameters No.	MP2300 Fixed parameters Name		SERVOPACK SGD-N, SGDB-N	SERVOPACK SGDH + NS100	SERVOPACK SGDH + NS115	SERVOPACK SGDS
16	Backlash Compensation	←	–		Pn81B	Pn214

- The default settings are written if the axis is not set.

[b] Motion Setting Parameters

■ SERVOPACK to MP2300

MP2300 Setting parameters Address	MP2300 Setting parameters Name		SERVOPACK SGD-N, SGDB-N	SERVOPACK SGDH + NS100	SERVOPACK SGDH + NS115	SERVOPACK SGDS
OW□□2E	Position Loop Gain	←	Cn-001A	Pn102		
OW□□2F	Speed Loop Gain	←	Cn-0004	Pn100		
OW□□30	Speed Feed Forward Compensation	←	Cn-001D	Pn109		
OW□□32	Position Loop Integration Time Constant	←	–	Pn11F		
OW□□34	Speed Loop Integration Time Constant	←	Cn-0005	Pn101		
OW□□3A	S-curve Acceleration Time	←	Cn-0026	Pn812		

- The above processing is not performed when the axis has been set.
- The default settings are used for all those parameters not listed above.

■ MP2300 to SERVOPACK (RAM)

MP2300			SERVOPACK			
Setting parameters						
Address	Name		SGD-N, SGDB-N	SGDH + NS100	SGDH + NS115	SGDS
OLxx1E	Position Completed Width	→	–		Pn500	Pn522
OLxx36	Linear Acceleration Time	→	Cn-0020	Pn80B		
OLxx38	Linear Deceleration Time	→	–	Pn80E		

- The default settings are written if the axis has not been set.
- When the axis has been set, parameters are written only when bit 10 of fixed parameter 1 is set to enable automatic updating of parameters.
- The Positioning Completed Width is written only when MECHATROLINK-II is used in 32-byte mode.

(2) SERVOPACK Parameters

The SERVOPACK parameters are written to SERVOPACK EEPROM or RAM during self-configuration as shown below. Care must therefore be taken because the SERVOPACK parameters will be overwritten when self-configuration is executed.

- These settings, however, are not written to the set values for the SERVOPACK parameters saved in the MP2300.

[a] SERVOPACK Parameters (1)

MP2300			SERVOPACK			
SERVOPACK Parameters						
Name	Setting		SGD-N, SGDB-N	SGDH + NS100	SGDH + NS115	SGDS
P-OT Signal Mapping	Disable	→	Cn-0001 Bit 2	Pn50A.3		
N-OT Signal Mapping	Disable	→	Cn-0001 Bit 3	Pn50B.0		
SERVOPACK Software Limit Function (Positive)	Disable	→	Cn-0014 Bit 2	Pn801.0		
SERVOPACK Software Limit Function (Negative)	Disable	→	Cn-0014 Bit 3			
SERVOPACK Electronic Gear Ratio (Numerator)	1	→	Cn-0024	Pn202		Pn20E
SERVOPACK Electronic Gear Ratio (Denominator)	1	→	Cn-0025	Pn203		Pn210
Autotuning Application Switch	Disable	→	–	Pn110		
/DEC Signal Mapping	CN1-9 input terminal	→	–	Pn511.0		
/EXT1 Signal Mapping	CN1-10 input terminal	→	–	Pn511.1		
/EXT2 Signal Mapping	CN1-11 input terminal	→	–	Pn511.2		
/EXT3 Signal Mapping	CN1-12 input terminal	→	–	Pn511.3		
Speed Reference Command Options	Use T-REF as the external torque limit input.	→	–	Pn002.0		
Torque Reference (TRQ) Command Option	Use V-REF as the external speed limit input.	→	–	Pn002.1		
Reverse Latching Area	Pn820 value	→	–		Pn822	

- The above processing is not performed when the axis has been set.
- The above set values are written to the SERVOPACK’s EEPROM.

[b] SERVOPACK Parameters (2)

MP2300			SERVOPACK			
SERVOPACK Parameters						
Name	Setting		SGD-N, SGDB-N	SGDH + NS100	SGDH + NS115	SGDS
Excessive Position Error Area	65535	→	Cn-001E	—		
Overflow Level	32767	→	—	Pn505		—
Excessive Position Error Alarm Detection Level	2^{30}-1	→	—			Pn520
Excessive Position Error Warning Detection Level	100	→	—	Pn51E		

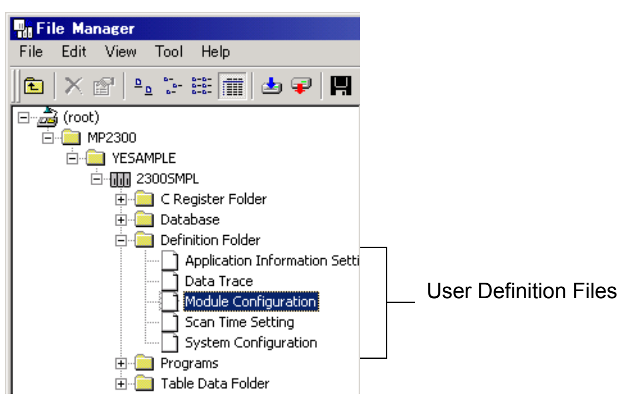
- The above set values are written to the SERVOPACK's RAM.

11.2 Precautions When Setting or Changing User Definition Files and Scan Times

This section describes precautions for setting or changing user definition files and for setting the scan times.

11.2.1 Setting or Changing User Definition Files

User definition files must be saved to flash memory (***Save & Save to Flash***).



Use the MPE720 to set or change a user definition file. Be sure to save the results to flash memory. If data is not saved to flash memory, the settings and changes will be lost when the power supply to the MP2300 is turned OFF and ON.

11.2.2 Setting or Changing Module Configuration Definition Files

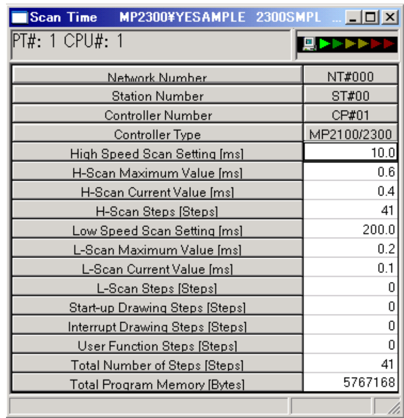
Observe the following precautions when setting or changing module configuration definition files.

- Always check to make sure that the mounted Module is the one that is defined.
- Be sure to save any new settings or changes to flash memory.
- After the settings or changes have been completed, turn the power supply to the MP2300 OFF and ON.

11.2.3 Setting and Changing the Scan Time

(1) Precautions When Setting or Changing the Scan Time

Double-click the scan time file in the File Manager Window on the MPE720. Scan time settings or changes can be performed from the Scan Time Window that is displayed.



Observe the following precautions when setting or changing the scan time.

- Set the set values of the scan time for both the high-speed (H) and low-speed (L) scans to at least the maximum time required to execute the scans. We recommend setting the set values of the scan time using the formula (set value – maximum time to execute scan) ≥ (0.2 × set values of the scan time), i.e., setting the set values of the scan time to at least 1.25 times the maximum times required to execute the scans.
  If the scan time is set too close to the maximum execution time for the scan, the refresh time for the screen on the MPE720 will be very slow and communication timeouts may occur. If the maximum execution time exceeds the scan time set value, a watchdog timer timeout error will occur and the MP2300 system will stop.
- Set the set values of the high-speed (H) and low-speed (L) scan time to an integral multiple of the MECHATROLINK communication cycle (1 or 2 ms) set in the MP2300. Always check the set values of the scan time after changing the MECHATROLINK communication cycle.
- Do not change the scan time set value while the Servo is ON. Never change the setting while the axis is moving (while the motor is running). Otherwise an error may occur during motor operation (e.g., high-speed rotation).
- When the scan time is set or changed, be sure to save the data to flash memory.

(2) Scan Time Set Value Examples

■ 0.8-ms Maximum Scan Time and 1-ms Communication Cycle (MECHATROLINK-II Only)

High-speed (or low-speed) scan set value ≥ 1.25 × 0.8 (= 1 ms)

High-speed (or low-speed) scan set value = 1 ms, 2 ms, 3 ms, etc. (an integral multiple of at least 1 ms)

■ 1.4-ms Maximum Scan Time and 1-ms Communication Cycle (MECHATROLINK-II Only)

High-speed (or low-speed) scan set value ≥ 1.25 × 1.4 (= 1.75 ms)

High-speed (or low-speed) scan set value = 2 ms, 3 ms, etc. (an integral multiple of at least 2 ms)

■ 0.8-ms Maximum Scan Time and 2-ms Communication Cycle (MECHATROLINK-I or MECHATROLINK-II)

High-speed (or low-speed) scan set value ≥ 1.25 × 0.8 (= 1 ms)

High-speed (or low-speed) scan set value = 1 ms, 2 ms, 4 ms, etc. (an integral multiple of 2 ms at 1 ms and 2 ms or higher)

■ 1.4-ms Maximum Scan Time and 2-ms Communication Cycle (MECHATROLINK-I or MECHATROLINK-II)

High-speed (or low-speed) scan set value ≥ 1.25 × 1.4 (= 1.75 ms)

High-speed (or low-speed) scan set value = 2 ms, 4 ms, etc. (an integral multiple of 2 ms at 2 ms or higher)

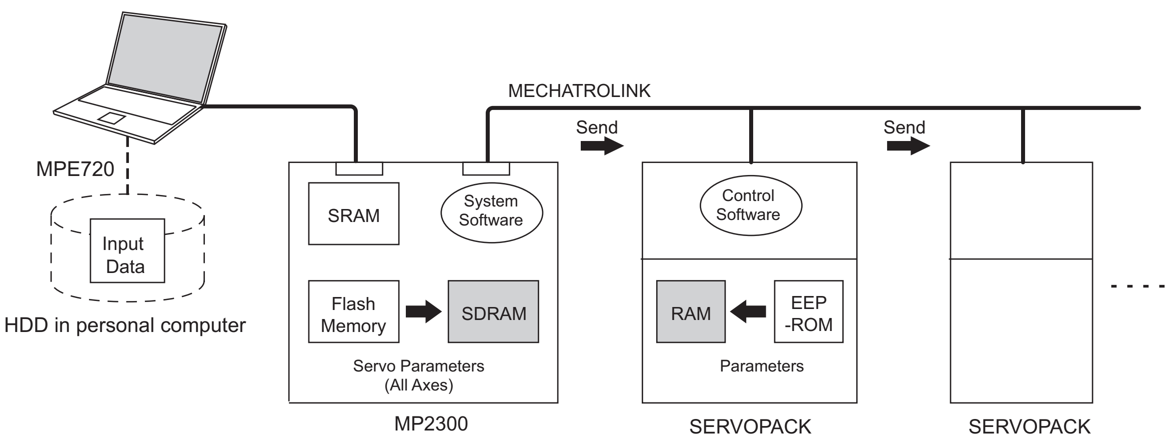
11.3 SERVOPACK Parameter Data Flow

In systems connected to MECHATROLINK, SERVOPACK parameters can be read directly from the MP2300. (Refer to *11.1 Parameters That Are Automatically Updated* on page 11-2.) This means that parameters are saved in the memory area of both the MP2300 and the SERVOPACK. It is thus necessary to consider the relationship between the settings in both memory areas.

11.3.1 Operations and Parameter Data Flow

(1) Power ON

- Parameter data saved in the SERVOPACK's EEPROM*1 is copied to SERVOPACK's RAM.
- Parameter data saved in the MP2300's flash memory*1 for all axes is copied to SDRAM*2. Some gain-related settings are sent from the MP2300 to SERVOPACK RAM*1.



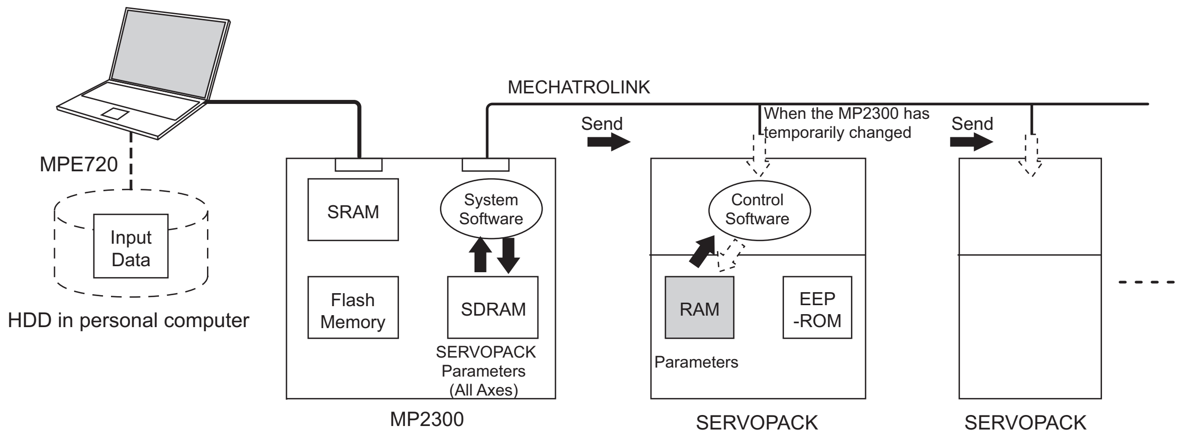
* 1. EEPROM, flash memory, and SRAM: Store data even when the power is turned OFF.

* 2. RAM (SRAM, SDRAM): Lose data when the power is turned OFF.

♦ ▒ Indicates data has been written (same below).

(2) Normal Operation

- Control software of the SERVOPACK operates based on the parameter data held in SERVOPACK's RAM.
- Some of MP2300 setting parameters and commands temporarily change SERVOPACK parameters (refer to *Chapter 6 Motion Parameters* for details). RAM in the SERVOPACK are written.

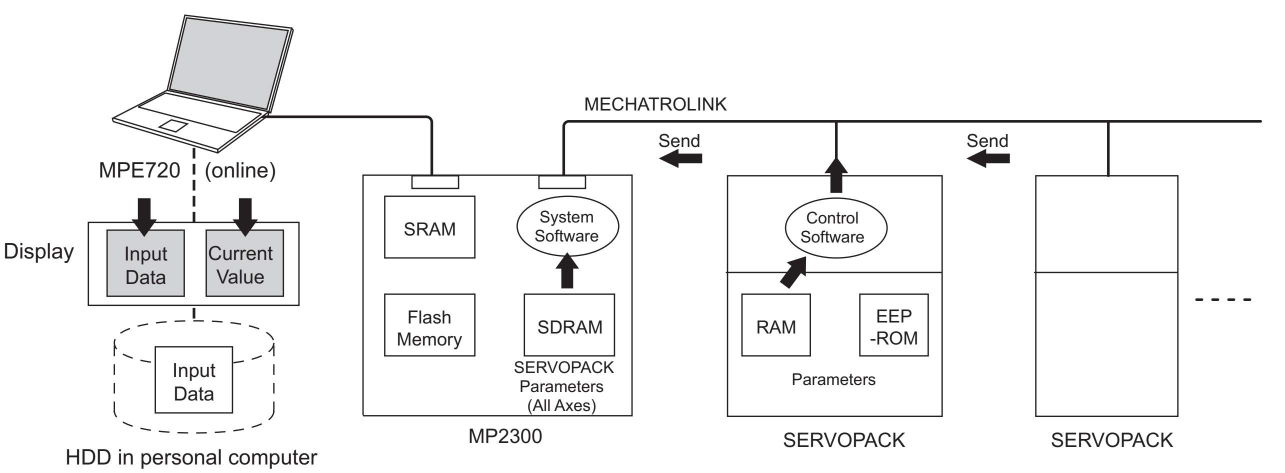


- Parameters held in the SERVOPACK's RAM are displayed on a Digital Operator connected to the SERVOPACK. They are also written to EEPROM when the DATA/ENTER Key is pressed.

(3) When the SERVOPACK Tab Page Is Open

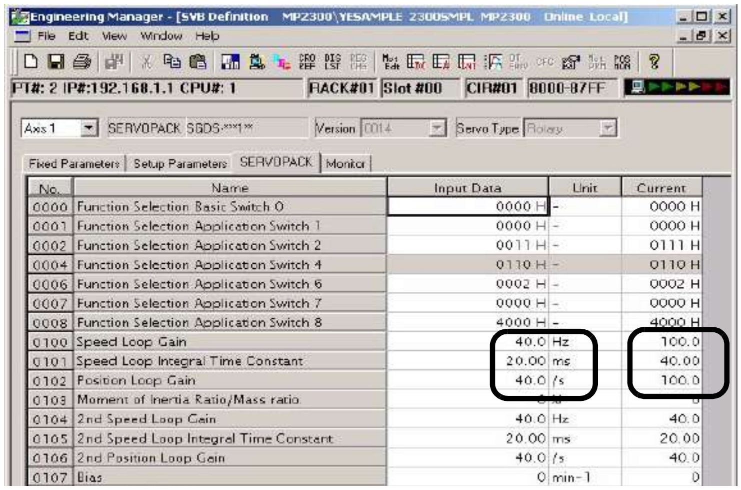
The data flow for SERVOPACK parameters is as follows when the SERVOPACK Tab Page is open in the SVB Definitions Window on the MPE720 (refer to *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28 for details on how to open the SERVOPACK Tab Page.):

- The MPE720 writes and displays the parameters that are held in the SERVOPACK's RAM for the relevant axis to the ***Current Value*** in the SERVOPACK Tab Page.
  It also reads and displays the values that are held in the MP2300's SDRAM values to the ***Input Data*** in the SERVOPACK Tab.



The following figure shows an example of the SERVOPACK Tab in the **SVB Definition** Window.

The values in *Current Value* are different from the values in *Input Data*.

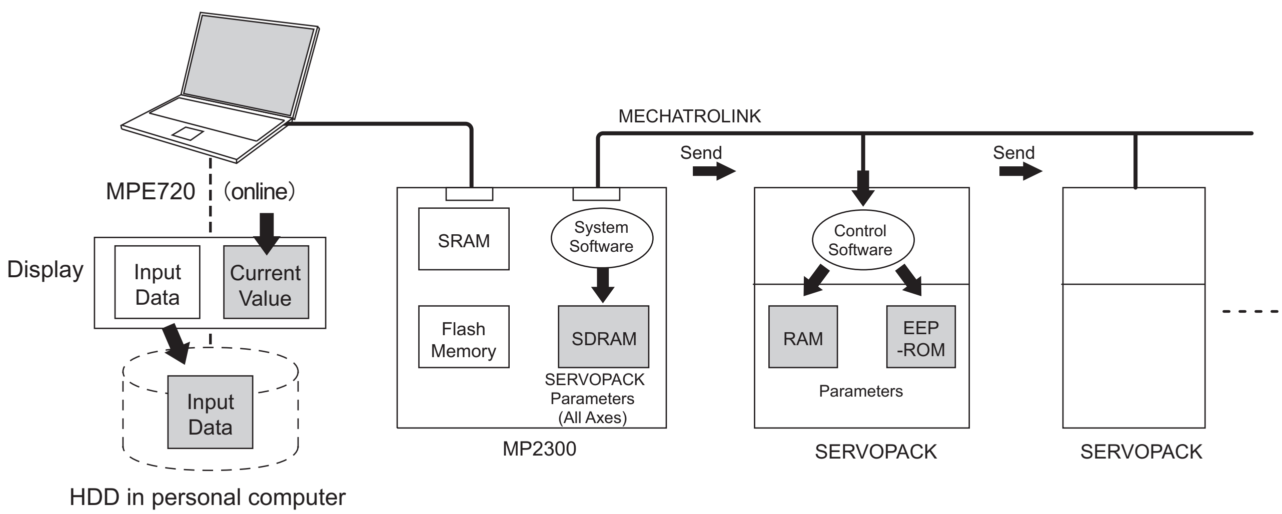


No.	Name	Input Data	Unit	Current
0000	Function Selection Basic Switch 0	0000 H	-	0000 H
0001	Function Selection Application Switch 1	0000 H	-	0000 H
0002	Function Selection Application Switch 2	0011 H	-	0111 H
0004	Function Selection Application Switch 4	0110 H	-	0110 H
0006	Function Selection Application Switch 6	0002 H	-	0002 H
0007	Function Selection Application Switch 7	0000 H	-	0000 H
0008	Function Selection Application Switch 8	4000 H	-	4000 H
0100	Speed Loop Gain	40.0	Hz	100.0
0101	Speed Loop Integral Time Constant	20.00	ms	40.00
0102	Position Loop Gain	40.0	/s	100.0
0103	Moment of Inertia Ratio/Mass ratio	0	%	0
0104	2nd Speed Loop Gain	40.0	Hz	40.0
0105	2nd Speed Loop Integral Time Constant	20.00	ms	20.00
0106	2nd Position Loop Gain	40.0	/s	40.0
0107	Bias	0	min-1	0

(4) SERVOPACK Parameters Saved in the MPE720

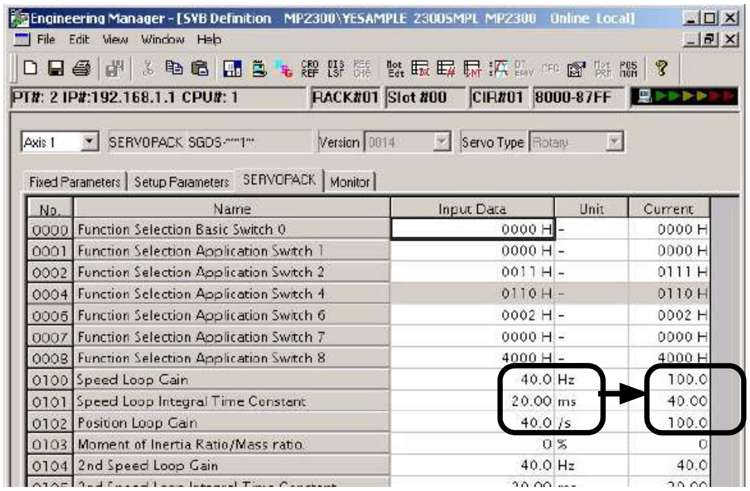
The data flow for SERVOPACK parameters is as follows when ***File* – *Save*** is selected from the SERVOPACK Tab Page:

- The MPE720 writes all the parameters in *Input Data* currently displayed on SERVOPACK Tab Page of the relevant axis to the followings.
  - HDD (hard disk) of the personal computer
  - SDRAM of MP2300
  - RAM and EEPROM of the SERVOPACK
- After having completed writing the parameters, the MPE720 updates the values in *Current Value* on the SERVOPACK Tab Page with the SERVOPACK parameter values stored in the RAM.

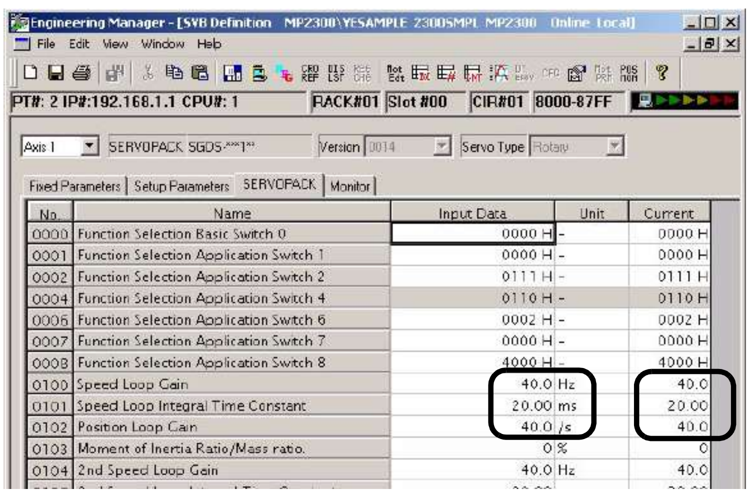


The following figure shows a display example after having executed save operation on the SERVOPACK Tab in the SVB Definition Window. After having saved the data, the values in *Input Data* of all the parameters become the same as the values in *Current Value* on the SERVOPACK Tab.

Before saving



After saving

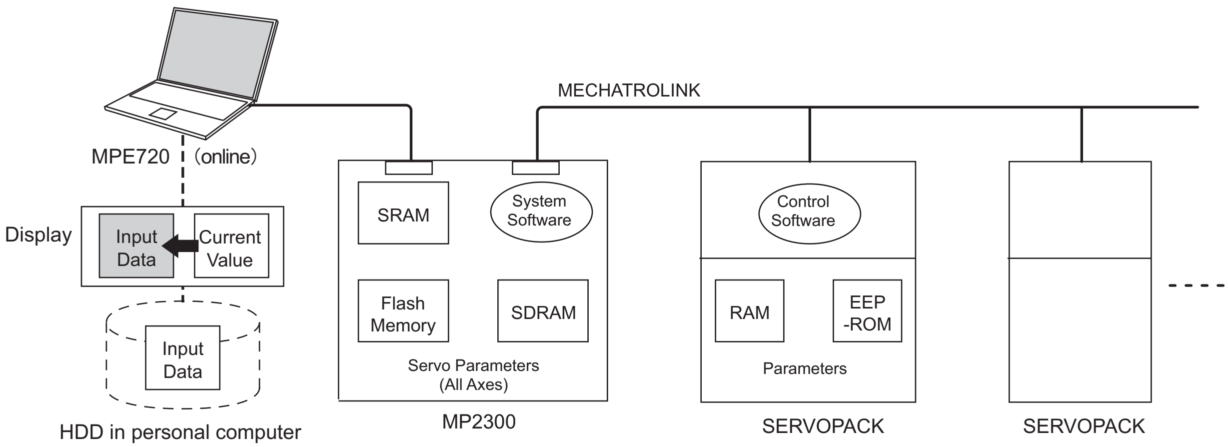


- The saving operation of SERVOPACK parameters can be used for writing data after SERVOPACK replacement because it writes all the parameters of the relevant axis.

(5) Copying Current Values to Set Values (Input Data) in the SERVOPACK Tab

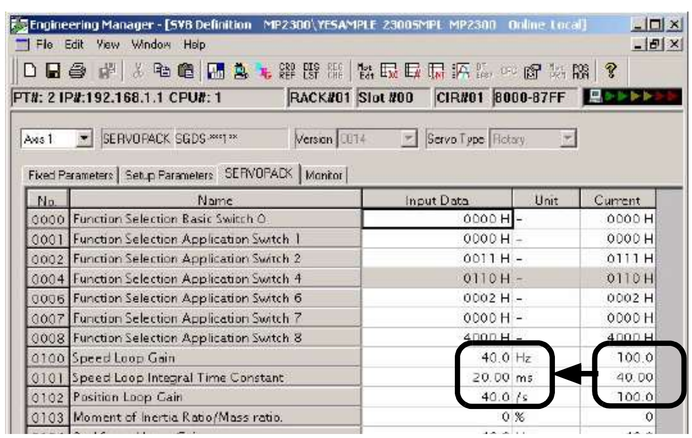
The data flow for SERVOPACK parameters is as follows when selecting ***Edit - Copy Current Value*** from the SERVOPACK Tab in the SVB Definition Window on the MPE720:

- The MPE720 copies the values currently displayed in *Current Value* to *Input Data* on the SERVOPACK Tab and displays.

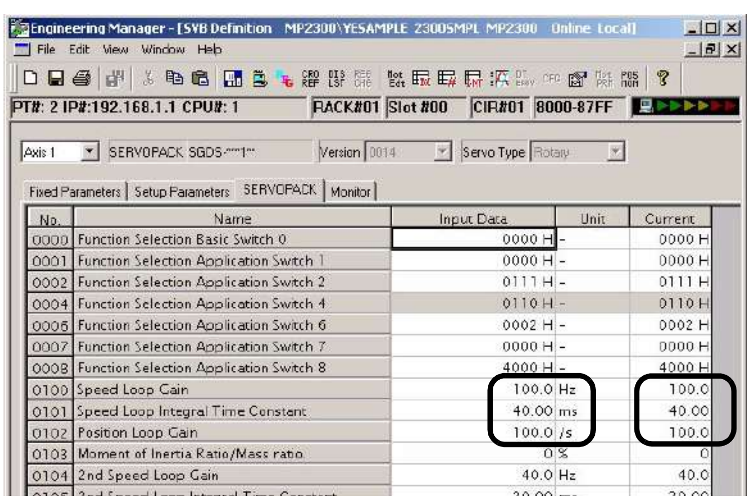


The following figure shows a display example after having selected ***Edit - Copy Current Value*** on the SERVOPACK Tab in the **SVB Definition** Window. The values in *Current Value* are copied to *Input Data*.

Before copying



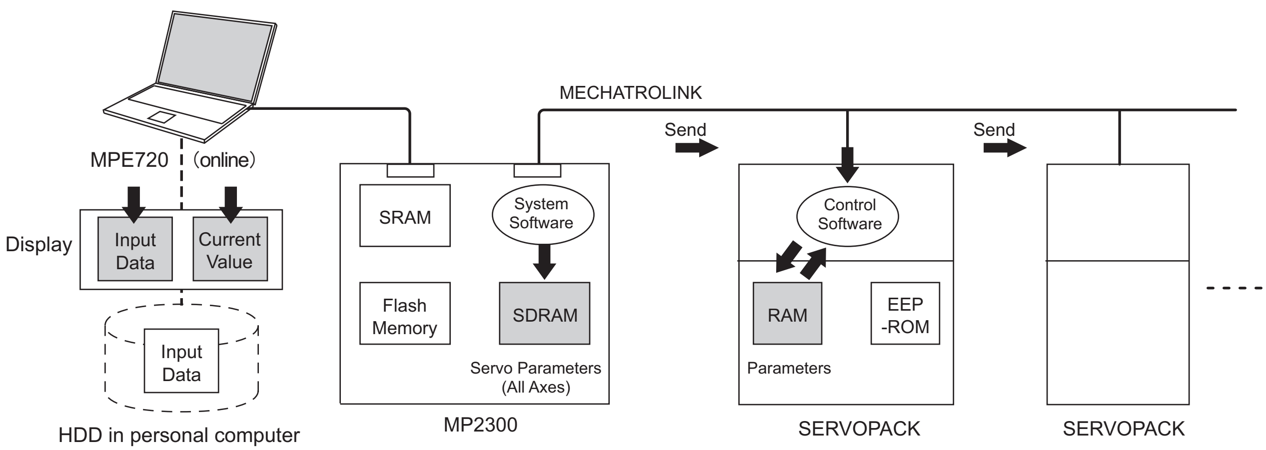
After copying



(6) Changing Parameters in the SERVOPACK Tab Page

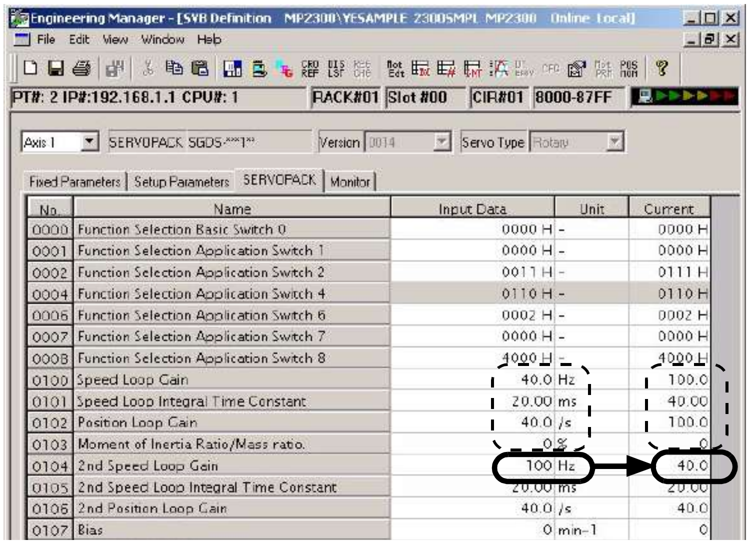
The data flow for SERVOPACK parameters is as follows when parameters for the cursor position are changed from the SERVOPACK Tab Page in the SVB Definition Window for MPE720:

- The MPE720 writes parameters of the relevant axis to the followings when the ENTER Key is pressed on the computer. (The parameters other than those of the relevant axis will not be written.)
  - *Input Data* (set data) on the SERVOPACK Tab Page
  - SDRAM of the MP2300
  - RAM of the SERVOPACK
- After having completed writing, the MPE720 updates the values in *Input Data* on the SERVOPACK Tab Page with the parameter values stored in the RAM of the SERVOPACK.

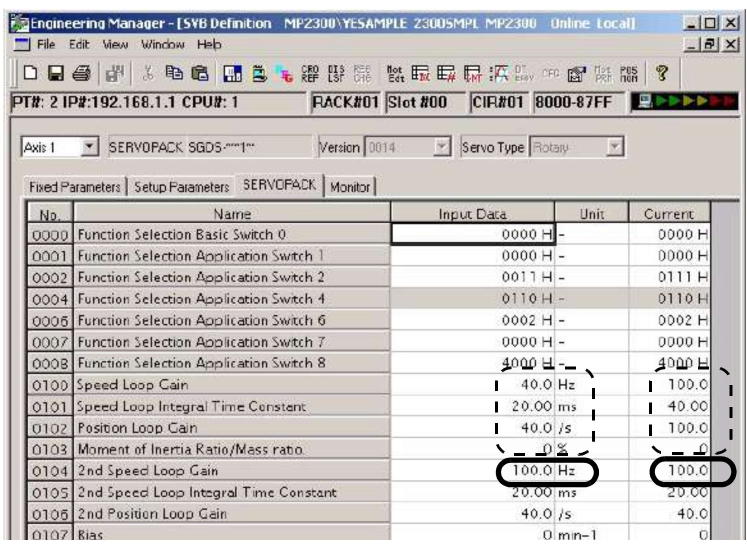


The following figure shows a display example after having changed the value (*2nd Speed Loop Gain*) in *Input Data* on the SERVOPACK Tab. After having pressed the ENTER Key, the values of *Speed Loop Gain*, *Speed Loop Integral Time Constant*, and *Position Loop Gain* (boxed in dotted line) in *Input Data* remain different from the values in *Current Value* since the parameters other than the one that has been changed are not written.

Before pressing ENTER Key



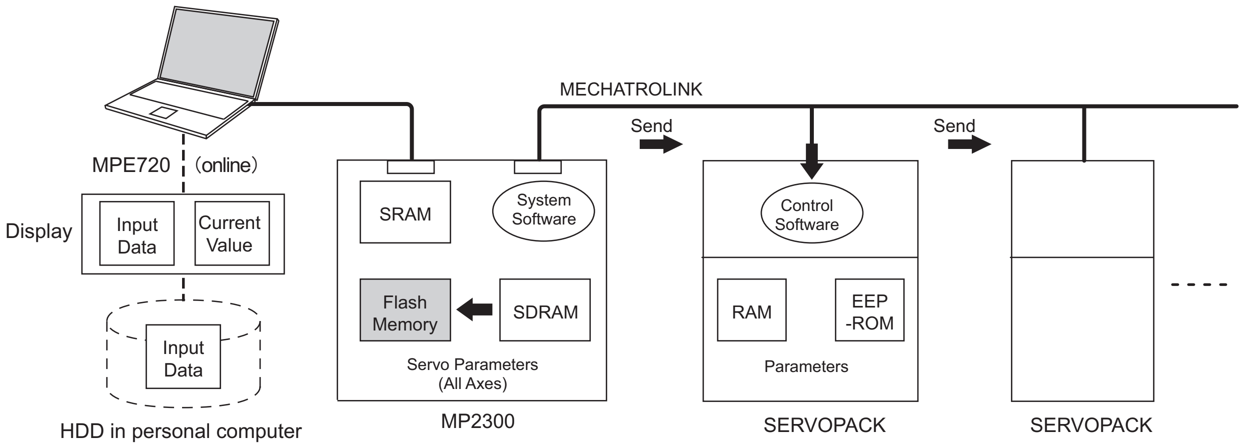
After having pressed ENTER Key



(7) Saving Data to Flash Memory

The data flow for SERVOPACK parameters is as follows when saving the parameters to flash memory on the MPE720:

- The MP2300 writes the parameters data (*Input Data*) held in SDRAM to flash memory.



- Save to flash memory also after having changed set data of SERVOPACK parameter.

11.3.2 Precautions When Saving SERVOPACK Parameters

Before executing saving operation in the SERVOPACK Tab Page in any cases including the SERVOPACK replacement, always select ***Edit - Copy Current Value*** to copy the values in Current Value to Input Data.

12

Maintenance and Inspection

This chapter explains daily and regular inspection items to ensure that the MP2300 can always be used at its best conditions.

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12.1 Inspection Items

This section summarizes daily and regular inspection items that must be performed by the customer.

12.1.1 Daily Inspections

The following table lists the daily inspection items.

No.	Inspection Item		Inspection Details	Criteria	Action
1	Installation conditions of Module, etc.		Check the mounting screws for looseness. Check whether the covers are all in place.	The screws and covers must be secured correctly.	Retighten the screws.
2	Connection conditions		Check the terminal screws for looseness.	The screws must be tight.	Retighten the screws.
			Check the connectors for looseness.	The connectors must be tight.	Retighten the connector set screws.
			Check the gap between crimp terminals.	There must be an appropriate gap between the terminals.	Correct as necessary.
3	Indicators	RDY	Check whether the indicator is lit.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	Refer to *12.3 Troubleshooting* on page 12-5.
		RUN	Check whether the indicator is lit while the system is in RUN state.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	Refer to *12.3 Troubleshooting* on page 12-5.
		ERR	Check whether the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	Refer to *12.3 Troubleshooting* on page 12-5.
		ALM	Check whether the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	Refer to *12.3 Troubleshooting* on page 12-5.
		TX	Check whether the indicator lights during communication.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	Refer to *12.3 Troubleshooting* on page 12-5.
		BAT	Check whether the indicator is not lit.	The indicator must be not lit. (The battery voltage is too low if the indicator is lit.)	Replace the battery.

12.1.2 Regular Inspections

This section explains inspection items that must be performed once or twice every six months to one year.

Inspections must also be performed when the equipment is relocated or modified or when the wiring is changed.

PROHIBITED

- Do not replace the built-in fuse.
  If the customer replaces the built-in fuse, the MP2300 may malfunction or break down.
  Contact your Yaskawa representative.

Inspection Item		Inspection Details	Criteria	Action
Operating environment	Ambient temperature	Check the temperature and humidity with a thermometer and hygrometer, respectively. Check for corrosive gases.	0°C to 55°C	If the MP2300 is used inside a panel, treat the temperature inside the panel as the ambient temperature.
	Ambient humidity		30% to 95%	
	Atmosphere		There must be no corrosive gases.	
Power supply voltage check	PS Module	Measure the voltage between 24-VDC terminals.	19.2 to 28.8 VDC	Change the power supply as necessary.
Installation conditions	Looseness and excess play	Attempt to move the Module.	The Module must be secured properly.	Retighten the screws.
	Dust and other foreign matter	Visually check.	The Module must be free from dust and other foreign matter.	Clean.
Connection conditions	Check the terminal screws for looseness.	Check by retightening the screws.	The screws must be tight.	Retighten.
	Gap between crimp terminals	Visually check.	There must be an appropriate gap between the terminals	Correct.
	Looseness of connectors	Visually check.	The screws must be tight.	Retighten the connector set screws.
Battery		Check the BAT indicator on the front panel of the Basic Module.	The BAT indicator must be not lit.	If the BAT indicator is lit, replace the battery.

12.2 Replacing the Basic Module Battery

The Basic Module has one replaceable built-in battery. This battery is used to back up data to prevent the data stored in the memory from being lost when power is interrupted (e.g., when the power supply to the Basic Module is turned OFF).
The built-in battery can retain the contents of the memory until the total time of power interruptions reaches one year. The warranty period of the battery is five years from the date of purchase. These values, however, differ according to the operating conditions, including the ambient temperature.
If the BAT indicator on the Basic Module lights, replace the battery with a replacement battery (JZSP-BA01) within two weeks. Any delay in battery replacement will result in the data stored in the memory being lost.
The appearance of the battery is illustrated below.

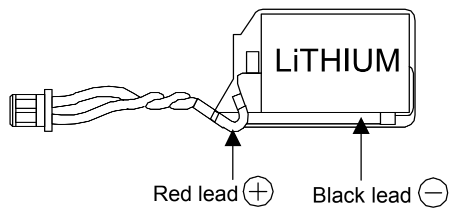


Fig. 12.1 JZSP-BA01 (Battery with Cable)

- This battery is not commercially available. Contact your Yaskawa representative.

12.2.1 Procedure

⚠ CAUTION

- There is danger of electric shock if the battery is not replace correctly. Furthermore, machine malfunction may occur, the operator may be injured, or the machine may be damaged. Allow only a qualified technician trained in safety procedures to replace the battery.
- When replacing the battery, always do so with power supplied to the Basic Module. If power to the Basic Module is turned OFF when the battery is replaced, data stored in the memory in the Module may be lost.
- Do not touch the battery electrodes. The battery may be destroyed by the static electricity.

1. Save the data stored in the Motion Board to a compact flash memory, hard disk on an external computer, or other media.

This data is used to restore any data accidently lost during battery replacement.

- For information on saving methods, refer to the *MPE720 Programming Device Software for MP900/MP2000 Machine Controllers User's Manual (Manual No. SIEPC88070005☐)*.

2. Check that the RDY indicator on the MP2300 Basic Module is lit.

3. Open the battery cover on the unit front surface.

4. Remove the connector on the end of lead of the built-in battery from the connector on the MP2300 Basic Module. Then, remove the built-in battery from the battery holder.

5. Insert securely the connector on the end of the lead of the replacement battery into the connector on the MP2300. Then, insert the replacement battery into the battery holder.

6. Check if the BAT indicator on the MP2300 is unlit.

7. Close the battery cover. This completes replacing the battery.

12.3 Troubleshooting

This section describes the basic troubleshooting methods and provides a list of errors.

12.3.1 Basic Flow of Troubleshooting

When problems occur, it is important to quickly find the cause of the problems and get the system running again as soon as possible. The basic flow of troubleshooting is illustrated below.

Step 1	Visually confirm the following items.

- Machine movement (or status if stopped)
- Power supply
- I/O device status
- Wiring status
- Indicator status (LED indicators on each Module)
- Switch settings (e.g., DIP switches)
- Parameter settings and program contents

↓

Step 2	Monitor the system to see if the problem changes for the following operations.

- Switching the Controller to STOP status
- Resetting alarms
- Turning the power supply OFF and ON

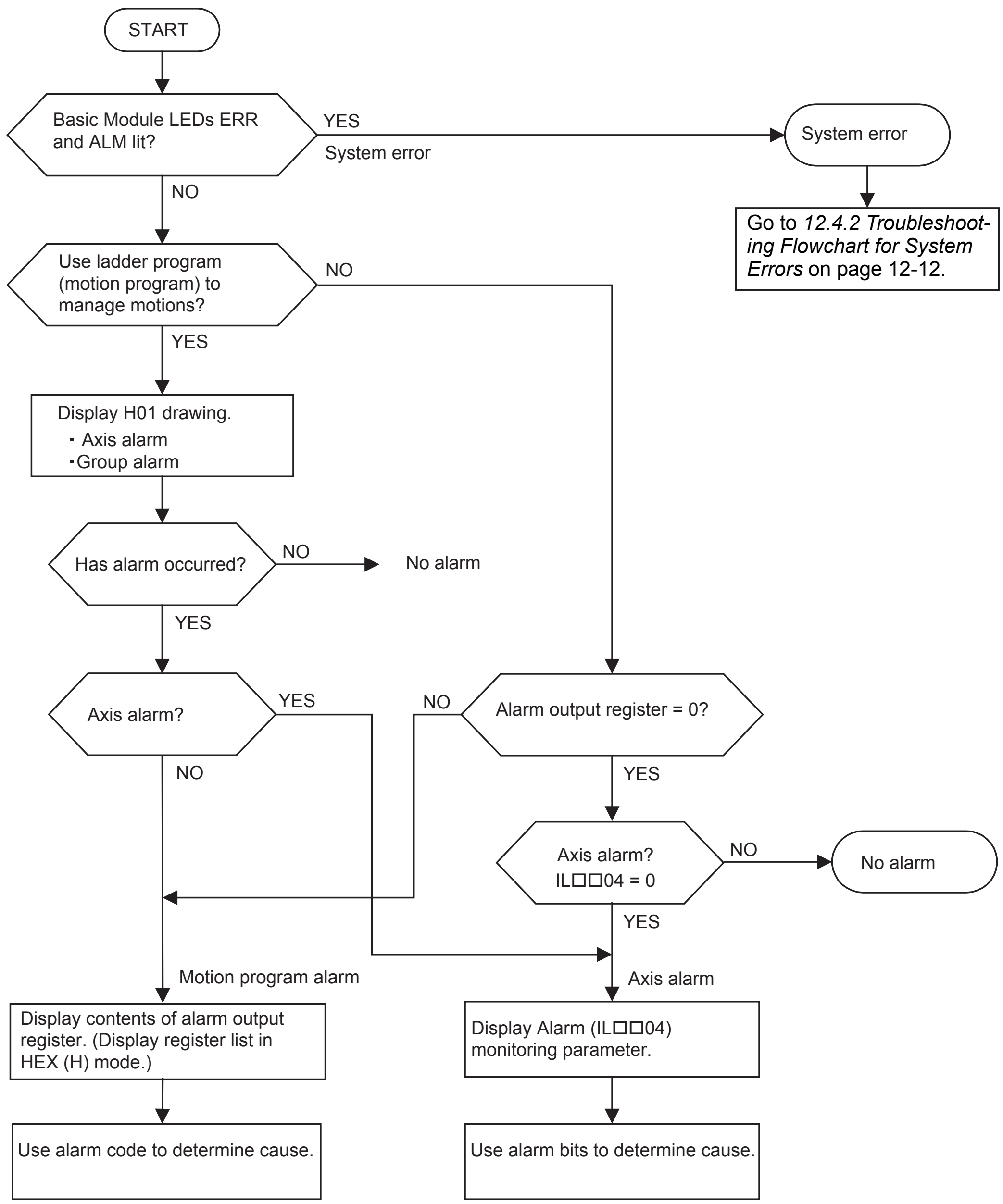
↓

Step 3	Determine the location of the cause from the results of steps 1 and 2.

- Controller or external?
- Sequence control or motion control?
- Software or hardware?

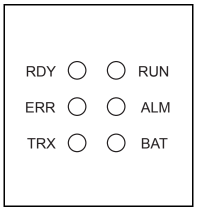
12.3.2 MP2300 Error Check Flowchart

Find the correction to the problem using the following flowchart if the cause of the problem is thought to be the MP2300 or SERVOPACK.



12.3.3 LED Indicators

(1) LED Indicators



The status of the LED indicators on the front of the MP2300 can be used to determine the error status and meaning.
The locations in the program that need to be corrected can be determined by using the LED indicator status to determine the general nature of the error, using the contents of system (S) registers to check drawings and function numbers causing the error, and knowing the meaning of operation errors.

(2) LED Indicator Meanings

The following table shows how to use the LED indicators to determine the operating status of the MP2300, as well as relevant error information when the LED indicator status indicates an error.

<table>
<tr><th rowspan="2">Classification</th><th colspan="5">LED Indicator</th><th rowspan="2">Indicator Details</th><th rowspan="2">Countermeasures</th></tr>
<tr><th>RDY</th><th>RUN</th><th>ALM</th><th>ERR</th><th>BAT</th></tr>
<tr><td rowspan="5">Normal operation</td><td>Not lit</td><td>Not lit</td><td>Lit</td><td>Lit</td><td>Not lit</td><td>Hardware reset status</td><td rowspan="3">Usually the CPU will start within 10 seconds. If this status continues for more than 10 seconds, either a program error or hardware failure has occurred. Refer to 12.4 Troubleshooting System Errors on page 12-9 and correct any system errors.</td></tr>
<tr><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Initialization</td></tr>
<tr><td>Not lit</td><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Drawing A (DWG.A) being executed.</td></tr>
<tr><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>User program stopped.
(Offline Stop Mode)</td><td>This status occurs
• When the stop operation is executed from the MPE720
• When the STOP switch is turned ON
This status does not indicate an error.</td></tr>
<tr><td>Lit</td><td>Lit</td><td>Not lit</td><td>Not lit</td><td>Not lit</td><td>User program being executed normally.</td><td>This is the normal status.</td></tr>
</table>

(cont'd)

Classification	LED Indicator					Indicator Details	Countermeasures
	RDY	RUN	ALM	ERR	BAT		
Errors	Not lit	Not lit	Not lit	Lit	Not lit	A serious error has occurred.	Refer to *12.4.3 Correcting User Program Errors* on page 12-13.
	No lit	Not lit	Lit	Not lit	Not lit		
	Not lit	Not lit	Not lit	Blinking	Not lit	Software Error Number of LED blinks indicates error type. 3: Address error (read) exception 4: Address error (write) exception 5: FPU exception 6: Illegal general command exception 7: Illegal slot command exception 8: General FPU inhibited exception 9: Slot FPU inhibited exception 10: TLB multibit exception 11: LTB error (read) exception 12: LTB error (write) exception 13: LTB protection volation (read) exception 14: LTB protection volation (write) exception 15: Initial page write exception	A hardware error has occurred. Replace the Module.
	Not lit	Not lit	Blinking	Blinking	Not lit	Hardware Error Number of LED blinks indicates error type. 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error	
Warnings	–	–	–	–	Lit	Battery alarm	Refer to *12.2 Replacing the Basic Module Battery* on page 12-4 and replace the Battery.
	Lit	Lit	Lit	Not lit	Not lit	Operation error I/O error	Refer to *12.4.4 (3) Ladder Program User Operation Error Status* on page 12-16 and *12.4.4 (5) System I/O Error Status* on page 12-18.

12.4 Troubleshooting System Errors

This section provides troubleshooting information for system errors.

12.4.1 Outline of System Errors

The LED indicators on the front of the Basic Module can be used to determine MP2300 operating status and error status. To obtain more detailed information on errors, the system (S) registers can be used. A detailed check of the contents of system registers can be used to determine the location of the error and take the corrective measures.
Details on system registers are provided below.

(1) System Register Allocations

The following table shows the overall structure of the system registers. Refer to the sections given on the right for details.

SW00000	System Service Register	
SW00030	System Status	→ *12.4.4 (1) System Status* on page 12-14
SW00050	System Error Status	→ *12.4.4 (2) System Error Status* on page 12-15
SW00080	User Operation Error Status	→ *12.4.4 (3) Ladder Program User Operation Error Status* on page 12-16
SW00090	System Service Execution Status	→ *12.4.4 (4) System Service Execution Status* on page 12-18
SW00110	User Operation Error Status Details	→ *12.4.4 (3) Ladder Program User Operation Error Status* on page 12-16
SW00190	Alarm Counter and Alarm Clear	→ *12.4.4 (5) System I/O Error Status* on page 12-18
SW00200	System I/O Error Status	→ *12.4.4 (5) System I/O Error Status* on page 12-18
SW00500	Reserved by the system.	
SW00698	Interrupt Status	
SW00800	Module Information	→ *12.4.4 (7) Module Information* on page 12-20
SW01312	Reserved by the system.	
SW02048	Reserved by the system.	
SW03200	Motion Program Information	→ *12.5 Motion Program Alarms* on page 12-21
SW05200 to SW08191	Reserved by the system.	

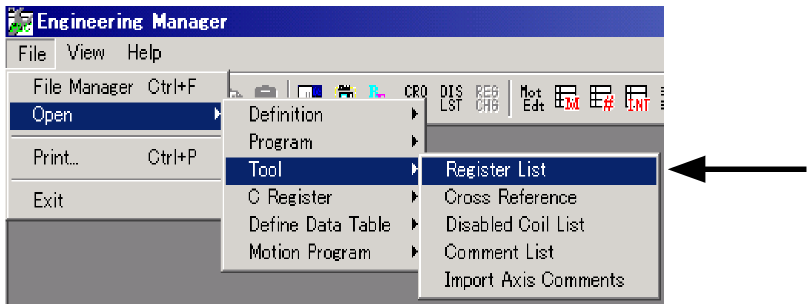
(2) Accessing System Registers

To access the contents of system registers, start the MPE720 Programming Tool and use the Register List or Quick Reference function.

[a] Register List Display Procedure

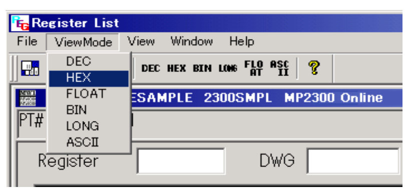
Use the following procedure to display the register list.

1. Select ***File*** – ***Open*** – ***Tool*** – ***Register List*** from the MPE720 Engineering Manager Window to open the **Register List** Window.

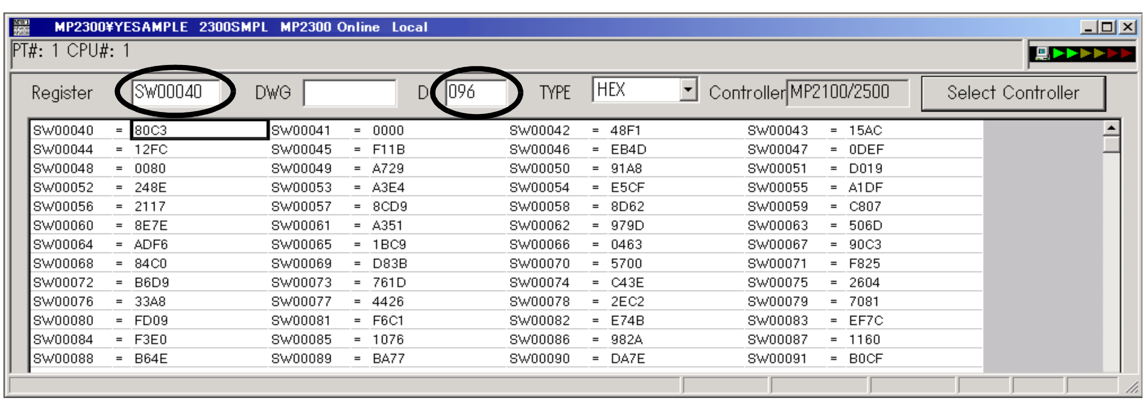


- Refer to *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28 for details on how to display the **Engineering Manager** Window.

2. Select ***View Mode*** – ***HEX*** to change the view mode to hexadecimal.



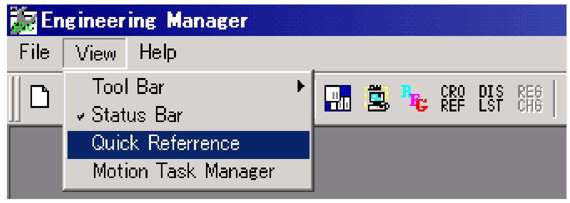
3. Input the register number of the first system register to be accessed for *Register*, input the register number of the last system register to be accessed for */D*, and click anywhere in the list. The contents of the specified range of register numbers will be displayed.



[b] Displaying a Register List with the Quick Reference

Register lists can also be accessed with the Quick Reference.

1. Select ***View*** – ***Quick Reference*** from the MPE720 Engineering Manager Window.

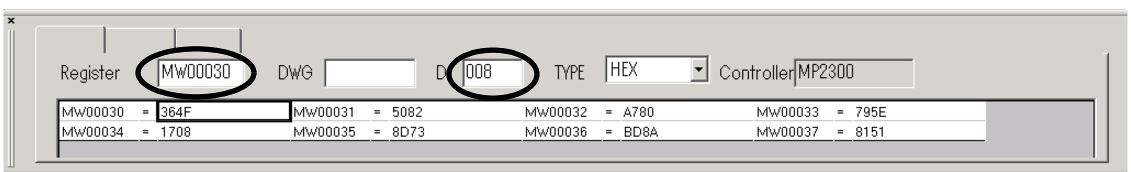


The Quick Reference will be displayed at the bottom of the **Engineering Manager** Window.

- Refer to *2.1.6 (4) Set and Save Motion Fixed Parameters* on page 2-28 for details on how to display the **Engineering Manager** Window.

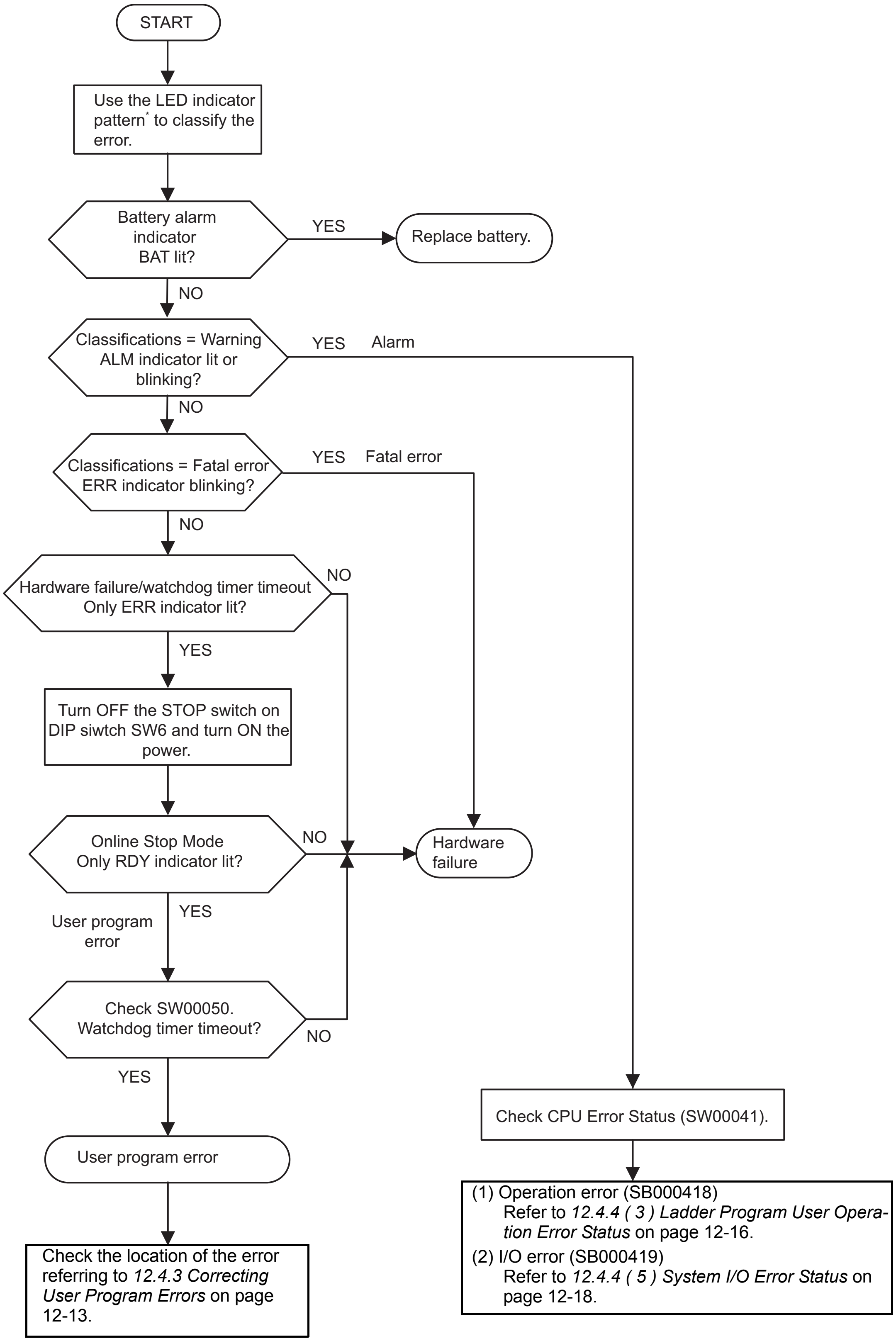
2. Click the **Register List** Tab to switch to the register list.

3. Input the register number of the first system register to be accessed for *Register*, input the register number of the last system register to be accessed for */D*, and click anywhere in the list. The contents of the specified range of register numbers will be displayed.



12.4.2 Troubleshooting Flowchart for System Errors

A troubleshooting flowchart for system errors is provided below.



* For LED indicator pattern, refer to *12.3.3 (2) LED Indicator Meanings* on page 12-7.

12.4.3 Correcting User Program Errors

A serious error may have occurred if the ALM and ERR indicators on the front of the MP2300 Basic Module are lit red. Set the MP2300 in stop status (STOP switch on DIP switch 6: ON) and investigate the error.
Use the following procedure to investigate ladder program errors.

ERR indicator lit	(1) Investigate type of serious error.	Check the contents of SW00050 (Error Type) to determine if the type of the serious error is a system error or a user program error.
ERR indicator lit	(2) Investigate type of program in which there is an error.	Check the contents of SW00055 (Program Type) to determine if the error is in a drawing or function.
ERR indicator lit	(3) Investigate the drawing with the error.	Check the contents of SW00054 (Error Task) and SW00056 (Drawing Number) to determine the drawing with the error.
ERR indicator lit	(4) Investigate the function with the error.	If SW00056 (Drawing Number) contains 0100H, the error is in a function. Check the contents of SW00057 (Error Task) and SW00058 (Drawing Number) to determine the drawing with the error. Check the contents of SW00059 (Function Referencing Drawing Step No.) to determine the step number with the operation error.
ALM indicator lit	(5) Check to see whether an operation error has occurred.	Check the error count for each drawing in SW00080 to SW00088. If errors have been counted, an operation error has occurred. Go to (6).
ALM indicator lit	(6) Investigate the type of operation error and its location. If an operation error occurs, the □00 (H00, L00, i00, and A00) drawings will execute. These drawings can also be used to correct or confirm operation.	1. Check Error Details Check error codes for drawings where the error is counted. DWG.A: SW00111, DWG.H: SW00143 DWG.I: SW00127, DWG.L: SW00175 2. Check the Drawing Number Check the error drawing number for the drawing number where an error occurred. DWG.A: SW00122, DWG.H: SW00154 DWG.I: SW00138, DWG.L: SW00186 3. Errors in Functions Check the Function Referencing Drawing Number and Function Referencing STEP Number. DWG.A: SW00123, 4; DWG.H: SW00155, 6 DWG.I: SW00139, 40; DWG.L: SW00187, 8
	(7) Correct the Program.	Correct the program at the point where the error occurred.

12.4.4 System Register Configuration and Error Status

(1) System Status

System operating status and error status is stored in registers SW00040 to SW00048. Checking of system status details are used to determine whether hardware or software is the cause of an error.

Name	Register No.	Description		
Reserved by the system.	SW00030 to SW00039			
CPU Status	SW00040	SB000400	READY	0: Failure 1: Normal
		SB000401	RUN	0: Stopped, 1: Running
		SB000402	ALARM	0: Normal, 1: Alarm
		SB000403	ERROR	0: Normal, 1: Error
		SB000404	Reserved by the system.	
		SB000405	Reserved by the system.	
		SB000406	FLASH	1: Flash operation
		SB000407	WEN	0: Write-disabled, 1: Write-enabled
		SB000408 to SB00040D	Reserved by the system.	
		SB00040E	Operation Stop Request	0: RUN selection, 1: STOP selection
		SB00040F	Run Switch Status at Power ON	0: STOP 1: RUN
CPU Error Status	SW00041	SB000410	Serious Failure	1: WDGE, undefined command See SW00050 for details.
		SB000411	Reserved by the system.	
		SB000412	Reserved by the system.	
		SB000413	Exception Error	
		SB000414 to SB000417	Reserved by the system.	
		SB000418	User operation error	1: User operation error
		SB000419	I/O Error	1: I/O error
		SB00041A to SB00041F	Reserved by the system.	
Reserved by the system.	SW00047	SB000470 to SB00047F	Reserved by the system.	
Hardware Configuration Status	SW00048	SB000480	TEST	DIP switch alarms 0: ON, 1: OFF
		SB000481	MON	
		SB000482	CNFG	
		SB000483	INIT	
		SB000484	SUP	
		SB000485	STOP	
		SB000486	—	
		SB000487	Battery Alarm	
		SB000488 to SB00048F	Reserved by the system.	
Reserved by the system.	SW00049	SW000490 to SW00049F	Reserved by the system.	

(2) System Error Status

System error status is stored in registers SW00050 to SW00060.

Name	Register No.	Description		
32-bit Error Code	SW00050	0001H	Watchdog timer over error	
		0041H	ROM diagnosis error	
		0042H	RAM diagnosis error	
		0043H	CPU diagnosis error	
		0044H	FPU diagnosis error	
		00E0H	Address read execption error	
		0100H	Address write execption error	
		0120H	FPU exception error	
		0180H	Illegal general command error	
		01A0H	Illegal slot command error	
		01E0H	User break after command execution	
		0800H	General FPU inhibited exception error	
		0820H	Slot FPU inhibited exception error	
	SW00051	For system error analysis		
32-bit Addresses Generating Error	SW00052 SW00053	For system error analysis		
Ladder Program Error Task	SW00054	0000H: System 0001H: DWG.A	0002H: DWG.I 0003H: DWG.H	0005H: DWG.L
Ladder Program Type	SW00055	0000H: System 0001H: DWG.A	0002H: DWG.I 0003H: DWG.H	0005H: DWG.L 0008H: Function
Ladder Program Error Drawing Number	SW00056	Ladder program parent drawing: FFFFH Ladder program function: 0100H Ladder program child drawing: □□00H（H□□: Child drawing number） Ladder program grandchild drawing: □□yyH（Hyy: Grandchild drawing number）		
Ladder Program Function Calling Drawing Type	SW00057	Type of drawing that calls the ladder program function in which an error occurred.		
		0001H: DWG.A 0002H: DWG.I 0003H: DWG.H	0005H: DWG.L 0008H: Ladder program function	0010H: Reserved by system. 0011H: Reserved by system.
Ladder Program Function Calling Drawing Number	SW00058	Number of drawing that calls the ladder program function in which an error occurred.		
		Parent drawing: FFFFH Function: 0100H	Child drawing: □□00H（H□□: Child drawing number） Grandchild drawing: □□yyH（Hyy: Grandchild drawing number）	
Ladder Program Function Calling Drawing Number	SW00059	STEP number of the drawing that calls the ladder program function in which an error occurred. 0 when there is an error in the drawing.		
Error Data	SW00060 and SW00061	Reserved by the system.		
	SW00062 to SW00065	Name of Task Generating Error		
	SW00066 and SW00067	Reserved by the system.		
	SW00068	Year Generated		
	SW00069	Month Generated		
	SW00070	Day of Week Generated		
	SW00071	Day of Month Generated		
	SW00072	Hour Generated		
	SW00073	Minutes Generated		
	SW00074	Seconds Generated		
	SW00075	Milliseconds Generated (Not used.)		
	SW00076 to SW00079	Reserved by the system.		

(3) Ladder Program User Operation Error Status

Error information for user operation errors in ladder programs is stored in registers SW00080 to SW00089 (Error Status 1) and SW00110 to SW00189 (Error Status 2).

[a] Ladder Program User Operation Error Status 1

Name	Register No.	Description
DWG.A Error Count Error Code	SW00080	Operation error code: See *Ladder Program User Operation Error Codes 1*. Error code when an index error occurs: See *Ladder Program User Operation Error Codes 2*.
	SW00081	
DWG.I Error Count Error Code	SW00082	
	SW00083	
DWG.H Error Count Error Code	SW00084	
	SW00085	
Reserved by the system.	SW00086	
	SW00087	
DWG.L Error Count Error Code	SW00088	
	SW00089	

[b] Ladder Program User Operation Error Status 2

Name	Register No.				Remarks
	DWG.A	DWG.I	DWG.H	DWG.L	
Error Count	SW00110	SW00126	SW00142	SW00174	Error Drawing Number Parent drawing: FFFFH Child drawing: □□00H（H□□: Child drawing number） Grandchild drawing: □□yyH （Hyy: Grandchild drawing number） Function: 0100H Function Calling Drawing Number Number of the drawing that calls the function in which an error occurred. Function Calling DWG Step Number Step number of the drawing that calls the function in which an error occurred. 0 when there is an error in the drawing.
Error Code	SW00111	SW00127	SW00143	SW00175	
Error A Register	SW00112	SW00128	SW00144	SW00176	
	SW00113	SW00129	SW00145	SW00177	
Modification A Register	SW00114	SW00130	SW00146	SW00178	
	SW00115	SW00131	SW00147	SW00179	
Error F Register	SW00116	SW00132	SW00148	SW00180	
	SW00117	SW00133	SW00149	SW00181	
Modification F Register	SW00118	SW00134	SW00150	SW00182	
	SW00119	SW00135	SW00151	SW00183	
Address Generating Error	SW00120	SW00136	SW00152	SW00184	
	SW00121	SW00137	SW00153	SW00185	
Error Drawing Number	SW00122	SW00138	SW00154	SW00186	
Function Calling Drawing Number	SW00123	SW00139	SW00155	SW00187	
Function Calling DWG Step Number	SW00124	SW00140	SW00156	SW00188	
Reserved by the system.	SW00125	SW00141	SW00157	SW00189	

[c] Ladder Program User Operation Error Codes 1

<table>
<tr><th></th><th>Error Code</th><th colspan="2">Error Contents</th><th>User*</th><th>System Default Value</th></tr>
<tr><td rowspan="7">Integer Operations</td><td>0001H</td><td colspan="2">Integer operation - underflow</td><td>Yes</td><td>–32768 [–32768]</td></tr>
<tr><td>0002H</td><td colspan="2">Integer operation - overflow</td><td>Yes</td><td>32767 [32767]</td></tr>
<tr><td>0003H</td><td colspan="2">Integer operation - division error</td><td>Yes</td><td>The A register remains the same.</td></tr>
<tr><td>0009H</td><td colspan="2">Double-length integer operation - underflow</td><td>Yes</td><td>–2147483648 [–2147483648]</td></tr>
<tr><td>000AH</td><td colspan="2">Double-length integer operation - overflow</td><td>Yes</td><td>2147483647 [2147483647]</td></tr>
<tr><td>000BH</td><td colspan="2">Double-length integer operation - division error</td><td>Yes</td><td>The A register remains the same.</td></tr>
<tr><td>010□H</td><td colspan="2">Operation error drawing - integer operation error (□ = 1 to B)</td><td>No</td><td>Default indicated above.</td></tr>
<tr><td rowspan="21">Real Number Operation</td><td>0010H</td><td colspan="2">Integer storage - non-numeric error</td><td>Yes</td><td>Store not executed. [00000]</td></tr>
<tr><td>0011H</td><td colspan="2">Integer storage - underflow</td><td>Yes</td><td>Store not executed. [–32768]</td></tr>
<tr><td>0012H</td><td colspan="2">Integer storage - overflow</td><td>Yes</td><td>Store not executed. [+32767]</td></tr>
<tr><td>0021H</td><td colspan="2">Real number storage - underflow</td><td>Yes</td><td>Store not executed. [–1.0E+38]</td></tr>
<tr><td>0022H</td><td colspan="2">Real number storage - overflow</td><td>Yes</td><td>Store not executed. [1.0E+38]</td></tr>
<tr><td>0023H</td><td colspan="2">Real number operation - division-by-zero error</td><td>Yes</td><td>Operation not executed.
The F register remains the same.</td></tr>
<tr><td>0030H</td><td colspan="2">Real number operation - invalid operation (non-numeric)</td><td>No</td><td>Operation not executed.</td></tr>
<tr><td>0031H</td><td colspan="2">Real number operation - exponent underflow</td><td>No</td><td>0.0</td></tr>
<tr><td>0032H</td><td colspan="2">Real number operation - exponent overflow</td><td>No</td><td>Maximum value</td></tr>
<tr><td>0033H</td><td colspan="2">Real number operation - division error (non-numeric 0/0)</td><td>No</td><td>Operation not executed.</td></tr>
<tr><td>0034H</td><td colspan="2">Real number storage - exponent underflow</td><td>No</td><td>Stores 0.0.</td></tr>
<tr><td>0035H</td><td colspan="2">Real number operation - stack error</td><td></td><td></td></tr>
<tr><td rowspan="9">0040H
to
0059H</td><td colspan="2">Standard System Functions
Real number operation errors</td><td>No</td><td>Interrupt operation and output = 0.0</td></tr>
<tr><td>0040H: SQRT</td><td>0041H: SIN</td><td>0042H: COS</td><td>0043H: TAN</td></tr>
<tr><td>0044H: ASIN</td><td>0045H: ACOS</td><td>0046H: ATAN</td><td>0047H: EXP</td></tr>
<tr><td>0048H: LN</td><td>0049H: LOG</td><td>004AH: DZA</td><td>004BH: DZB</td></tr>
<tr><td>004CH: LIM</td><td>004DH: PI</td><td>004EH: PD</td><td>004FH: PID</td></tr>
<tr><td>0050H: LAG</td><td>0051H: LLAG</td><td>0052H: FGN</td><td>0053H: IFGN</td></tr>
<tr><td>0054H: LAU</td><td>0055H: SLAU</td><td>0056H: REM</td><td>0057H: RCHK</td></tr>
<tr><td>0058H: BSRCH</td><td>0059H: SQRT</td><td></td><td></td></tr>
<tr><td colspan="4">1000H or 2000H is added for an index error.</td></tr>
</table>

* Yes: Can be set to value other than system default from the user program.
No: The system default cannot be changed from the user program.

[d] Ladder Program User Operation Error Codes 2

<table>
<tr><th></th><th>Error Code</th><th colspan="2">Error Contents</th><th>User</th><th>System Default</th></tr>
<tr><td rowspan="2">Integer - Real Number Operations</td><td>1000H</td><td colspan="2">Index error within drawing</td><td>×</td><td>Execute again with i,j = 0.</td></tr>
<tr><td>2000H</td><td colspan="2">Index error within function</td><td>×</td><td>Execute again with i,j = 0.</td></tr>
<tr><td rowspan="4">Integer Operation</td><td rowspan="4">□060H
to
□077H
(□ = 1,2)</td><td colspan="2">Integer system functions
Index error</td><td>×</td><td>Operation stopped and output = input.
The A register remains the same.</td></tr>
<tr><td>□06DH: PI</td><td>□06DH: PD</td><td>□06FH: PID</td><td>□070H: LAG</td></tr>
<tr><td>□071H: LLAG</td><td>□072H: FGN</td><td>□073H: IFGN</td><td>□074H: LAU</td></tr>
<tr><td>□075H: SLAU</td><td>□076H: FGN</td><td>□077H: IFGN</td><td></td></tr>
</table>

(4) System Service Execution Status

[a] Data Trace Execution Status

Name	Register No.	Remarks
Reserved by the system.	SW00090 to SW00097	
Existence Of Data Trace Definition	SW00098	Bit 0 to 3 = Group 1 to 4 Definition exists = 1, No definition = 0
Data Trace Execution Status	SW00099	Bit 0 to 3 = Group 1 to 4 Trace stopped = 1, Trace executing = 0

[b] Latest Data Trace Record Numbers

Name	Register No.	Remarks
Data Trace Group 1	SW00100	Latest record number
Data Trace Group 2	SW00101	Latest record number
Data Trace Group 3	SW00102	Latest record number
Data Trace Group 4	SW00103	Latest record number

(5) System I/O Error Status

Name	Register No.	Remarks
Current Alarm	SW00190	Cleared when power is turned ON.
Number of Alarm History Records	SW00191	The number of alarms in the alarm history.
Clear Alarms	SW00192	1: Alarm cleared 2: Current alarm and alarm history cleared
I/O Error Count	SW00200	Number of I/O errors
Input Error Count	SW00201	Number of input errors
Input Error Address	SW00202	Latest input error address (OW□□□□ register number)
Output Error Count	SW00203	Number of output errors
Output Error Address	SW00204	Latest output error address (OW□□□□ register number)
Reserved by the system.	SW00205	(Not used.)
	SW00206	
	SW00207	
I/O Error Status	SW00208 to SW00215	Slot 0 error status
	SW00216 to SW00223	Reserved by the system.
	SW00224 to SW00231	Slot 1 error status
	SW00232 to SW00239	Slot 2 error status
	SW00240 to SW00247	Slot 3 error status
	SW00248 to SW00255	Reserved by the system. (Slot 4 error status)
	...	
	SW00456 to SW00463	Reserved by the system. (Slot 30 error status)

(6) Actions to be Taken when a Transmission Error Occurs

When a transmission error occurs during system I/O, the error status is reported in the system regis-

Name	Register No.	Remarks
Slot 0 Error Status	SW00208 to SW00215	(Depends on the mounted module and error code.)
Reserved by the system.	SW00216 to SW00223	(Depends on the mounted module and error code.)
Slot 1 Error Status	SW00224 to SW00231	(Depends on the mounted module and error code.)
Slot 2 Error Status	SW00232 to SW00239	(Depends on the mounted module and error code.)
Slot 3 Error Status	SW00240 to SW00247	(Depends on the mounted module and error code.)
Reserved by the system (Slot 4 Error Status)	SW00248 to SW00255	(Depends on the mounted module and error code.)
	…	
Reserved by the system (Slot 30 Error Status)	SW00456 to SW00463	(Depends on the mounted module and error code.)

ters as shown below.

The following [a] to [c] show the allocations of the registers when the Basic Module is allocated to the slot 0, the LIO-01/LIO-02 Module to the slot 1, and the 260IF-01 Module to the slot 3.

[a] Basic Module Error Status

■ Example: Slot 0 (Basic Module)

(Bit No.)	F--- 8	7 --- 0
SW00208	Error Code (I/O Error = 2)	Sub-slot No. (= 2)
(Bit No.)	F --- 8	7--- 0
SW00209	Error Code (Station Error = 1)	Sub-slot No. (= 3)

(Bit No.)	F		3	2	1	0
SW00210	ST #16	-------------------	ST #4	ST #3	ST #2	ST #1
SW00211	ST #32	---			ST #18	ST #17
SW00212	ST #48	---			ST #34	ST #33
SW00213	ST #64	---			ST #50	ST #49
(Bit No.)	F				1	0
SW00214	Not used.	---			Not used.	Not used.

Error Flags

SW00215	Not used.	--	Not used.

[b] LIO-01/LIO-02 Module Error Status

■ Example: Slot 1

(Bit No.)	F ---------- 8		7 ---------- 0
SW00224	Error Code (I/O error = 2)		Sub-slot No. (= 1)
SW00225	Error Code (I/O error = 2)		Sub-slot No. (= 2)
SW00226	Not used	....	Not used
SW00227	Not used	....	Not used
SW00228	Not used	....	Not used
SW00229	Not used	....	Not used
SW00230	Not used	....	Not used
SW00231	Not used	....	Not used

[c] 260IF-01 Module Error Status

■ Example: Slot 3

(Bit No.)	F ---------- 8		7 ---------- 0
SW00240	Error Code (Station error = 1)		Sub-slot No. (= 2)
SW00241	ST15	....	ST0
SW00242	ST31	....	For ST16
SW00243	ST47	....	ST22
SW00244	ST63	....	ST48

(7) Module Information

Name	Register No.	Remarks
Module Information	SW00800	Basic Module (C380H)
	SW00801	Reserved by the system.
	SW00802	CPU Software version (BCD)
	SW00803	Number of sub-slots (0004H)
	SW00804	CPU Function ID (C310H)
	SW00805	CPU Function Module Status
	SW00806	I/O Function Module ID (8070H)
	SW00807	I/O Function Module Status
	SW00808	SVB Function Module ID (9113H)
	SW00809	SVB Function Module Status
	SW00810	SVR Function Module ID (9210H)
	SW00811	SVR Function Module Status
	SW00812 to SW00815	Reserved by the system.
	SW00816 to SW00823	Slot 1
	SW00824 to SW00831	Slot 2
	SW00832 to SW00839	Slot 3
	…	
	SW01008 to SW01015	Reserved by the system (Slot 26)

12.5 Motion Program Alarms

If the result of investigation using *12.3.2 MP2300 Error Check Flowchart* on page 12-6 indicates that a motion program alarm has occurred, use the alarm code to determine the cause of the error.

12.5.1 Motion Program Alarm Configuration

Motion program alarms stored in the alarm output register (default: SW03268) are displayed as shown in the following diagram.

Bit 15	Bit 12	Bit 8	Bit 7	Bit 0
	Alarm Axis Information (1 to 14)	Axis Alarm		Alarm Code

- Refer to *5.2.4 (5) Monitoring Motion Program Execution Information Using S Registers* on page 5-15 for information on finding the alarm output register.

12.5.2 Motion Program Alarm Code List

The motion program alarm codes are listed in the following table.

- When displaying these on the register list, set the view mode to hexadecimal.

	Alarm Code	Description	Correction
Program alarms	0	No alarm	Check the specifications for the instruction that was being executed in the motion program when the alarm occurred according to the meaning of the alarm code.
	10h	Complete circle specified for radius designation	
	11h	Interpolation feed speed exceeded	
	12h	Interpolation feed speed not specified	
	13h	Range exceeded after acceleration/deceleration speed parameter conversion	
	14h	LONG_MAX exceeded for circular arc length	
	15h	No vertical specification for circular plane designation	
	16h	No horizontal specification for circular plane designation	
	17h	Specified axes exceeded	
	18h	Specified number of turns exceeded	
	19h	LONG_MAX exceeded for radius	
	1Bh	Emergency stop in progress	
	1Ch	LONG_MAX exceeded for linear interpolation block moving amount	
	1Dh	FMX not defined	
	1Eh	Address T out of range	
	1Fh	Address P out of range	
	20h	REG data error	
	21h	Function work duplication (Function work in second PFORK column was used at a different nesting level.)	
	22h	Indirect register designation range error	
	23h	Overflow when converting reference unit	
Axis alarms*	80h	During use of logical axis prohibited	Check the specifications for the instruction that was being executed in the motion program when the alarm occurred according to the meaning of the alarm code.
	81h	Specifications exceeding POSMAX made for infinite length axis designation	
	82h	LONG_MAX exceeded for axis moving distance	
	84h	Motion command duplication	
	85h	Motion command response duplication	
	87h	VEL setting data out of range	
	88h	INP setting data out of range	
	89h	ACC/SCC/DCC setting data out of range	
	8Ah	T reference for MVT instruction is 0	
	8Bh	Instruction designated that cannot be executed for the Motion Module model	
	8Ch	Prohibition command executed when pulse distribution was not completed	
	8Dh	Motion command error end status	

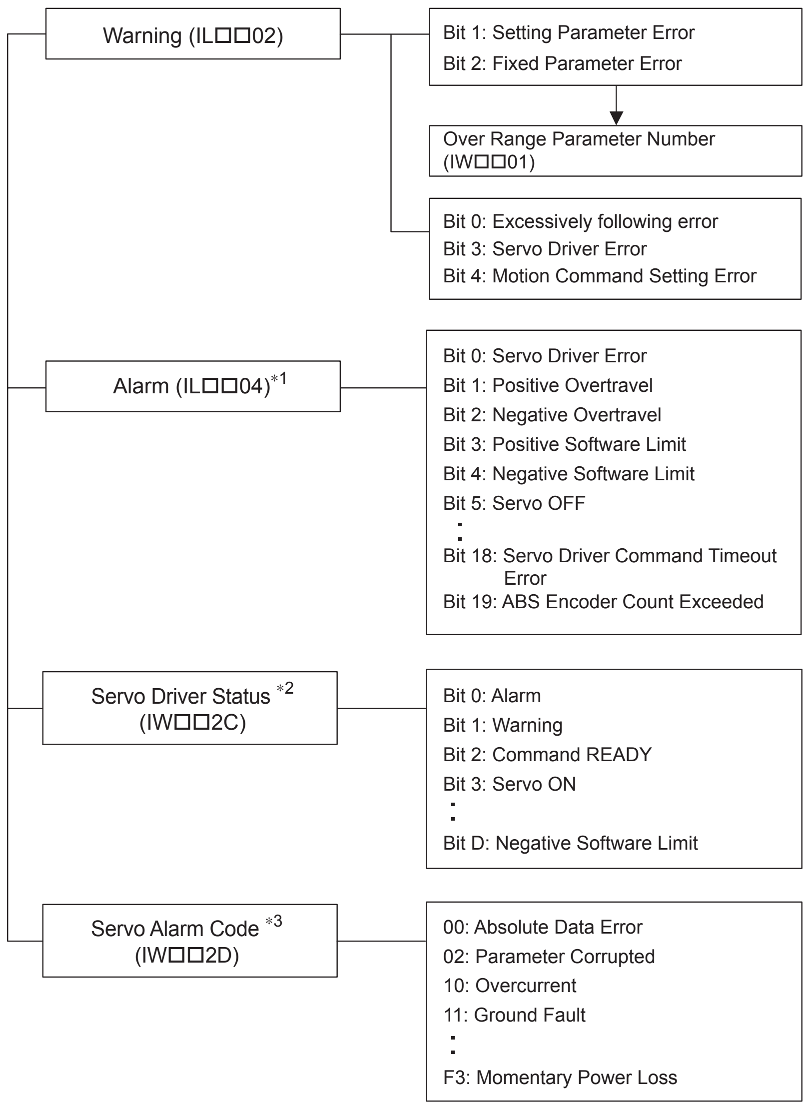
* The axis number is stored in bits 8 to 11 for axis alarms.

12.6 Troubleshooting Motion Errors

This section explains the details and remedies for errors that occur in motion control functions.

12.6.1 Overview of Motion Errors

Motion errors in the MP2300 include axis alarms detected for individual SERVOPACKs.
The failure location can be determined and appropriate corrections can be taken simply by checking the contents of the Warning (IL□□02) and Alarm (IL□□04) monitoring parameters.
The motion alarms for the MP2300 Basic Module's MECHATROLINK-I or MECHATROLINK-II functionality are shown below.



* 1. Refer to *12.6.2 Motion Error Details and Corrections* on page 12-23.
* 2. Refer to *12.6.3 (1) Bit 19: ABS Encoder Count Exceeded* on page 12-28.
* 3. Refer to *12.6.3 (2) Servo Alarm Code (IW□□2D)* on page 12-29.

12.6.2 Motion Error Details and Corrections

The following tables show the contents of the axis alarms (IL□□04) (subsection 1) and axis alarm details
(subsection 2).

(1) Alarm IL□□04 List

IL□□04	Alarm Contents	IL□□04	Alarm Contents
Bit 0	Servo Driver Error	Bit 16	Servo Driver Synchronization Communication Error
Bit 1	Positive Overtravel	Bit 17	Servo Driver Communication Error
Bit 2	Negative Overtravel	Bit 18	Servo Driver Command Timeout Error
Bit 3	Positive Soft Limit (Positive Software Limit)	Bit 19	ABS Encoder Count Exceeded
Bit 4	Negative Soft Limit (Negative Software Limit)	Bit 20	Reserved by the system.
Bit 5	Servo OFF	Bit 21	Reserved by the system.
Bit 6	Positioning Time Over	Bit 22	Not used
Bit 7	Excessive Positioning Moving Amount	Bit 23	Not used
Bit 8	Excessive Speed	Bit 24	Not used
Bit 9	Excessively Following Error	Bit 25	Not used
Bit 10	Filter Type Change Error	Bit 26	Not used
Bit 11	Filter Time Constant Change Error	Bit 27	Not used
Bit 12	Not used	Bit 28	Not used
Bit 13	Zero Point Not Set	Bit 29	Not used
Bit 14	Not used	Bit 30	Not used
Bit 15	Not used	Bit 31	Not used

(2) Bit 0: Servo Driver Error

Detection Timing	• SERVOPACK alarms are continuously monitored by the alarm management section.
Processing when Alarm Occurs	• The current command will be aborted. If a SERVOPACK error is detected during execution of a POSING command, the positioning will be aborted and the axis will decelerate to a stop. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• The cause of the error depends on the type of alarm. The contents of an alarm is monitored in IW□□2D. Refer to the list of SERVOPACK alarms in *12.6.3 (2) Servo Alarm Code (IW□□2D)* on page 12-29 for details.
Correction	• Confirm the SERVOPACK alarm and remove the cause. • Reset the alarm.

- The above status bit will turn ON for any of the SERVOPACK alarm codes for alarms classified as SERVOPACK alarms.

(3) Bit 1: Positive Overtravel and Bit 2: Negative Overtravel

Detection Timing	• Overtravel is continuously monitored by the position management section during execution of a motion command. • Overtravel is detected when the overtravel signal in the direction of movement turns OFF.
Processing when Alarm Occurs	• The SERVOPACK performs stop processing. The stop method and processing after stopping depends on the SERVOPACK parameter settings. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON. • MP2300 Processing The command is canceled and the axis decelerates to a stop. Follow-up processing (each scan the current position of the machine is adjusted to the reference position) is executed.
Error and Cause	One of the following is possible. • A move command that exceeded the travel limit of the machine was executed as follows: A user program command exceeded the travel limit. The software limit was exceeded in manual operation. • Overtravel signal malfunction.
Correction	• Check the following. Check the overtravel signal. Check the program or manual operation. • Then, after clearing the motion command code and resetting the alarm, use a return operation to eliminate the overtravel status. (Commands in the overtravel direction will be disabled and an alarm will occur again if one is executed.)

- For a vertical axis, the following should be set at the SERVOPACK to avoid dropping and vibration at the overtravel limit.
  - An emergency deceleration stop
  - Zero clamp status after the deceleration stop

(4) Bit 3: Positive Software Limit and Bit 4: Negative Software Limit

Detection Timing	• Enabled when using a motion command and detected by the position management section. • The software limits are valid after a ZRET or ZSET command has been completed.
Processing when Alarm Occurs	• The axis decelerates to a stop at the software limit. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• A move command that exceeded a software limit of the machine was executed as follows: A user program command exceeded the software limit. The software limit was exceeded in manual operation.
Correction	• Check the program or manual operation. • Then, after clearing the motion command code and resetting the alarm, use a return operation to eliminate the software limit status. (Commands in the direction of the software limit will be disabled and an alarm will occur again if one is executed.)

(5) Bit 5: Servo OFF

Detection Timing	• Servo OFF status is detected when a move command is executed.
Processing when Alarm Occurs	• The specified movement command will not be executed. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• A move command (commands for positioning, external positioning, STEP operation, JOG operation, etc.) was executed when the SERVOPACK was Servo OFF status.
Correction	• After clearing the motion command and resetting the alarm, turn the SERVOPACK to the Servo ON status.

(6) Bit 6: Positioning Time Over

Detection Timing	• Positioning was not completed after completing pulse distribution.
Processing when Alarm Occurs	• The current command was ended forcibly. • The Command Error Occurrence in the Servo Module Command Status (IW☐☐09 bit 3) will turn ON.
Error and Cause	One of the following is possible. • The position loop gain and speed loop gain are not set correctly, creating poor response. • The Position Complete Timeout (OW☐☐26) is too short. • The capacity of the motor is insufficient for the machine load. • Connections are not correct between the SERVOPACK and the motor.
Correction	Check the following. • Check the SERVOPACK gain parameters. • Check connections between the SERVOPACK and the motor. • Check the motor capacity. • Check the Position Complete Timeout (OW☐☐26).

- The above check is not performed if the Position Complete Timeout (OW☐☐26) is set to 0.

(7) Bit 7: Excessive Positioning Moving Amount

Detection Timing	• Enabled when the electronic gear is used and detected when positioning command is executed.
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Occurrence in the Servo Module Command Status (IW☐☐09 bit 3) will turn ON.
Error and Cause	• A move command (commands for positioning, external positioning, or STEP operation) was executed that exceeded the limit of the positioning moving amount.
Correction	• Check the moving amount for the axis being positioned.

(8) Bit 8: Excessive Speed

Detection Timing	• Enabled when the electronic gear is used and detected when positioning command is executed.
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Occurrence in the Servo Module Command Status (IW☐☐09 bit 3) will turn ON.
Error and Cause	• The limit to the moving amount that can be distributed during one scan has been exceeded.
Correction	• Check the moving amount for the axis that is being subjected to position control.

(9) Bit 9: Excessively Following Error

Detection Timing	• Detected during execution of positioning commands (commands for positioning, external positioning, STEP operation, JOG operation, etc.). • Detected during execution of phase control commands.
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Occurrence in the Servo Module Command Status (IW☐☐09 bit 3) will turn ON.
Error and Cause	One of the following is possible. • The position loop gain and speed loop gain are not set correctly, creating poor response. • The Deviation Abnormal Detection Value (OL☐☐22) is too small. • The capacity of the motor is insufficient for the machine load. • SERVOPACK failure
Correction	Check the following and correct the problem. If the problem persists, contact the maintenance department. • Check the position loop gain and speed loop gain. • Check the Deviation Abnormal Detection Value (OL☐☐22). • Check the motor capacity.

- The above check is not performed if the Deviation Abnormal Detection Value (OL☐☐22) is set to 0.

(10) Bit 10: Filter Type Change Error

Detection Timing	• Continuously monitored by the motion command processing section.
Processing when Alarm Occurs	• The Change Filter Type command will not be executed. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• Interpolation Commands (Interpolation or Interpolation with Position Latch) An error occurs if the Change Filter Type command is executed before the specified pulse distribution has not been completed (i.e., when IB□□0C0 was OFF). • Positioning Commands (Positioning, External Positioning, STEP Operation, or JOG Operation) The Change Filter Type command will be ignored. (An error will not occur.)
Correction	• Correct the program to execute the Change Filter Type command after Distribution Completed status (i.e., that IB□□0C0 is ON) is checked.

- The command running will not stop even if the above error occurs. The stop processing from the user program is needed to stop running commands when necessary.

(11) Bit 11: Filter Time Constant Change Error

Detection Timing	• Continuously monitored by the motion command processing section.
Processing when Alarm Occurs	• The SCC (Change Filter Time Constant) command will not be executed. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• Interpolation Commands (Interpolation or Interpolation with Position Latch) An error occurs if the SCC command is executed before the specified pulse distribution has not been completed (i.e., when IB□□0C0 was OFF). • Positioning Commands (Ppositioning, External Positioning, STEP Operation, or JOG Operation) The Change Filter Time Constant command will be ignored. (An error will not occur.)
Correction	• Correct the program to execute the SCC command after Distribution Completed status (i.e., that IB□□0C0 is ON) is checked.

- The command running will not stop even if the above error occurs. The stop processing from the user program is needed to stop running commands when necessary.

(12) Bit 13: Zero Point Not Set

Detection Timing	• Enabled only when an absolute encoder is used for an infinite length axis and detected when the next command is set in the Motion Command (OW□□08). Commands: Positioning, External Positioning, Interpolation, or Latch
Processing when Alarm Occurs	• The set command will not be executed. • The Command Error Occurrence in the Servo Module Command Status (IW□□09 bit 3) will turn ON.
Error and Cause	• A move command was set without executing the ZSET command (IW□□0C bit 5 is OFF).
Correction	• After clearing the motion command and resetting the alarm, execute a Zero Point Setting operation.

(13) Bit 16: Servo Driver Synchronization Communication Error

Detection Timing	• Detected by the communication control section when communication are synchronized between the MP2300 and SERVOPACK.
Processing when Alarm Occurs	• The current command will be aborted.
Error and Cause	• An error occurred in MECHATROLINK communication (e.g., cable disconnect or noise interference on communication line).
Correction	• Check the MECHATROLINK cable and reset the alarm.

(14) Bit 17: Servo Driver Communication Error

Detection Timing	• Detected by the communication control section when communication is not synchronized between the MP2300 and SERVOPACK.
Processing when Alarm Occurs	• The current command will be aborted. • The SERVOPACK will be Servo OFF status.
Error and Cause	• MECHATROLINK communication stopped because the cable was disconnected or the power supply to the SERVOPACK was turned OFF.
Correction	• Check the MECHATROLINK cable and reset the alarm.

(15) Bit 18: Servo Driver Command Timeout Error

Detection Timing	• Detected during execution of each motion commands. • Detected by the MECHATROLINK communication control section when the Servo command responses are checked for each process.
Processing when Alarm Occurs	• The current command will be aborted.
Error and Cause	• The MECHATROLINK Servo command did not complete within the specified time (5 s).
Correction	• Check for alarms in the SERVOPACK for MECHATROLINK communication.

- The above error occurs when Module allocations of SERVOPACK for MECHATROLINK communication have been completed and the power is not being supplied to the SERVOPACK.

(16) Bit 19: ABS Encoder Count Exceeded

Detection Timing	• Enabled only when an absolute encoder is used for a finite length axis, and the electronic gear used. Detected by the position management section when power is turned ON.
Processing when Alarm Occurs	• The absolute position information read from the absolute encoder when the SEN signal turned ON is ignored.
Error and Cause	• An operation error occurred when the absolute position information read from the absolute encoder is converted from pulses to reference units at power ON.
Correction	• Check the gear ratio, number of encoder pulses for other motion fixed parameters.

12.6.3 Servo Driver Status and Servo Driver Error Codes

(1) Network Servo Status (IW□□2C) List

The status of a SERVOPACK for MECHATROLINK communication can be monitored in Monitor Parameter IW□□2C.
A list is provided in the following table.

Bit No.	Status	Description
Bit 0	Alarm (ALARM)	OFF: No alarm occurred. ON: Alarm occurred.
Bit 1	Warning (WARNG)	OFF: No warning occurred. ON: Warning occurred.
Bit 2	Command Ready (CMDRDY)	OFF: Command reception not possible (busy). ON: Command reception possible (ready).
Bit 3	Servo ON (SVON)	OFF: Servo OFF (baseblock) ON: Servo ON (baseblock cleared)
Bit 4	Main Power ON (PON)	OFF: Main power OFF ON: Main power ON
Bit 5	Machine Lock (MLOCK)	OFF: Machine lock released ON: Machine locked
Bit 6	Zero Point Position (ZPOINT)	OFF: The APOS (absolute position) is not in the zero point. ON: The APOS (absolute position) is in the zero point range.
Bit 7	Positioning Completed (PSET)	OFF: Pulse distribution is not completed or the APOS is not in the positioning completed width. ON: Pulse distribution is completed and the APOS is within the positioning completed width.
Bit 8	Distribution Completed (DEN)	OFF: Pulse distribution is being performed for positioning command. ON: Pulse distribution for positioning commands has been completed
Bit 9	Torque Limit (T_LIM)	OFF: A torque limit is not being applied. ON: A torque limit is being applied.
Bit A	Latch Completed (L_CMP)	OFF: Latch not completed. ON: Latch completed.
Bit B	Position Proximity (NEAR)	OFF:The APOS is outside the position proximity range. ON: The APOS is inside the position proximity range.
Bit C	Positive Software Limit (P-SOT)	OFF: The positive software limit has not been exceeded. ON: The positive software limit has been exceeded.
Bit D	Negative Software Limit (N-SOT)	OFF: The negative software limit has not been exceeded. ON: The negative software limit has been exceeded.
Bit E	Reserved	–
Bit F	Reserved	–

(2) Servo Alarm Code (IW□□2D)

When the Servo Driver Error (IL□□04, bit 0) turns ON, a SERVOPACK alarm will exist. The content of the alarm can be confirmed using the Servo Alarm Code (monitoring parameter IW□□2D). The Servo alarm codes are listed in the following tables.

[a] Σ-I Series

Name	Register Number	Code	Meaning
Servo Alarm Code	IW□□2D	99	Normal
		94	Parameter Setting Warning
		95	MECHATROLINK Command Warning
		96	MECHATROLINK Communication Error Warning
		00	Absolute Value Data Error
		02	Parameter Corrupted
		10	Overcurrent
		11	Ground Fault
		40	Overvoltage
		41	Undervoltage
		51	Overspeed
		71	Overload (Instantaneous)
		72	Overload (Continuous)
		7A	Heat Sink Heating
		80	Absolute Encoder Error
		81	Absolute Encoder Backup Error
		82	Absolute Encoder Checksum Error
		83	Absolute Encoder Battery Error
		84	Absolute Encoder Data Error
		85	Absolute Encoder Overspeed
		B1	Gate Array 1 Error
		B2	Gate Array 2 Error
		B3	Current Feedback Phase-U Error
		B4	Current Feedback Phase-V Error
		B5	Watchdog Detector Error
		C1	Servo Run-away
		C2	Encoder Phase Error Detected
		C3	Encoder Phase-A or -B Broken
		C4	Encoder Phase-C Broken
		C5	Incremental Encoder Initial Pulses Error
		D0	Position Error Exceeded
		E5	MECHATROLINK Sync Error
		E6	MECHATROLINK Communication Error
		F1	Broken Phase in Power Line
		F3	Momentary Power Loss

[b] Σ-II Series

Name	Register Number	Code	Meaning
Servo Alarm Code	IW□□2D	99	Normal
		90	Excessive Position Deviation Warning
		91	Overload Warning
		92	Regeneration Overload Warning
		93	Absolute Encoder Battery Error
		94	Data Setting Warning
		95	Command Warning
		96	Communication Warning
		02	Parameter Corrupted
		03	Main Circuit Detector Error
		04	Parameter Setting Error
		05	Combination Error
		09	Divider Setting Error
		0A	Encoder Type Mismatch
		10	Overcurrent or Heat Sink Overheat
		30	Regeneration Error
		32	Regeneration Overload
		33	Main Circuit Wiring Error
		40	Overvoltage
		41	Undervoltage
		51	Overspeed
		71	Overload (Instantaneous Maximum Load)
		72	Overload (Continuous Maximum Load)
		73	DB Overload
		74	Inrush Resistance Overload
		7A	Heat Sink Overheat
		81	Encoder Backup Alarm
		82	Encoder Checksum Alarm
		83	Encoder Battery Alarm
		84	Encoder Data Alarm
		85	Encoder Overspeed
		86	Encoder Overheat
		B1	Speed Reference A/D Error
		B2	Torque Reference A/D Error
		B3	Current Sensor Error
		B6	Gate Array Error
		BF	System Alarm
		C1	Servo Run-away
		C6	Full-closed Loop Phase-A or -B Broken
		C7	Full-closed Loop Phase-C Broken
		C8	Encoder Clear Error Multiturn Limit Setting Error
		C9	Encoder Communication Error
		CA	Encoder Parameter Error
		CB	Encoder Echoback Error
		CC	Multiturn Limit Mismatch
		D0	Excessive Position Error
		D1	Excessive Error between Motor Load and Position
		E0	No Option
		E1	Option Timeout

Name	Register Number	Code	Meaning
Servo Alarm Code (cont'd)	IW□□2D (cont'd)	E2	Option WDC Error
		E5	WDT Error
		E6	Communication Error
		E7	Application Module Detection Failure
		E9	Bus OFF Error
		EA	SERVOPACK Failure
		EB	SERVOPACK Initial Access Error
		EC	SERVOPACK WDC Error
		ED	Command Execution Not Completed
		EF	Application Module Alarm
		F1	Broken Phase in Power Line
		F5	Motor Wire Disconnection (when control power supply is turned ON)
		F6	Motor Wire Disconnection (when Servo is ON)

[c] Σ-III Series

Name	Register Number	Code	Meaning
Servo Alarm Code	IW□□2D	000	Normal
		900	Excessive Position Error
		901	Excessive Position Error at Servo ON
		910	Overload
		911	Vibration
		920	Regeneration Overload
		930	Absolute Encoder Battery Error
		941	Parameter Change Requiring Power Recycling
		94A	Data Setting Warning 1 (Parameter Number)
		94B	Data Setting Warning 2 (Outside Data Range)
		94C	Data Setting Warning 3 (Calculation Error)
		94D	Data Setting Warning 4 (Parameter Size)
		95A	Command Warning 1 (Command Conditions Not Met)
		95B	Command Warning 2 (Unsupported Command)
		95C	Command Warning 3
		95D	Command Warning 4
		95E	Command Warning 5
		960	MECHATROLINK Communication Warning
		020	Parameter Checksum Error 1
		021	Parameter Format Error 1
		022	System Constant Checksum Error 1
		023	Parameter Password Error 1
		02A	Parameter Checksum Error 2
		02B	System Constant Checksum Error 2
		030	Main Circuit Detector Error
		040	Parameter Setting Error 1
		04A	Parameter Setting Error 2
		041	Divided Pulse Output Setting Error
		042	Parameter Combination Error
		050	Combination Error
		051	Unsupported Product Alarm

Name	Register Number	Code	Meaning
Servo Alarm Code (cont'd)	IW□□2D (cont'd)	0B0	Servo ON Reference Invalid Alarm
		100	Overcurrent or Heat Sink Overheat
		300	Regeneration Error
		320	Regeneration Overload
		330	Main Circuit Wiring Error
		400	Overvoltage
		410	Undervoltage
		510	Overspeed
		511	Divided Pulse Output Overspeed
		520	Vibration Alarm
		710	Overload (Instantaneous Maximum Load)
		720	Overload (Continuous Maximum Load)
		730, 731	DB Overload
		740	Inrush Resistance Overload
		7A0	Heat Sink Overheat
		810	Encoder Backup Alarm
		820	Encoder Checksum Alarm
		830	Encoder Battery Alarm
		840	Encoder Data Alarm
		850	Encoder Over Speed
		860	Encoder Overheat
		870	Full-closed Serial Encoder Checksum Alarm
		880	Full-closed Serial Encoder Data Alarm
		8A0	Full-closed Serial Encoder Scale Error
		8A1	Full-closed Serial Encoder Module Error
		8A2	Full-closed Serial Encoder Sensor Error (Incremental Value)
		8A3	Full-closed Serial Encoder Position Error (Absolute Value)
		B31	Current Detection Error 1
		B32	Current Detection Error 2
		B33	Current Detection Error 3
		B6A	MECHATROLINK Communication ASIC Error 1
		B6B	MECHATROLINK Communication ASIC Error 2
		BF0	System Alarm 0
		BF1	System Alarm 1
		BF2	System Alarm 2
		BF3	System Alarm 3
		BF4	System Alarm 4
		C10	Servo Run-away
		C80	Encoder Clear Error Multiturn Limit Setting Error
		C90	Encoder Communication Error
		C91	Encoder Communication Position Data Acceleration Error
		C92	Encoder Communication Timer Error
		CA0	Encoder Parameter Error
		CB0	Encoder Echoback Error
		CC0	Multiturn Limit Mismatch
		CF1	Full-closed Serial Conversion Unit Communication Error (Reception Failure)

Name	Register Number	Code	Meaning
Servo Alarm Code (cont'd)	IW☐☐2D (cont'd)	CF2	Full-closed Serial Conversion Unit Communication Error (Timer Stopped)
		D00	Excessive Position Error
		D01	Excessive Position Error Alarm at Servo ON
		D02	Excessive Position Error Alarm for Speed Limit at Servo ON
		D10	Excessive Error between Motor Load and Position
		E00	COM Alarm 0
		E01	COM Alarm 1
		E02	COM Alarm 2
		E07	COM Alarm 7
		E08	COM Alarm 8
		E09	COM Alarm 9
		E40	MECHATROLINK-II Transmission Cycle Setting Error
		E50	MECHATROLINK-II Sync Error
		E51	MECHATROLINK-II Sync Failure
		E60	MECHATROLINK-II Communication Error
		E61	MECHATROLINK-II Transmission Cycle Error
		EA0	DRV Alarm 0
		EA1	DRV Alarm 1
		EA2	DRV Alarm 2

- Alarm codes are normally two digits, but three-digit codes are stored in the Alarm Monitor for motion commands.

MEMO

Appendix A

A Switching Motion Commands and Subcommands A-2
A.1 Motion Command Execution Table..A-2
A.2 Motion Subcommand Execution Table...A-4

A Switching Motion Commands and Subcommands

A.1 Motion Command Execution Table

The following table shows which commands can be executed during execution of another motion command for the MP2300.

Code	Command Being Executed	Set Command															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		NOP	POS	EX_P	ZRET	INTE	ENDO	LATC	FEED	STEP	ZSET	ACC	DCC	SCC	CHG	KVS	KPS
0	NOP	–	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	POSING	C	–	A	A	C	C	C	A	C	A	C	C	C	C	A	A
2	EX_POSING	C	B	–	A	C	C	C	A	C	B	C	C	C	C	B	B
3	ZRET	C	C	C	–	C	C	C	C	C	C	C	C	C	C	C	C
4	INTERPOLATE	A	A	A	A	–	A	A	A	A	A	A	A	A	A	A	A
5	ENDOF_INTER POLATE	A	A	A	A	A	–	A	A	A	A	A	A	A	A	A	A
6	LATCH	A	A	A	A	A	A	–	A	A	A	A	A	A	A	A	A
7	FEED	C	B	B	A	C	C	C	–	C	A	C	C	C	C	C	C
8	STEP	C	A	A	A	C	C	C	A	–	A	C	C	C	C	A	A
9	ZSET	A	A	A	A	A	A	A	A	A	–	A	A	A	A	A	A
10	ACC	D	D	D	D	D	D	D	D	D	D	–	D	D	D	D	D
11	DCC	D	D	D	D	D	D	D	D	D	D	D	–	D	D	D	D
12	SCC	D	D	D	D	D	D	D	D	D	D	D	D	–	D	D	D
13	CHG_FILTER	A	A	A	A	A	A	A	A	A	A	A	A	A	–	A	A
14	KVS	D	D	D	D	D	D	D	D	D	D	D	D	D	D	–	D
15	KPS	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	–
16	KFS	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
17	PRM_RD	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
18	PRM_WR	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
19	ALM_MON	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
20	ALM_HIST	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
21	ALMHIST_ CLR	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
22	ABS_RST	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
23	VELO	C	A	A	C	C	C	C	A	A	C	C	C	C	C	C	C
24	TRQ	C	A	A	C	C	C	C	A	A	C	C	C	C	C	C	C
25	PHASE	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
26	KIS	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
29	SV_ON	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
30	SV_OFF	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
31	ALM_CLR	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

Code	Command Being Executed	Set Command													
		16	17	18	19	20	21	22	23	24	25	26	29	30	31
		KFS	PRM_	PRM_	ALM_	ALM_	ALMH	ABS_	VELO	TRQ	PHAS	KIS	SV_ON	SV_OF	ALM
0	NOP	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	POSING	A	A	A	A	A	A	C	A	A	A	A	–	A	C
2	EX_POSING	B	B	B	B	B	B	C	C	C	C	B	–	A	C
3	ZRET	C	C	C	C	C	C	C	C	C	C	C	–	A	C
4	INTERPOLATE	A	A	A	A	A	A	A	A	A	A	A	–	A	C
5	ENDOF_INTE RPOLATE	A	A	A	A	A	A	A	A	A	A	A	–	A	C
6	LATCH	A	A	A	A	A	A	A	A	A	A	A	–	A	C
7	FEED	C	C	C	C	C	C	C	A	A	A	×	–	A	C
8	STEP	A	A	A	A	A	A	C	A	A	A	A	–	A	C
9	ZSET	A	A	A	A	A	A	A	A	A	A	A	C	A	D
10	ACC	D	D	D	D	D	D	D	D	D	D	D	C	A	D
11	DCC	D	D	D	D	D	D	D	D	D	D	D	C	A	D
12	SCC	D	D	D	D	D	D	D	D	D	D	D	C	A	D
13	CHG_FILTER	A	A	A	A	A	A	A	A	A	A	A	C	A	D
14	KVS	D	D	D	D	D	D	D	D	D	D	D	C	A	D
15	KPS	D	D	D	D	D	D	D	D	D	D	D	C	A	D
16	KFS	–	D	D	D	D	D	D	D	D	D	D	C	A	D
17	PRM_RD	D	–	D	D	D	D	D	D	D	D	D	C	A	D
18	PRM_WR	D	D	–	D	D	D	D	D	D	D	D	C	A	D
19	ALM_MON	D	D	D	–	D	D	D	D	D	D	D	C	A	D
20	ALM_HIST	D	D	D	D	–	D	D	D	D	D	D	C	A	D
21	ALMHIST_ CLR	D	D	D	D	D	–	D	D	D	D	D	C	A	D
22	ABS_RST	D	D	D	D	D	D	–	D	D	D	D	C	D	D
23	VELO	C	C	C	C	C	C	C	–	A	A	C	A	A	C
24	TRQ	C	C	C	C	C	C	C	A	–	A	C	A	A	C
25	PHASE	A	A	A	A	A	A	A	A	A	–	A	–	A	C
26	KIS	D	D	D	D	D	D	D	D	D	D	–	×	A	D
29	SV_ON	D	D	D	D	D	D	D	D	D	D	D	–	A	D
30	SV_OFF	D	D	D	D	D	D	D	D	D	D	D	C	–	D
31	ALM_CLR	D	D	D	D	D	D	D	D	D	D	D	C	A	–

- A: Execution possible.
  B: Execution possible if position reference type is set for absolute position reference mode. Axis will stop at switching point if incremental addition mode is being used.
  C: Command aborted (deceleration stop)
  D: The new command is ignored and the current command is continued.
- Although the table shows that changing to ACC, DCC, SCC, or CHG_FILTER is possible from INTERPOLATE, ENDOF_INTERPOLATE, LATCH, or PHASE, a command error will occur if pulse distribution has not been completed.

A.2 Motion Subcommand Execution Table

The following table shows which subcommands can be executed during execution of a motion command for the MP2300.

Code	Motion Command Being Executed	Set Subcommand				
		0	1	2	4	5
		NOP	PRM_RD	PRM_WR	SMON	FIXPRM_RD
0	NOP	✓	✓	✓	✓	✓
1	POSING	✓	✓	✓	✓	✓
2	EX_POSING	✓	–	–	✓	✓
3	ZRET	✓	–	–	✓	✓
4	INTERPOLATE	✓	✓	✓	✓	✓
5	ENDOF_INTERPOLATE	✓	✓	✓	✓	✓
6	LATCH	✓	✓	✓	✓	✓
7	FEED	✓	✓	✓	✓	✓
8	STEP	✓	✓	✓	✓	✓
9	ZSET	✓	✓	✓	✓	✓
10	ACC	✓	–	–	✓	✓
11	DCC	✓	–	–	✓	✓
12	SCC	✓	–	–	✓	✓
13	CHG_FILTER	✓	✓	✓	✓	✓
14	KVS	✓	–	–	✓	✓
15	KPS	✓	–	–	✓	✓
16	KFS	✓	–	–	✓	✓
17	PRM_RD	✓	–	–	✓	✓
18	PRM_WR	✓	–	–	✓	✓
19	ALM_MON	✓	–	–	✓	✓
20	ALM_HIST	✓	–	–	✓	✓
21	ALMHIST_CLR	✓	–	–	✓	✓
22	ABS_RST	✓	–	–	✓	✓
23	VELO	✓	✓	✓	✓	✓
24	TRQ	✓	✓	✓	✓	✓
25	PHASE	✓	✓	✓	✓	✓
26	KIS	✓	–	–	✓	✓

- ✓: Execution possible.
  –: Execution not possible.

Appendix B

B System Registers Lists A-2
B.1 System Service Registers A-2
B.2 Scan Execution Status and Calendar..A-4
B.3 Program Software Numbers and Remaining Program Memory Capacity Name...A-4

B System Registers Lists

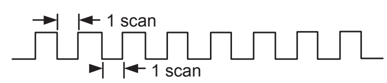
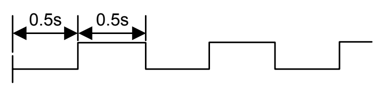
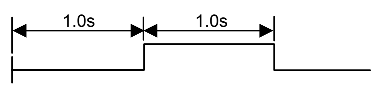
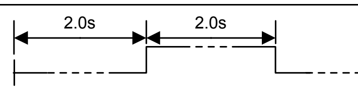
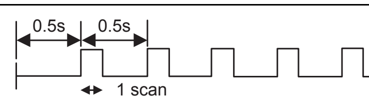
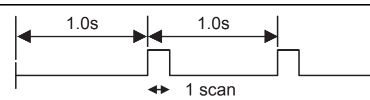
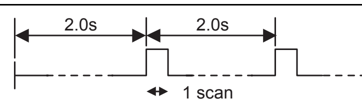
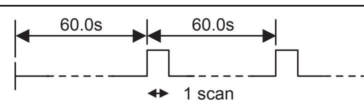
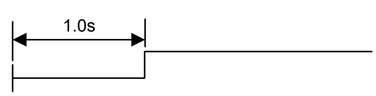
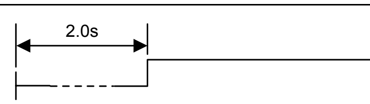
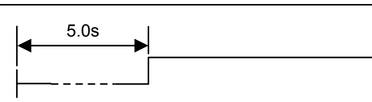
B.1 System Service Registers

(1) Shared by All Drawings

Name	Register No.	Remarks
Reserved (Reserved for the system)	SB000000	(Not used)
First High-speed Scan	SB000001	ON for only the first scan after high-speed scan is started.
First Low-speed Scan	SB000003	ON for only the first scan after low-speed scan is started.
Always ON	SB000004	Always ON (= 1)
Reserved (Reserved for the system)	SB000005 to SB00000F	(Not used)

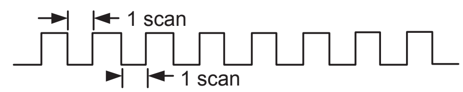
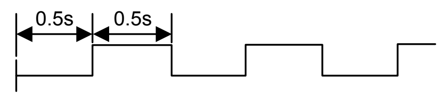
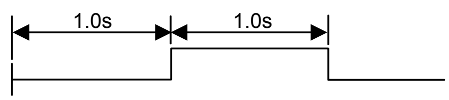
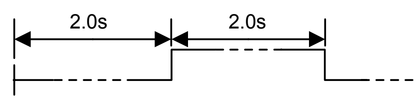
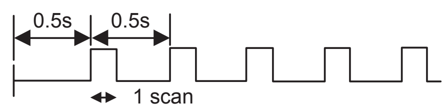
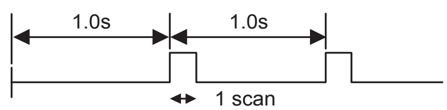
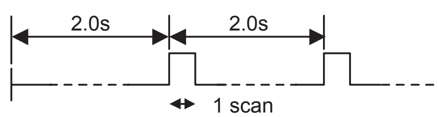
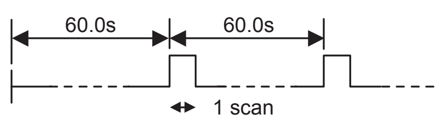
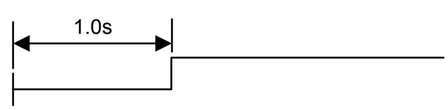
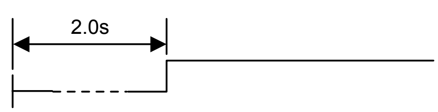
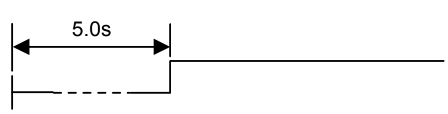
(2) DWG.H Only

The following relays are reset at the start of the high-speed scan.

Name	Register No.	Remarks
1-scan Flicker Relay	SB000010	
0.5-s Flicker Relay	SB000011	
1.0-s Flicker Relay	SB000012	
2.0-s Flicker Relay	SB000013	
0.5-s Sampling Relay	SB000014	
1.0-s Sampling Relay	SB000015	
2.0-s Sampling Relay	SB000016	
60.0-s Sampling Relay	SB000017	
1.0 s After Start of Scan Relay	SB000018	
2.0 s After Start of Scan Relay	SB000019	
5.0 s After Start of Scan Relay	SB00001A	

(3) DWG.L Only

The following relays are reset at the start of the low-speed scan.

Name	Register No.	Remarks
One-scan Flicker Relay	SB000030	
0.5-s Flicker Relay	SB000031	
1.0-s Flicker Relay	SB000032	
2.0-s Flicker Relay	SB000033	
0.5-s Sampling Relay	SB000034	
1.0-s Sampling Relay	SB000035	
2.0-s Sampling Relay	SB000036	
60.0-s Sampling Relay	SB000037	
1.0 s After Start of Scan Relay	SB000038	
2.0 s After Start of Scan Relay	SB000039	
5.0 s After Start of Scan Relay	SB00003A	

B.2 Scan Execution Status and Calendar

Name	Register No.	Remarks
High-speed Scan Set Value	SW00004	High-speed Scan Set Value (0.1 ms)
High-speed Scan Current Value	SW00005	High-speed Scan Current Value (0.1 ms)
High-speed Scan Maximum Value	SW00006	High-speed Scan Maximum Value (0.1 ms)
Reserved by the system.	SW00007 to SW00009	(Not used)
Low-speed Scan Set Value	SW00010	Low-speed Scan Set Value (0.1 ms)
Low-speed Scan Current Value	SW00011	Low-speed Scan Current Value (0.1 ms)
Low-speed Scan Maximum Value	SW00012	Low-speed Scan Maximum Value (0.1 ms)
Reserved by the system.	SW00013	(Not used)
Executing Scan Current Value	SW00014	Executing Scan Current Value (0.1 ms)
Calendar: Year	SW00015	1999: 0099 (BCD) (Last two digits only)
Calendar: Month Day	SW00016	December 31: 1231 (BCD)
Calendar: Hours Minutes	SW00017	23 hours 59 minutes: 2359 (BCD)
Calendar: Seconds	SW00018	59 s: 59 (BCD)
Calendar: Day of Week	SW00019	0 to 6: Sun., Mon. to Sat.

B.3 Program Software Numbers and Remaining Program Memory Capacity Name

Name	Register No.	Remarks
System Program Software Number	SW00020	S□□□□ (□□□□ is stored as BCD)
System Number	SW00021 to SW00025	(Not used)
Remaining Program Memory Capacity	SW00026	Bytes
Total Memory Capacity	SW00028	Bytes

Appendix C

C Initializing the Absolute Encoder..A-2

C.1 Initializing Procedures for Σ-III Series SERVOPACKs.............................A-2

C.2 Σ-II SERVOPACK A-4

C.3 Σ-I SERVOPACK A-7

C Initializing the Absolute Encoder

The procedure for initializing an absolute encoder for a Σ-I, Σ-II , or Σ-III SERVOPACK is given below.

- Refer to *9.2.1 System Startup Flowchart* on page 9-5 for the procedure for absolute-position detection.

C.1 Initializing Procedures for Σ-III Series SERVOPACKs

- Refer to the following manuals for information on Σ-III series SERVOPACKs:
  Σ-III Series SGM□S/SGDS User's Manual (Manual No. SIEP C80000000□),
  Σ-III Series SGM□S/SGDS User's Manual for MECHATROLINK-II Communications (Manual No. SIEP C80000011□), and Σ-III Series SGM□S/SGDS Digital Operator Instructions Manual (Manual No. TOEP C80000001□)

Follow the setup procedure below using a Digital Operator.

1. Press the [MODE/SET] Key to display the Utility Function Mode main menu. Use the UP Key or DOWN Key to select Fn008.

```
BB        —FUNCTION—
Fn007
Fn008
Fn009
Fn00A
```

2. Press the [DATA] Key.

The display is switched to the execution display of Fn008 (Absolute encoder multi-turn reset and encoder alarm reset).

```
BB

 Multiturn Clear

      PGCL1
```

- If the display is not switched and "NO_OP" is displayed in the status display, the Write Prohibited setting (Fn010 = 0001) is set. Check the status and reset. Then clear the Write Prohibited setting.

3. Keep pressing the [∧] Key until "PGCL1" is changed to "PGCL5."

```
BB

 Multiturn Clear

      PGCL5
```

4. Press the DATA Key.

"BB" in the status display changes to "Done."

```
Done

 Multiturn Clear

      PGCL5
```

5. Press the MODE/SET Key. The display returns to the Utility Function Mode main menu.

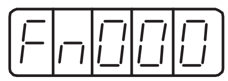
This completes setting up the absolute encoder. Turn the power supply OFF and then back ON to reset the SERVOPACK.

C.2 Σ-II SERVOPACK

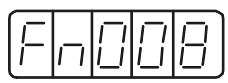
- Refer to the following manuals for information on Σ-II SERVOPACKs.
  Σ-II Series SGM□H/SGDH User's Manual (SIEP S8000 000 05□)
  Σ-II Series SGM□/SGDB/SGM□H/SGDM User's Manual (SIEP S800000 15□)

(1) Initialization Using a Hand-held Digital Operator

1. Press the DSPL/SET Key to select the Auxiliary Function Mode.

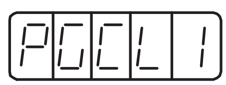


2. Select parameter Fn008 by pressing the LEFT (<) and RIGHT (>) Keys to select the digit to be changed and then using the UP (∨) and DOWN (∧) Keys to change the value of the digit.



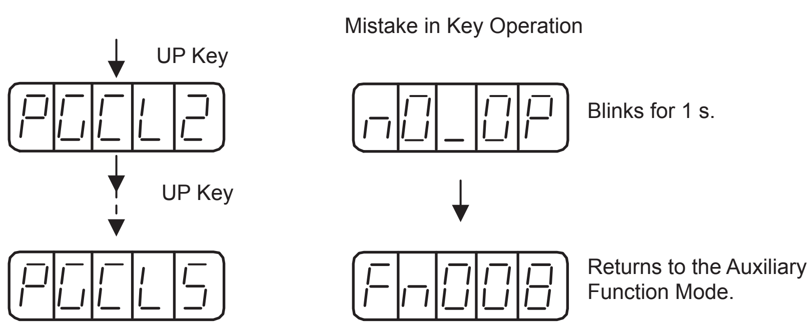
3. Press the DATA/ENTER Key.

The following display will appear.



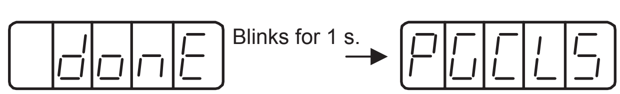
4. The rightmost digit will be incremented each time the UP (∨) Key is pressed. Press the UP (∨) Key several times until "PGCL5" is displayed.

If a mistake is made in the key operation, "nO_OP" will blink on the display for 1 second and then the display will return to the Auxiliary Function Mode. If this happens, return to step 3, above, and repeat the operation.



5. Press the DSPL/SET Key.

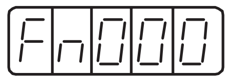
The display will change as shown below and the clear operation will be performed for multi-turn data for the absolute encoder.



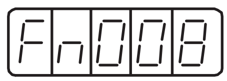
This completes initializing the absolute encoder. Reset the SERVOPACK to turn the power supply OFF and then back ON.

(2) Initialization Using the Built-in Panel Operator

1. Press the MODE/SET Key to select the Auxiliary Function Mode.

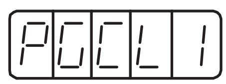


2. Press the UP (▲) and DOWN (▼) Keys to select parameter Fn008.



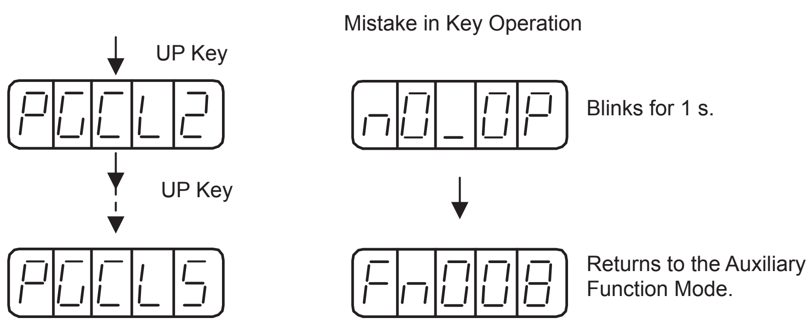
3. Press the DATA/ENTER Key for more than one second.

The following display will appear.



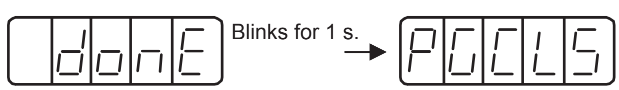
4. The rightmost digit will be incremented each time the UP (▲) Key is pressed. Press the UP (▲) Key several time until “PGCL5” is displayed.

If a mistake is made in the key operation, “nO_OP” will blink on the display for 1 second and then the display will return to the Auxiliary Function Mode. If this happens, return to step 3, above, and repeat the operation.



5. Press the MODE/SET Key.

The display will change as shown below and the clear operation will be performed for multi-turn data for the absolute encoder.



This completes initializing the absolute encoder. Reset the SERVOPACK to turn the power supply OFF and then back ON.

C.3 Σ-I SERVOPACK

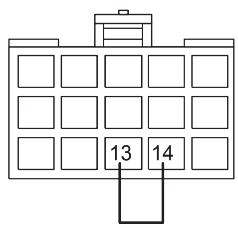
- Refer to the following manuals for information on Σ-I SERVOPACKS.
  Σ Series SGM□/SGD User's Manual (Manual No. SIE-S800-26.3□)
  Σ Series SGM□/SGDB High-speed Field Network MECHATROLINK-compatible AC Servo Driver User's Manual (Manual No. SIE-S800-26.4□)

(1) Initializing a 12-bit Absolute Encoder

Use the following procedure to initialize a 12-bit absolute encoder.

1. Properly connect the SERVOPACK, Servomotor, and MP2300.

2. Disconnect the connector on the encoder end and short-circuit pins 13 and 14 on the encoder end connector for 2 seconds or more.



3. Remove the short piece and insert the connector securely in its original position.

4. Connect the cables using normal wiring and make sure the encoder battery is connected.

5. Turn ON the system.

Repeat the procedure starting from step 1 if an Absolute Encoder Alarm occurs, so the system has been successfully initialized.

(2) Initializing a 15-bit Absolute Encoder

Use the following procedure to initialize a 15-bit absolute encoder.

1. Turn OFF the SERVOPACK and MP2300.

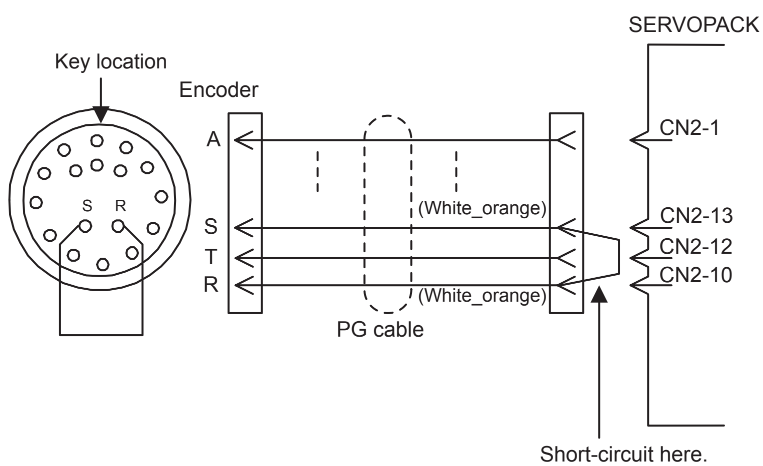
2. Discharge the large-capacity capacitor in the encoder using one of the following methods.

■ At the SERVOPACK End Connector

1) Disconnect the connector on the SERVOPACK end.
2) Use a short piece to short-circuit together connector pins 10 and 13 on the encoder end and leave the pins short-circuited for at least 2 minutes.
3) Remove the short piece and insert the connector securely in its original position.

■ At the Encoder End Connector

1) Disconnect the connector on the encoder end.
2) Use a short piece to short-circuit together connector pins R and S on the encoder end and leave the pins short-circuited for at least 2 minutes.
3) Remove the short piece and insert the connector securely in its original position.



3. Connect the cables using normal wiring and make sure the encoder battery is connected.

4. Turn ON the system.

Repeat the procedure starting from step 1 if an Absolute Encoder Alarm occurs, so the system has been successfully initialized.

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