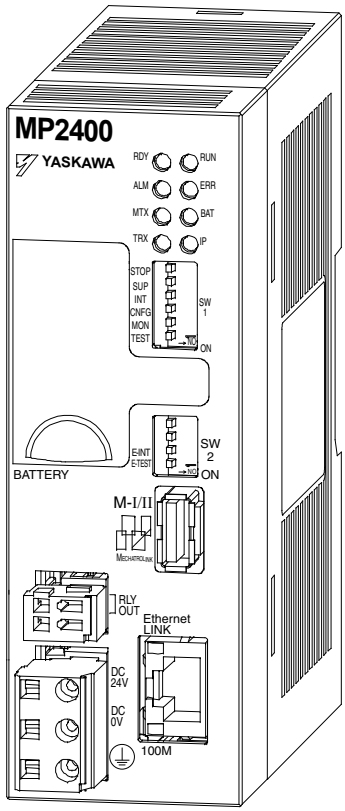
YASKAWA

Machine Controller MP2400

USER'S MANUAL

Model: JEPMC-MP2400-E



MANUAL NO. SIEP C880742 00A

Using this Manual

The MP2400 is a compact Machine Controller that contains the power supply, the CPU, and the communication functions in one single unit.
Please read this manual to ensure correct usage of the MP2400 system and apply to your manufacturing system for control. Keep this manual in a safe place for future reference.

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MP2400: MP2400 Machine Controller
- MPE720: The Programming Device Software or a Programming Device (i.e., a personal computer) running the Programming Device Software
- PLC: Programmable Logic Controller

■ 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	√	–	–	–	–	–
Chapter 2 Specifications and Functions	√	√	√	√	–	–
Chapter 3 Mounting and Wiring	–	√	√	√	–	–
Chapter 4 System Start Up and Easy Programming	√	–	–	–	√	–
Chapter 5 Outline of Motion Control Systems	–	–	√	–	√	–
Chapter 6 Ethernet Communications	–	–	√	–	√	–
Chapter 7 Maintenance, Inspection, and Troubleshooting	–	–	–	–	√	√
Appendices A to F	–	–	√	–	√	√

For information on motion parameters and motion commands, refer to *Machine Controller MP2000-series SVB/SVB-01 Motion Module User's Manual* (Manual no.: SIEPC88070033).

■ 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

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

■ Related Manuals

The following table lists the manuals relating to the MP2400. Refer to these manuals as required.

Manual Name	Manual Number	Contents
Machine Controller MP2000 series SVB/SVB-01 Motion Module User's Manual	SIEPC88070033	Describes the functions, specifications, and application methods of the MP2000-series Motion Module that is built into the SVB, SVB-01, and SVR Module.
Machine Controller MP2300 Basic Module User's Manual	SIEPC88070003	Describes the application methods and modules to be connected.
Machine Controller MP2000 Communication Module User's Manual	SIEP C880700 04	Describes the functions, specifications, and application methods of the MP2□00 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.
Engineering Tool for MP2000-series Machine Controller MPE720 Version 6 User's Manual	SIEPC88070030	Describes the installation and operation of the engineering tools for MP2000-series Machine Controller MPE720 Version 6.
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 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 S800000 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	TOBP S800000 01	Describes the operating methods of the JUSP-OP05A Digital Operator.
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.

■ Copyrights

Safety Information

The following conventions are used to indicate precautions in this manual. These precautions are provided to ensure the safe operation of the MP2400 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,  indicates prohibition of open flame.
MANDATORY	Indicates mandatory actions. Specific actions are indicated inside ●. For example,  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 MP2400.
  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 MP2400.
- Do not attempt to modify the MP2400 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 MP2400 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 MP2400 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 MP2400 during transportation.
  There is a risk of injury or an accident.
- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.
  Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.
  If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

■ Installation

⚠ CAUTION

- Never use the MP2400 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 MP2400 or place heavy objects on the MP2400.
  There is a risk of injury.
- Do not block the air exhaust port or allow foreign objects to enter the MP2400.
  There is a risk of element deterioration inside, an accident, or fire.
- Always mount the MP2400 in the specified orientation.
  There is a risk of an accident.
- Do not subject the MP2400 to strong shock.
  There is a risk of an accident.

■ Wiring

⚠ CAUTION

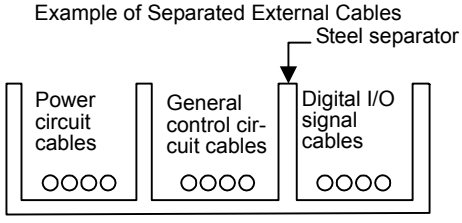
- Check the wiring to be sure it has been performed correctly.
  There is a risk of motor run-away, injury, or an accident.
- Always use a power supply of the specified voltage.
  There is a risk of burning.
- In places with poor power supply conditions, take all steps necessary to ensure that the input 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 MP2400 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.
- Only qualified safety-trained personnel should replace the battery.
  If the battery is replaced incorrectly, machine malfunction or damage, electric shock, or injury may result.
- When replacing the battery, do not touch the electrodes.
  Static electricity may damage the electrodes.

■ Selecting, Separating, and Laying External Cables

⚠ CAUTION

- Consider the following items when selecting the I/O signal lines (external cables) to connect the MP2400 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 MP2400. 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 MP2400, 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 MP2400 as general industrial waste.

Contents

1

Overview

This chapter explains an overview and features of the MP2400 Machine Controller.

1.1 MP2400 Features

The MP2400 is a small all-in-one machine controller, and successor to the MP2000 series in function and performance. It is characterized by the following standard features:

■ Standard Feature Motion Network MECHATROLINK-II

- Controls up to 16 axes of servos supporting MECHATROLINK-II.
- Connects up to 21 stations including I/Os.

■ Standard Feature Ethernet (100Mbps)

- Allows high-speed communications with the engineering tool MPE720.
- Enables communication without a ladder program by using a touch panel (automatic receive function).
- Enables communication without a ladder program by using an upper PLC (I/O message communication function).

■ Simple Programming

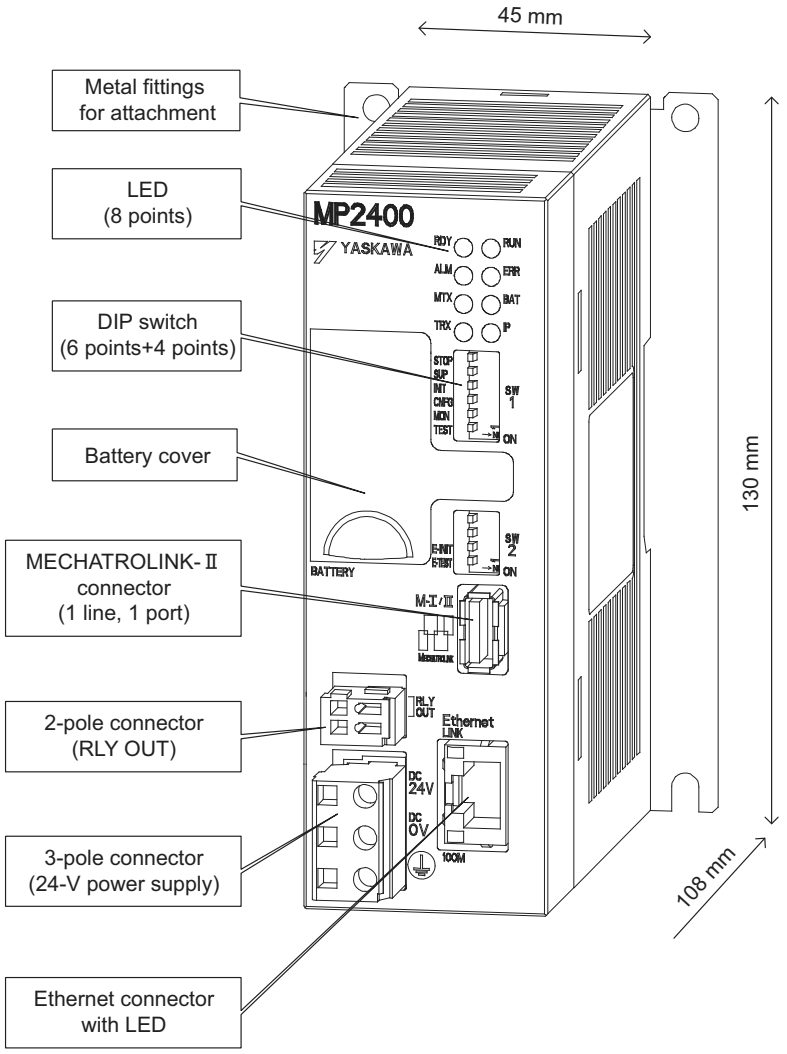
- The operation procedures needed before performing a motion operation are significantly reduced.
- You can start up a motion program from an upper PLC without the need for programming, simply by creating the motion program and registering execution orders.

1.2 MP2400 Configuration

The MP2400 is configured with one Basic Module.

1.2.1 Basic Module Appearance

The following figure shows the external appearance of the Basic Module with metal fittings for attachment. Also, the values in the figure do not include the length of metal fittings.



1.2.2 MP2400 Modules

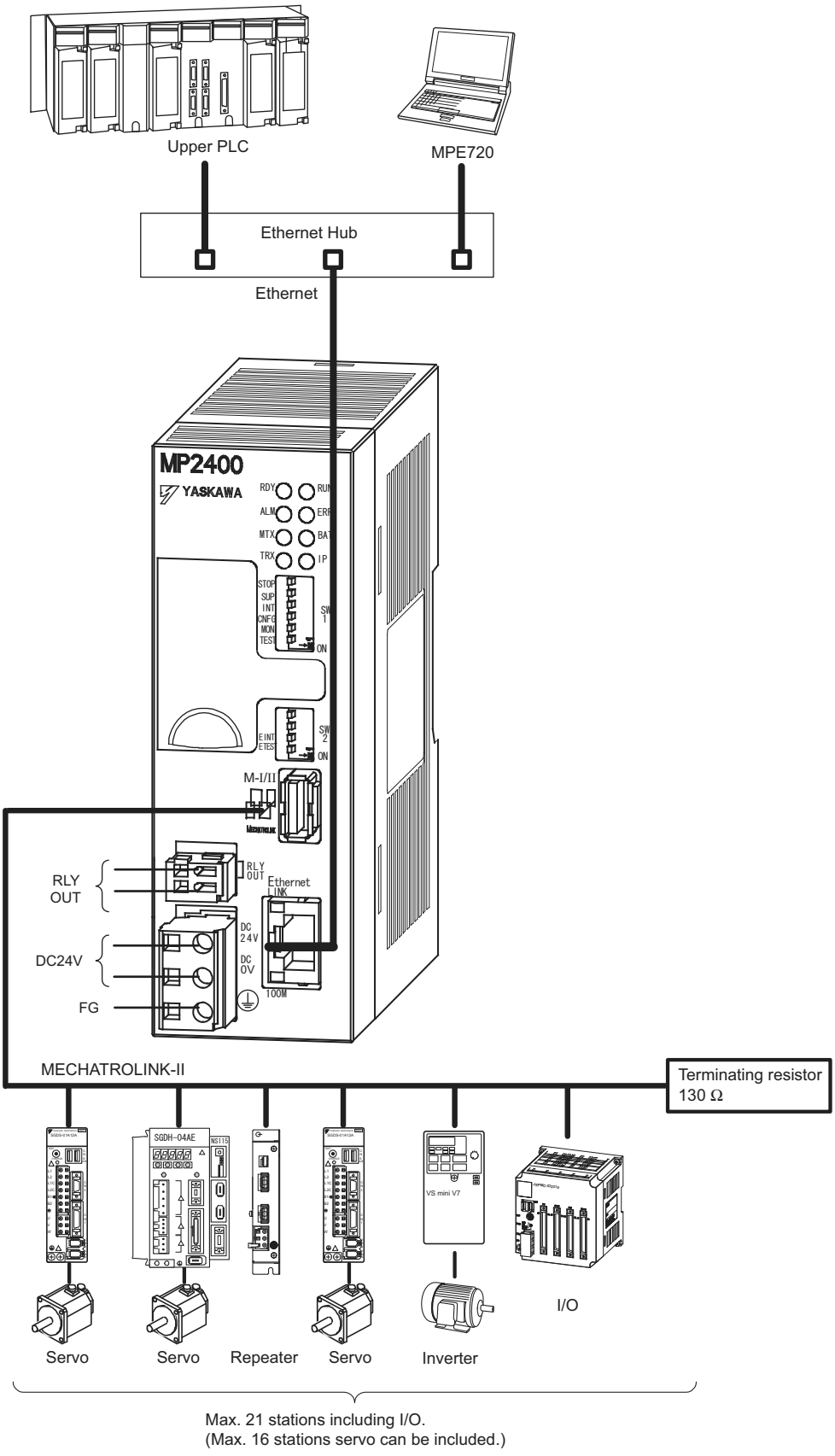
The following table shows the names and specifications of the Basic Module.

Group	Name	Description	Model	Specifications
MP2400 Basic Module	Basic Module	MP2400	JEPMC-MP2400-E	MECHATROLINK-I and -II Interface Ethernet communications

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 *4.2.1 (1) System Layout Model* on page 4-3.
- 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 1-6 and select the appropriate SERVOPACKs.
- If devices compatible with MECHATROLINK-I and with 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 MECHATROLINK-compatible Devices

The devices that are compatible with MECHATROLINK and can be connected to the MP2400 and the SVB-01 Module are listed below.

1.4.1 SERVOPACKs

Model Number	Details	MECHATROLINK-I	MECHATROLINK-II
SGDV-□□□1□□	SGDV SERVOPACK	Yes	Yes
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 MP2400 Basic Module and Optional Modules.

Module	Connector Name	Application	Model	Specifications
MP2400 Basic Module	Ethernet	Ethernet communication cable	Provided by customers.	–
	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

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
RLY OUT Connector	Accessory	734-YE102	Cable side
DIN Rail Mounting Parts	Accessory	JEPMC-OP300	1 pair
Terminator (Terminating Resistor)	Accessory	JEPMC-W6022	Q'ty: 1
Metal Fittings for Attachment	Optional	JEPMC-OP2400-E	–

1.5.3 Software (Programming Tool)

The MPE720, programming tool for MP2400, is available.

Name	Model	Remarks
MPE720	CPMC-MPE720 (Ver. 5.38 or later)	CD-ROM (1 disk)
MPE720 Version 6	CPMC-MPE720 (Ver. 6.04 or later)	CD-ROM (1 disk)
MPE720 Ver. 6 Lite	CPMC-MPE770L (Ver. 6.04 or later)	Can be downloaded from the Yaskawa's products and technical information website (http://www.e-mechatronics.com)

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2

Specifications and Functions

This chapter explains detailed specifications for the Basic Module and Optional Modules of the MP2400.

2.1 Specifications

2.1.1 General Specifications

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

2.1.2 Product Specifications

The following table shows the product specifications of the MP2400.

Items		MP2400
External Dimensions		45 mm × 130 mm × 108 mm
Number of Control Axes	Maximum Number of Control Axes	16 axes
	Number of Virtual Axis Controlling Axes	16 axes
MECHATROLINK	Communication System	MECHATROLINK-I, MECHATROLINK-II (32 byte), or MECHATROLINK-II (17 byte)
	Communication Cycle (M-II)	0.5 ms, 1 ms, 1.5 ms, or 2 ms
	Maximum Number of Connectable Stations (M-II)	21 stations (up to 16 servo stations)
	Slave Function	√
Scan Interval Setting	High-speed Scan	1.0 ms to 32 ms (per 0.5 ms)
	Low-speed Scan	2.0 ms to 300 ms (per 0.5 ms)
Communication I/F	Ethernet	100Base-TX 1 port
I/O	On-board I/O	– (Optional)
	Output Signal during RUN	√
Memory Capacity	SDRAM	32 MB
	SRAM	512 KB (Battery backup)
	FLASH	8 MB
	Program Capacity	5.5 MB
Programming Language	Ladder Language	–
	Motion Language	√
	Sequence Program	√
	C Language	√

- Symbols in the table mean as follows.
  M-I: MECHATROLINK-I, M-II: MECHATROLINK-II
  √: Available, –: Not available

2.1.3 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	Text-type language: Numeric operations, logic operations, etc.
Scan	Two scan levels: High-speed scan and low-speed scan High-speed scan time setting: 1.0 to 32 ms (Integral multiple of MECHATROLINK communication cycle) Low-speed scan time setting: 2 to 300 ms (Integral multiple of MECHATROLINK communication cycle)
Motion Programs	Motion programs and sequence programs: A total of up to 256
	Revision history of motion programs Security function for motion programs
Data Memory	Common data (M) registers: 64 kwords System (S) registers: 8 kwords 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: 512 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

(2) Motion Control Function Specifications

The following table lists the motion control function specifications for the MP2400.

Item			Specifications
Interface			MECHATROLINK-I, MECHATROLINK-II
Number of Controlled Axes/Module			Up to 16 axes
Control Specifications	PTP Control		Linear, rotary, and infinite-length
	Interpolation		Up to 16 linear axes, 2 circular axes, and 3 helical axes
	Speed Reference Output		Yes (Only with MECHATROLINK-II)
	Torque Reference Output		Yes (Only with MECHATROLINK-II)
	Phase Control		Yes (Only with MECHATROLINK-II)
	Position Control	Positioning	Yes
		External positioning	Yes
		Zero point return	Yes
		Interpolation	Yes
		Interpolation with position detection function	Yes
		JOG operation	Yes
		STEP operation	Yes
		Parameter changes during motion command execution	Yes (Only with MECHATROLINK-II in 32-byte mode)
Reference Unit			mm, inch, deg, or pulse
Reference Unit Minimum Setting			1, 0.1, 0.01, 0.001, 0.0001, 0.00001
Maximum Programmable Value			–2147483648 to +2147483647 (signed 32-bit value)
Speed Reference Unit			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
Acceleration/Deceleration Type			Linear, asymmetric, S-curve, exponent
Acceleration/Deceleration Reference Unit			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)
Override Function			Positioning: 0.01% to 327.67% by axis
Coordinate System			Rectangular coordinates
Zero Point Return	DEC1+ Phase-C pulse		Yes
	ZERO signal		Yes
	DEC1+ ZERO signal		Yes
	Phase-C pulse		Yes
	Only Phase-C pulse		Yes
	POT and Phase-C pulse		Yes
	POT		Yes
	Home limit switch and Phase-C pulse		Yes
	HOME		Yes
	NOT and Phase-C pulse		Yes
	NOT		Yes
	INPUT and Phase-C pulse		Yes
	INPUT		Yes

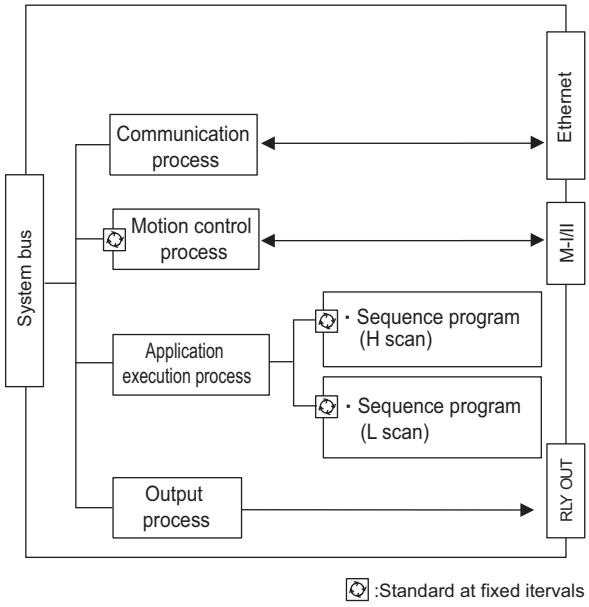
Item	Specifications	
Applicable SERVOPACKs	■ MECHATROLINK-I • SERVOPACKs SGD-□□□N SGDB-□□AN SGDH-□□□E + NS100 SGDS-□□□1□□ SGDV-□□□1□□	■ MECHATROLINK-II • SERVOPACKs SGDH-□□□E + NS115 SGDS-□□□1□□ SGDV-□□□1□□
Encoders	• Incremental Encoder • Yaskawa Absolute Encoder	

2.2 Basic Module

This section describes the functions, the external appearance, the LED indicators, the setting switches, and the hardware specifications of the MP2400 Basic Module and also describes the virtual motion module (SVR).

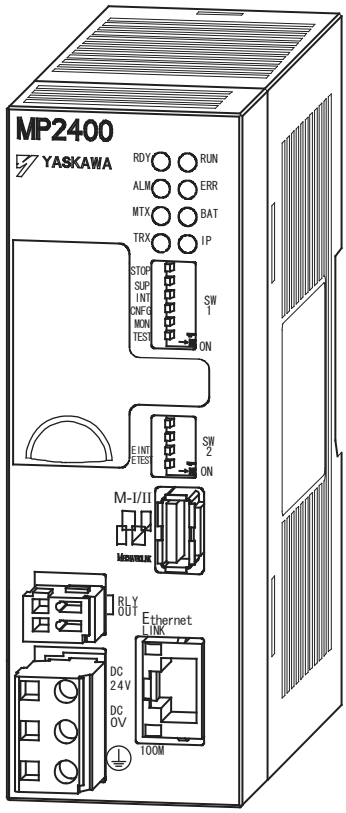
2.2.1 Outline of Functions

The Basic Module is an all-in-one, compact module that combines power supply, CPU, and 218IFA in one module. The Basic Module has both motion control and sequence control functions. With a 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.



2.2.2 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.

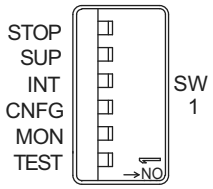
	Indicator	Color	Status
RDY ◯ ◯ RUN ALM ◯ ◯ ERR MTX ◯ ◯ BAT TRX ◯ ◯ IP	RDY	Green	Lit during normal operation.
	RUN	Green	Lit during execution of user program.
	ALM	Red	Lit/blinking when warning occurs.
	ERR	Red	Lit/blinking when malfunction occurs.
	MTX	Green	Lights up when submitting MECHATROLINK-I/ MECHATROLINK-II data
	BAT	Red	Lit during battery alarm.
	TRX	Green	Lights up when transmitting and receiving Ethernet data
	IP	Green	Lights up when an IP address setting is completed

- For details on indicator meanings, refer to *7.2.3 (2) LED Indicator Meanings* on page 7-7.

(3) Switch Settings

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

[a] SW1



No.	Name	Setting	Operating Mode	Default	Details
S1-6	STOP	ON	User program stopped	OFF	Stops the user program execution. Enabled only when the power is turned ON.
		OFF	User program running		
S1-5	SUP	ON	System load	OFF	If set to ON, starts in a mode that can change the version.
		OFF	Normal operation		
S1-4	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		
S1-3	CNFG	ON	Self-configuration mode	OFF	Set to ON to execute self-configuration for connected devices.
		OFF	Normal operation		
S1-2	MON	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		
S1-1	TEST	ON	System use	OFF	Always leave set to OFF.
		OFF	Normal operation		

[b] SW2

Sets the Ethernet port condition and other operating conditions.
The change of switch setting is invalid after the power is turned ON (read only when the module is initialized by software).

No.	Switch Name	State	Operation Mode	Default	Description
S2-4	–	ON	Reserved	OFF	Reserved for future use
		OFF			
S2-3	–	ON	Reserved	OFF	Reserved for future use
		OFF			
S2-2	E-INIT	ON	Transmission parameter for Ethernet, default	OFF	When ON, transmission parameters such as an IP address are set to default at startup.
		OFF	Normal operation		
S2-1	E-TEST	ON	System use	OFF	Always leave set to OFF
		OFF	Normal operation		

2.2.3 Specifications

(1) Hardware Specifications

The following table shows hardware specifications for the basic module:

Item		Specifications
Classification		Basic Module
Name		MP2400
Model Number		JEPMC-MP2400-E
Power Unit	Input Voltage	24 VDC (± 20%)
	Input Current*	1 A max. (during input/output rating)
	Inrush Current*	40 A max. (full discharge state, during output rating, or the secondary output of the external 24 V power supply is turned ON)
	Rated Voltage	5.0 V
	Rated Current	2.0 A
	Output Current Range	0.0 to 2.0 A
	Constant Voltage Precision	±2% max. (including input voltage and output load fluctuations)
	Battery	Battery for memory retention attachable
Flash Memory		8 MBytes (User area 5.5 MBytes)
SDRAM		32 MBytes
SRAM		512 kBytes: M registers, S registers, trace memory, alarm history (battery backup)
Motion Network		MECHATROLINK: 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)
Communication Function		Ethernet: 100BASE-TX/10BASE-T
Calendar		Seconds to year timer (Battery backup)
Connectors		POWER: Power supply connector M-I/II: MECHATROLINK connector Ethernet: Ethernet connector RLY OUT: RLY OUT connector
Indicators		RDY(green), RUN(green), ALM(red), ERR(red), MTX(green), BAT(red), TRX(green), IP(green), LINK(yellow), 100M(green)
Switches		STOP, SUP, INIT, CNFG, MON, TEST, E-INIT, and E-TEST
Current Consumption		1A max.
Dimensions (mm)		45 × 130 × 108 (W × H × D)
Mass		350 g

* For the external 24V power supply, select a power supply which satisfies the specifications below as well as the rated current (not more than 1A):

- Allowable output load capacity: 1200μF or more
- Overcurrent detection is automatically restored by removing causes

However, except that the primary side (AC side) of the external 24V power supply is turned ON/OFF.

Note: Recommended external 24V power supply: RTW24-2R2 (manufactured by TDK)

2.2.4 218IFA Module (Ethernet)

(1) Overview of 218IFA Module Functions

MP2400 built-in 218IFA module is a 10Base-T/100Base-TX Ethernet interface and a communication interface equipped as standard in MP2400.

- 100Mbps transmission speed is supported (100Base-TX).
- Supports the following various communication protocols:
  - Support for MEMOBUS protocol, Extended MEMOBUS protocol
  - Support for MELSEC protocol
  - Support for MODBUS/TCP protocol
- An I/O message communication function enables you the data exchange in the form of I/O image when communicating with upper PLC, eliminating you from creating a ladder program.
- An automatic receive function eliminates you from creating a ladder program when connected to the indicator and the like.
- Enables you to use as a standard interface with the engineering tool MPE720. In addition, provides a simple function for connecting with the engineering tool, allowing you to connect to MPE720 without the knowledge of MP2400 IP address.

(2) Specification of 218IFA Module

The following table shows the specification of the 218IFA Module.

Items		MP2400/218IFA
Communication Interface (Note1)		10Base-T/100Base-TX
Communication Protocol (Note2)		TCP/UDP/IP/ARP/ICMP
Maximum Number of Communication Connections		1 (automatic receive) +2 (I/O Message communication)
Maximum Number of Communication Channels		1 (automatic receive) +2 (I/O Message communication)
Message Communication (maximum) *When automatic receive is used.	MEMOBUS	Write: 100W Read: 125W
	Extended MEMOBUS	Write: 2043W Read: 2044W
	MELSEC	Write: 1017W Read: 1017W
	MODBUS/TCP	Write: 100W Read: 125W
I/O Message Communication (maximum)	MEMOBUS	Write: 100W Read: 125W
	Extended MEMOBUS	Write: 1024W Read: 1024W
	MELSEC	Write: 256W Read: 256W
	MODBUS/TCP	Write: 100W Read: 125W
Automatic Receive	MEMOBUS	O
	Extended MEMOBUS	O
	MELSEC	O
	MODBUS/TCP	O
Simple Function for Connecting with Engineering Tool		O

Note: 1. Communication Interface
The discrimination between 10Base-T/100Base-TX and full-duplex/half-duplex is done by 218IFA based on the remote equipment. When connecting to an equipment without automatic negotiation function, set the remote equipment to half-duplex mode.

Correspondence of Communication Mode

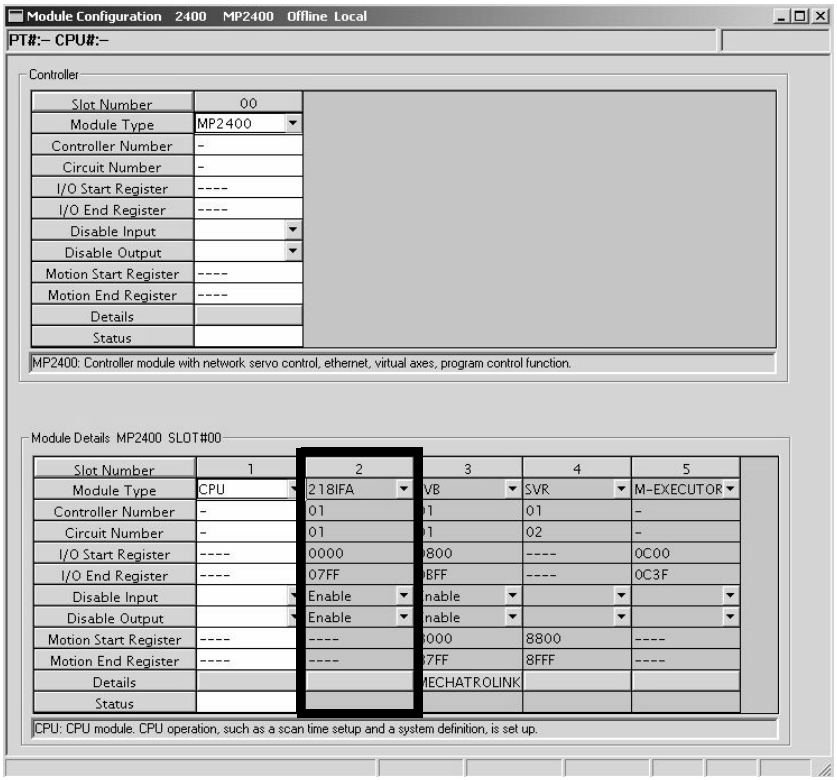
218IFA Module	Device to be connected				
	Automatic Negotiation	10Base-T Half-duplex	10Base-T Full-duplex	100Base-TX Half-duplex	100Base-TX Full-duplex
Automatic Negotiation	Depends on the remote equip-ment	Communicates in 10Base-T half-duplex mode	Unable to communicate	Communicates in 100Base-TX half-duplex mode	Unable to communicate

2. Communication protocols
- TCP(Transmission Control Protocol): Connection-oriented transport layer protocol
- UDP(User Datagram Protocol): Connectionless transport layer protocol
- IP(Internet Protocol): Protocol for establishing a communication link between computers
- ICMP(Internet Control Message Protocol): Error control protocol for IP protocol
- ARP(Address Resolution Protocol): Address resolving protocol. Protocol for converting IP address into MAC address

(3) Module Configuration Definition

(a) Module Configuration Definition Screen Details

Click **MP2400** in the **Controller** area to display the details of the Basic Modules' functions in the **Module Details** area. The cell No.2 provides a detailed definition of 218IFA.



Items displayed in the **Module Details** area show the following meanings:

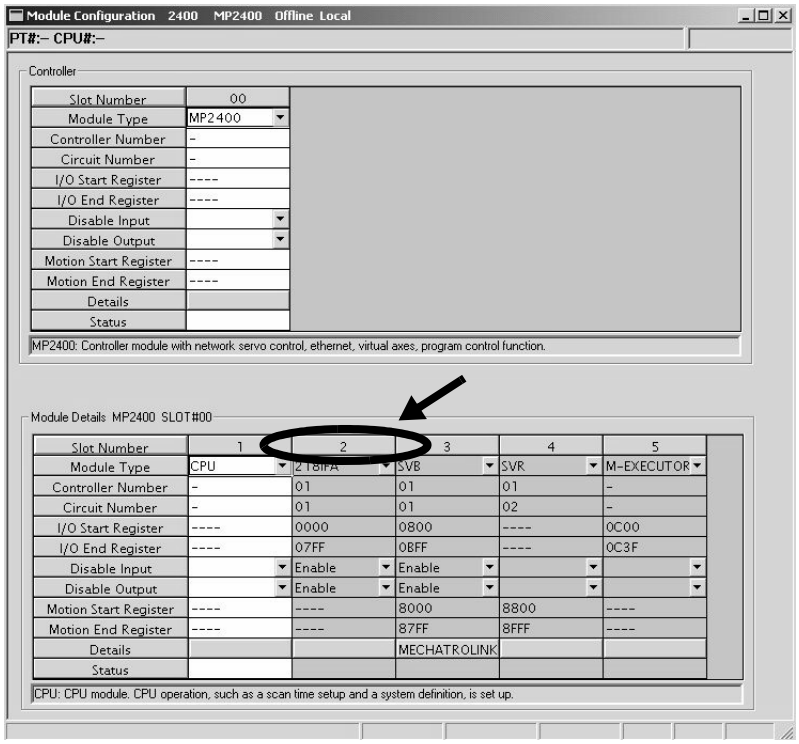
Items	Descriptions	Change
Slot Number	Sub-slot number. Double-click it to open the 218IFA detailed definition window.	–
Module Type	A module name is shown. Changing the name to UNDEFINED enables you to disable 218IFA functions.	√
Controller Number	Not used. Fixed at "–".	–
Circuit Number	Module's line number (valid range: 01-08)	√
I/O Start Register	Start register of the I/O register used in the I/O message communication of 218IFA (valid range: 0000-7FFFh, size: 800h words)	√
I/O End Register	End register of the I/O register used in the I/O message communication of 218IFA (valid range: 0000-7FFFh, size: 800h words)	√
Disable Input	Input Enable/Disable.	√
Disable Output	Output Enable/Disable.	√
Motion Start Register	Not used. Fixed at "– – – –".	–
Motion End Register	Not used. Fixed at "– – – –".	–
Details	Not used.	–
Status	218IFA module status in online mode.	–

√: Available, –: Not available

(4) 218IFA Module Detailed Screen

(a) Displaying the 218IFA Module Detailed Window

The 218IFA Module Detailed Window is displayed by selecting **MP2400** in the **Controller** area of the **Module Configuration** Window and double-clicking the cell No.2 in the **Module Details** field.

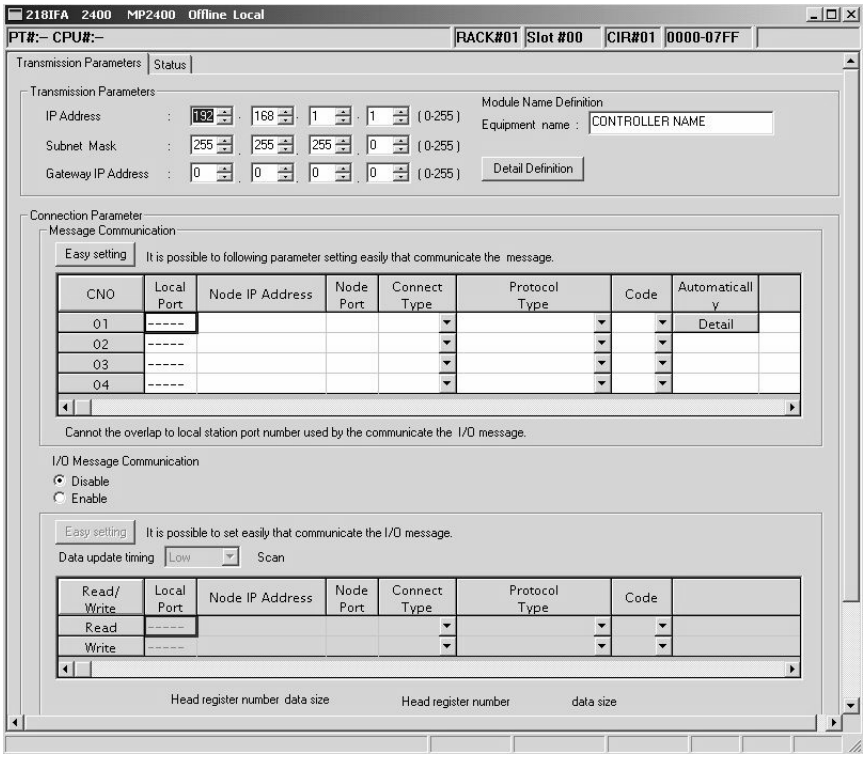


(b) 218IFA Module Detailed Window

The 218IFA Module Detailed Window is composed of **Transmission Parameter** and **Status** Tabs, and each tab is changed with a click.

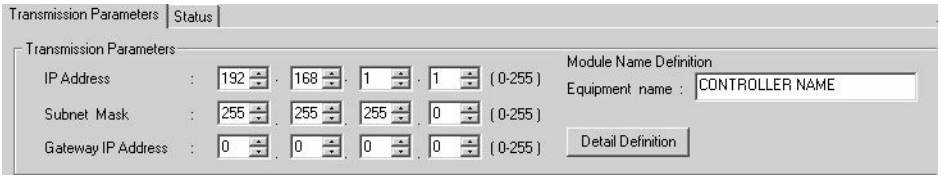
1. Parameter Setting Tab

The **Transmission Parameters** Tab sets 218IFA transmission parameters. The setting details are as follows:

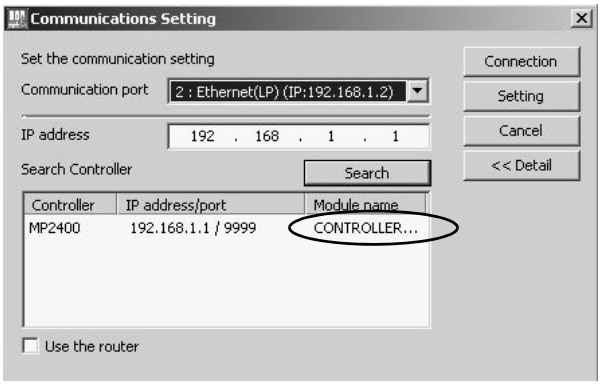


■ Transmission Parameter Setting Items

Sets local transmission parameters for 218IFA.

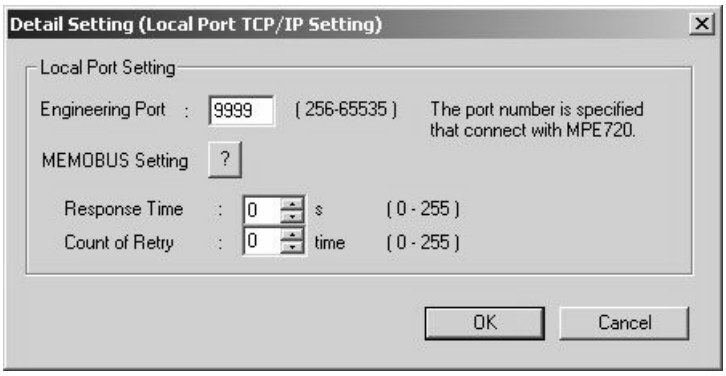


The following table shows each setting item.

Item	Setting Range	Details	Default
IP Address	0.0.0.1 to 255.255.255.254	Sets 218IFA IP address. However, the following addresses are excluded: 127.xxx.xxx.xxx xxx.xxx.xxx.000 xxx.xxx.xxx.255	192.168.001.001
Subnet Mask	0.0.0.0 to 255.255.255.254	Sets the 218IFA subnet mask.	255.255.255.000
Gateway IP Address	0.0.0.0 to 255.255.255.254	Sets the 218IFA default gateway IP address. However, the following addresses are excluded: 127.xxx.xxx.xxx xxx.xxx.xxx.000 (except 000.000.000.000) xxx.xxx.xxx.255 When you do not use it, set it to 000.000.000.000.	000.000.000.000
Equipment Name	Up to 16 single-byte characters	218IFA can be any name. The name specified here is displayed as a search result in the module name field of controller search list when running the Search in the communications setting dialog box of MPE720 Ver.6. 	CONTROLLER NAME
Detailed Definition	–	Opens the screen for setting the engineering communication with MPE720 and the MEMOBUS communication.	–

■ Detailed Setting Screen of Transmission Parameter Setting

Sets the engineering communication with MPE720 and the message communication.

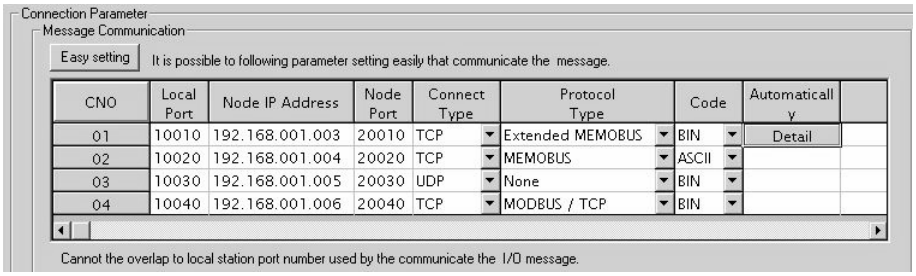


The following table shows each setting item.

Item	Setting Range	Details	Default
Engineering Port	256 to 65535	Specify the 218IFA port number used in the engineering communication with MPE720. Note: When changing this setting, you must also change the engineering port value in the logical port setting detailed screen of the MPE720 communication process. The port number cannot be 9998 or 10000.	9999
Response Time	0 to 255 (sec)	Specify the wait time until a remote response is returned after sending a command, when carrying out a message communication using MSG-SND function. (value zero waits infinitely.) If the retransmit number of times is zero, set response monitor period to zero. Note: If no response is returned after the setting period expires, a timeout occurs, retry the transmission the number of times specified by resend number of times.	0
Count of Retry	0 to 255 (time)	Specify the command retransmit number of times when a timeout is detected after response monitor period expires. Note: If no response is returned after as many retries as the retransmit number of times, an error is returned to the MSG-SND function.	0

■ Message Communication Item of Connection Parameter Setting

Sets the connection parameters for the message communication using MSG-SND/MSG-RCV function and the message communication using automatic receive function.



The following table shows each setting item.

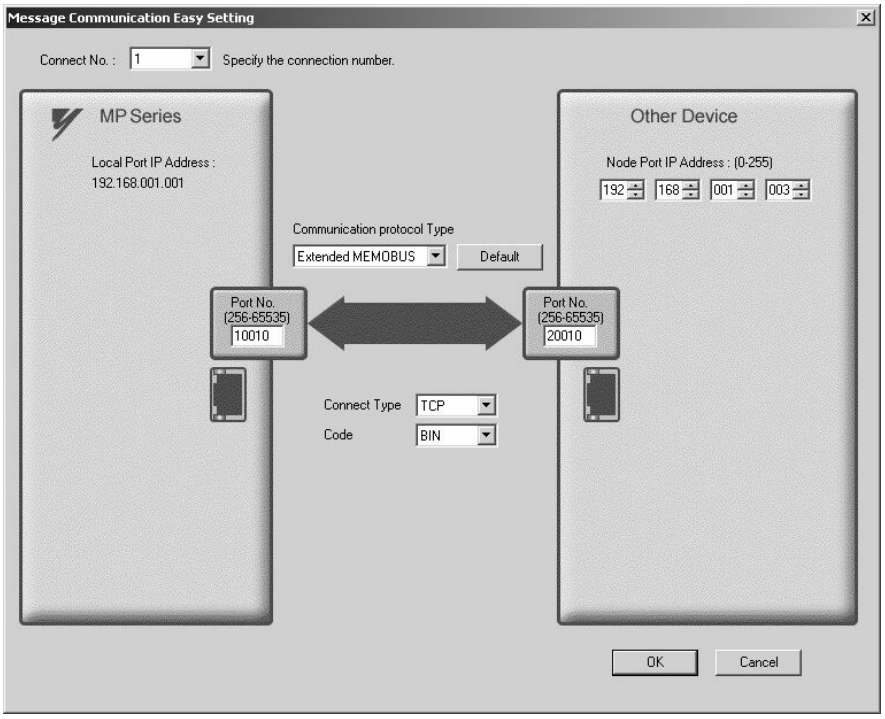
Item	Setting Range	Details	Default
Easy Setting	–	Opens the easy setting screen for the connection parameters. The content of the selected connection is shown.	–
Connection Number (CNO)	1	In 218IFA Ethernet communication, remote stations are distinguished by their connection numbers.	–
Local Port	256 to 65535	Specify the 218IFA port number for each connection. 218IFA establishes a message communication with the connection with this port number only. Set an unique channel number for the port number of this connections. Also, to delete the port number, enter zero. Note: When the connection type = UDP, the port number cannot be 9998 or 10000.	0
Node IP Address	0.0.0.0 to 255.255.255.254	Set the remote IP address for each connection. However, the following addresses are excluded: 127.xxx.xxx.xxx xxx.xxx.xxx.000 (except 000.000.000.000) xxx.xxx.xxx.255 Note: When 0.0.0.0 is set, it will enter into "Unpassive open mode." When 218IFA is within the network specified by the subnet mask, it responds to the connection request from the remote station regardless of the remote IP address setting.	000.000.000.000
Node Port	0 and 256 to 65535	Specify the remote port number for each connection. A pair of remote IP address and remote port number must not be duplicated. Note: In case of "Unpassive open mode," set it to zero.	0
Connect Type	TCP, UDP	Select a transport layer protocol. TCP: Transmission control protocol UDP: User datagram protocol	TCP
Protocol Type	Extended MEMOBUS, MEMOBUS, MELSEC, MODBUS/TCP	Select an application layer protocol. Protocol Type / Overview: Extended MEMOBUS – Yaskawa's Extended MEMOBUS protocol. MEMOBUS – Yaskawa's MEMOBUS protocol. MELSEC – Ethernet I/F protocol for the sequencer (A series) manufactured by Mitsubishi Electric Corporation. MODBUS/TCP – Industrial Ethernet protocol proposed by Modicon, Inc.	Extended MEMOBUS

<table>
<tr><th>Item</th><th>Setting Range</th><th>Details</th><th>Default</th></tr>
<tr><td>Code</td><td>ASCII
BIN
RTU</td><td>Select a code type for the message communication data.
Depending on protocol type, available codes are restricted as follows:
<table><tr><th rowspan="2">Protocol Type</th><th colspan="3">Code</th></tr><tr><th>ASCII</th><th>BIN</th><th>RTU</th></tr><tr><td>Extended MEMOBUS</td><td>√</td><td>√</td><td>–</td></tr><tr><td>MEMOBUS</td><td>√</td><td>–</td><td>√</td></tr><tr><td>MELSEC</td><td>√</td><td>√</td><td>–</td></tr><tr><td>MODBUS/TCP</td><td>–</td><td>√</td><td>–</td></tr></table>√ : Available, – : Not available</td><td>ASCII</td></tr>
<tr><td>Automatically</td><td>–</td><td>Opens the automatic receive setting screen. To open the screen, double-click this button.
Note: The automatic receive function is valid only for a connection when the connection number = 1.</td><td>–</td></tr>
<tr><td>Remote Station Name</td><td>Up to 32 single-byte characters (16 double-byte characters)</td><td>Any text can be entered as a connection comment.</td><td>Blank</td></tr>
</table>

■ Simple Setting Screen for Message Communication

Graphically sets connection parameters for each connection.
Basically, the same content as with message communication items in connection parameter setting can be set.

When connection parameters are not yet set and this screen is opened, the default value for each connection will be automatically stored.



The following table provides the default values for each connection stored when the connection parameters are not yet set and this screen is opened.

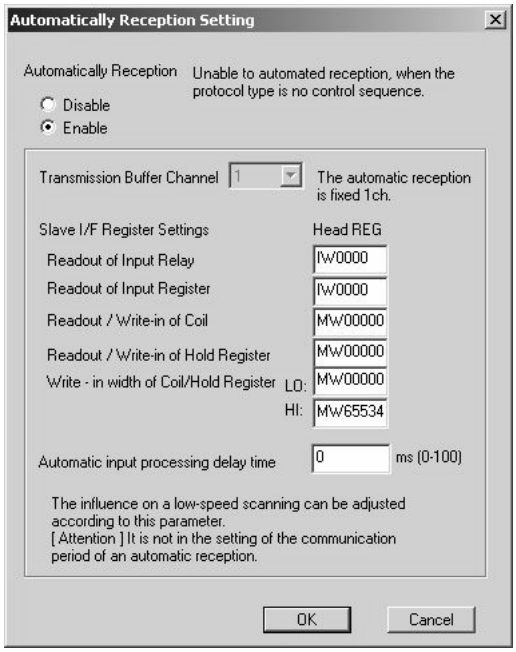
Item	Default
	Connection Number 01
Local Port	10001
Node IP Address	192.168.1.2
Node Port Number	10001
Communication Protocol Type	Extended MEMOBUS
Connect Type	TCP
Code	BIN

By clicking the **Default** Button, default values are set for each data code type according to the selected communication protocol type.
The following table shows the default values for each data code type.

Communication Protocol Type	Default for Data Code Type
Extended MEMOBUS	BIN
MEMOBUS	RTU
MELSEC	BIN
MODBUS/TCP	BIN

■ Automatic Receive Setting Screen for Message Communication

The automatic receive function can be enabled only for connections where the connection number = 1.
The automatic receive function enables you to automatically run a function equivalent to the MSG-RCV function.



The following table explains each setting item.

Item	Setting Range	Details	Default
Automatic Reception Enable/Disable	Enable/Disable	Select whether to enable automatic reception. Note: When the local port number is not yet set, it becomes invalid regardless of the enable/disable selection.	Enable
The setting items below can only be set when the Automatic Reception is set to “Enable.”			
Transmission Buffer Channel	Cannot be set (fixed at one)	The communication buffer channel is usually used for data exchanged between the MSG-SND/MSG-RCV function and 218IFA. The communication buffer channel is associated with the connection according to the input item “CH-NO” for the MSG-SND/ MSG-RCV function and node connection number (PARAM02) setting for the parameter list (PARAM). When automatic reception is running, the function equivalent to the MSG-RCV function is realized by using the communication buffer channel number “1.”	1
Readout of Input Relay	IW0000 to IWFFFF	Set a start register of the input relay used for the automatic reception.	IW0000
Readout of Input Register	IW0000 to IWFFFF	Set a start register of the input register used for the automatic reception.	IW0000
Readout/Write-in of Coil	MW00000 to MW65534	Set a start read/write register of the coil used for the automatic reception.	MW00000
Readout/Write-in of Hold Register	MW00000 to MW65534	Set a start read/write register of the holding register used for automatic reception.	MW00000
Write-in Width of Coil/Hold Register (LO)	MW00000 to MW65534	Set a write range (LO) of the coil/holding registers used for automatic reception.	MW00000
Write-in Width of Coil/Hold Register (HI)	MW00000 to MW65534	Set a write range (HI) of the coil/holding registers used for the automatic reception.	MW65534

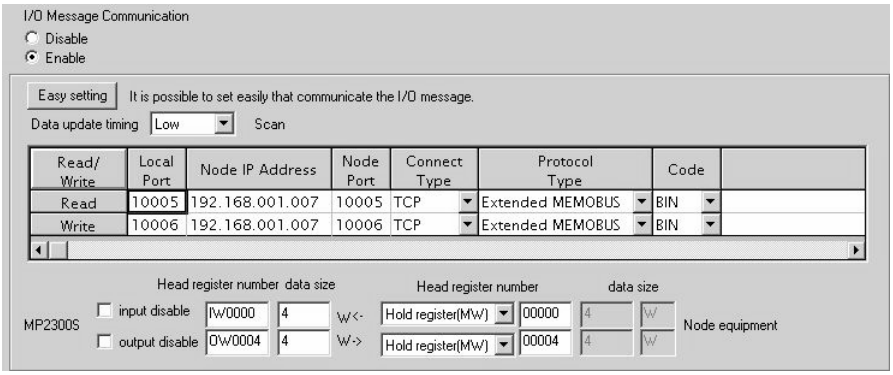
The following table provides the valid setting items for each communication protocol type.

Setting Item	Communication Protocol Type				
	Extended MEMOBUS	MEMOBUS	MELSEC	Non-procedure	MODBUS/TCP
Readout of Input Relay	√	√	–	–	√
Readout of Input Register	√	√	–	–	√
Readout/Write-in of Coil	√	√	–	–	√
Readout/Write-in of Hold Register	√	√	√	–	√
Write-in Width of Coil/Hold Register (LO)	√	√	√	–	√
Write-in Width of Coil/Hold Register (HI)	√	√	√	–	√

Note: √ : Enable
– : Disable

■ I/O Message Communication Item Connection Parameter Setting

Sets connection parameters for I/O message communication.
I/O message communication exchanges the data using I/O images with the remote equipment.



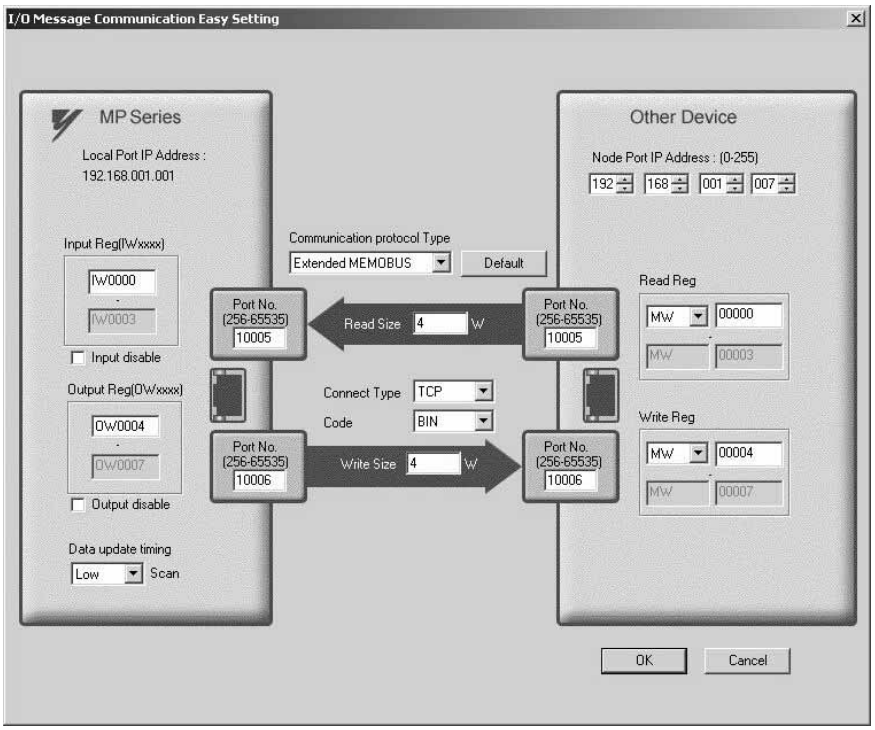
The following table explains each setting item.

Item	Setting Range	Details	Default
I/O Message Communication Enable/Disable	Enable/Disable	Select whether to enable I/O message communications.	Disable
The setting items below can only be set when the I/O Message Communication is set to “Enable.”			
Easy Setting	–	Opens the Simple Setting screen for the read/write connection parameters.	–
Data Update Timing	H Scan/ L Scan	Set when to update the I/O data for the controller side when the I/O message communication is established.	L Scan
Read/Write	–	In 218IFA Ethernet communications, remote stations are distinguished by their connection numbers. I/O message communications have a connection for each read/write.	
Local Port	256 to 65535	Specify the 218IFA port number for each read/write connection. To delete the port number setting, enter zero. To use only a read or a write connection, set the other port number to zero to delete the connection. Note: When the connection type = UDP, the port number cannot be 9998 or 10000.	0
Node IP Address	0.0.0.1 to 255.255.255.254	Set a remote IP address for both read and write connections. Set a common value for both read and write. However, the following addresses cannot be used: 127.xxx.xxx.xxx xxx.xxx.xxx.000 xxx.xxx.xxx.255	000.000.000.000
Node Port	256 to 65535	Specify the remote port number for each read/write connection. A pair of a remote IP address and remote port number must not be duplicated.	0
Connect Type	TCP UDP	Select a transport layer protocol. TCP: Transmission control protocol UP: User datagram protocol	TCP

<table>
<tr><th>Item</th><th>Setting Range</th><th>Details</th><th>Default</th></tr>
<tr><td>Protocol Type</td><td>Extended MEMOBUS
MEMOBUS</td><td>Select an application layer protocol.
<table><tr><th>Protocol Type</th><th>Overview</th></tr><tr><td>Extended MEMOBUS</td><td>Yaskawa’s Extended MEMOBUS protocol.</td></tr><tr><td>MEMOBUS</td><td>Yaskawa’s MEMOBUS protocol.</td></tr><tr><td>MELSEC</td><td>Ethernet I/F protocol for the sequencer (A series) manufactured by Mitsubishi Electric Corporation.</td></tr><tr><td>MODBUS/TCP</td><td>Industrial Ethernet protocol proposed by Modieon, Inc.</td></tr></table></td><td>Extended MEMOBUS</td></tr>
<tr><td>Code</td><td>ASCII
BIN
RTU</td><td>Select a code type for the message communication data.
Depending on protocol type, available codes are restricted as follows:
<table><tr><th rowspan="2">Protocol Type</th><th colspan="3">Code</th></tr><tr><th>ASCII</th><th>BIN</th><th>RTU</th></tr><tr><td>Extended MEMOBUS</td><td>√</td><td>√</td><td>–</td></tr><tr><td>MEMOBUS</td><td>√</td><td>–</td><td>√</td></tr><tr><td>MELSEC</td><td>√</td><td>√</td><td>–</td></tr><tr><td>MODBUS/TCP</td><td>–</td><td>√</td><td>–</td></tr></table>√ : Available
–: Not available</td><td>ASCII</td></tr>
<tr><td>Remote Station Name</td><td>Up to 32 single-byte characters (16 double-byte characters)</td><td>Any text can be entered as a connection comment.</td><td>Blank</td></tr>
<tr><td>Input Disable</td><td>Enable/disable</td><td>Select whether to update the input data in the I/O message communication.</td><td>enable</td></tr>
<tr><td>Output Disable</td><td>Enable/disable</td><td>Select whether to update the output data in the I/O message communication.</td><td>enable</td></tr>
<tr><td rowspan="2">MP2400 Head Register Number Data Size</td><td>IW0000 to IW7FFF</td><td>Set a start address of the input register of the MP2400 side for storing the data read from the remote equipment.
Note1: “xxxx” represents a start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen.</td><td>IW xxxx (Note1)</td></tr>
<tr><td>OW0000 to OW7FFF</td><td>Set a start address of the MP2400 side output register for referencing the data written in the remote equipment.
Note2: “xxxx” represents a start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen.</td><td>OWxxxx + 4 (Note2)</td></tr>
<tr><td rowspan="2">Data Size</td><td rowspan="2">Varies according to protocol type</td><td>Specify the data size (word) read from the remote equipment.</td><td>4</td></tr>
<tr><td>Specify the data size (word) written in the remote equipment.</td><td>4</td></tr>
<tr><td rowspan="2">Head Register Number for the Node Equipment</td><td rowspan="2">Varies according to protocol type</td><td>Specify the register type and the start register address for the remote equipment to read.</td><td rowspan="2">Varies according to protocol type.</td></tr>
<tr><td>Specify the register type and the start register address for the remote equipment to write.</td></tr>
<tr><td rowspan="2">Data Size of the Node Equipment</td><td rowspan="2">Display only</td><td>Generally, the same value specified in MP2400 data size is shown. By way of exception, when MELSEC is selected for communication protocol type and a bit device such as input relay (X)/ output relay (Y)/ internal relay (M)/ link relay (B) is selected for read register, the display is shown in bit size.</td><td>4</td></tr>
<tr><td>Generally, the same value specified in MP2400 data size is shown. By way of exception, when MELSEC is selected for communication protocol type and a bit device such as input relay (X)/ output relay (Y)/ internal relay (M)/ link relay (B) is selected for read register, the display is shown in bit size.</td><td>4</td></tr>
</table>

■ Easy Setting Window for I/O Message Communication

Graphically adjusts the setting for the read/write connection parameters.
Generally, the contents are similar to I/O message communication items in connection parameter setting.
When the connection parameters are not yet set and this dialog box is opened, the default values for read/write connection will be automatically stored.



The following table provides the default values for each connection stored when the connection parameters are not yet set and this screen is opened.

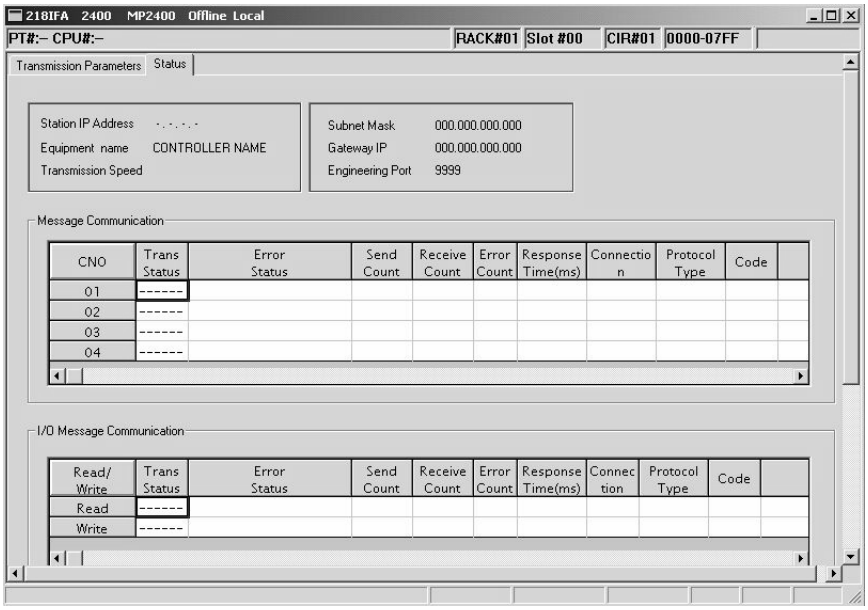
Item			Default
MP Series	Local IP Address		Values set in transmission parameter setting items are shown.
	Local Port	Read	10005
		Write	10006
	Input Register (IW xxxx)		Start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen.
	Input Disable		Not checked (enable)
	Output Register (OW xxxx)		Start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen + 4.
	Data Update Timing		Low
Other Device	Node IP Address		192.168.1.7
	Node Port Number	Read	10005
		Write	10006
	Read Register		MW00000
	Write Register		MW00004
Communication Protocol Type			Extended MEMOBUS
Read Size			4
Write Size			4
Connect Type			TCP
Code			BIN

In addition, click the **Default** Button to set the default values for data code type, local I/O register setting, read/write size, and node read/write register setting according to the selected communication protocol type.
The following table provides these default values.

Communication Protocol Type	Default			
	Data Code Type	Local Input/Output Register Setting	Read/Write Size	Node Read/Write Register Setting
Extended MEMOBUS	BIN	IW□□□□ to IW□□□□+ 3 (input) OW□□□□+ 4 to OW□□□□+7 (output)	4 (read) 4 (write)	MW0000 to MW0003 (read) MW0004 to MW0007 (write)
MEMOBUS	RTU	Same as above	Same as above	Same as above
MELSEC	BIN	Same as above	Same as above	D0000 to D0003 (read) D0004 to D0007 (write)
MODBUS/TCP	BIN	Same as above	Same as above	4X00001 to 4X0004 (read) 4X00005 to 4X0008 (write)

2. Status tab

In the **Status** Tab, each setting for 218IFA transmission definition and transmission status is shown.
The displayed contents are as follows:



■ Transmission Parameter Item

Item	Displayed Content	Default
Station IP Address	Displays local IP address specified in the **Transmission Parameter** Tab.	000.000.000.000
Equipment Name	Displays equipment name specified in the **Transmission Parameter** Tab. When the equipment name is not yet set, nothing is shown.	NULL
Transmission Speed	Displays transmission rate retrieved from the status information. (Fixed at Automatic)	Automatic
Subnet Mask	Displays a subnet mask set in the **Transmission Parameter** Tab.	000.000.000.000
Gateway IP	Displays a default gateway IP address set in the **Transmission Parameter** Tab.	000.000.000.000
Engineering Port	Displays a port number set in the detailed definition of the **Transmission Parameter** Tab.	9999

■ Message Communication and I/O Message Communication Items

Item	Displayed Content	Default
Trans Status	Displays the transmission status for each connection.	–
Error Status	If an error is indicated in the transmission status, the error details are shown.	–
Send Count	Displays the number of packets transmitted to the remote station.	–
Receive Count	Displays the number of packets received from the remote station.	–
Error Count	Displays the number of errors that occurred in each connection.	–
Response Time (ms)	Displays the time taken to receive a response after issuing a command in the I/O message communication.	–
Connection	Displays the connection type set in the **Transmission Parameter** Tab.	–
Protocol Type	Displays the protocol of the connection parameter set in the **Transmission Parameter** Tab.	–
Code	Displays the code type of the data set in the **Transmission Parameter** Tab.	–
Node Station Name	Displays the remote station name set in the **Transmission Parameter** Tab.	–

Note: 1. Transmission status
In online mode, displays the transmission status for each connection.

Transmission Status	State
IDLE	IDLE
WAIT	WAIT (waiting for connection)
CONNECT	CONNECT (capable of transmitting and receiving data)
–	Unused connection

2. Error status
If an error is indicated in the transmission status, the error details are shown.

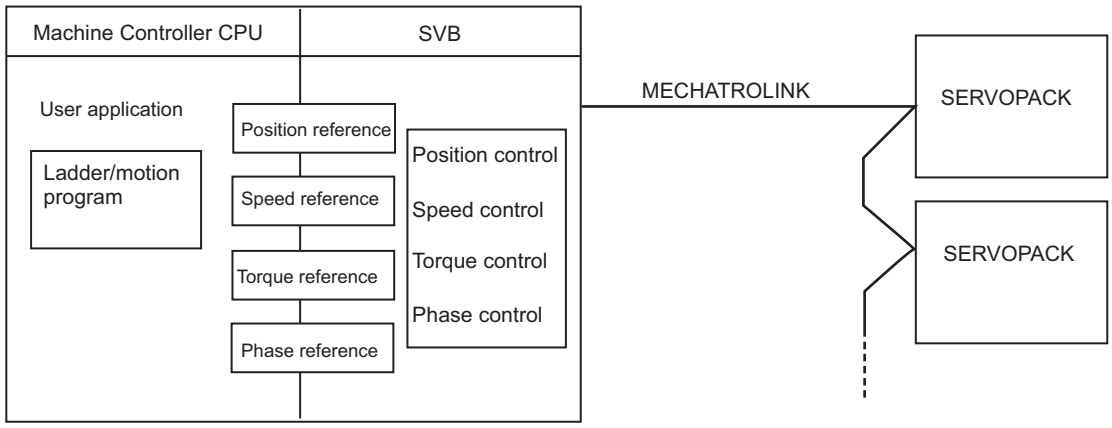
Error Status	State	Remarks
No Error	Normal	–
Socket Generation Error	System error	Socket generation failed
Local Port Number Error	Error in setting the local port number (the same address is bound while disconnecting the TCP connection)	Bind error (duplicated port number)
		A bind error occurred while ending the connection.
		Before the connection was completed, another function issued a command to the same remote station.
Socket Attribute Change Error	System error (in TCP)	An error occurred while setting a socket attribute.
Connection Error (I/O Message Communication)	Connection error (when actively open in TCP, a connection is rejected by the node station)	Tried to connect using the I/O message communication, but the connection was rejected by the remote station, and the command was reset.
		When disconnecting the cable, retried connecting for one minute (default value) without a response.
Connection Error (Automatic receive)	Connection error (when passively open in TCP)	An error occurred while receiving the connection from automatic receive.
System Error	System error	A socket polling (select specification) error occurred while receiving data.
Data Transmit Error (TCP)	Data transmit error (in TCP, either there is no node station or a node station did not startup.)	A response transmit error occurred in automatic receive. An error also occurred in I/O message communication. An error occurred only in TCP when there was no node station to transmit or a node station was rebooted.
Data Transmit Error (UDP)	Data transmit error (in UDP)	A transmit request was issued to a nonexistent socket.
Data Receive Error (TCP)	Data receive error (in TCP, a request to disconnect the connection is received from the node station)	An error occurred when disconnecting the connection from the node station. It also may occur even when close is processed properly.
Data Receive Error (UDP)	Data receive error (in UDP)	A data receive command was issued to a nonexistent socket.
Socket Option Change Error	System error	Error when changing a socket option
Data Change Error	Data change error	Protocol change error

2.2.5 Built-in SVB Module

(1) Overview

[a] About SVB Module

The SVB Module is a motion module used to control SERVOPACKs, stepping motor drivers, inverters, distributed I/O devices, etc. via MECHATROLINK interface MECHATROLINK-I or -II.
The MECHATROLINK-II enables position, speed, torque, and phase control for highly accurate synchronized control. In addition, sophisticated machine operations can be performed by switching the control mode while the axis is moving.



[b] Built-in SVB and Slot-mounting Optional SVB

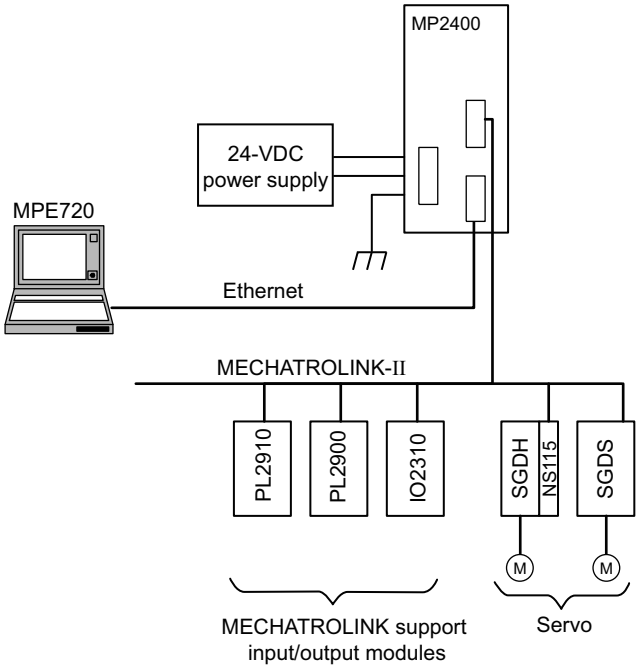
The SVB Modules are of two types: The built-in SVB (hereinafter referred to as Built-in SVB) and the Slot-mounting Optional SVB (hereinafter referred to as Optional SVB)
A built-in SVB Module is incorporated in the MP2400.
The Optional SVB is one of the optional modules for the Machine Controller. The SVB-01 Module is an Optional SVB that can be mounted on the optional slot of the MP2400.

[c] Features

- Up to 21 slave stations can be connected to a single Module (the SERVOPACKs can be connected up to 16 axes).
- Self-configuration enables automatic allocation of setting data for the slave device that is connected to MECHATROLINK.
- SERVOPACK parameters can be managed over networks.

[d] System Configuration Example

The following diagram shows a system configuration example.



- Use the specified cables and connectors. Refer to *1.1.5 (3) Cables* in the *Machine Controller MP2000-series SVB/ SVB-01 Motion Module User's Manual (manual no.: SIEPC88070033)* to select appropriate cables and connectors to connect each device.
- The SERVOPACK models that can be connected through MECHATROLINK-I differ from those connected through MECHATROLINK-II. Refer to *1.4 MECHATROLINK-compatible Devices* on page 1-6 to select appropriate SERVOPACK models for the MECHATROLINK interface to be used.
- If both MECHATROLINK-I (4 Mbps) compatible devices and MECHATROLINK-II (10 Mbps) compatible devices are connected in a system, make the settings in accordance with MECHATROLINK-I specifications.
- When connecting a servo to an SVB Module via MECHATROLINK, connect signals such as overtravel, zero-point return deceleration limit switch, and external latch to the servo. Refer to the relevant SERVOPACK manual for details on the connections.
- When connecting Σ-II series SERVOPACKs (SGDH+NS100 or SGDH+NS115), do not connect a hand-held type digital operator and SigmaWin+. If connected, alarms A.95 (command warning) and A.ED (execution not completed) will occur for the commands sent from the SVB Module, and normal operation will be interrupted. If a digital operator or SigmaWin+ must be connected to a Σ-II series SERVOPACK, disconnect the SERVOPACK from the SVB Module.

(2) Specifications

The specifications of built-in and optional SVB Modules are as follows.

[a] Motion Control Function

Item			Details	
MECHATROLINK Communication	Number of Communication Lines		One line	
	Number of Communication Ports (Connectors)		1 port	
	Terminating Resistor		Built-in terminator	
	Transmission Distance		MECHATROLINK-II Min. distance between stations: 0.5 m Total network length: 50 m (can be extended to 100 m by connecting repeaters) MECHATROLINK-I Min. distance between stations: 0.3 m Total network length: 50 m (can be extended 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, or 2 ms	2 ms
		Number of Link Communication Bytes	17 bytes or 32 bytes	17 bytes
		Number of Connectable Stations	Up to 21 stations (SERVOPACK 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	For details, refer to *1.4.2 Modules* on page 1-6.	
	Slave Functions*	Communication Interface	MECHATROLINK-II	
		Baud Rate	10 Mbps	
		Transmission Cycle	The transmission cycle of the master station (0.5 ms min.)	
		Number of Link Communication Bytes	17 bytes or 32 bytes	
		Messaging (Slave Function)	Supported.	

* Only with MECHATROLINK-II

(cont'd)

Item		Details
Servo Control	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 is cleared).
	I/O Registers	Input/output using motion registers (synchronized on high-speed scan)
	Command Mode	Motion Command Mode/MECHATROLINK Transparent Command Mode
	Supported Servomotors	Standard motors, linear motors, and direct-drive motors
	Control Type	Position control, speed control, torque control, and phase control
	Motion Commands	Positioning, External Positioning, Zero Point Return, Interpolation, Interpolation with Position Detection, JOG operation, STEP operation, Speed Reference*, Torque Reference*, Phase Control*, etc.
	Acceleration/Deceleration Method	One-step asymmetric trapezoidal acceleration/deceleration, exponential acceleration/deceleration filter, moving average filter
	Position Unit	pulse, mm, inch, degree, μm
	Speed Unit	Reference units/s, 10^n reference units/min, percentage of rated speed
	Acceleration Unit	Reference units/s^2, ms (acceleration from 0 until rated speed reached)
	Torque Unit	Percentage of rated torque
	Electronic Gear	Provided.
	Position Control Method	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 Method	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 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
	Control Type	Speed control only (V/F, vector control and other control methods use inverter 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 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.

* Only with MECHATROLINK-II

[b] MECHATROLINK Communication Specifications

Item	MECHATROLINK-I	MECHATROLINK-II
Topology	Bus	Bus
Transmission Media	Twisted-pair cable	Twisted-pair cable
Transmission Distance	50 m max. (can be extended to 100 m by connecting repeaters)	50 m max. (can be extended to 100 m by connecting repeaters)
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	2:N
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.

[c] Maximum Number of Slave Stations

The maximum numbers of slave stations that can be connected to the SVB-01 Module 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 *8.8.6 MECHATROLINK Definitions* of *Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual* (Manual No.: SIEPC88070005) for information on the settings for MECHATROLINK transmission.

■ Transmission Distance and Maximum No. of Slave Stations

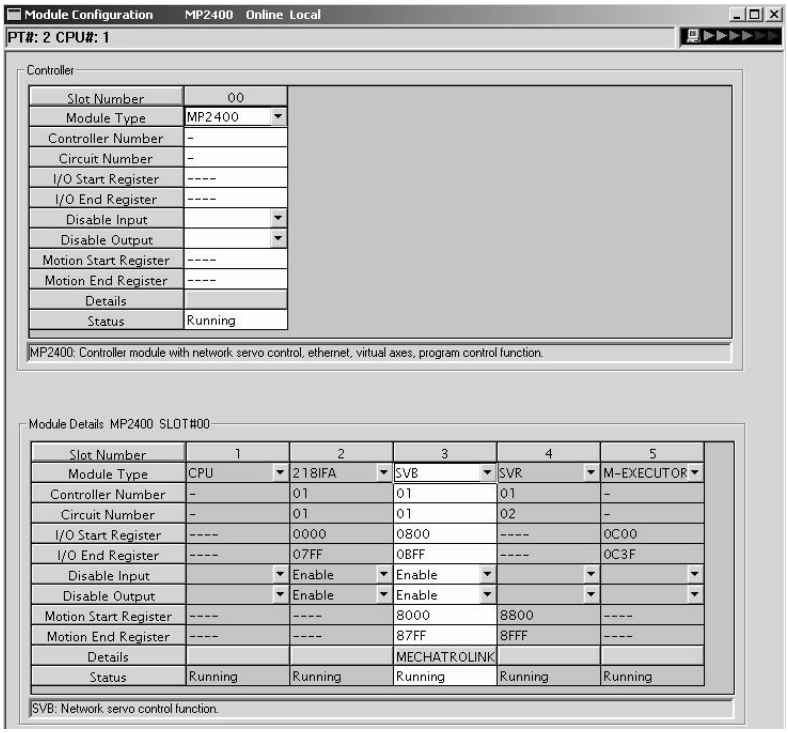
Communication Method	Transmission Distance (Total Network Length)	Maximum Number of Slave Stations
MECHATROLINK-I	50 m (can be extended to 100 m by connecting repeaters)	14
MECHATROLINK-II	30 m (can be extended to 100 m by connecting repeaters)	16 (21)*
	50 m (can be extended to 100 m by connecting repeaters)	15 (21)*

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

(3) Module Configuration

[a] Module Configuration Window

Click **MP2400** in the **Controller** area to display the details of the basic module functions in the **Module Details** area. The cell No.3 provides a detailed definition of built-in SVB.



The following table lists the items shown in the **Module Configuration** Window.

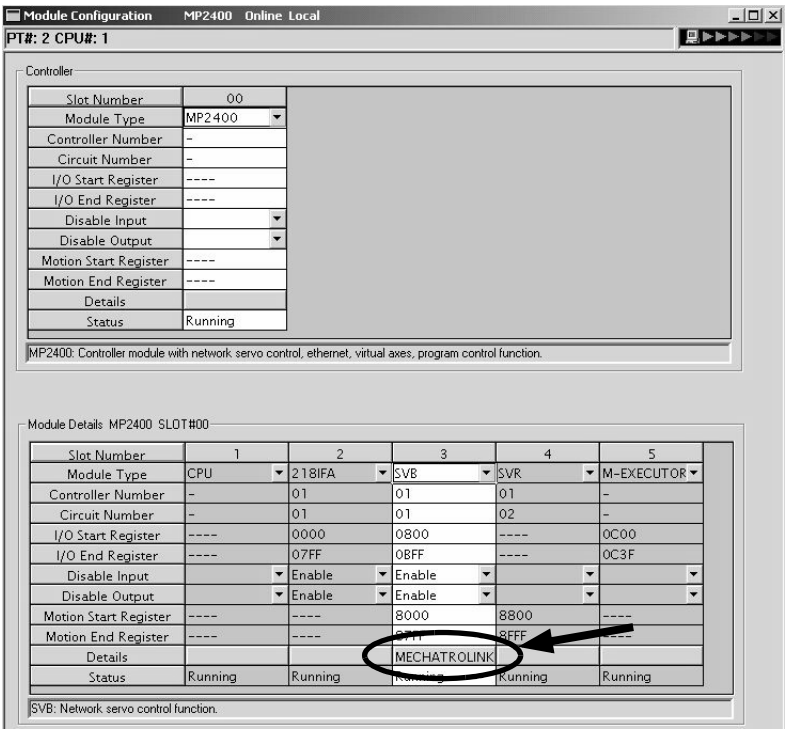
Item	Description	Modification
Slot Number	Slot number	Not possible
Module Type	Module detected in the slot	Possible
Controller Number	Fixed to 01	Not possible
Circuit Number	Module circuit number	Possible
I/O Start Register	I/O start register number of the I/O Module to be connected to MECHATROLINK (Setting range: 0000 to 7FFFh, max. 400h words per SVB Module)	Possible
I/O End Register	I/O last register number of the I/O Module to be connected to MECHATROLINK (Setting range: 0000 to 7FFFh, max. 400h words per SVB Module)	Possible
Disable Input	Input enabled (Enable)/disabled (Disable)	Possible (Not possible if the cell is blank)
Disable Output	Output enabled (Enable)/disabled (Disable)	Possible (Not possible if the cell is blank)
Motion Start Register	Start register number of the motion parameters (Automatically sets according to the circuit number)	Not possible
Motion End Register	Last register number of the motion parameters (Automatically sets according to the circuit number)	Not possible
Details	Opens the MECHATROLINK Transmission Definition Window. (Double-click the **MECHATROLINK** cell to open the window.)	–
Status	Status of each module in online mode	Not possible

- "Possible" in the Modification line in the above table means that it is possible to change the setting of the item. Always save the setting to the flash memory after having changed the setting.
  - When changing the setting, be careful not to set the register numbers overlapped with another module.
  - I/O Start Register and I/O End Register must be set even though the I/O Module is connected or not connected to MECHATROLINK.

(4) MECHATROLINK Transmission Definition

[a] How to Open the MECHATROLINK Transmission Definition Window

In the Module Configuration Window, select MP2400 in the **Controller** field and double-click the **MECHATROLINK** cell in the Module **Details** field. The MECHATROLINK Transmission Definition Window will open.



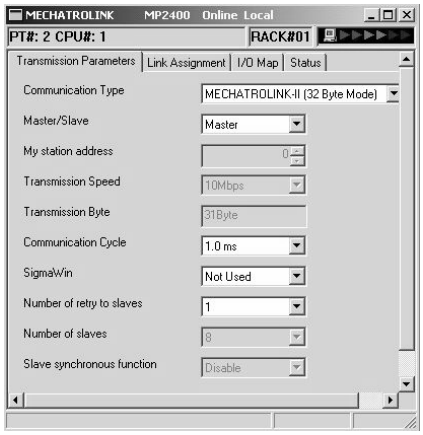
[b] MECHATROLINK Transmission Definition Window Details

The MECHATROLINK Transmission Definition Window has four tabs: **Transmission Parameters, Link Assignment, I/O Map**, and **Status**. Click the tab to view each.

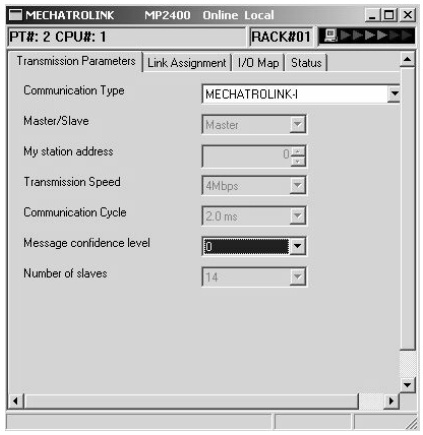
1. Transmission Parameters Tab

The parameters required to use the MECHATROLINK transmission system are displayed.

<Communication Method in MECHATROLINK-II>



<Communication Method in MECHATROLINK-I>



The items shown on the **Transmission Parameters** Tab are described in the following table. For items whose input fields are available, the settings can be changed. Always save the settings to the flash memory after changing them.

Item	Display during Self-configuration	Options and Precautions on Settings
Communication Type	Displays the detected communication method.	Select **MECHATROLINK-II (32 Byte Mode), MECHATROLINK-II (17 Byte Mode),** or **MECHATROLINK-I**.
Master/Slave	Displays whether the selected SVB Module is used as a Master station or Slave station.	Select either **Master** or **Slave**.
My station address (Local station address)	Displays the local station address set by using the rotary switches.	For Master station, fixed to 0. For slave stations, set a number between 1 and the number of slave stations.
Transmission Speed	Displays the transmission speed: MECHATROLINK-II (32-byte mode): 10 Mbps MECHATROLINK-II (17-byte mode): 10 Mbps MECHATROLINK-I: 4 Mbps	Cannot be set.
Transmission Byte (Hidden for MECHATROLINK-I)	Displays the number of transmission bytes. The number of transmission bytes depends on the communication type and the station type, Master or Slave. Refer to ■ *Transmission Bytes, Communication Cycle, Number of Retries to Slaves, Number of Slaves* for details.	Cannot be set.
Communication Cycle	Displays the communication cycle. The number of transmission bytes depends on the communication type and the station type, Master or Slave. Refer to ■ *Transmission Bytes, Communication Cycle, Number of Retries to Slaves, Number of Slaves* for details.	Can be set only for the Master station and when MECHATROLINK-II is selected as the communication type. The value that can be set differs depending on whether the SVB Module is a built-in SVB Module or optional SVB Module. Refer to ■ *Communication Cycle That Can be Set* for details.
Message Confidence Level (Hidden for MECHATROLINK-II)	Not used for MECHATROLINK transmission.	Set to 0 (default).

(cont'd)

Item	Display during Self-configuration	Options and Precautions on Settings
SigmaWin (Hidden for MECHATROLINK-I)	For MECHATROLINK-II communications, displays whether or not to use SigmaWin+ for communication via MECHATROLINK-II adapter such as JUSP-NP115.	Select either **use** or **not use**.
Number of Retry to Slaves (Hidden for MECHATROLINK-I)	Displays the maximum number of slave stations to which the Master can retry transmission in one transmission cycle when the Master has not received a normal response from a slave.	Only for Master station. Set a number between 0 and 7. Cannot set for Slaves.
Number of Slaves	Displays the number of slave stations that can be connected. The number of slave stations that can be connected is determined by communication type, communication cycle, SigmaWin+ use/not use, and number of retry to slaves.	Cannot be set.
Slave Synchronous Function	When using a built-in SVB as a slave station, select whether to synchronize with a master station.	Select either **Enable** or **Disable**.

■ Transmission Bytes, Communication Cycle, Number of Retries to Slaves, Number of Slaves

Transmission bytes, communication cycle, number of retries to slaves, and number of slaves at execution of self-configuration will be automatically set according to conditions including communication type, station type (Master or Slave), and the largest slave station number (the largest number among the detected slave station numbers).

<For Master Station>

Item	MECHATROLINK-II (32-byte mode)				MECHATROLINK-II (17-byte mode)		MECHATRO-LINK-I
Largest Slave Station Number	1 to 8	9	10 to 16	17 to 21	1 to 14	15	
Transmission Byte	31 bytes				16 bytes		–
Communication Cycle	1 ms	1 ms	2 ms	2 ms	1 ms	1 ms	2 ms
Number of Retry to Slaves	1	0	5	21 (The largest slave station number)	1	0	14
Number of Slaves	8	9	16	The largest slave station number	14	15	14

<For Slave Stations>

Item	MECHATROLINK-II (32-byte mode)	MECHATROLINK-II (17-byte mode)	MECHATROLINK-I
Transmission Byte	–	–	–
Communication Cycle	1 ms	1 ms	2 ms
Number of Retry to Slaves	30	30	15
Number of Slaves	30	30	15

■ Communication Cycle That Can be Set

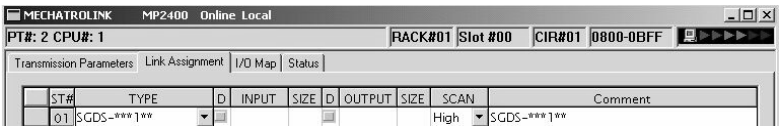
The communication cycle that can be set will differ depending on the communication type as follows.

MECHATROLINK-II Communication Mode	32-byte mode	17-byte mode
Communication Cycle That Can be Set	0.5 ms, 1 ms, 1.5 ms, or 2 ms	0.5 ms or 1 ms

- Communication Cycle can only be set for Master.
- The communication cycle for MECHATROLINK-I is fixed to 2 ms.

2. Link Assignment Tab Page

The data of the slave devices (MECHATROLINK connected devices such as SERVOPACK, inverter, and distributed I/O) are displayed on the **Link Assignment** Tab.



The items shown on the **Link Assignment** Tab are as follows. You can change the settings or delete the data station by station on this tab. Always save the settings to the flash memory after changing them.

Item	Description	Options and Precautions on Settings
ST #	Station number	The station number set here must be the same as the number set using rotary switches.
TYPE	Slave device connected at the station	Select the device type from the pull-down list.
D	I/O register's enable/disable status : Enabled : Disabled	Click the button to switch the status.
INPUT, SIZE	The leading input register number (**INPUT**) and the number of input registers in words (**SIZE**). The maximum number of input registers will be automatically set in **SIZE**.	When setting, be careful not to overlap the register range among stations. The register numbers that can be set are in the range between the leading register number and the ending register number in the Module Configuration Definition Window.
OUTPUT, SIZE	The leading output register number (**OUTPUT**) and the number of input registers in words (**SIZE**). The maximum number of output registers will be automatically set in **SIZE**.	When setting, be careful not to overlap the register range among stations. The register numbers that can be set are in the range between the leading register number and the ending register number in the Module Configuration Definition Window.
SCAN	Scan type used for synchronization with CPU. **High**: High-speed scan **Low**: Low-speed scan	Select either **High** or **Low**. When **TYPE** is set to a SERVOPACK, fixed to **High**.
Comment (Station name)	–	Enter a comment of up to 32 characters for each station.

■ Deleting a Station Assignment

Click any cell in the row of the station to be deleted, and select ***Edit - Assignment Delete*** from the main menu.

- Care must be taken when deleting a station assignment. The deletion is irreversible.

■ *****I/O and *****SERVO in Type

The following slave devices (I/O Modules) do not have model codes. Therefore, "*****I/O**"(wild card I/O) will be displayed in ***TYPE*** for these devices after execution of self-configuration.

- JEPMC-IO350
- JAMSC-120DAI53330
- JAMSC-120DAI73330
- JAMSC-120DAO83330
- JAMSC-120DRA83030

For a servo with customized specifications that could not be recognized by self-configuration, "*****SERVO**" (wild card servo) will be displayed in ***TYPE***.

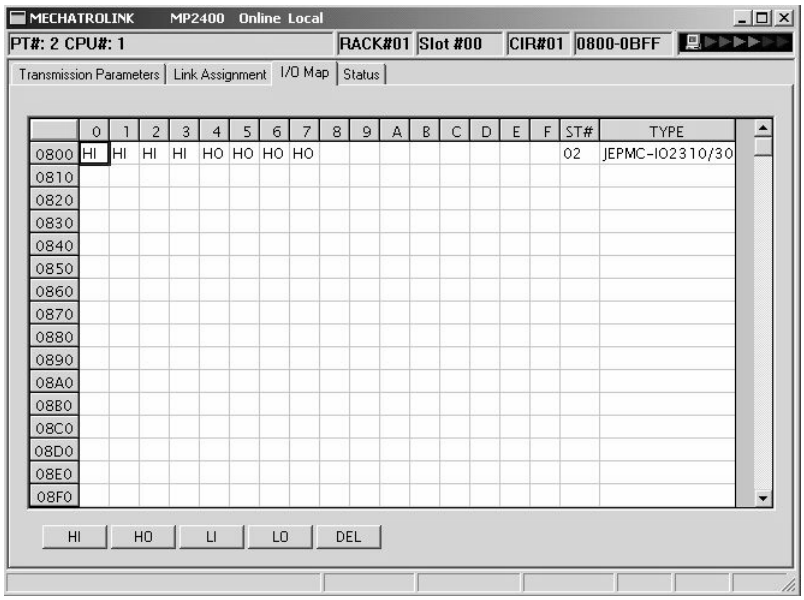
Select a correct device type in the Link Assignment Tab Page for the devices with *****I/O** or *****SERVO** displayed in ***TYPE***.

---

3. I/O Map Tab

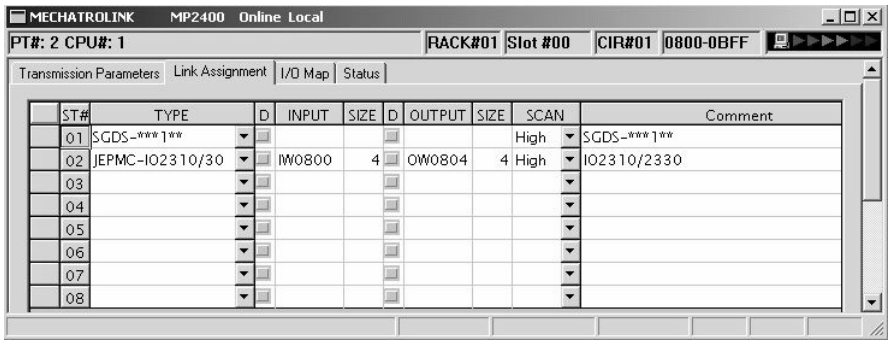
The status allocated to I/O registers is displayed.

- The **I/O Map** Tab is used for monitoring (read-only). Do not change the displayed settings.



[c] Status Tab Page

The MECHATROLINK transmission status is displayed. The displayed settings cannot be changed.



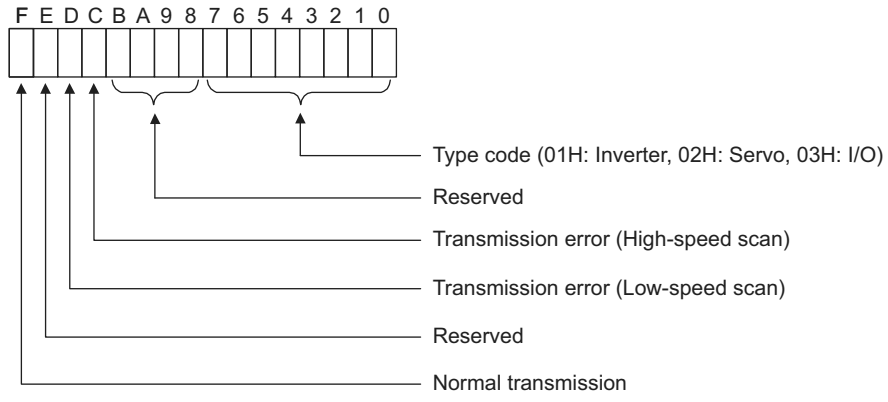
The items shown on the **Status** Tab are the same as those on the **Link Assignment** Tab except for STS.

■ STS

In online mode MECHATROLINK transmission status information is displayed in hexadecimal.

- In offline mode, nothing will be displayed.

The meaning of each bit is shown below.



(5) SVB Definition

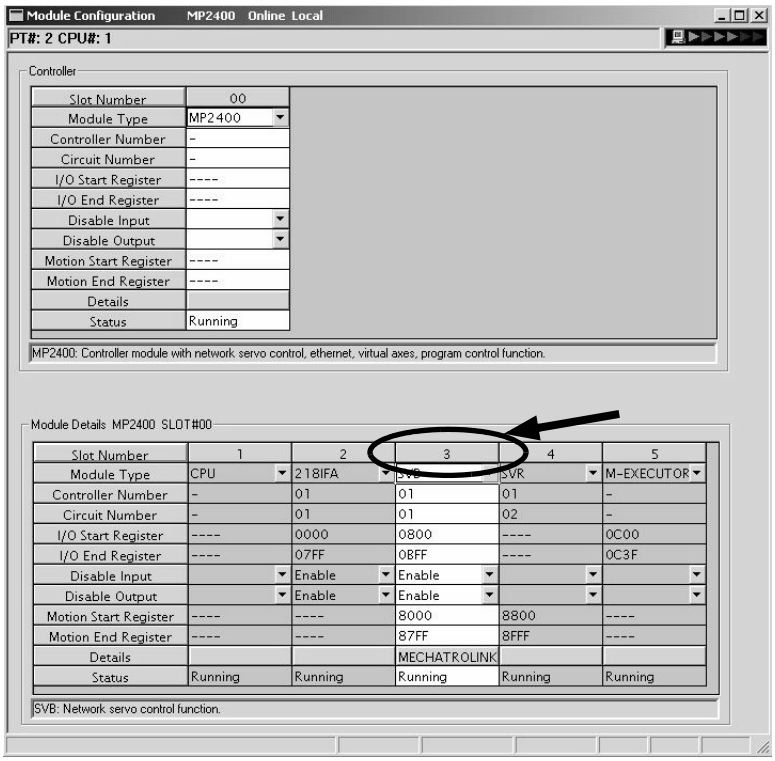
The SVB Definition file defines the motion parameters (motion fixed parameters, motion setting parameters, and motion monitoring parameters) to control motion axes such as the SERVOPACK, inverter, and stepper.

- Refer to *Appendix E Motion Parameter Details* for details on motion parameters.

[a] Opening the SVB Definition Window

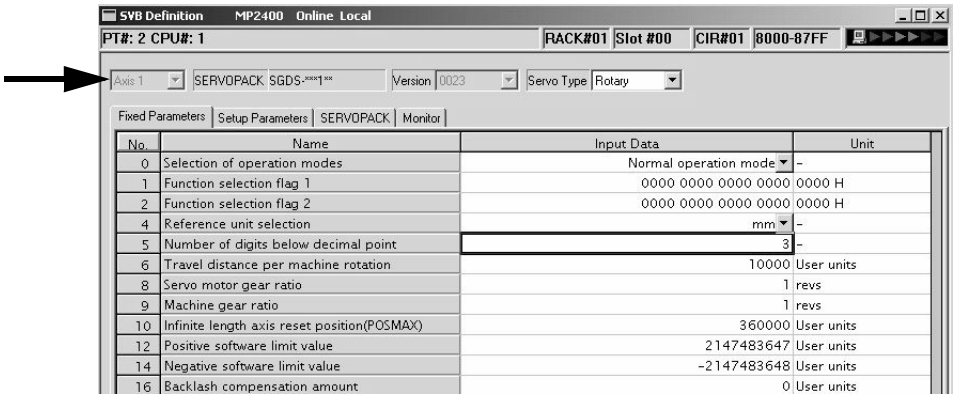
Open the SVB Definition Window by the following procedure.

1. Select ***MP2400*** in the Controller area, then double-click the slot number cell of the SVB Module in the ***Module Details*** field in the **Module Configuration** Window.



The Create New Confirmation Dialog Box will open. Click **OK** to display the **Fixed Parameters** Tab of the **SVB Definition** Window.

2. Select the axis to be set or monitored from the ***Axis*** pull-down list.



- ***Axis*** corresponds to ***ST#*** (station number) in the **Link Assignment** Tab of the MECHATROLINK Transmission Definition Window.

3. Click the **Fixed Parameters**, **Setup Parameters**, or **Monitor** Tab to display the desired page.

- If the setting in **Servo Type** is switched from Rotary to Linear, or vice-versa, some of the displayed parameters will change. Refer to *4.2.2 Motor Type and Related Alarms in the Machine Controller MP2000-series SVB/ SVB-01 Motion Module User's manual* (manual no.: SIEPC88070033) for details.

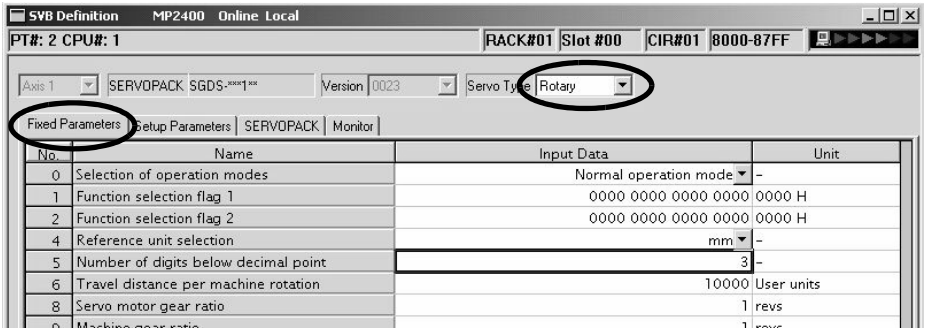


Fig. 2.1 Fixed Parameters Tab

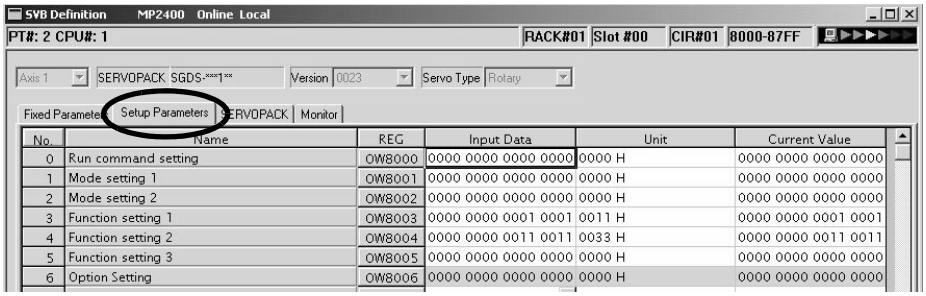


Fig. 2.2 Setup Parameters Tab

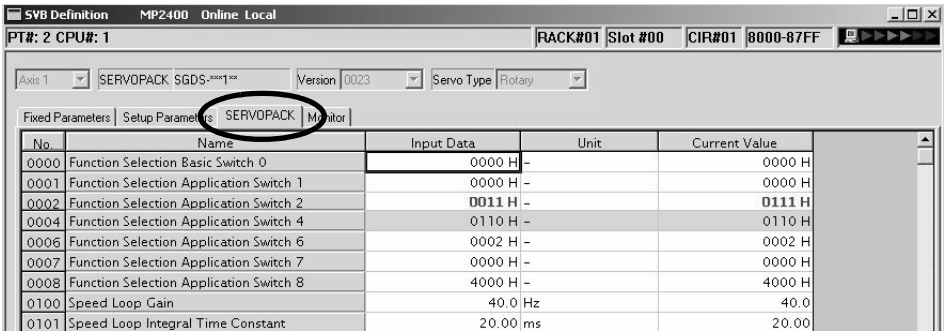


Fig. 2.3 SERVOPACK Parameters Tab

- Refer to the relevant SERVOPACK user's manual for information on SERVOPACK parameters.
- Refer to *Appendix B SERVOPACK Parameter Data Flow*.

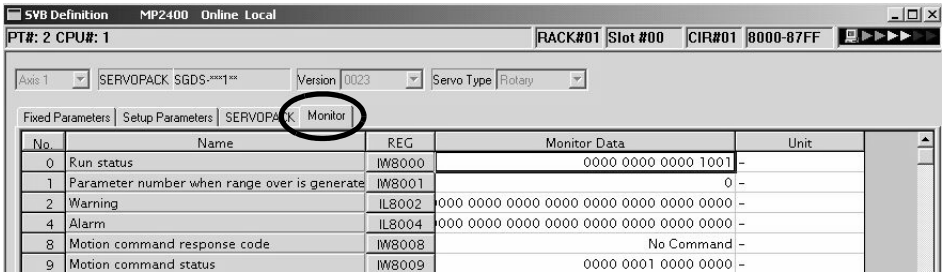


Fig. 2.4 Monitor Parameters Tab (read-only)

(6) Precautions when Saving the Servo User Constant

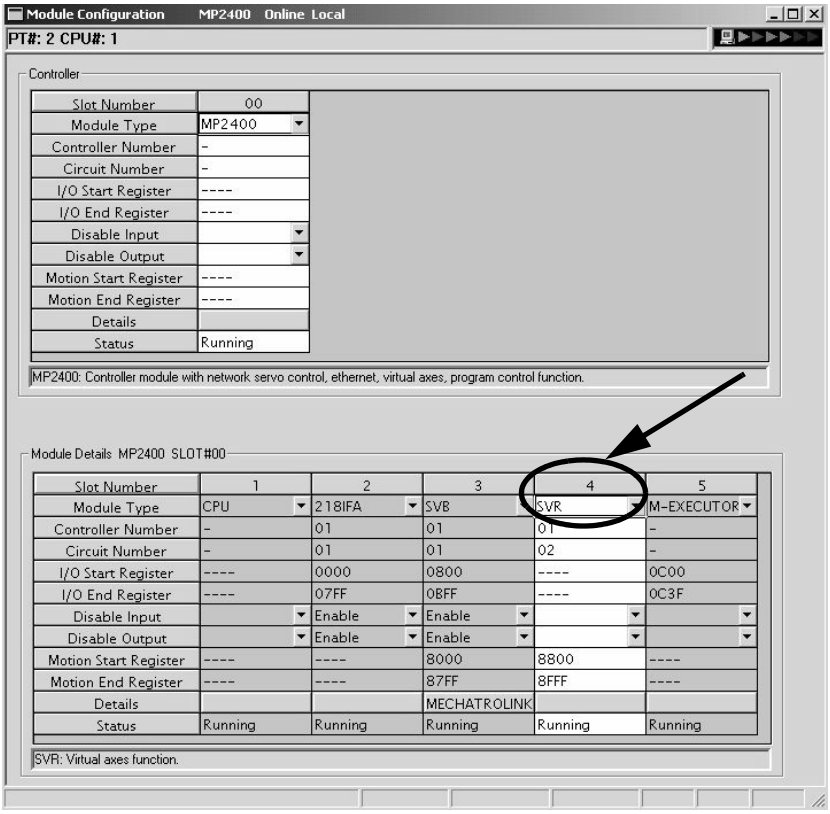
To save it in the SERVOPACK parameter screen except when SERVOPACK is changed, make sure in advance to select ***Edit (E) - SERVOPACK Current Value*** and ***To Setting Value (V)*** menus in order.

2.2.6 SVR Virtual Motion Module

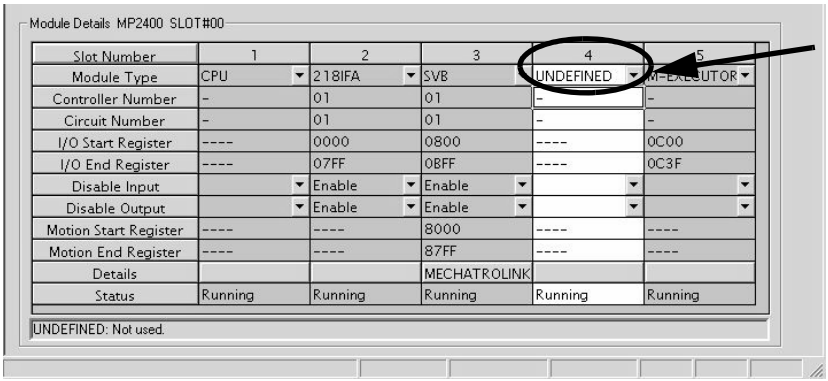
(1) Outline

The Virtual Motion Module is a software module provided as a standard feature with the MP2400. It is not connected to a motor, but provides a virtual axis interface.
The SVR is configured in the same way as the MP2400 built-in SVB with fixed parameters, setting parameters, and monitoring parameters, and can be accessed from application programs using I/O registers.
The SVR can be used to control up to 16 virtual axes in the high-speed scan control cycle.
Note: For information on how to use SVR motion parameters and motion commands, refer to *Machine Controller MP2000-series SVB/SVB-01 Motion Module User's Manual* (manual no.: SIEPC88070033).

In the MP2400 Basic Module, slot 4 in the default **Module Configuration** Window is for SVR.



- If the SVR is not used, MP2400 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.

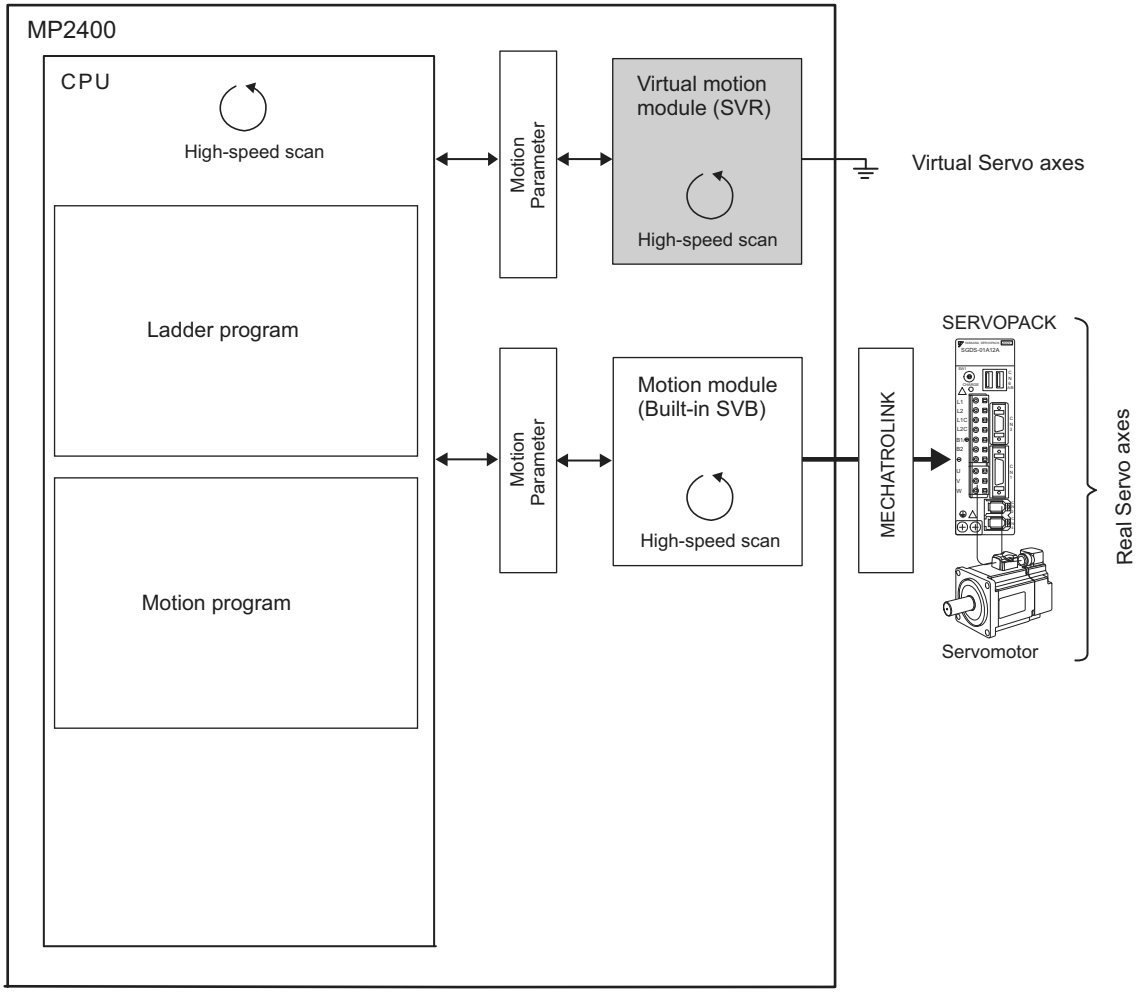
The following table lists application examples of the SVR.

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

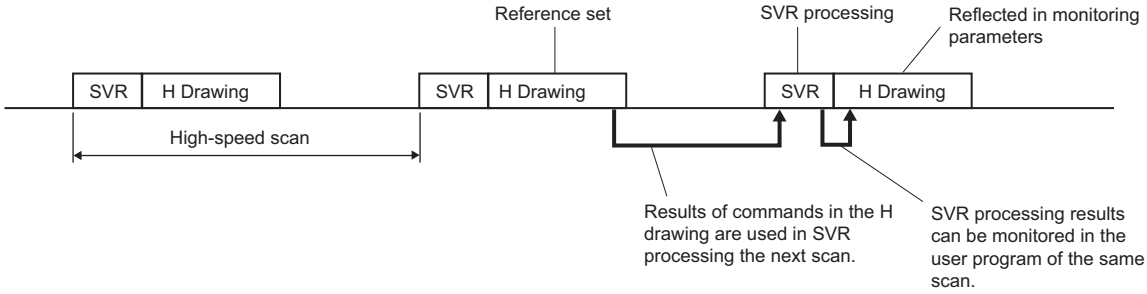
The following figure shows an example system configuration using SVR.



(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 (Selection of Operation Modes) is set to 0 (Normal Operation Mode), services are started for each of the 16 SVR Module virtual axes.

- The default for the Selection of Operation Modes parameter is 1 (Axis Unused).

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

Command	MP2400
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 Selection of Operation Modes (fixed parameter 0) is set to Normal Operation Mode (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.

2.2.7 M-EXECUTOR Module (Motion Program Executor)

This section explains the M-EXECUTOR Module (motion program executor) function and its detail screen.

(1) M-EXECUTOR Module Function Overview

The M-EXECUTOR Module is a software module that executes a motion or sequence program.
The M-EXECUTOR Module enables the following features:

■ Executing a motion program without using a ladder program

Conventionally, in order to execute a motion program, you need to incorporate an MSEE command into a ladder program. The M-EXECUTOR Module allows you to execute the motion program without incorporating the MSEE command into the ladder program.
Note: You can incorporate a MSEE command into the ladder program as ever.

■ Controlling a motion program without using a ladder program

You can map any register to the control signal of the motion program registered in the M-EXECUTOR Module.
So, without a ladder program, this allows you to directly control a motion program from a host PLC or other device.

■ Describing sequence control in motion language

As a new programming method, a sequence program has been added to the MP2400.
A sequence program is a scan execution type program where a process is completed with one scan. It employs a text language similar to a motion program.
You can use the sequence program as an alternative to the ladder program.
For information about commands available in the sequence program, see *Machine Controller MP900/MP2000 Series Users Manual Motion Programming* (manual number: SIE-C887-1.3).

(2) M-EXECUTOR Module Specification

[a] Programs Capable of Registration in M-EXECUTOR

The following table shows programs capable of registration in M-EXECUTOR.

Program Type		Number of Registrations	Remarks
Motion Program		16	Up to 16 programs in total
Sequence Program	Startup	1	
	Interrupt	Disable	
	H Scan	16	
	L Scan	16	

[b] Program Control Method

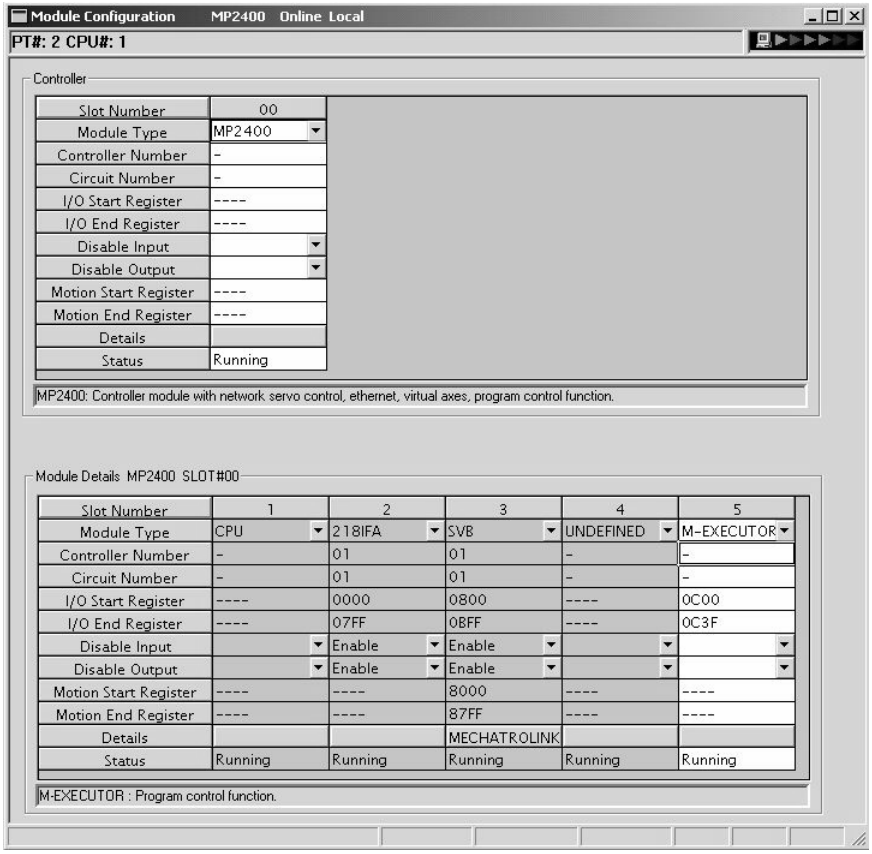
The following table shows the program control methods registered in M-EXECUTOR.

Item	Motion Program	Sequence Program
Execution Method	Sequential Execution	Startup: Event driven H Scan: Scan execution L Scan: Scan execution
System Work	1:1 correspondence between the definition number and system work (The number of program definitions is set in the MPE720 screen.) Definition No. / System Work Number No. 1 / 1 No. 2 / 2 ・ / ・ No. 16 / 16	
Program Designation Method	Direct or indirect designation	Direct designation
Program Startup Method	Registered in the definition, turns start signal ON	Starts up when registered in the definition
Override Setting for Interpolation	Yes	No
I/O Link Definition	Yes	No
S Register Report Function of Motion Program Status	Yes	
Number of Parallels	1 to 8 (4 main parallels × 2 sub parallels)	1
Execute an Error Drawing when Operation Error Occurred	Yes	

(3) Module Configuration Definition

(a) Details of Module Configuration Definition Window

Click **MP2400** in the **Controller** area to display the details of the basic module functions in the **Module Details** area. The cell No.5 provides a detailed definition of M-EXECUTOR.



Items displayed in the **Module Details** area show the following:

Item	Description	Change
Slot Number	Sub-slot number. Double-click to open the M-EXECUTOR detailed definition screen.	–
Module Type	A module name appears. Changing the name to UNDEFINED enables you to disable M-EXCUTOR functions.	√
Controller Number	Not used. Fixed to "–".	–
Circuit Number	Not used. Fixed to "–".	–
I/O Start Register	Start register of the M-EXECUTOR I/O register (valid range: 0000-7FFFh, size: 40h words)	√
I/O End Register	End register of the M-EXECUTOR I/O register (valid range: 0000-7FFFh, size: 40h words)	√
Disable Input	Not used. Fixed at "blank".	–
Disable Output	Not used. Fixed at "blank".	–
Motion Start Register	Not used. Fixed at "– – – –".	–
Motion End Register	Not used. Fixed at "– – – –".	–
Details	Not used.	–
Status	M-EXECUTOR Module status in online mode.	–

√ : Available, – : Not available

■ I/O Register Details

An I/O register assigned to M-EXECUTOR is used to run a motion program and sequence program, and to monitor a sequence program.
M-EXECUTOR I/O register details are as follows:

M-EXECUTOR Input Register

M-EXECUTOR Input Register	Item	
Iwxxxx + 0	Definition No.1	Status
Iwxxxx + 1		Spare
Iwxxxx + 2		Spare
Iwxxxx + 3		Spare
Iwxxxx + 4	Definition No.2	Status
Iwxxxx + 5		Spare
Iwxxxx + 6		Spare
Iwxxxx + 7		Spare
	・ ・ ・	
Iwxxxx + 3C	Definition No.16	Status
Iwxxxx + 3D		Spare
Iwxxxx + 3E		Spare
Iwxxxx + 3F		Spare

M-EXECUTOR Output Register

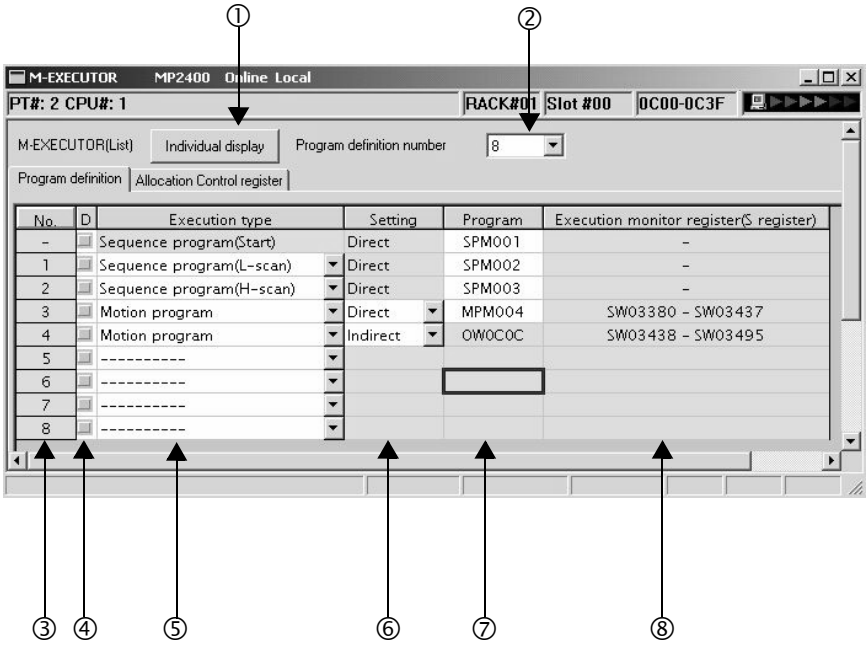
M-EXECUTOR Output Register	Item	
Owxxxx + 0	Definition No.1	Program number
Owxxxx + 1		Control signal
Owxxxx + 2		Override
Owxxxx + 3		Spare
Owxxxx + 4	Definition No.2	Program number
Owxxxx + 5		Control signal
Owxxxx + 6		Override
Owxxxx + 7		Spare
	・ ・ ・	
Owxxxx + 3C	Definition No.16	Program number
Owxxxx + 3D		Control signal
Owxxxx + 3E		Override
Owxxxx + 3F		Spare

(4) Detailed Screen

This section describes the M-EXECUTOR detail screen.

■ Program Definition Screen (M-EXECUTOR (list display) screen)

The program definition screen allows you to register a motion or sequence program to run.
Programs are executed according to the scan, in ascending numeric order.
A white cell can be set by the user, and a grey cell cannot be set by the user.



① Individual display
Shows M-EXECUTOR (individual display) screen.

② Program definition number
Sets the number of program definitions registered in the M-EXECUTOR Module.
The valid range is 0-16 (8 by default).

③ No.
Shows the program execution order. Processed according to the scan in ascending numeric order.

④ D
Enables/disables the definition. Uncheck to enable the definition.

⑤ Execution type

Sets the program execution type.

Execution Type	Program to Execute	Execution Condition
----------	None	None (select this to delete the definition)
Sequence Program (startup)	Sequence program	Power-up (during power-up, run only once)
Sequence Program (L scan)		Periodical startup (run each time a low-sped scan is performed)
Sequence Program (H scan)		Periodical startup (run each time a high-speed scan is performed)
Motion Program	Motion program	Turns ON the program operation start request of the control signal (runs when the program operation start request is ON).

⑥ Setting

Sets the a program designation.

The way to designate a program may differ according to the program.

Designation Method	Motion Program	Sequence Program	Remarks
Direct Designation	Enable	Enable	The way to designate the program number Example: MPM001, SPM002, and so on
Indirect Designation	Enable	Disable	The way to designate the register for storing the program number Example: OW0C0C, and so on (refers to MPM001 by storing one in OW0C0C)

⑦ Program

Sets a program number.

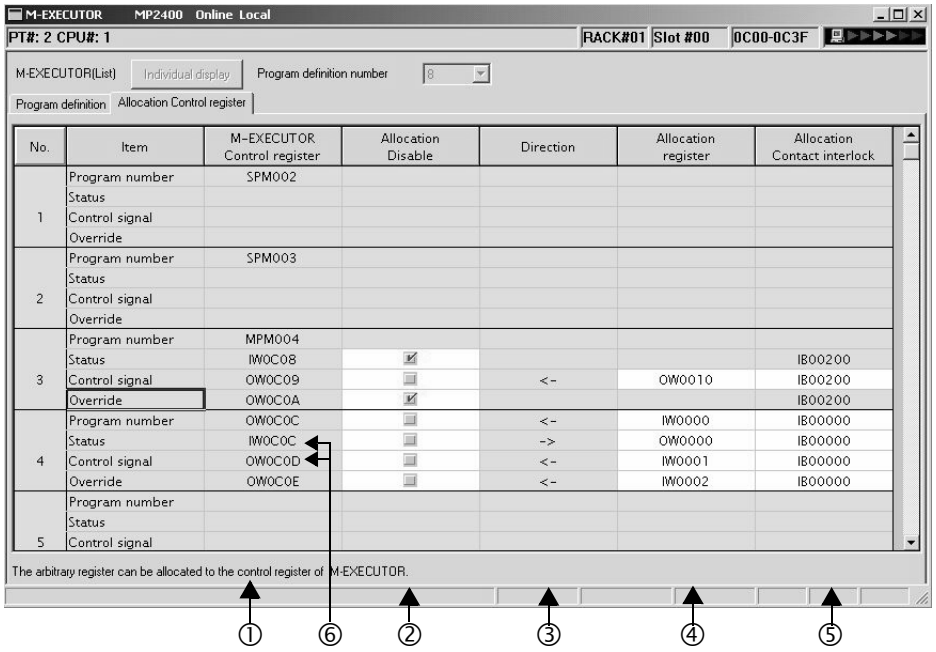
Execution Type	Remarks
Sequence Program (startup, L scan, H scan)	Enter “1” and press ENT to automatically input “SPM001.” You can save an unregistered program or exit this screen without setting (blank), but in these cases, the program will not be executed.
Motion Program	Direct designation: Enter “1” and press ENT to automatically input “MPM001.” You can save an unregistered program or exit this screen without setting (blank), but in these cases, the program will not be executed. Indirect designation: O register of M-EXECUTOR Module is automatically set. It cannot be set by the user.

⑧ Execution monitor register (S Register)

When the execution type is set to motion program, the range of the execution monitor registers (S registers) is shown. For more information on the execution monitor register, refer to *(6) Monitor the motion program execution information using S register* of *5.2.2 Motion Programs*.

■ Control Register Mapping Window

The control register mapping screen sets a mapping register.
A white cell can be set by the user, and a shaded cell cannot be set by the user.



① M-EXECUTOR Control register

Displays an I/O register mapped to the M-EXECUTOR Module.
Controls the motion program and monitors the state, using the M-EXECUTOR control register.

M-EXECUTOR Control Register	Usage
Program Number	Sets a program number. This register is used only when set to an indirect designation.
Status	Monitors the program execution status.
Control Signal	Controls the program.
Override	Sets an override value when running a move command for the interpolation system.

Note: For more information on the M-EXECUTOR control register, refer to *2.2.7 (1) M-EXECUTOR Module Function Overview*.

② Allocation Disable

Enables/disables the mapping register. Uncheck to enable the definition.

③ Direction

Displays the data I/O direction.

④ Allocation register

Data is exchanged between mapping and M-EXECUTOR control registers in real-time.
Any register can be mapped to the mapping register.

Registers that can be set as a Mapping Register
Word type I, O, M (except the motion register)

⑤ Allocation Contact interlock

An allocation contact interlock is used to control the data exchange between the allocation register and M-EXECUTOR control registers. When the allocation contact interlock is ON, data can be exchanged between the allocation register and M-EXECUTOR control registers.
Any register bit can be mapped to the allocation contact interlock.

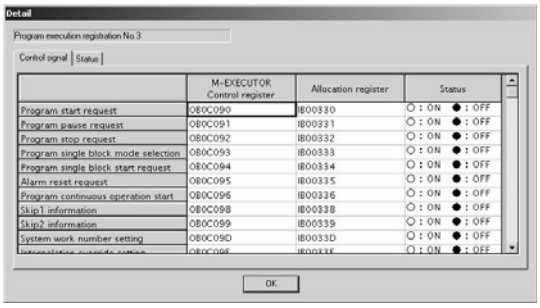
Registers that can be set as an Allocation Contact Interlock
Bit type I, O, S, M, C (except the motion register)

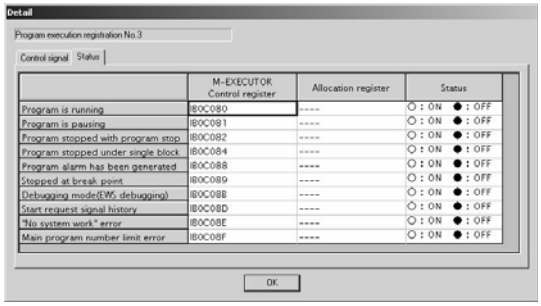
■ Caution

An allocation contact interlock is used to interlock the operation of a motion program.
When setting an allocation register, be sure to set the allocation contact interlock.

⑥ Status, Control Signal Details

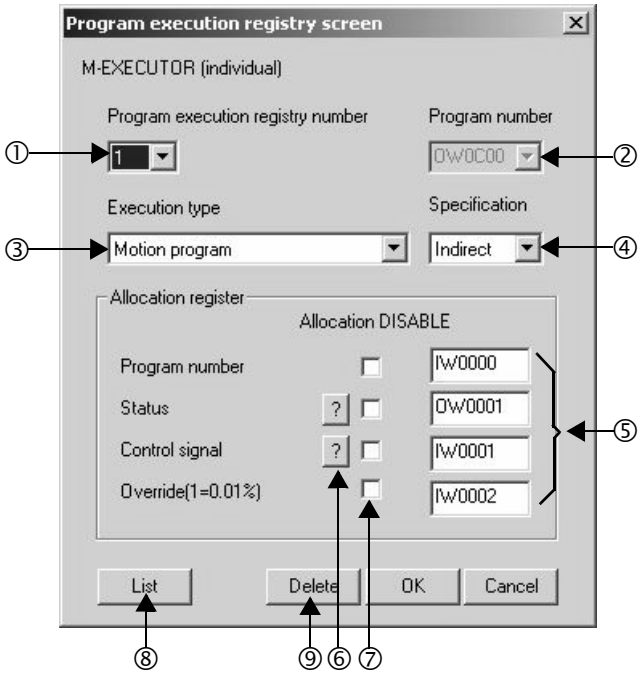
Double-click the status and control register to display the bit detail.
You can check the signal sequence and status here.





■ Program Execution Registration Screen (M-EXECUTOR (individual display) screen)

Click the **Individual Display** Button in the M-EXECUTOR (list display) dialog box to display this dialog box.
The items that can be set are similar to those in the program definition window and the control register mapping window.



① Program execution registry number
Selects a program execution registration No.

② Program number
Sets a program number.

③ Execution type
Sets the program execution type.

④ Specification
Sets the method of designating a program.

⑤ Allocation register
Sets a mapping register.

⑥ Status, Control signal
Displays the status and the signal sequence of the control register.

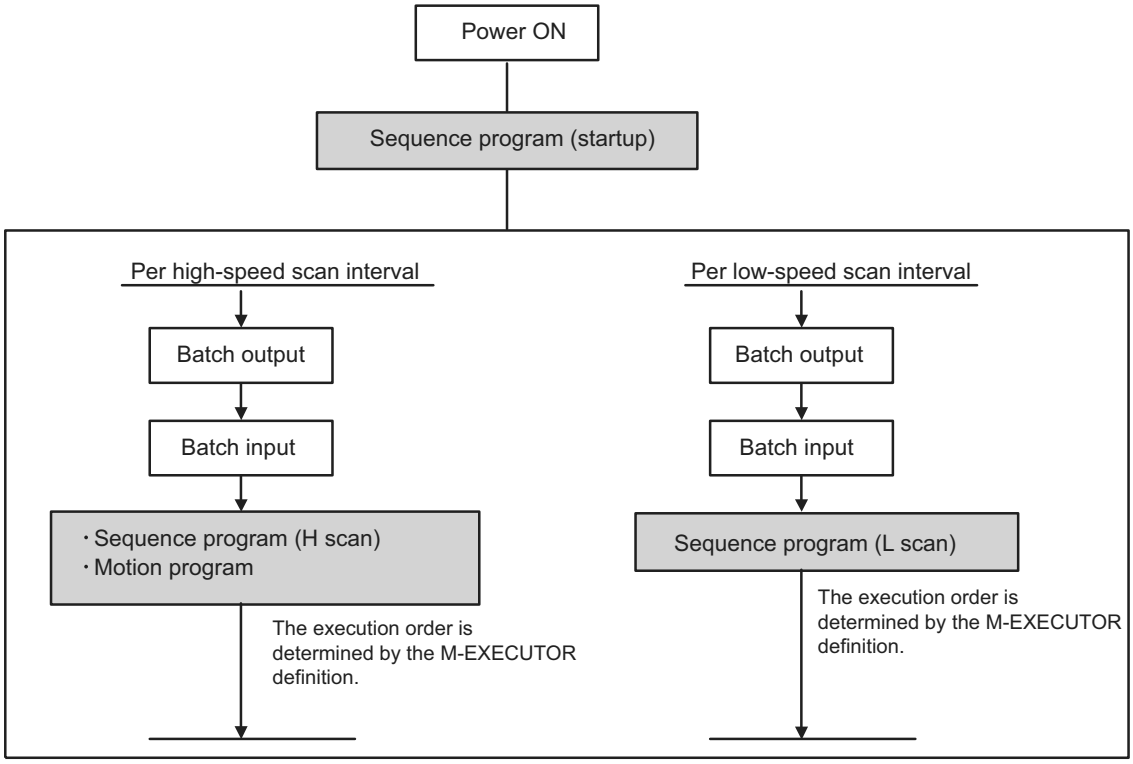
⑦ Allocation DISABLE
Enables/disables the allocation register. Uncheck to enable the definition.

⑧ List
Displays the M-EXECUTOR (list display) screen.

⑨ Delete
Deletes a definition.

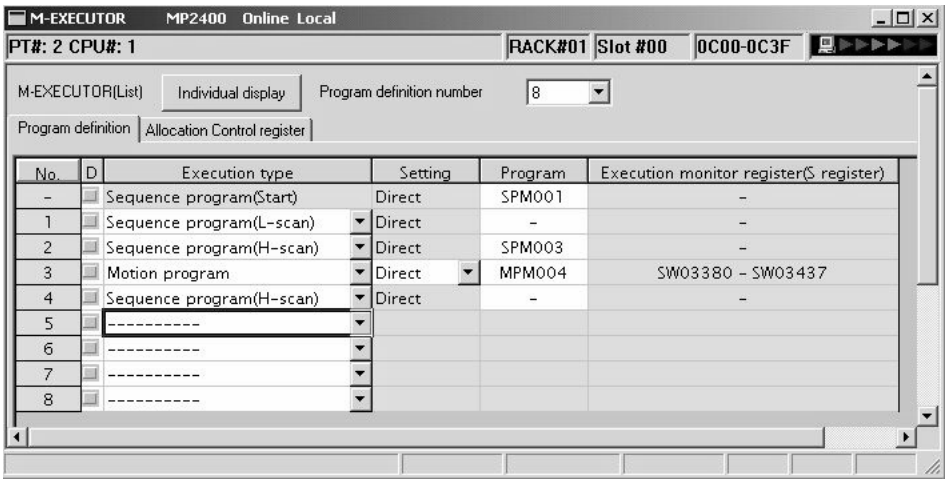
(5) Execution Scheduling

Programs registered in M-EXECUTOR are executed on the basis of their priorities (execution type).



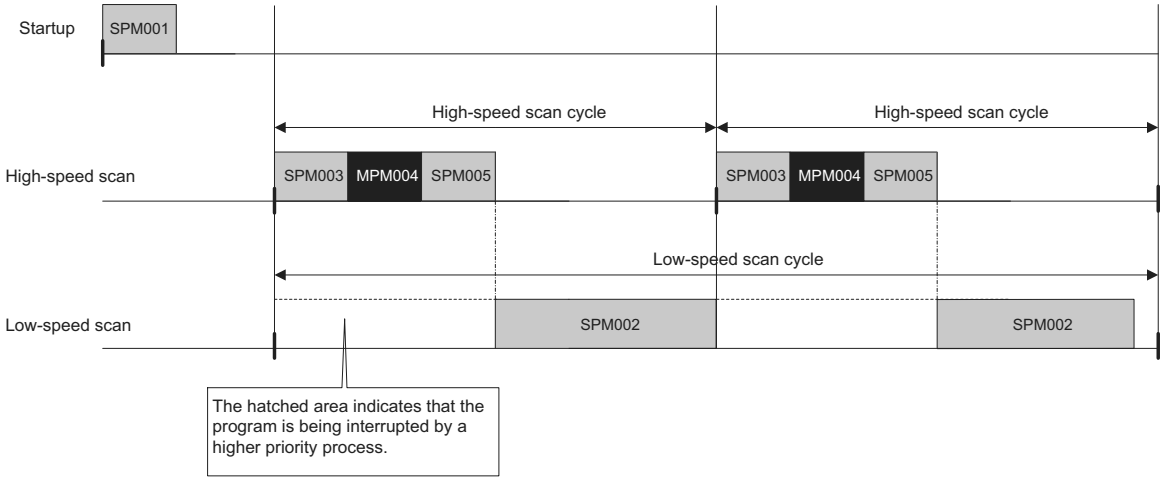
An execution example is as follows:

- M-EXECUTOR program definition



- Execution scheduling

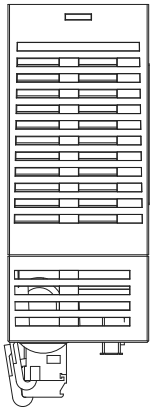
  The following diagram shows the execution scheduling when set in the screen above.

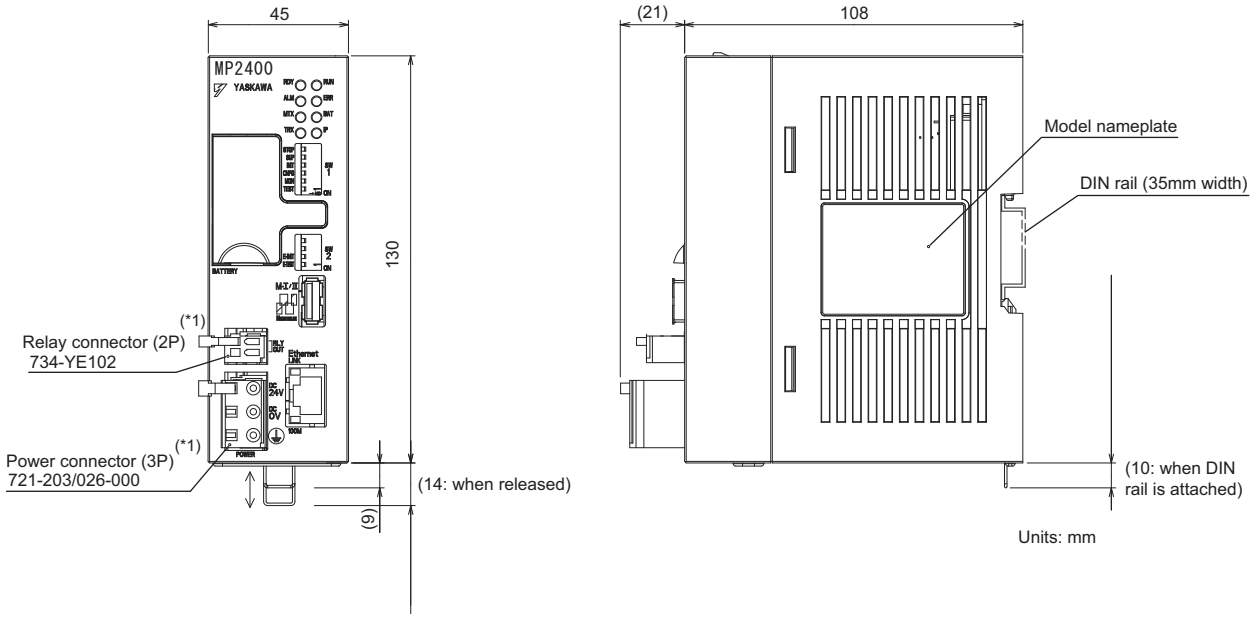


2.3 External Appearance

The external appearance of the basic module is as follows:

2.3.1 Basic Module

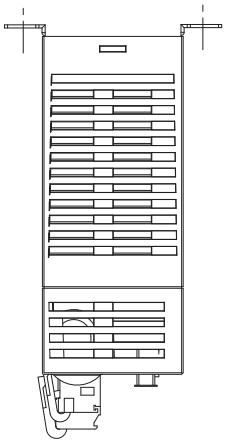


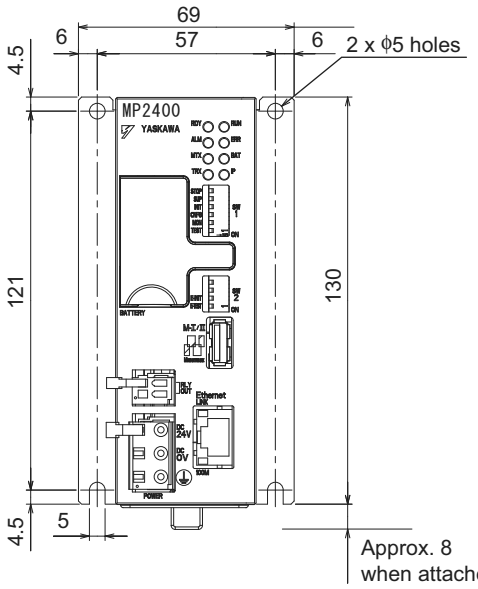


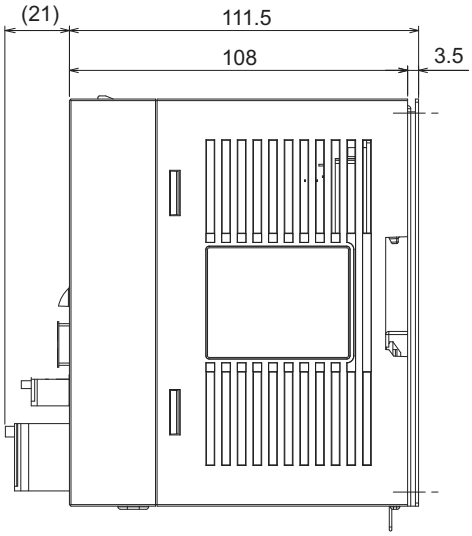
* 1. The following cable-side connectors are attached to the power and relay connectors.
  - Power connector: 721-203 / 026-000
  - Relay connector: 734-YE102

Note: Attachment
  - Handle for power connector (model: 231-131)
  - Handle for relay connector (model: 734-230)
    * These handles are used when connecting a cable to the cable-side connector.
  - Terminating resistor for MECHATROLINK (JEPMC-W6022-E)

2.3.2 Basic Module with Metal Fittings







Units: mm

3

Mounting and Wiring

This chapter explains how to handle MP2400 and the connection methods for each module.

3.1 Mounting MP2400

3.1.1 Method

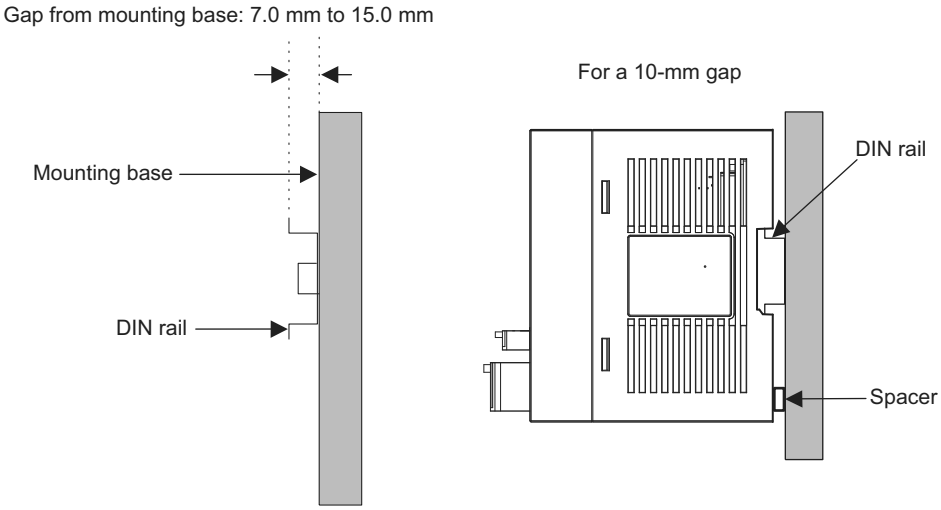
There are two methods for mounting MP2400.

- Using DIN rail (standard)
- Using screws

(1) DIN Rail Mounting

[a] DIN Rails and Spacer

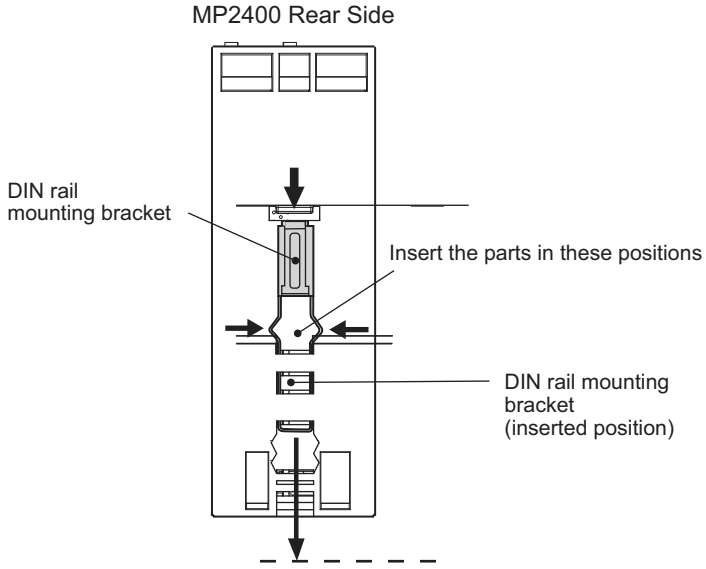
Several types of DIN rails are available: with 7-mm to 15-mm gap from the mounting base as shown in the following diagram. If mounting an MP2400 using DIN rail with 10 mm gap, install a spacer on the rear of the MP2400 near the bottom to protect the MP2400 from vibration and shock.



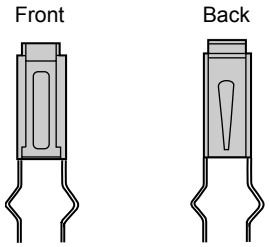
[b] Procedure for Mounting to DIN Rail

Use the following procedure to attach the DIN rail mounting parts to the MP2400 and then mount the MP2400 to the DIN rail.

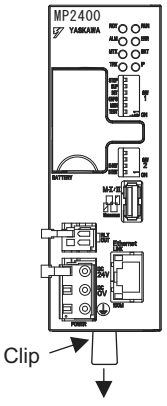
1. Insert the DIN rails to the dotted line in the two slots on the rear of the MP2400 as shown in the following figure.



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

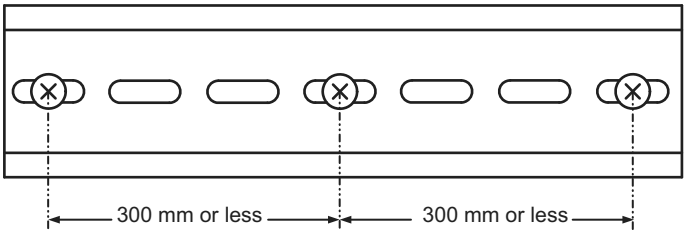


2. Pull the DIN rail mounting clips down to release them.

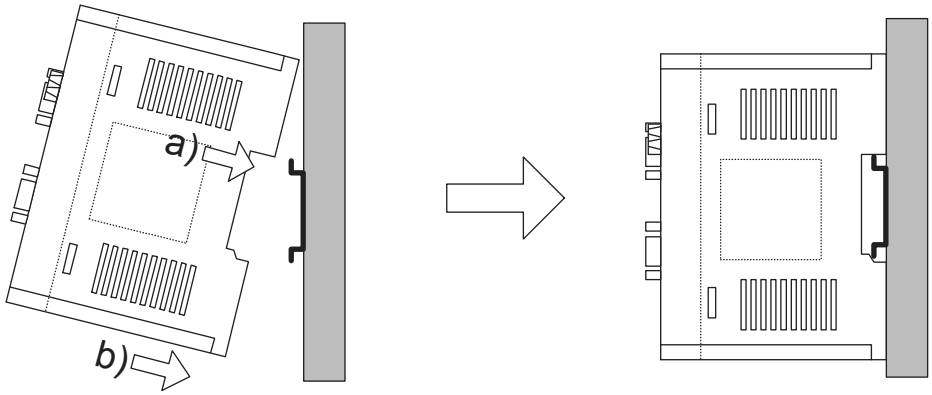


■ Fixing a DIN Rail

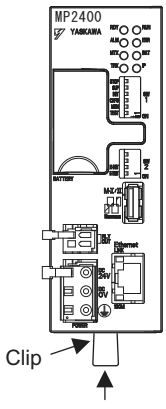
Make sure to fix a DIN rail at 300mm or less pitch as shown in the figure below.



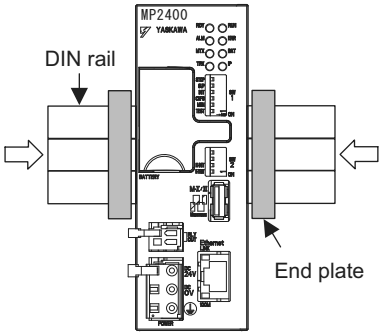
3. Hook the MP2400 to the top of the DIN rail (a), and then push the MP2400 towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MP2400 to secure it to the DIN rail.

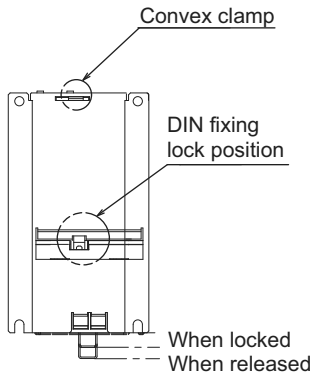


This completes the installation procedure.

(2) Screwed Method

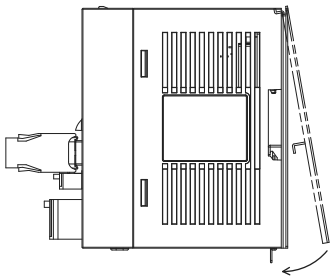
Use a panel mounting clamp (optional) by the following procedure to mount MP2400 on the panel.

1. Release the DIN fixing lock (one) at the center of the panel mounting clamp.



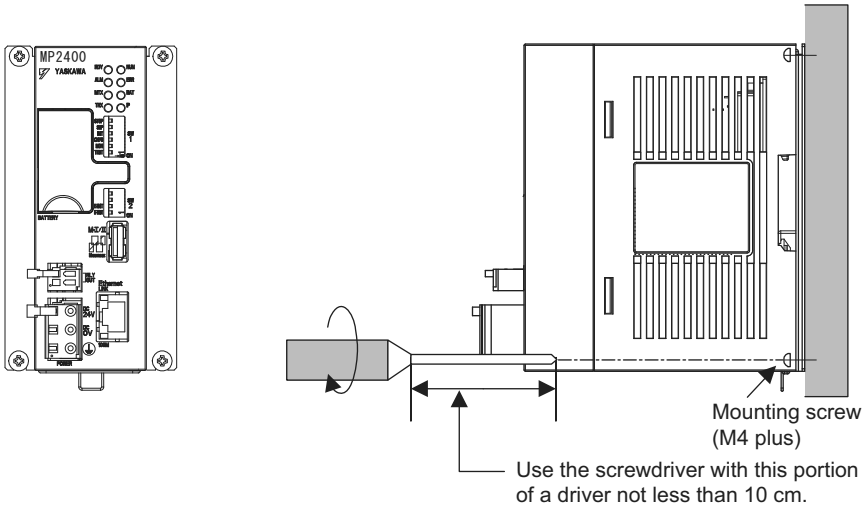
Attachment for mounting panel

2. Insert two convex portions at the top of the panel mounting clamp into holes of the MP2400 case.



3. Push the clamp as indicated by an arrow above onto the MP2400 case and use DIN fixing locks to fix MP2400.

4. Push the MP2400 mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.

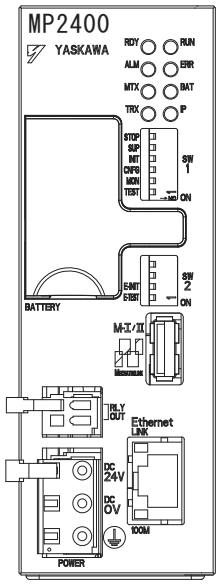


Note: Vertically mount it on the wall as shown in the figure above.

3.1.2 MP2400 Mount Direction

Be sure to mount the MP2400 using DIN rail or metal fittings.

View from front, when attached



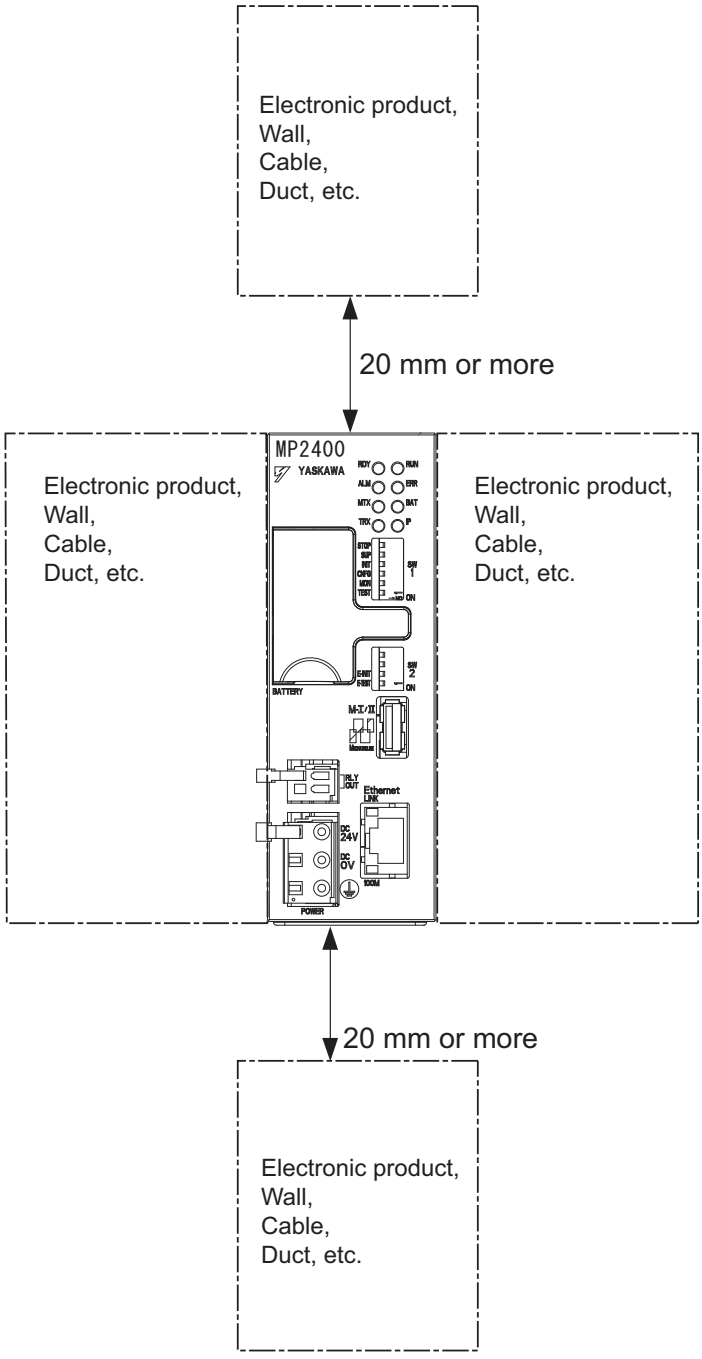
3.1.3 Space Required for Mounting MP2400

Install MP2400 so that enough space is left around it as shown in the following figure:

■ Mount condition

- Vertical direction: 20 mm or more
- Horizontal direction: no condition

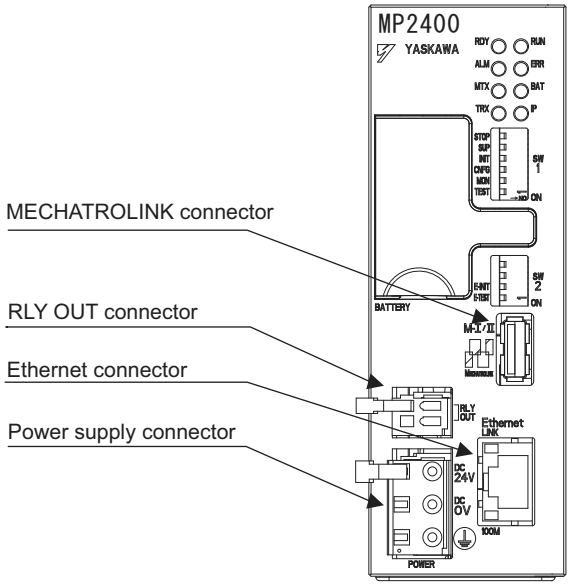
Note: However, ambient temperature should be 55°C or less.



3.2 Basic Module Connections

3.2.1 Connectors

The following diagram shows the connectors for the Basic Module.

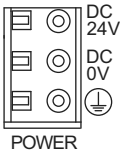


3.2.2 Power Supply Connector

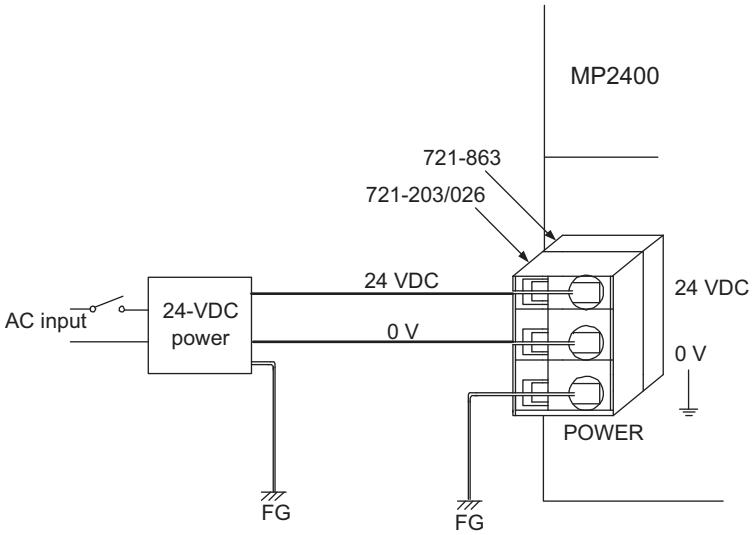
(1) Specifications, Pin Arrangement, and Connection Procedure

Supply a 24-VDC to the MP2400. 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	24 V	24 VDC input
0 VDC	0 V	0 V input
⏚	FG	Frame ground (Ground to 100 Ω or less.)

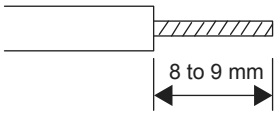


- Use an insulated 24-VDC power supply. Attach the power supply switch on the AC side. If the switch is attached on the 24-VDC side, there will be an inrush current of approximately 40 A when the power is turned ON.

(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. 8 to 9 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.

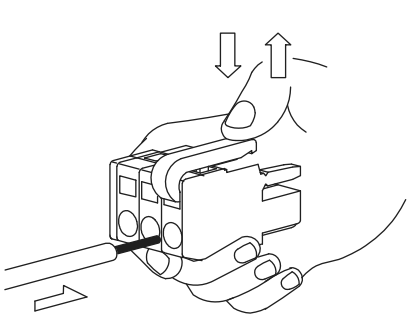


Fig. A (with lever)

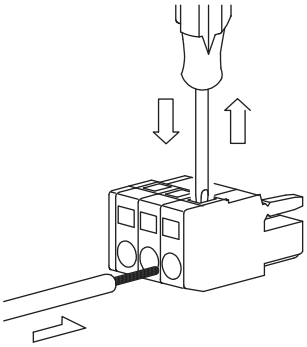


Fig. B (with screwdriver)

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

3.2.3 MECHATROLINK Connectors

MECHATROLINK connector is used to connect the MP2400 and the SERVOPACKs and distributed I/O via MECHATROLINK cables.

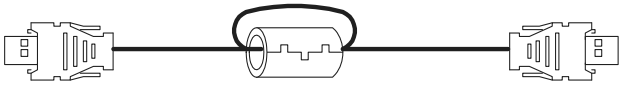
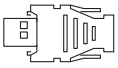
(1) Specifications and Pin Arrangement

Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
MECHATROLINK Connector	M-I/II	8	DUSB-ARB82-T11A-FA	DUSB-APA42-B1-C50	DDK Ltd.

M-I/II 

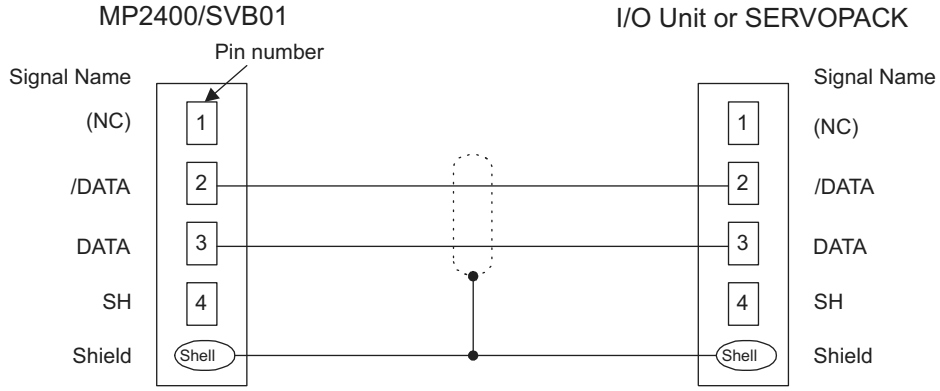
No.	Signal Name	Description	No.	Signal Name	Description
A1	–	–	B1	–	–
A2	SRD–	Signal –	B2	SRD–	Signal –
A3	SRD+	Signal +	B3	SRD+	Signal +
A4	SLD	Shield	B4	SLD	Shield

(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
MECHATROLINK Cable 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-W6003-50	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 MP2400 and I/O Units and the MP2400 and SERVOPACKs

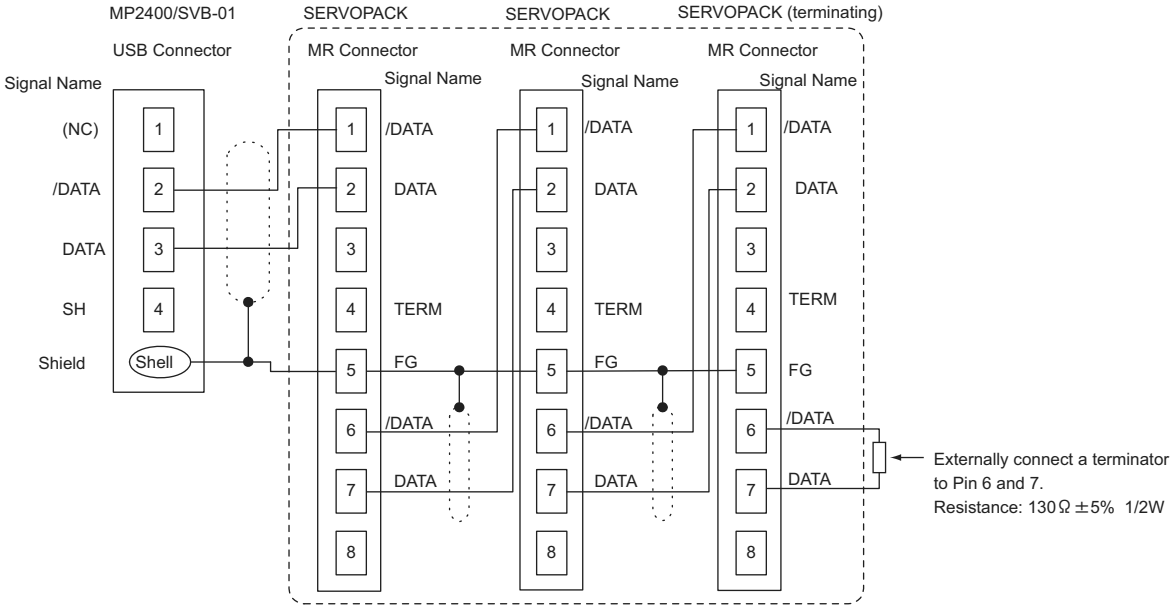
Use the MECHATROLINK cable JEPMC-W6002-□□ or JEPMC-W6003-□□ with a ferrite core for connection between the MP2400 and I/O units or SERVOPACKs.



Standard model: JEPMC-W6002-□□ and JEPMC-W6003-□□

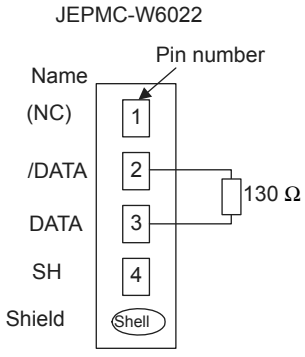
(4) Cable Connections between the MP2400 and SGD-□□□N and SGDB-□□AN SERVOPACKs

Use the MECHATROLINK cable JEPMC-W611-□□ for the connections between the MP2400 and SGD-□□□N or SGDB-□□AN SERVOPACK and between these SERVOPACKs.

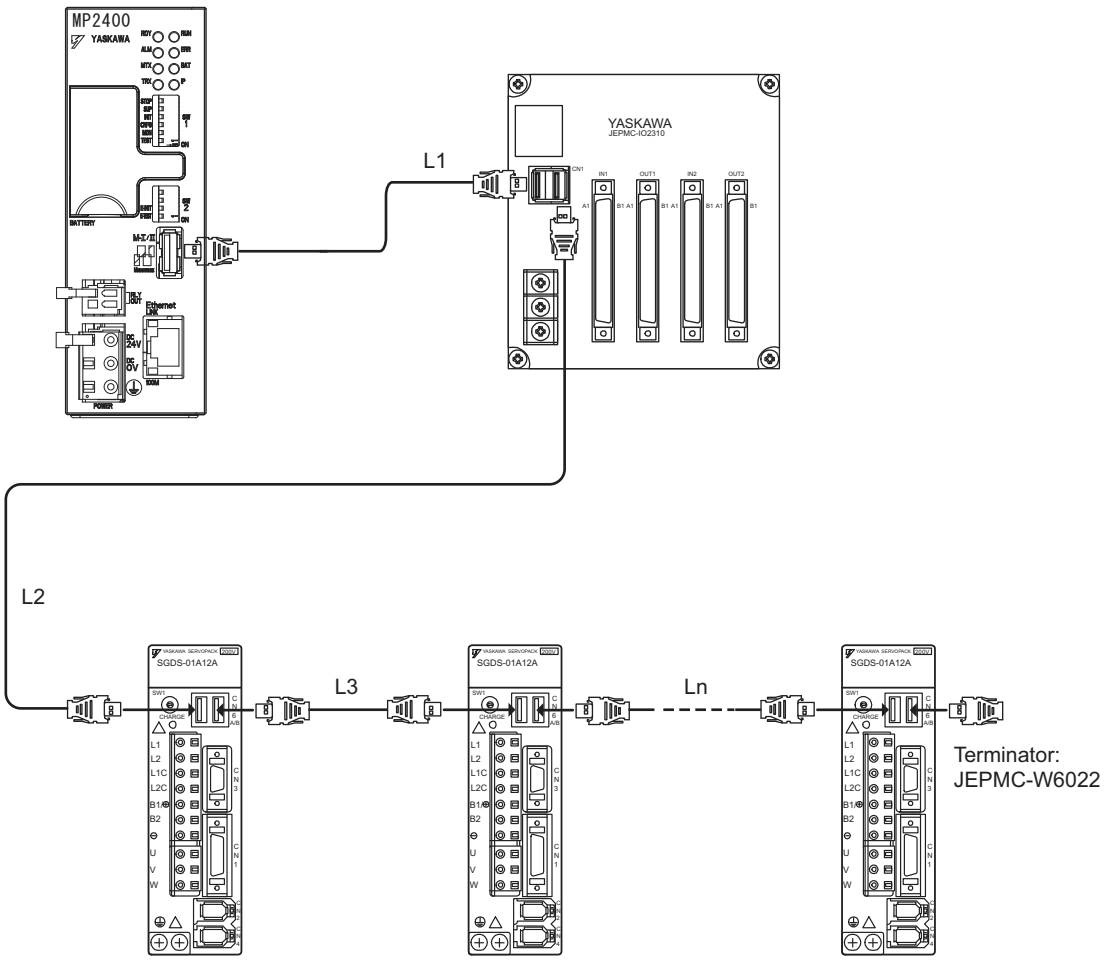


Note: 1. The JEPMC-6011-□□ has a USB connector on one end and loose wires on the other end. Use an MR connector and wiring material to create a 1:N cable. The terminator must be provided by the user.
2. The shield wire can be connected as instructed in the SERVOPACK's manual. However, the connections shown in the above diagram is recommended when using the MP2400 in combination with MP2000 series machine controllers.
3. 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 MP2400, SERVOPACK, and IO2310



- Use MECHATROLINK cables between modules.
- Use under the conditions that L1 + L2 + L3 + . . . + Ln ≤ 50 m

3.2.4 Ethernet Connector Details

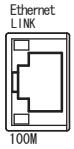
Connects to a personal computer or HMI device by Ethernet (100Base-TX /10Base-T).

(1) Ethernet Connector Specification and Pin Arrangement/ Indicator Light

The following table provides the Ethernet connector specifications.

Name	Connector Name	Number of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
Ethernet	Ethernet	8	RJ-45 CAT5 Socket	RJ-45 CAT5 Plug	Pulse Engineering

The following table provides Ethernet connector pin arrangement/ indicator light details.



Pin Number	Signal Name	Description
1	TXD+	Transmitted data + side
2	TXD-	Transmitted data – side
3	RXD+	Received data + side
4	–	–
5	–	–
6	RXD-	Received data – side
7	–	–
8	–	–

Display Name	Display Color	Description
LINK	Yellow	Lit: Connect Unlit: Unconnected
100M	Green	Lit: Connected at 100Mbps, or automatically negotiating Unlit: Connected at 10Mbps

(2) Ethernet Cable

For the Ethernet cable, use a twisted pair cable with RJ-45 connector.

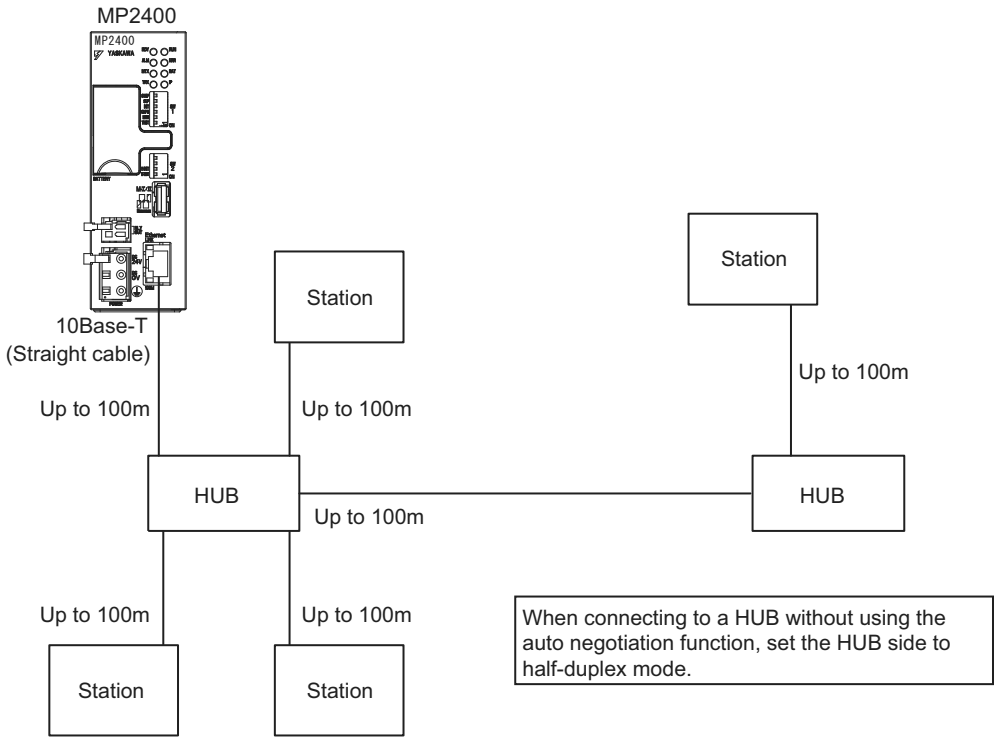
Ethernet Type	Category	Remarks
10Base-T	Category 3 or more	• When connecting to remote equipment through a hub: Straight cable • When connecting to remote equipment without using a hub: Cross cable
100Base-TX	Category 5 or more	

(3) Ethernet Connection Example

The following are examples of Ethernet network connections via 10Base-T cable:

■ Connection Example 1

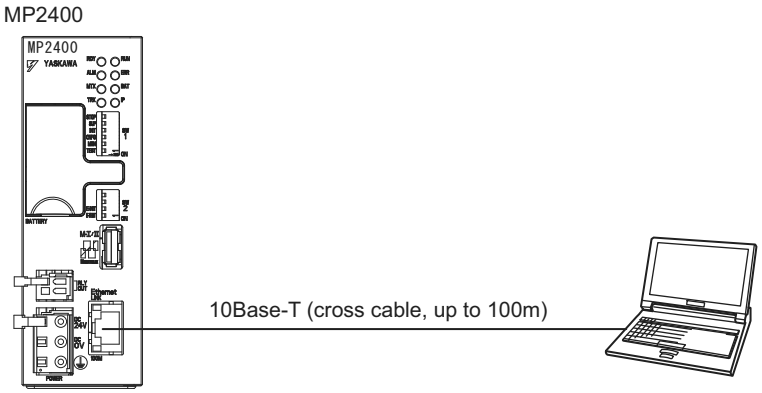
When using a repeater HUB:



Specification

Item	When Connecting to a Repeater HUB	When Connecting to a Switching HUB
Cable Length between Node-HUB	100 m or less	100 m or less
Cable Length between HUBs	100 m or less	100 m or less
Number of HUBs between Nodes	Up to four	Unlimited

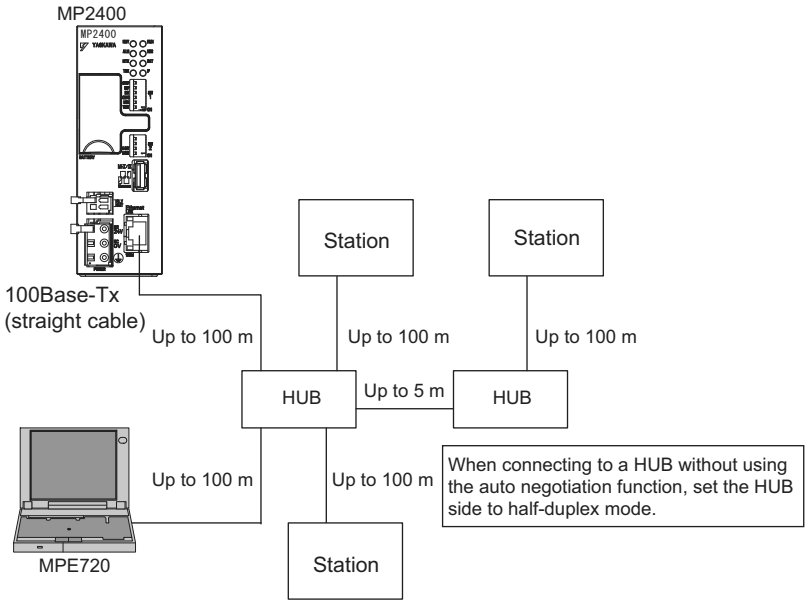
■ Connection Example 2



The following are examples of Ethernet network connections via 100Base-Tx cable:

■ Connection Example 3

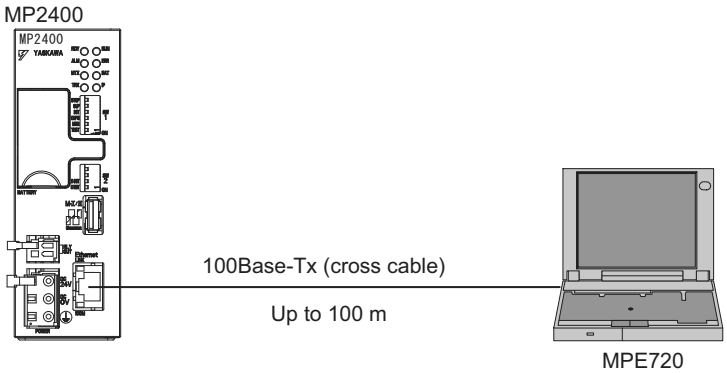
When using a repeater HUB:



Specification

Item	When Connecting to a Repeater HUB	When Connecting to a Switching HUB
Cable Length between Node-HUB	100 m or less	100 m or less
Cable Length between HUBs	5 m or less	100 m or less
Number of HUBs between Nodes	Up to two	Unlimited

■ Connection Example 2



■ Caution

High frequency wave noise from other devices in the installation environment may cause error in communications using 100 BASE-Tx or MECHATROLINK connections. When constructing a system, use MP2400 protective measures to avoid the influence of high frequency wave noise as follows:

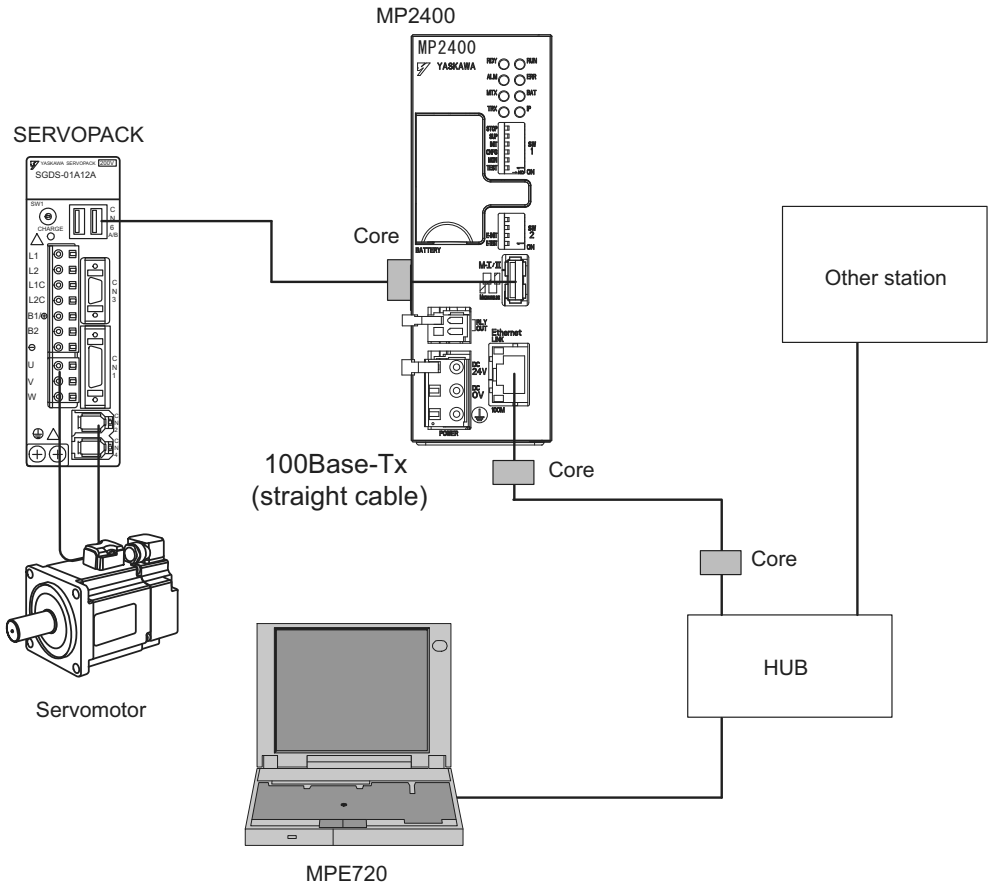
1 Wiring
Wire Ethernet or MECHATROLINK cables so that they are well-separated from other cable systems such as the main circuit or power lines.

2 Communication system (100BASE-TX)
- Communicate data to a remote device through TCP/IP communication.
- If necessary, increase the number of communication retries.

3 Attach a ferrite core.
Attach a ferrite core in the manner described below:

Ethernet : Attach it to the communication port side and the external equipment side of the MP2400 main unit.

MECHATROLINK : Attach it only to the communication port side of the MP2400 main unit.
(We will provide a standard cable with core. Model: JEPMC-W6003-□□)



Note: Recommended ferrite core

Model:	Manufacturer
E04SR301334	Seiwa Electric Mfg. Co., Ltd

3.2.5 RLY OUT Connector Details

The RLY OUT connector is a terminal for outputting state and NO contact relay output. A circuit between terminals is short-circuited when RDY LED is lit, and opens when it is unlit.

Note: A state when RDY LED is lit indicates that a controller is operating normally. It does not indicate that an user program is running.

(1) RLY OUT Connector Specifications and Pin Arrangement

The following table provides the RLY OUT connector specifications.

Name	Connector Name	Number of Pins	Connector Model		
			Module Side	Cable Side	Manufacturer
RLY OUT	RLY OUT	2	734-162	734-YE102	Wago Corporation

The following table shows the RLY OUT connector pin arrangement.

Pin Number	Signal Name	Description
1	OUT	• Operating normally: Short-circuit • Error occurred: Opened
2	OUT	

The following table provides the RLY OUT connector contact ratings.

Input Voltage	Current Capacity
24 VDC	0.5 A (resistance load) 0.25 A (induced load)
125 VAC	0.4A (resistance load) 0.2A (induced load)

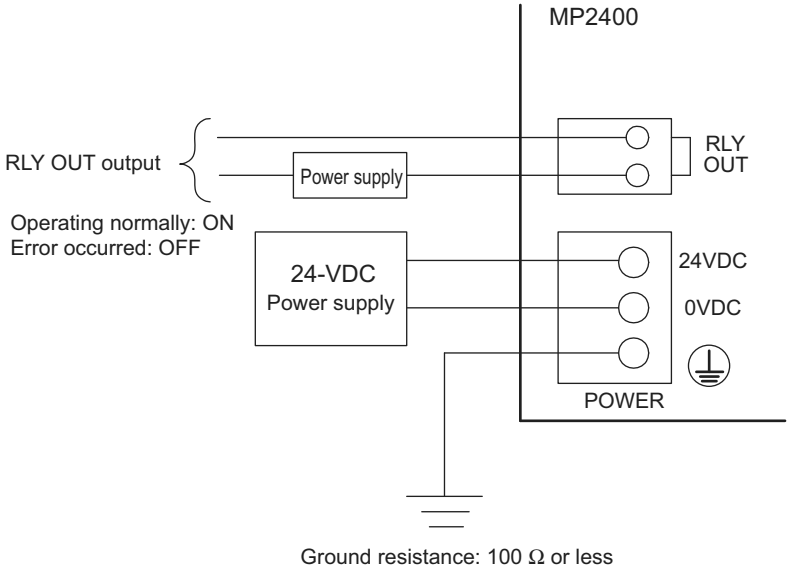
(2) RLY OUT Connection Cable

For the RLY OUT connection cable, use a cable of line size AWG28 to AWG14 (0.08 mm^2 to 1.5 mm^2), maximum sheath diameter ϕ3.4 mm.

The RLY OUT connector cable is similar in manufacture to the 24-VDC power supply cable.

(3) RLY OUT Connection Example

The following figure shows how to connect the RLY OUT connector:



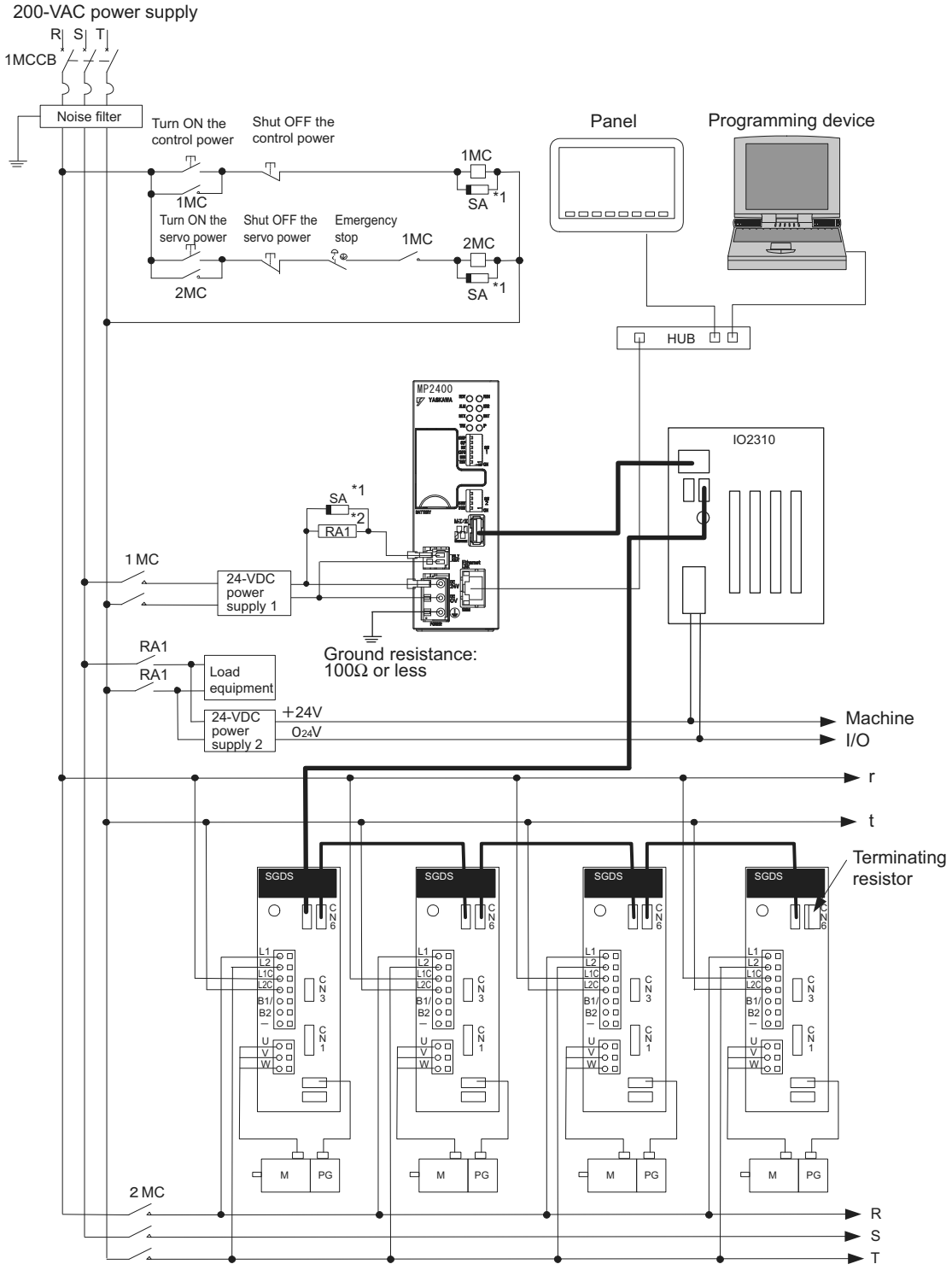
Ground resistance: 100 Ω or less

3.2.6 System Connection Example

The following diagram shows a connection example of a system using the MP2400.

The following diagram shows a 200-VAC power supply example.

Note: elect the SERVOPACK, 24-VDC power supply to use in accordance with the input power supply specification.



*1 SA: Surge absorber (for switching surge)
*2 RAI: CPU RUN output

4

System Start Up and Easy Programming

This chapter explains how to start up a model system using the programming tool MPE720 Ver.6. Note that the procedure for designing a mechanical system has been omitted here.

4.1 System Startup Overview

The start-up procedure for a model system is as follows. For detailed information of each step, refer to the cited references.
This chapter explains a procedure where you can easily run and check a program without external signals.
The simple motion program which you create has three lines only, moving and stopping 150,000 pulses from the current position.

```
INC;        Specify an incremental mode
MOV         [A1]150000, [B1]150000;Position two-axes 150,000 pulses
END;
```

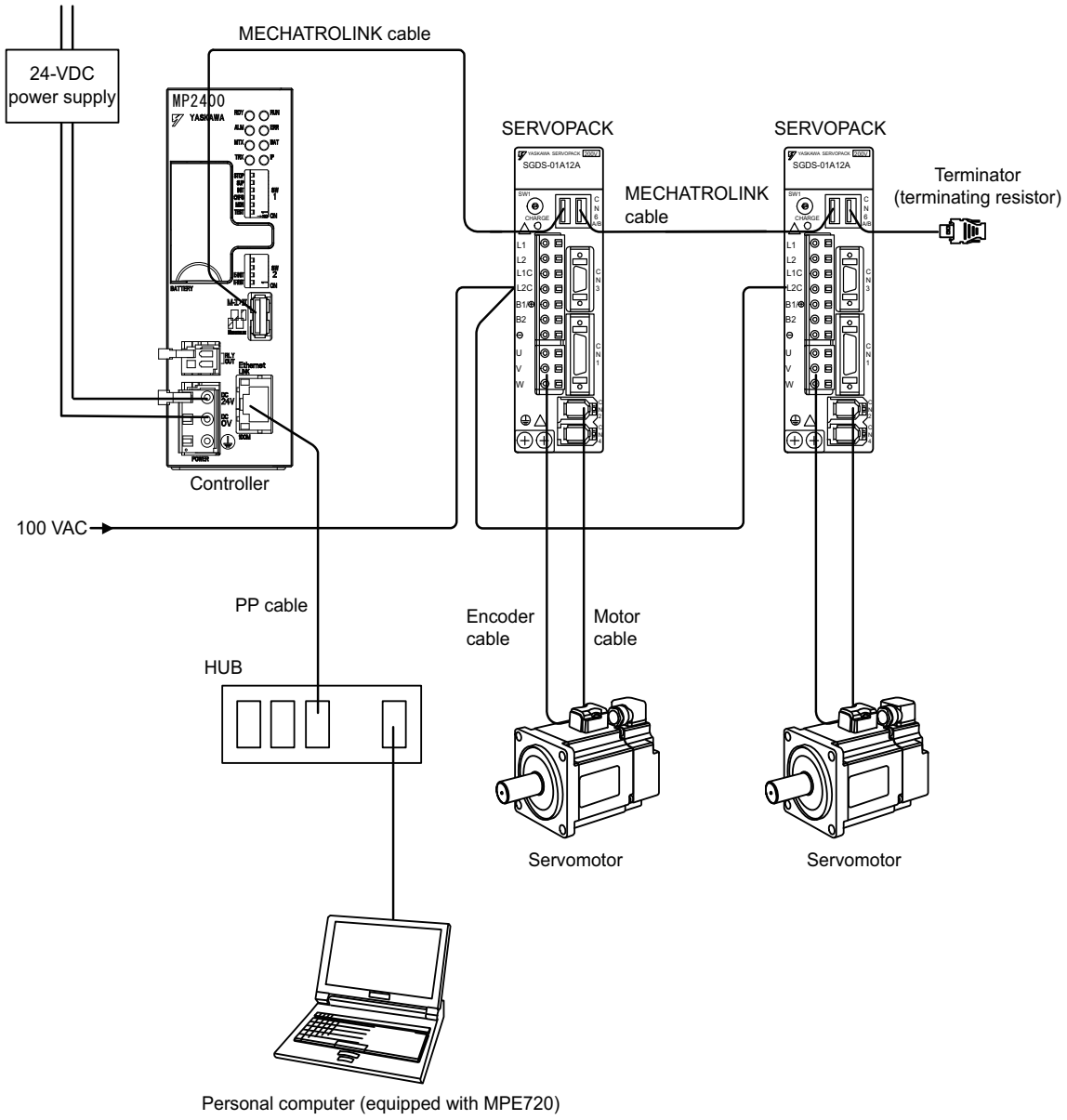
4.2 Preparation (step 1)

This section explains the steps of "wiring," "self-configuration," and "test operation" for starting up the model system.

4.2.1 Wiring

We use the following layout model to explain the startup of the model system. Prepare each device listed on the next page and connect them as shown in the figure below.

(1) System Layout Model



[a] Required Equipment

Product Name	Model	Q'ty
MP2400	JEPMC-MP2400-E	1
MECHATROLINK cable (0.5m)	JEPMC-W6002-A5	2
Terminator (terminating resistor)	JEPMC-W6022	1
Σ-III SERVOPACK	SGDS-A5F12A	2
Σ-III servomotor	SGMAS-A5A2A21	2
Motor cable (3m)	JZSP-CSM01-03	2
Encoder cable (3m)	JZSP-CSP05-03	2
HUB (commercial product)	LSW-TX-8EP	1
MPE720 Ver.6 Lite	CPMC-MPE770L	1
LAN cable (for Ethernet connection)	Commercial straight cable	2
Personal computer (main unit)	Commercial product	1
24-VDC	Current capacity of power supply 2A or more	1

■ Caution

- Install MPE720 Ver.6 in the personal computer before starting step 1.
  For information on its installation, refer to "MP2000 Series MPE720Ver.6.0 Users Manual" (manual number: SIEPC88070030).
- Set the PC Ethernet port in advance. For information on the setup, refer to *Appendix F How to Set up Communication Process* on page A-32.
- The SERVOPACK station number (SW1) is set to 1 and 2.
- In a 1:1 connection without HUB, use a cross cable as a LAN cable.

4.2.2 Self Configuration

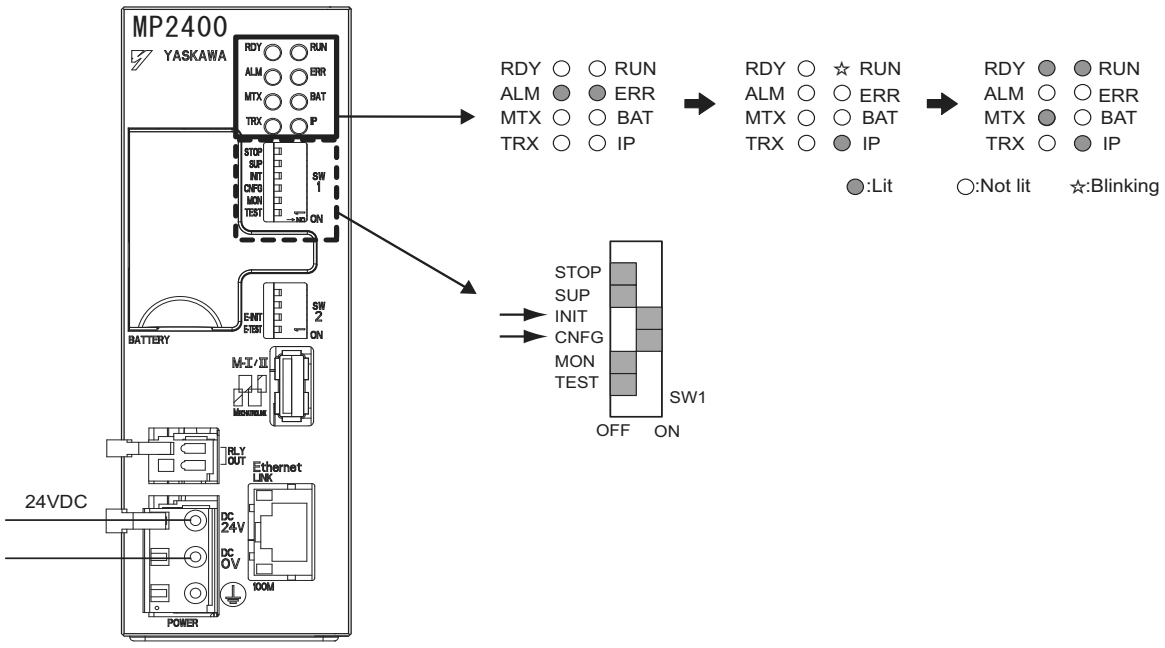
Run the self configuration to automatically recognize devices connected to the MECHATROLINK connector. Steps for self configuration are as follows.

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

2. Turn OFF the MP2400 24-V power supply.

3. Turn ON “INIT” and “CONFIG” of DIP switch (SW1) on the MP2400 main unit.

4. Turn ON the 24-VDC power supply on the MP2400 main unit, and confirm the LED display changes as follows:



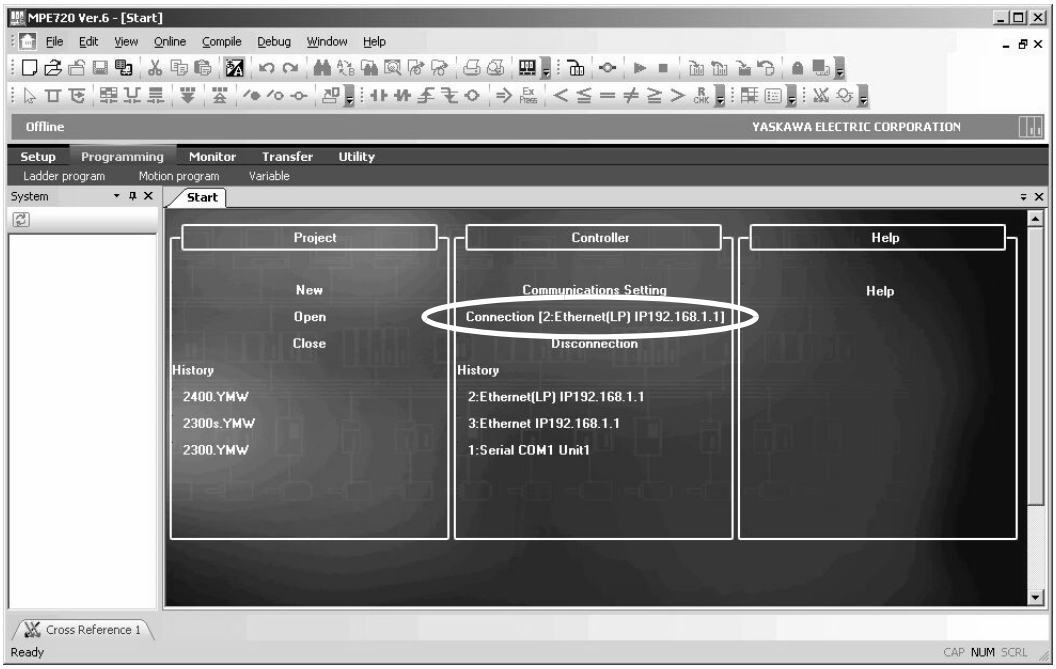
5. Self configuration is complete, and MECHATROLINK slave device information has been written to a definition information file.

4.2.3 Test Operation

Confirm that the machine controller can command axis servo ON/OFF and jog operation.

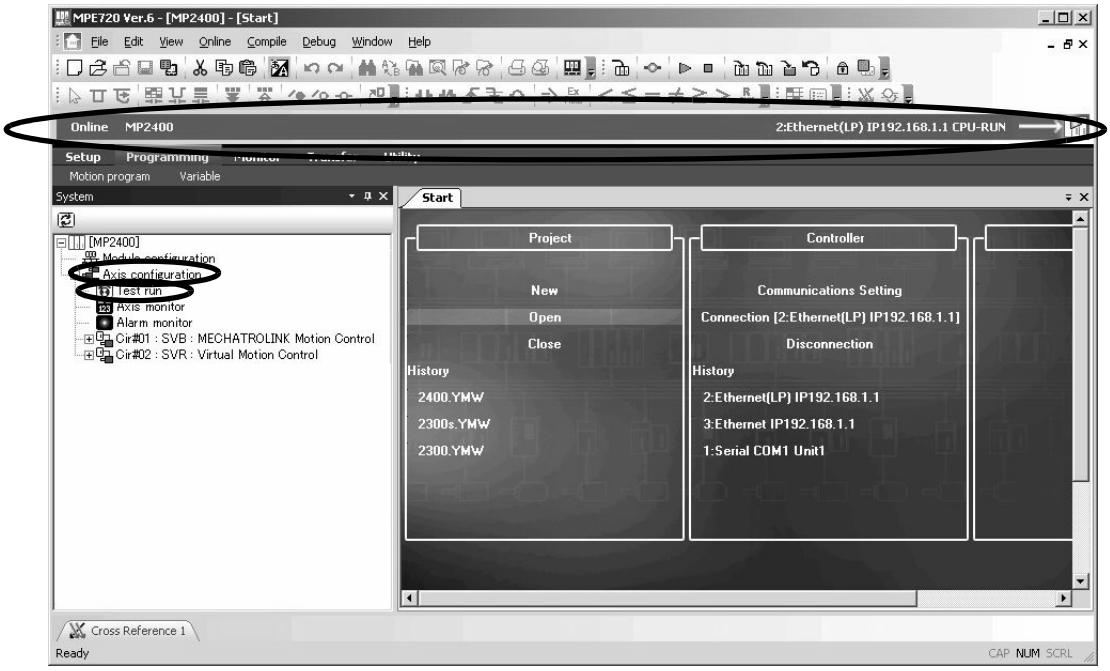
(1) Starting and Connecting MPE720 Ver.6 Lite

Launch MPE720Ver.6 Lite and click “1:Ethernet(LP)192.168.1.1” to connect to the controller.
For more information on the communications settings, refer to *Appendix F How to Set up Communication Process* on page A-32.



When the connection is complete, the display will change from offline to online.

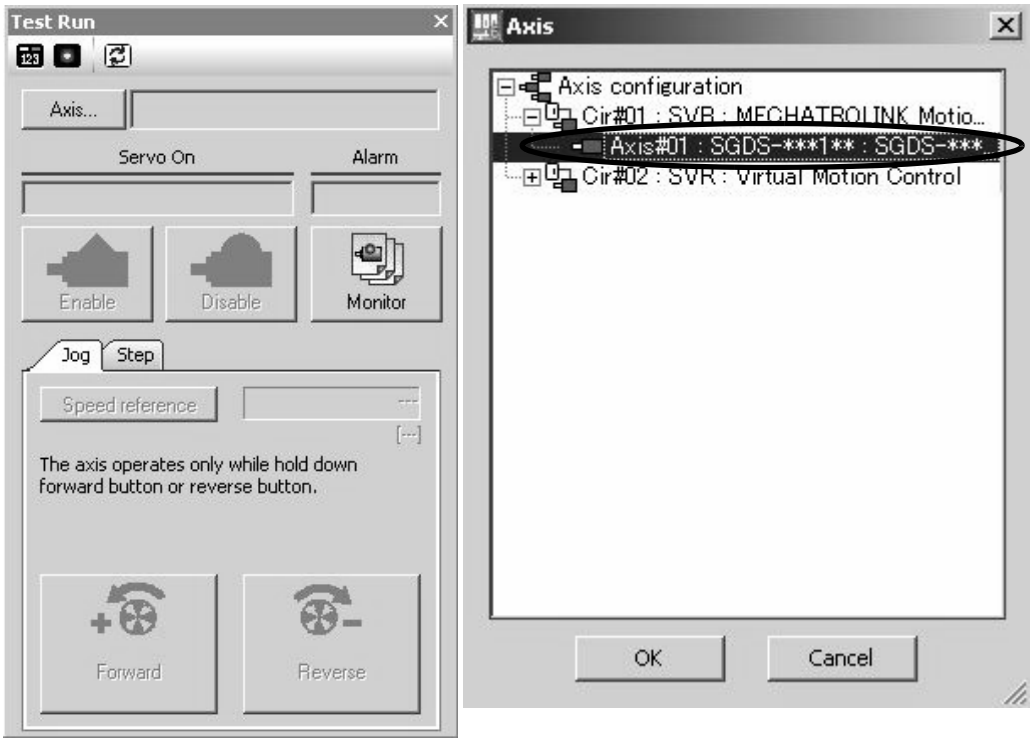
(2) Operating Manually in the Test Operation Screen

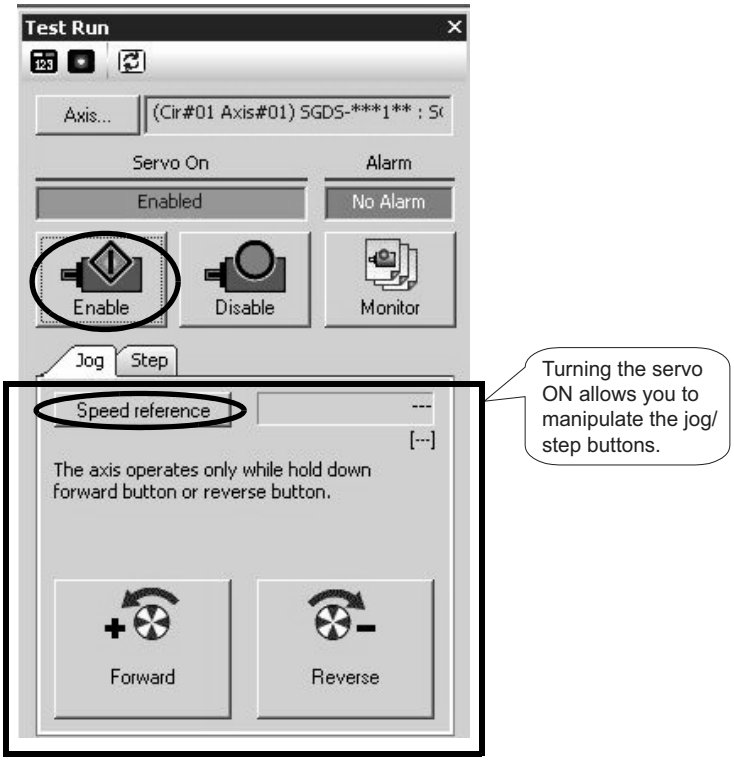


1. Click **System** in the subwindow and double-click ***Axis Configuration - Test Run*** to display a warning dialog a box for the test run. Click the **Accept** Button.

2. Axis Selection and Servo ON

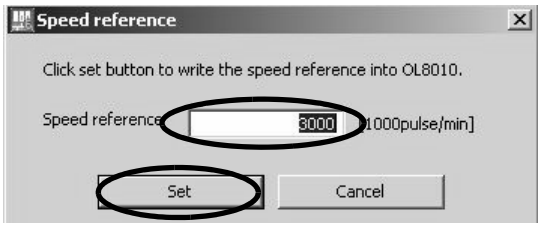
Set an axis number in the **Axis** Window and click the **Enable** (Servo ON) Button in the **Test Run** Window.

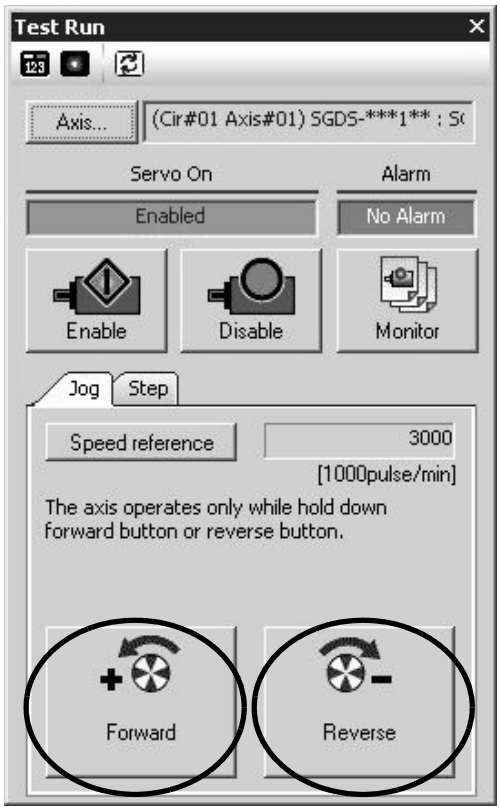




3. Jog Operation

Click the Speed reference icon and set a speed reference value, and check that the axis rotates normally while the **Forward** Button or **Reverse** Button is pressed.





The operation check of the first axis is complete.

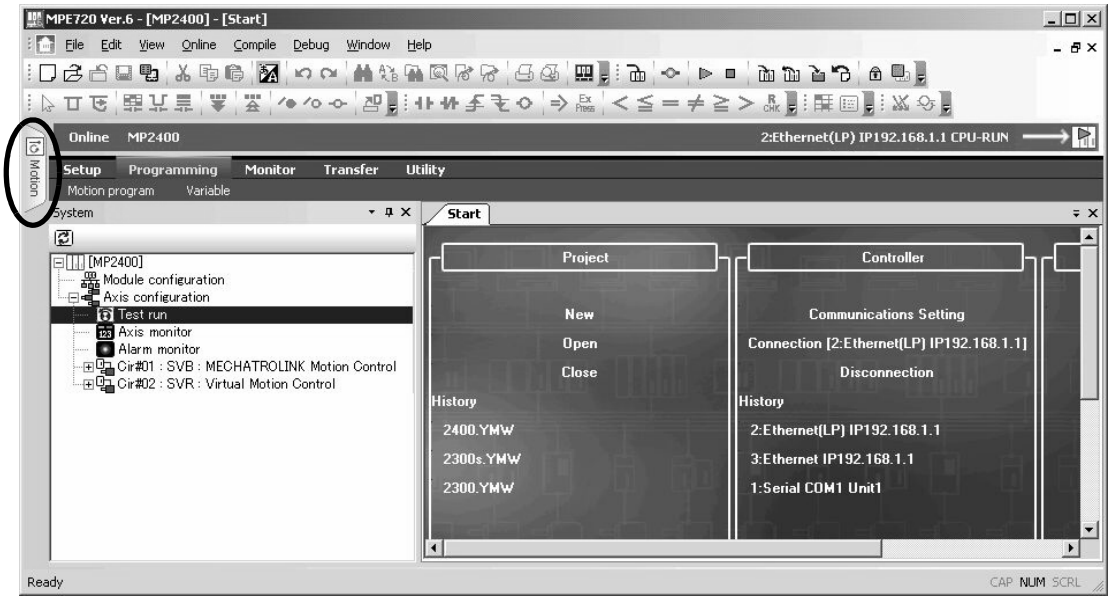
Press the **Axis ...** Button to change to “Axis #02” in the axis select screen, and perform the steps 1 to 3 above.

4.3 Programming (step 2)

This section describes the procedure from creating to saving a motion program.

4.3.1 Programming Procedure

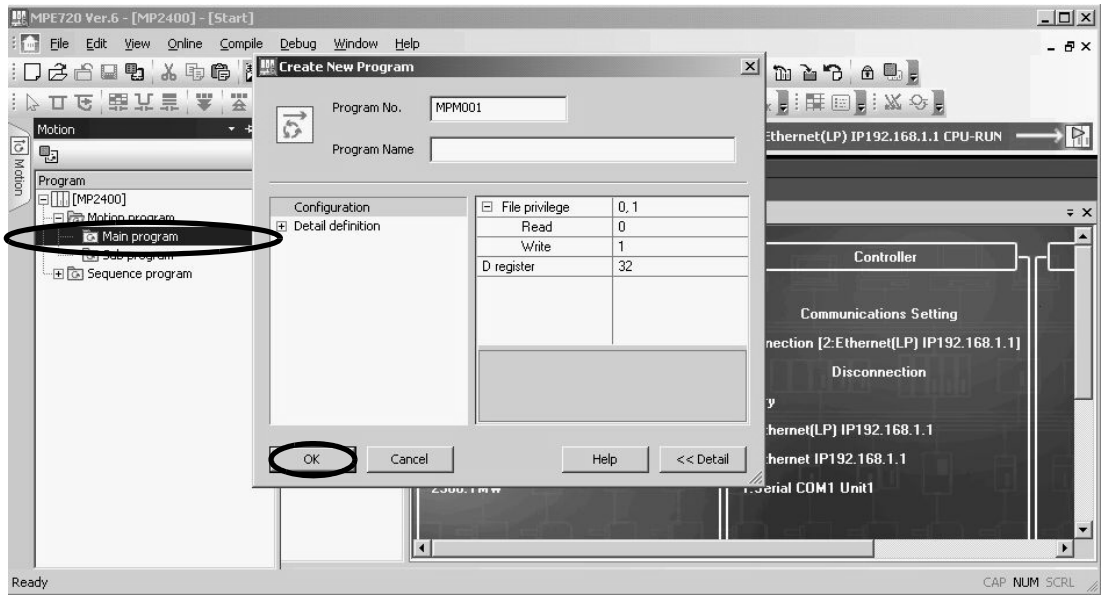
1. Click the **Motion** Tag in the subwindow.



2. The motion program subwindow will appears.

When you double-click **Motion Program** and there is not any group definition, the group definition screen will be shown. For this setting example, you do not need to change it, so accept the default setting and click the **OK** Button. Note that if a group definition already exists, the group definition screen will not be shown.

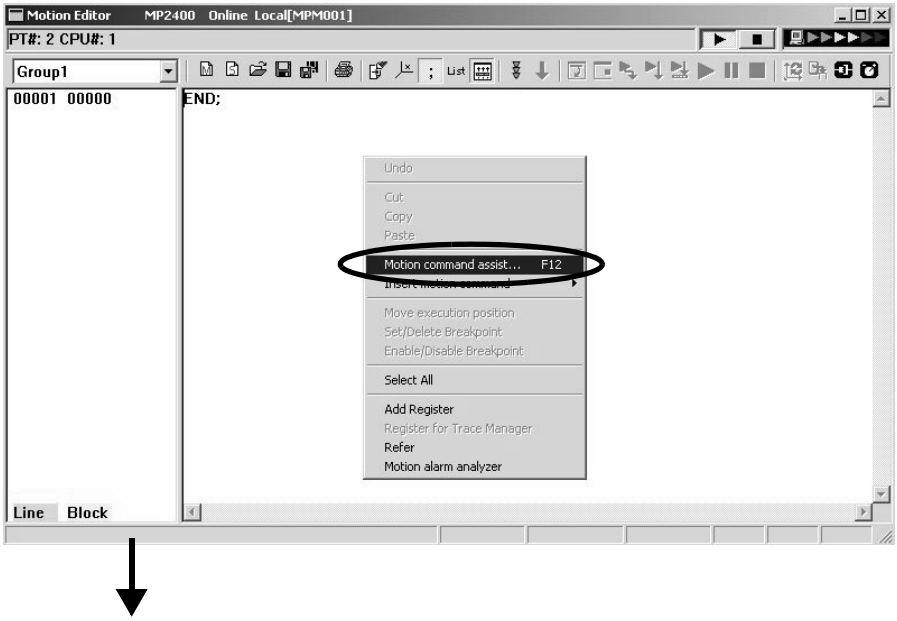
3. Right-click **Main Program** and select **Create New** to display the **Create New Program** Dialog Box. Then click the **OK** Button.



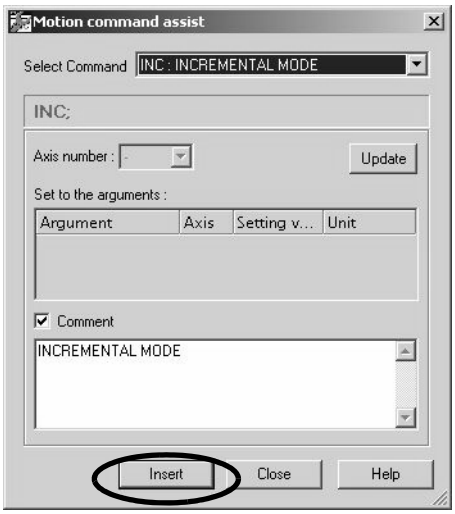
4. Editing Motion Program

Use the command input assist feature to insert INC and MOV Commands into the motion program.
The command input assist feature is made accesible by right-clicking the mouse on the **Motion Editor** Window.

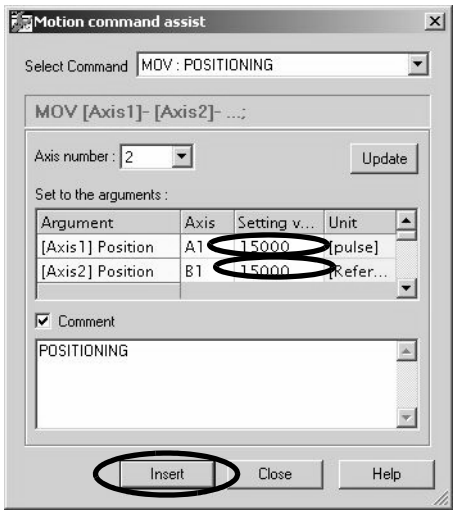
- Call the command input assist feature



- Insert an INC Command



- Insert a MOV Command

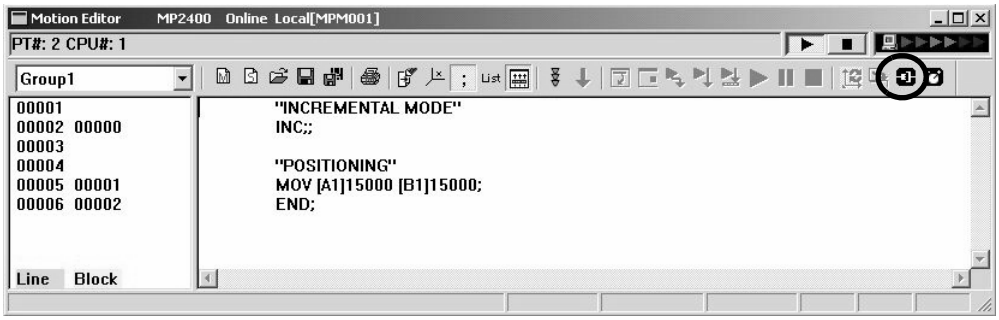


Click the save icon to save the motion program.

4.4 Executing Motion (step 3)

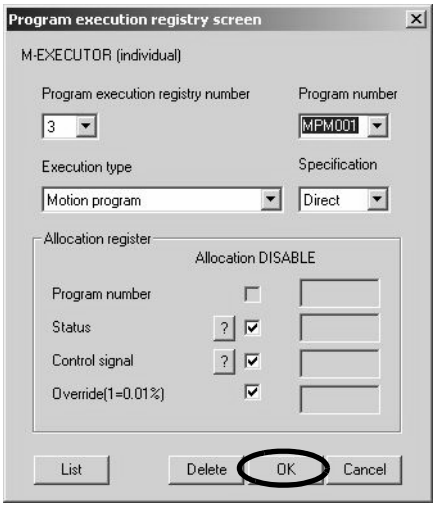
4.4.1 Registering Program Execution

1. Click the **Execution Registration** Icon.



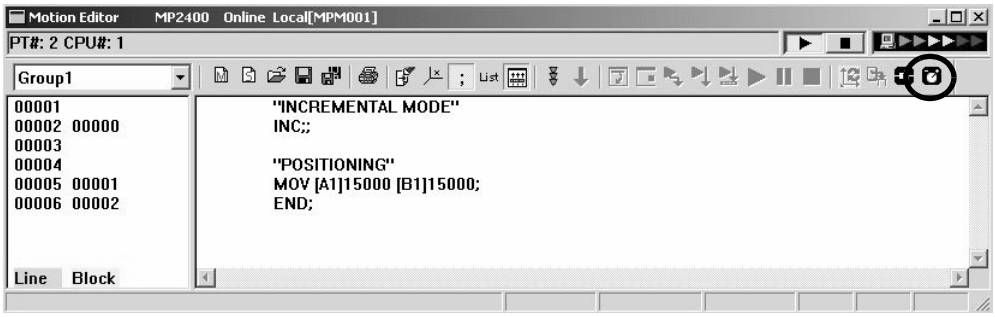
The **Program Execution Registry Screen** Dialog Box will appear.

2. Check Program Number and click **OK** to save the registered contents.



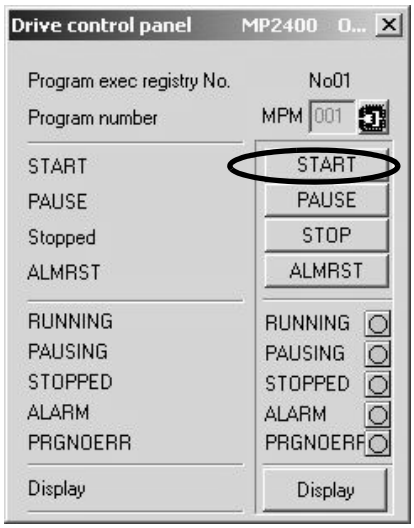
4.4.2 Starting a Motion Program Using the Operation Control Panel

1. Click the **Operation Control Panel** Icon.



The **Device Control Panel** Dialog Box will appear.

2. Check Program to run, and click the **START** Button.



The MPM001's motion program is executed.

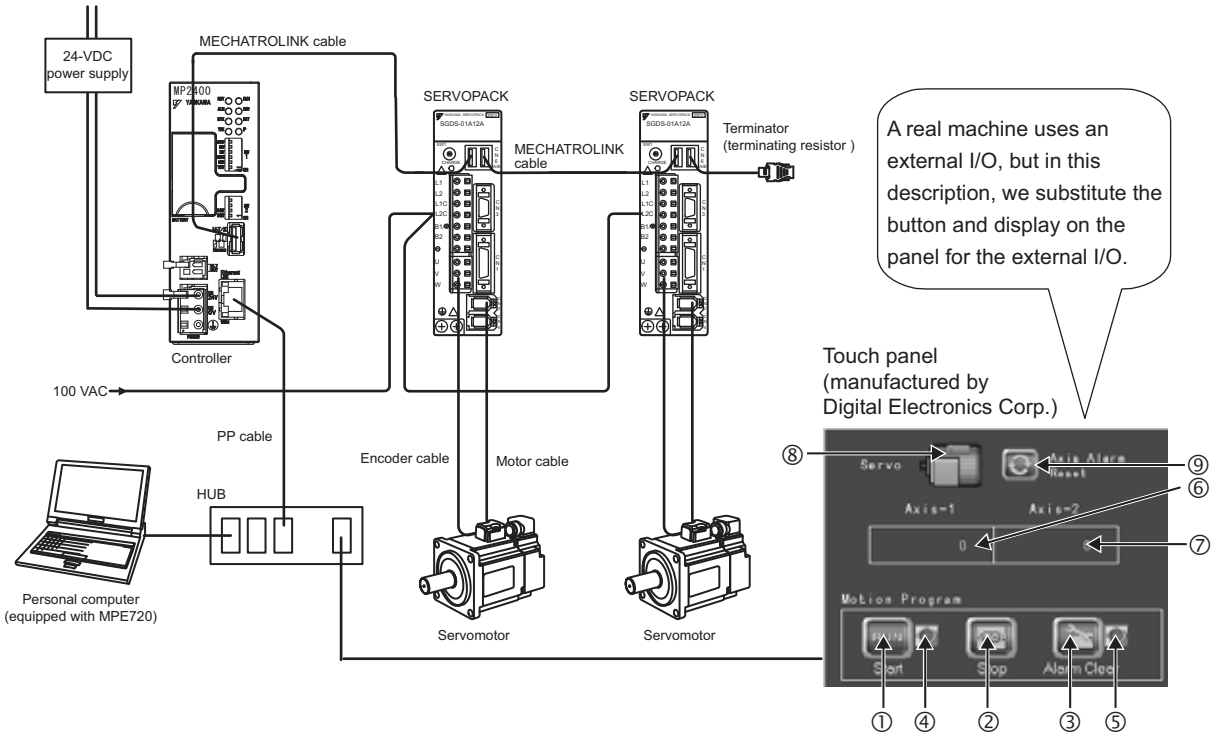
■ Caution

- This chapter explains the simple procedure where you can easily run and check a program without external signals. In practice, you need to connect to external signals and create a sequence.
- Registering a program execution enables the M-EXECUTOR definition. The MP2400 automatically controls the motion program, so be aware that changing registers registered in ladder and sequence programs may cause problems.

4.5 Starting Motion Program from an External Signal

4.5.1 Overview

This section explains how to start a motion program created in *4.3 Programming (step 2)* from external signals. Note that in this section, we show an example which substitutes a touch panel for the external signal.



4.5.2 Required Equipment

Product Name	Model	Q'ty
MP2400	JEPMC-MP2400-E	1
MECHATROLINK cable (0.5 m)	JEPMC-W6002-A5	2
Terminator (terminating resistor)	JEPMC-W6022	1
Σ-III SERVOPACK	SGDS-A5F12A	2
Σ-III servomotor	SGMAS-A5A2A21	2
Motor cable (3 m)	JZSP-CSM01-03	2
Encoder cable (3 m)	JZSP-CSP05-03	2
Touch panel (manufactured by Digital Electronics Corp.)	AGP3300-T1-D24	1
HUB (commercial product)	LSW-TX-8EP	1
MPE720 Ver.6 Lite	CPMC-MPE770L	1
LAN cable (for Ethernet connection)	Commercial straight cable	3
Personal computer (main unit)	Commercial product	1
24-VDC power supply	Current capacity of power supply 2 A or more	1

Mapping of the panel manufactured by Digital Electronics Corp.

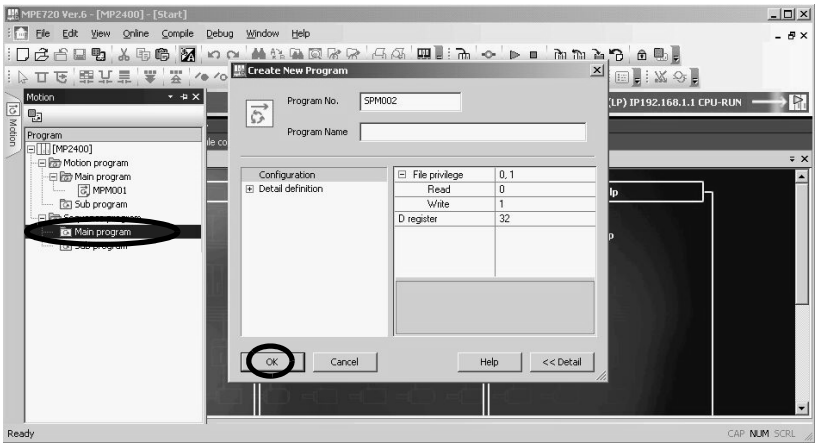
No.	Name	Mapping	Category	Description	MP2400 Operation
①	Start	MB5000	Control signal	Starts up a motion program	Sets in M-EXECUTOR
②	Stop	MB5002	Control signal	Displays the running of a motion program	
③	Clear Alarm	MB5005	Control signal	Stops a motion program	
④	Running Program	MB5010	Status	Clears an alarm of a motion program	
⑤	Alarm	MB5018	Status	Indicates an alarm is occurring in a motion program	
⑥	Axis 1 (current position)	IL8016	Monitor parameter	Displays current axis 1 position	Automatic receive function
⑦	Axis 2 (current position)	IL8096	Monitor parameter	Displays current axis 2 position	
⑧	Servo (ON/OFF)	MB5020	External signal	Axis 1, axis 2 servo ON signal	Sequence program is needed
⑨	Reset Axis Alarm	MB5021	External signal	Axis 1, axis 2 alarm reset signal	

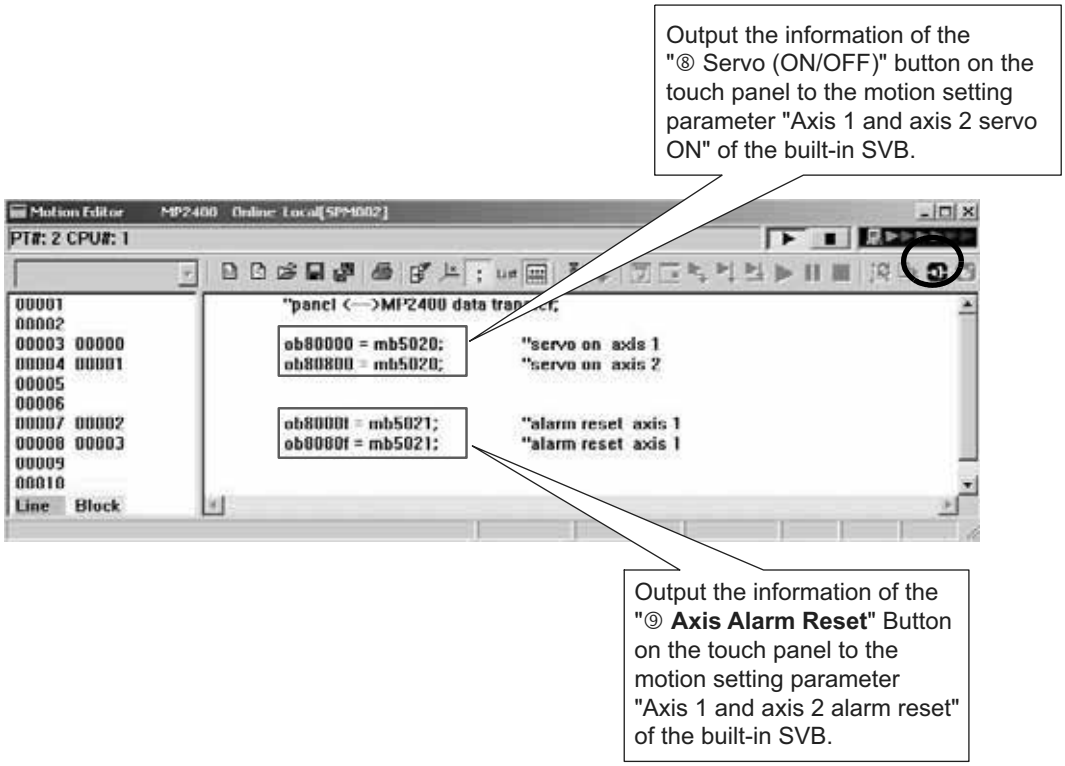
Note: 1. You do not need to create a program for signals and data in ① to ⑦.
2. You need to create a sequence program for outputting signals of ⑧ and ⑨ to the motion parameters.
3. For information on creating a program for the panel side, refer to *6.2.1 When the MP2400 Acts as Slave (automatic receive function is used)*.

4.5.3 Creation Procedure

1. Creating a Sequence Program

Now create a sequence program which copies the M register content mapped to "⑧ **Servo** (ON/OFF)" and "⑨ **Axis Alarm Reset**" Buttons on the touch panel to the relevant registers in the motion setting parameter of the embedded SVB.
Follow a procedure similar to creating a motion program from the motion program subwindow.

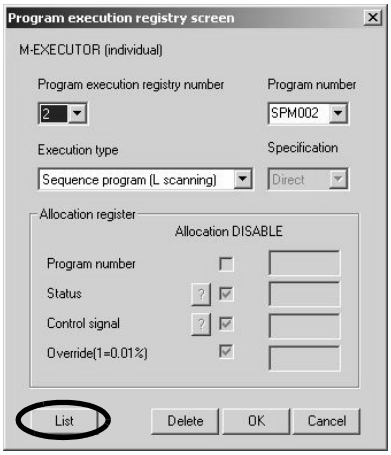


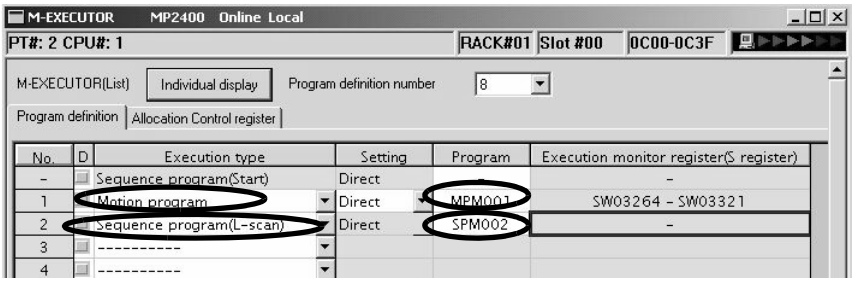


Click the **Execution Registration** Icon.

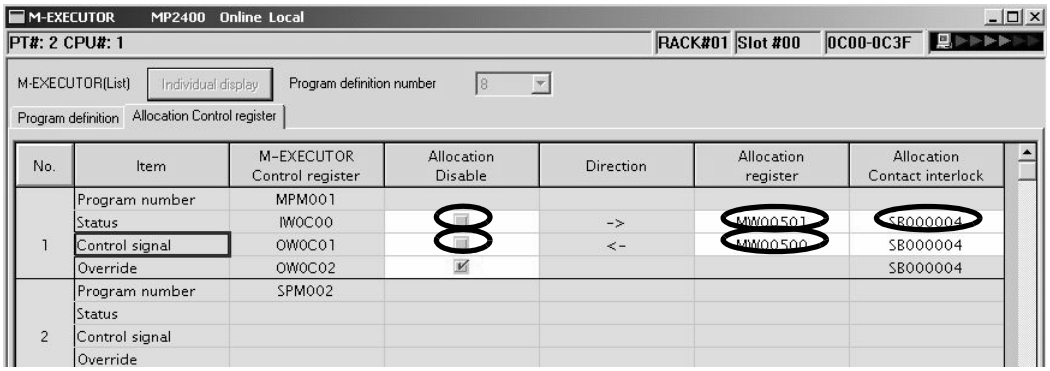
2. Registering Program Execution

- A **Program Execution Registry Screen** Dialog Box will appear.
- Click the **List** Button to set a program definition in the **M-EXECUTOR** Window.
  → Then register the MPM001, SPM001 executions.
  For more information on how to set the **M-EXECUTOR** Window, refer to *2.2.7 M-EXECUTOR Module (Motion Program Executor)* on page 2-48.

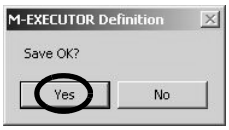




- In the **Allocation Control Register** Window, map the M registers allocated to control signals (① **Start** / ② **Stop** / ③ **Alarm Clear**) and status (④ **Running Program** / ⑤ **Alarm**) on the touch panel as an M-EXECUTOR allocation register for the motion program created in *4.3 Programming (step 2)*.
  Status=MW00501, control signal=MW00500, allocation contact interlock =SB00004



- Click the **Save** Icon to save the M-EXECUTOR definition.



3. Communication Setting with Touch Panel

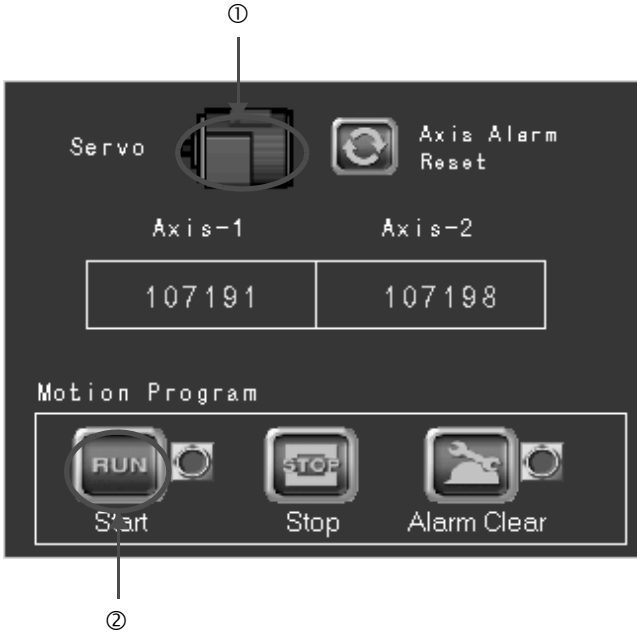
For information on communication setting with the touch panel, refer to *6.2.1 Automatic Receive Example Using Touch Panel*.

4. FLASH Save

When all settings are completed, click the **FLASH Save** Icon to save the data to the flash memory.

5. Operation Check

Turn ON MP2400 power again and press "① **Servo**" and "② **Start**" on the panel screen.
Then check that the motion program starts and the two-axes motor begins to operate to change the current position of the axis.



MEMO

5

Outline of Motion Control Systems

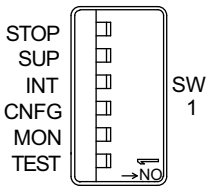
This chapter describes the basic operation of MP2400 Motion Control Systems and provides an outline of user programs and registers.

5.1 Startup Sequence and Basic Operation

This section describes the MP2400 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

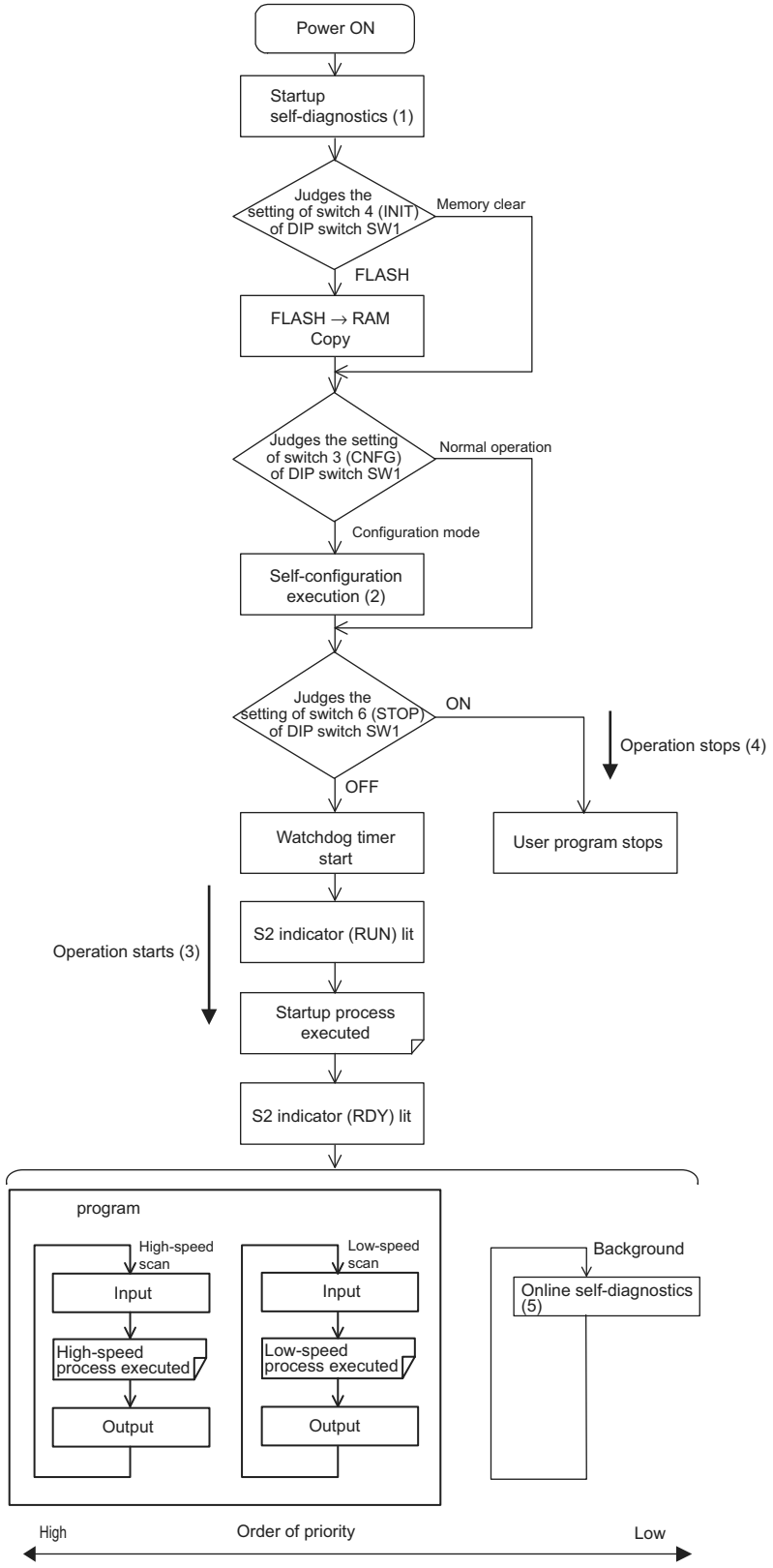
Set the DIP switch (SW1) on the Basic Module to control operations of the startup sequence. The six switches are provided on the DIP switch (SW1) on the Basic Module as shown in the following figure. The following table lists the functions of six switches.



No.	Switch Name	Status	Operating Mode	Default Setting	Remarks
S1-6	STOP	ON	User program stops	OFF	Set to ON to stop user program operation.
		OFF	User program operation		
S1-5	SUP	ON	System load	OFF	If set to ON, starts up in the mode that can renew the version of the farmware.
		OFF	Normal operation		
S1-4	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		
S1-3	CNFG	ON	Self-configuration mode	OFF	Set to ON for self-configuration of connected devices.
		OFF	Normal operation		
S1-2	MON	ON	System use	OFF	Always set to OFF.
		OFF	Normal operation		
S1-1	TEST	ON	System use Adjusted before Shipment	OFF	Always set to OFF.
		OFF	Normal operation		

5.1.2 Startup Sequence

The startup sequence for the MP2400 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 5-29.
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 the sequence program set in “Sequence Program (Startup).” Refer to the startup processing drawing and *5.2.2 Motion Programs* on page 5-7.
First scan processing is executed once the startup process 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

MP2400 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 MP2400 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 MP2400 LED indicator.

- MPE720 cannot be operated when the indicators are blinking.
- For information on errors and countermeasures, refer to *Chapter 7 Maintenance, Inspection, and Trouble-shooting*.

Type	LED Indicator Name					Indicator Details	Remarks
	RDY	FUN	ALM	ERR	BAT		
Normal	Not lit	Not lit	Lit	Lit	Not lit	Hardware reset status	–
	Not lit	Not lit	Not lit	Not lit	Not lit	Initializing	
	Not lit	Lit	Not lit	Not lit	Not lit	Executing startup process	
	Lit	Not lit	Not lit	Not lit	Not lit	User program stopped (Offline stop mode)	User program stops when the DIP switch or MPE720 is used to execute the STOP operation.
	Lit	Lit	Not lit	Not lit	Not lit	User program executing normally (Online operation mode)	–
Error	Not lit	Not lit	Not lit	Lit	Not lit	Major damage has occurred	The ERR LED indicator is lit red when the CPU is down.
	Not lit	Not lit	Not lit	Blinking	Not lit	(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	The ERR LED indicator will blink red when an exception error has occurred.
	Not lit	Not lit	Blinking	Blinking	Not lit	(Hardware errors) No. of blinks 2: RAM diagnosis error 3: ROM diagnosis error 4: CPU function diagnosis error 5: FPU function diagnosis error	The ALM and ERR LED indicators will blink red if there is a self-diagnosis failure.
Alarm	–	–	–	–	Lit	Battery alarm	The BAT LED indicator will be lit when the battery voltage drops.
	Lit	Not lit	Lit	Not lit	Not lit	Operation error I/O error	The ALM LED indicator will be lit red when an operation or I/O error is detected.

5.2 User Programs

User programs for executing machine control using the MP2400 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 Motion Programming (SIEZ-C887-1.3)
  Engineering Tool for MP2000 Series Machine Controller MPE720 Version 6 USER'S MANUAL (SIEP C880700 30)

5.2.1 Types and Execution Timing of User Program

The following table shows the types and execution timing of MP2400 user program.

User Program		Execution Timing
Motion Program	High-speed Scan Process	Turns ON the program operation start request of the control signal (runs when program operation start request is ON)
Sequence Program	Startup Process	Power-up (during power-up, runs only once)
	High-speed Scan Process	Periodical startup (runs each time a high-speed scan is performed)
	Low-speed Scan Process	Periodical startup (runs each time a low-speed scan is performed)

For more information on the user program, refer to the next page and after.

5.2.2 Motion Programs

Motion programs are programs written in a text-based language called motion language.
The following table shows the two types of motion programs.

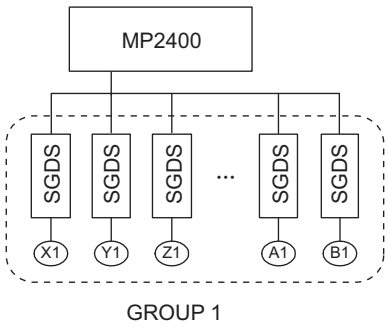
Type	Specification Method	Features	No. of Programs
Main Program	MPM□□□ (□□□ = 1 to 256)	Can be called from M-EXECUTOR program execution definition	Up to 256 programs (including main and sub programs) can be created.
Sub-program	MPS□□□ (□□□ = 1 to 256)	Can be called from main programs	

- The program numbers of motion programs are managed in the same manner as the sequence program numbers. Assign a unique number for each program number.
  - Program number of Motion program MPM □□□, MPS □□□
  - Program number of Sequence program SPM □□□, SPS □□□
- The MP2400 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

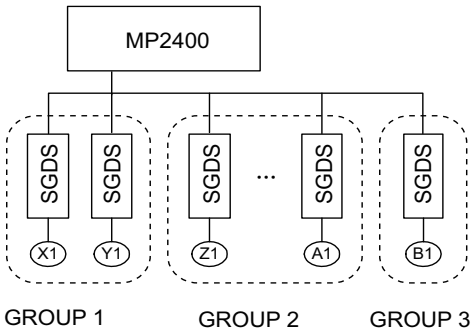
(1) Groups

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 MP2400 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*.

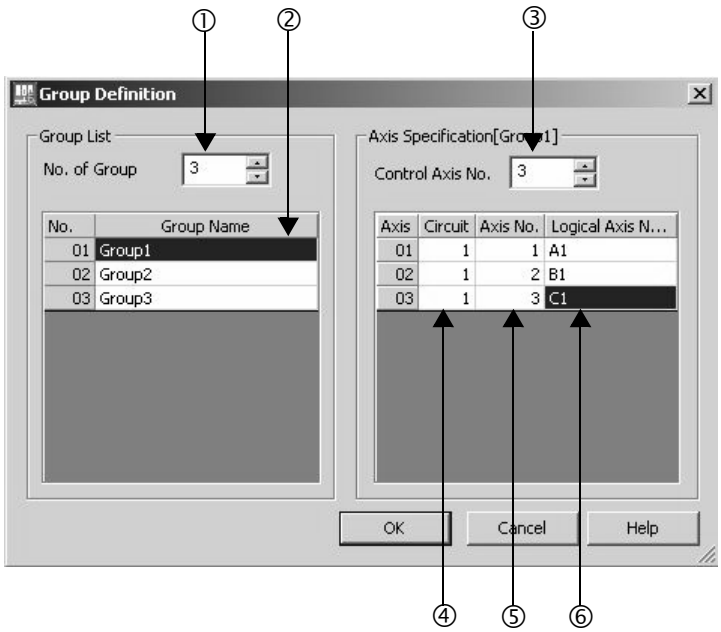
(a) Single Group Operation



(b) Multiple Group Operation



This section explains the Group Definition screen.



① No. of Group

Set a number for the operation as a group.
Set it to 1 for the operation as one group.
Set it to the number of groups for the operation with multiple groups.

② Group Name

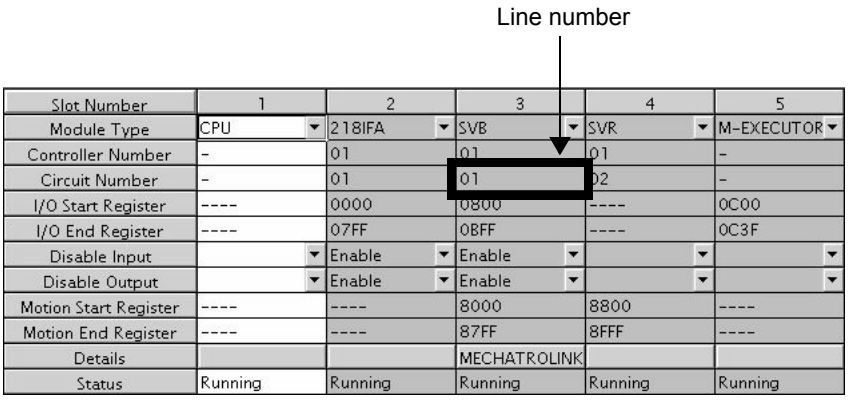
Define a group name.

③ Control Axis No.

Set the number of axes controlled in the group.

④ Circuit

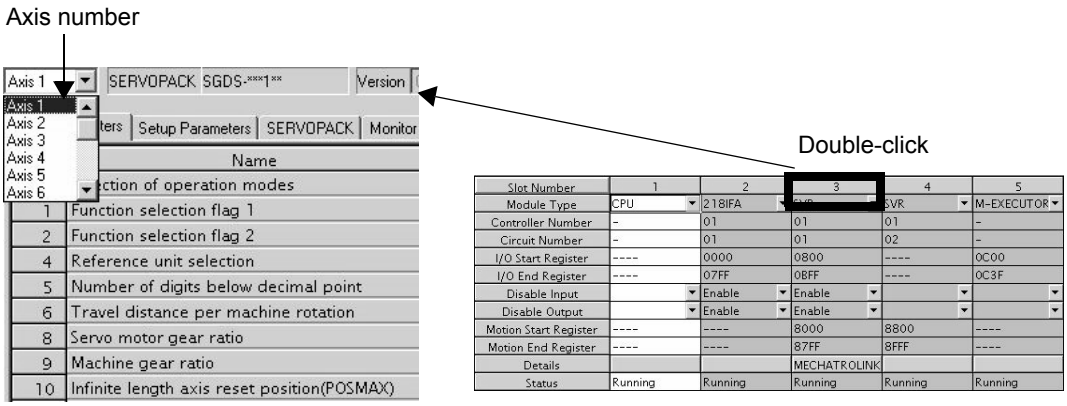
Set a line number for the used motion module.
The line number can be checked in the module configuration definition.



⑤ Axis No.

Set an axis number for the used axis.

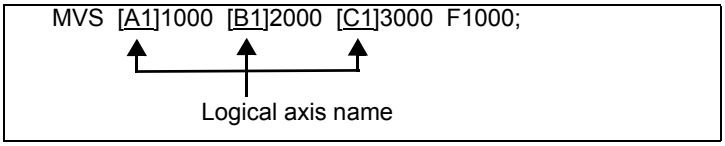
The axis number can be checked in the detailed screen of the used motion module.



⑥ Logical Axis Name

Define a name for the specified axis number.

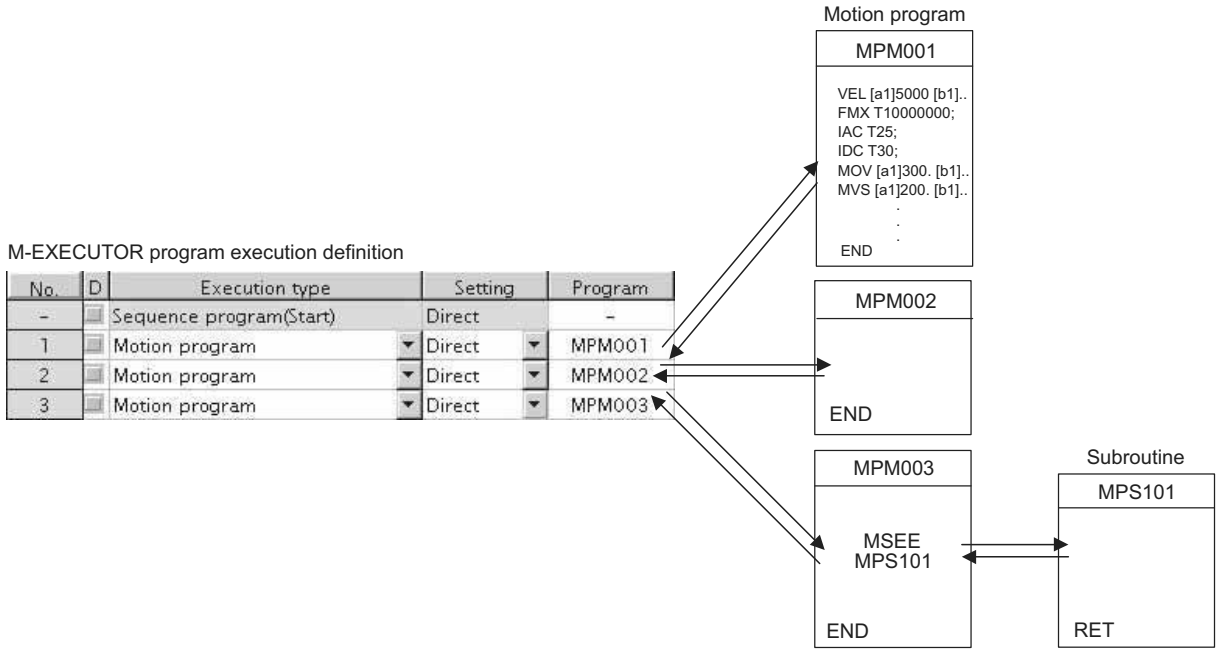
The name defined here is used when programming a motion program.



(2) How to Run a Motion Program

Motion program can be executed by registering it to the M-EXECUTOR program execution definition.
Motion programs are executed in ascending order.

The execution example is shown in the figure below.



The above method is a preparation for running a motion program. When registered in the M-EXECUTOR program execution definition, a motion program does not start up. To start up the motion program, after the motion program registration, use a control signal to turn ON the request for the program operation startup.
The motion program registered in M-EXECUTOR is executed at a scan cycle, but similar to a sequence progrem, the whole program cannot be executed at a single scan. In case of the motion program, a motion management function in the system carries out an execution control exclusive for the motion programs.

■ Caution

When registering a motion program to M-EXECUTOR, pay attention to the followings:

- Multiple motion programs with the same number cannot be registered.
- Multiple motion programs with the same number cannot be referenced using an indirect designation.

(3) How to Designate a Motion Program

The following two methods are available for designating a motion program.

- Using a direct designation to invoke a motion program
- Using a indirect designation to invoke a motion program

Now, this section explains each way to designate a motion program.

[a] Using a Direct Designation to Call a Motion Program

A direct designation method designates a motion program to call using a program number (MPM □□□).

■ A motion program registered in the M-EXECUTOR program execution definition

Select ***Direct*** for the Setting and set a program number (MPM □□□).

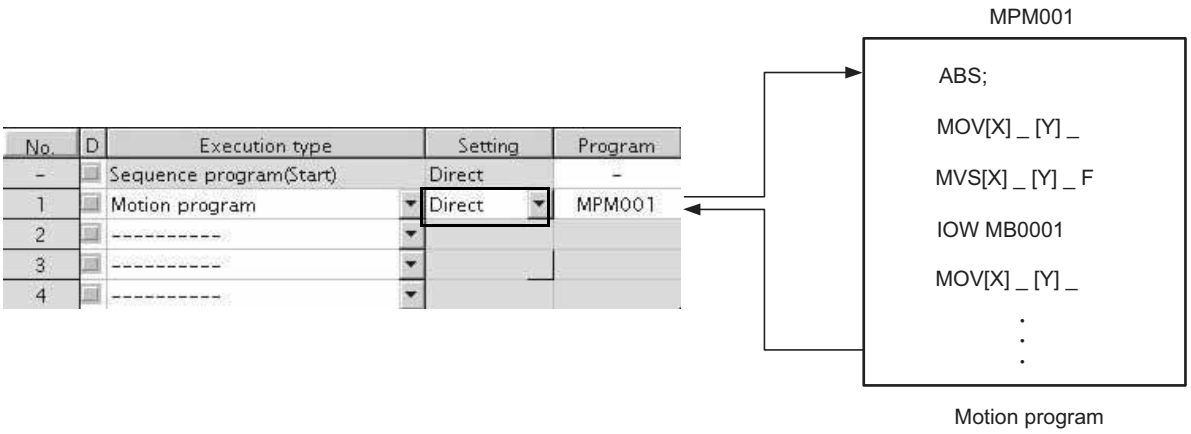


Fig. 5.1 Calling a Motion Program Using a Direct Designation

[b] Using an Indirect Designation to Call a Motion Program

An indirect designation method designates a motion program to call using a register.
In this method, a program (MPM □□□) coinciding with value stored in the register is called.

■ A motion program registered in the M-EXECUTOR program execution definition

Select ***Indirect*** for the Setting. A register for the indirect designation is automatically mapped.

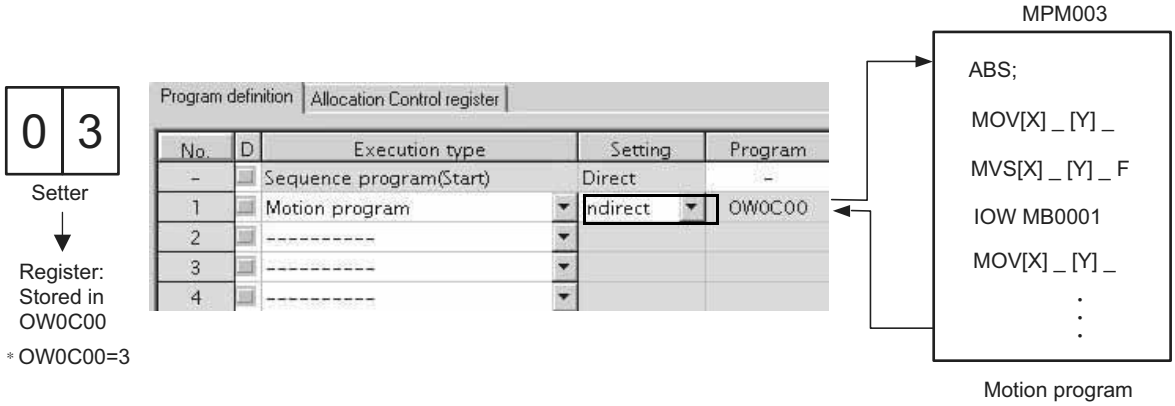


Fig. 5.2 Calling a Motion Program Using an Indirect Designation

(4) Work Register

Configure and monitor a motion program via a work register.
The work register constitution is as follows:

■ The work register constitution

The work register is assigned to a M-EXECUTOR control register. (automatically defined by system)
The M-EXECUTOR control register constitution is as follows:

M-EXECUTOR Control Register	Description
Status	Status flag of a motion program
Control Signal	Control Signal of a motion program
Override	Override for interpolation

For more information on the work register, refer to the subsequent pages.

[a] Status Flag of a Motion Program

The motion program status flag shows the execution status of the motion program.
The following table shows details of status flag.

[Status Flag]

Bit No.	Status
0	Program running
1	Program paused
2	Program stopped by stop request (used by system)
3	(Reserved)
4	Single program block operation stopped
5	(Reserved)
6	(Reserved)
7	(Reserved)
8	Program alarm
9	Stopped by brake point
A	(Reserved)
B	In debug mode (EWS debugging operation)
C	Program type 0: Motion program
D	Start request signal history
E	No system work error
F	Main program number exceeded error

- When program alarm has occurred, the error details of the motion program are stored in the error information screen and S registers.

[b] Control Signal

Program control signals (e.g., program operation start requests and program stop requests) need to be entered to execute the motion program.
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
7	(Reserved)	
8	Skip 1 information	NO contact
9	Skip 2 information	NO contact
A	(Reserved)	
B	(Reserved)	
C	(Reserved)	
D	(Reserved)	NO contact
E	Override setting for interpolation*	NO contact
F	(reserved)	

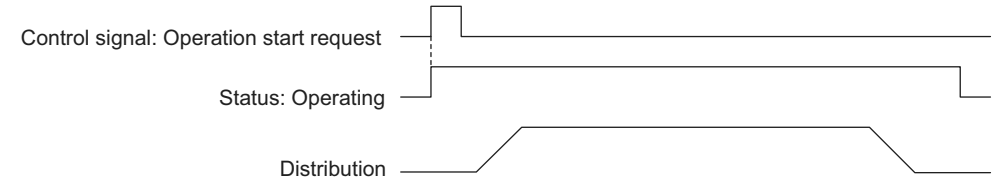
* Override setting for interpolation
OFF: 100% fixed at an override for interpolation
ON: Depends on the designated override for interpolation.

Use signals conforming to the above signal types when inputting each signal.
Note: Motion programs are executed if the program operation start request signal is ON when the power is turned ON.

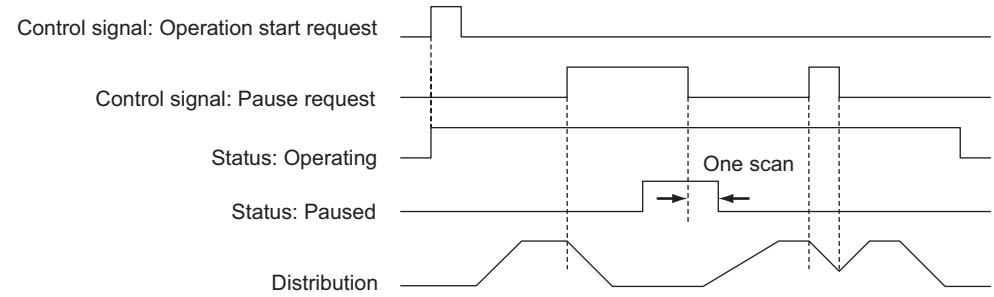
■ Timing Chart for Motion Program Control Signals

The following figure shows an example of a timing chart for motion program control signals.

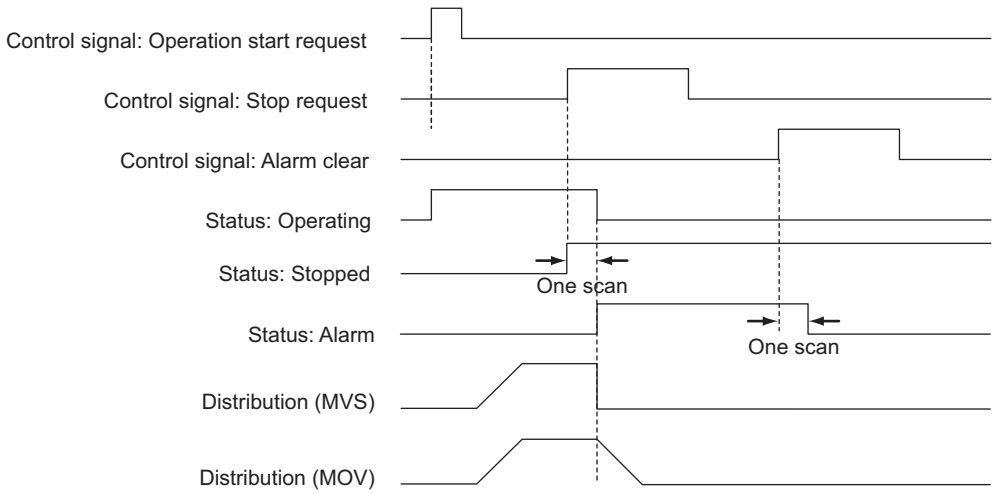
・Program Operation Start Request



・Pause Request



・Stop Request



- An alarm will occur if the stop request is turned ON during axis operation using a motion command.

[c] Interpolation Override

The override when executing interpolation travel commands (setting; unit: 1 = 0.01%) is set.
This interpolation override is enabled only when the motion program control signal bit E (interpolation override setting) is ON.

(5) How to Operate a Work Register

Select either of the following two execution processes as the method of operating a work register.

- A way to immediately control a motion program from external equipment
- A way to control a motion program via a sequence program

Now, this section explains each execution processing in the subsequent pages.

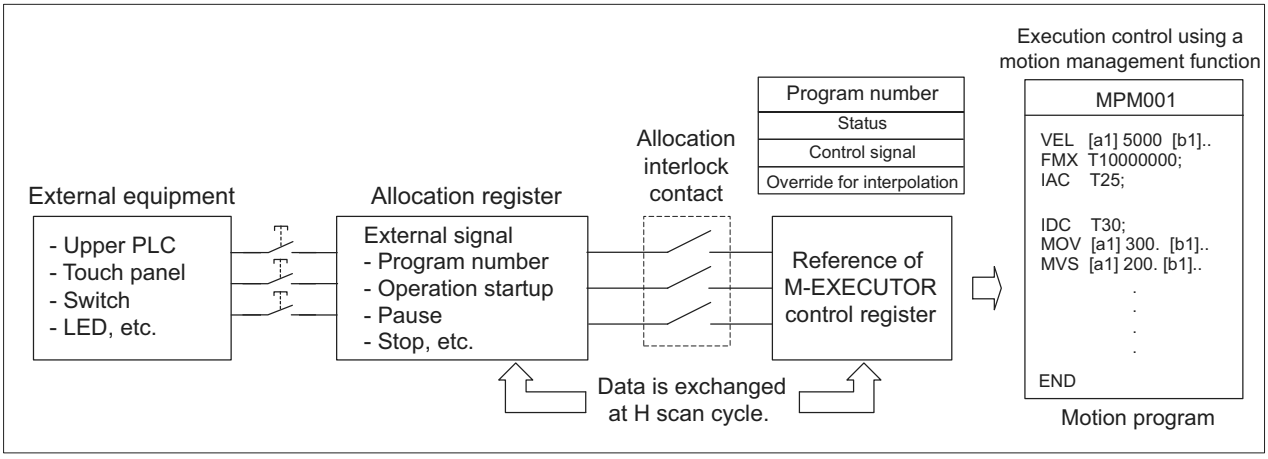
■ A Way to Immediately Control a Motion Program from External Equipment

M-EXECUTOR has a function which allocates any register to an M-EXECUTOR control register.
Using this function allows you to automatically exchange data between an M-EXECUTOR control register and an I/O register connected to an external equipment. This allows you to immediately control the motion program from the external equipment.
The following figure shows a setting example in this method.

Figure for allocating the M-EXECUTOR register

No.	Item	M-EXECUTOR Control register	Allocation Disable	Direction	Allocation register	Allocation Contact interlock
1	Program number	MPM001				
	Status	IW0C00		->	OW0000	IB00020
	Control signal	OW0C01		<-	IW0000	IB00020
	Override	OW0C02		<-	IW0001	IB00020

Specify any registers for mapping register and mapping interlock contact.



■ An allocation contact interlock is used to interlock the operation of a motion program. When setting an allocation register, be sure to set an allocation contact interlock.

It is processed, as shown below, by turning ON/OFF an allocation contact interlock:

- When an allocation contact interlock contact is ON, data is exchanged between an allocation register and M-EXECUTOR control register at H scan cycle. Now, the motion program becomes executable.
- When an allocation contact interlock is OFF, data is not exchanged between an allocation register and M-EXECUTOR control register. Now, the motion program becomes unexecutable.
- When an allocation contact interlock is switched from ON to OFF while running a motion program, the running motion program stops and an axis in operation also stops. Now, the motion program falls into the alarm "1Bh: Executing an emergency stop command" state, and the status "Bit8: Program alarm is occurring" is turned ON.
  Again, to execute a motion program, follow the procedure below for operation:

1. Switch the interlock contact from OFF to ON.
2. Turn ON a control signal "Bit5: Alarm reset request."
3. Make sure that the status "Bit8: Program alarm is occurring" is turned OFF.
4. Turn OFF the control signal "Bit5: Alarm reset request."
5. Turn ON a control signal "Bit0: Request for the program operation startup."

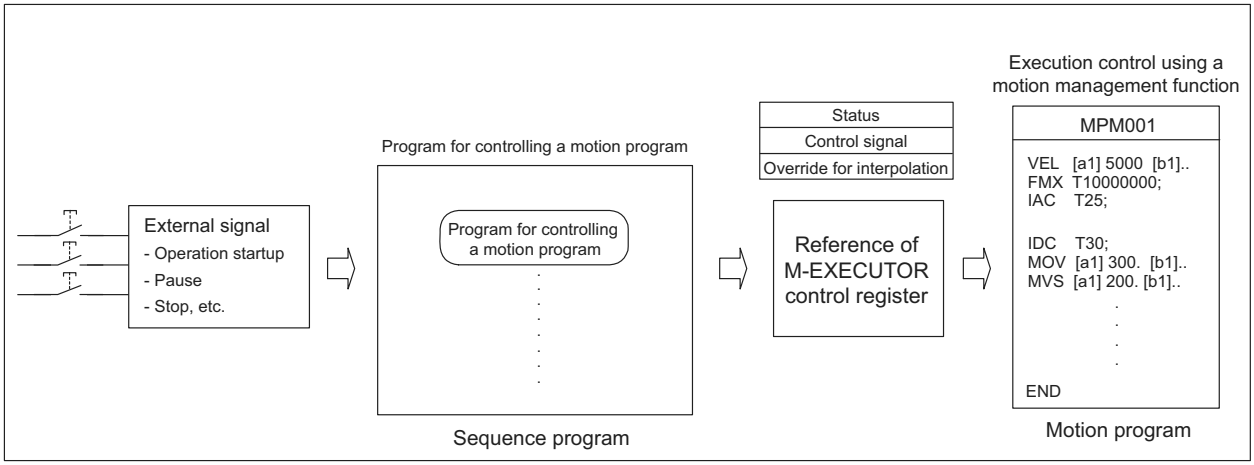
■ A Way to Control a Motion Program via a Sequence Program

Without using the allocating function of the above mentioned M-EXECUTOR control register, controls a motion program via a sequence program.
To use this execution processing, save the blank Allocation register and the blank Allocation interlock contact as a blank.
In this case, the M-EXECUTOR control register configures and monitors the motion program.
The following figure shows a setting example in this method.

M-EXECUTOR program execution definition

No.	Item	M-EXECUTOR Control register	Allocation Disable	Direction	Allocation register	Allocation Contact interlock
1	Program number	MPM001				
	Status	IW0C00	☐	->		
	Control signal	OW0C01	☐	<-		
	Override	OW0C02	☐	<-		

Save the mapping register and the mapping interlock contact as a blank.



The following is an example of a program for controlling the motion program.

Example using a sequence program

```
OB80000 = IB00000;                    “axis 1 servo on”
OB0C010 = PON( IB00001 DB000000 );    “program start”
OB0C011 = IB00002;                    “hold”
OB0C012 = IB00003;                    “program stop”
OB0C015 = IB00004;                    “alarm reset”
OB8000F = IB00005;                    “Turn ON a single axis servo”
IF NON( IB0C000 DB000001 ) == 1;      “Is the program operation OFF?”
;                                     “Process when program operation is stopped”
IEND;

END;
```

(6) Monitor the motion program execution information using S register

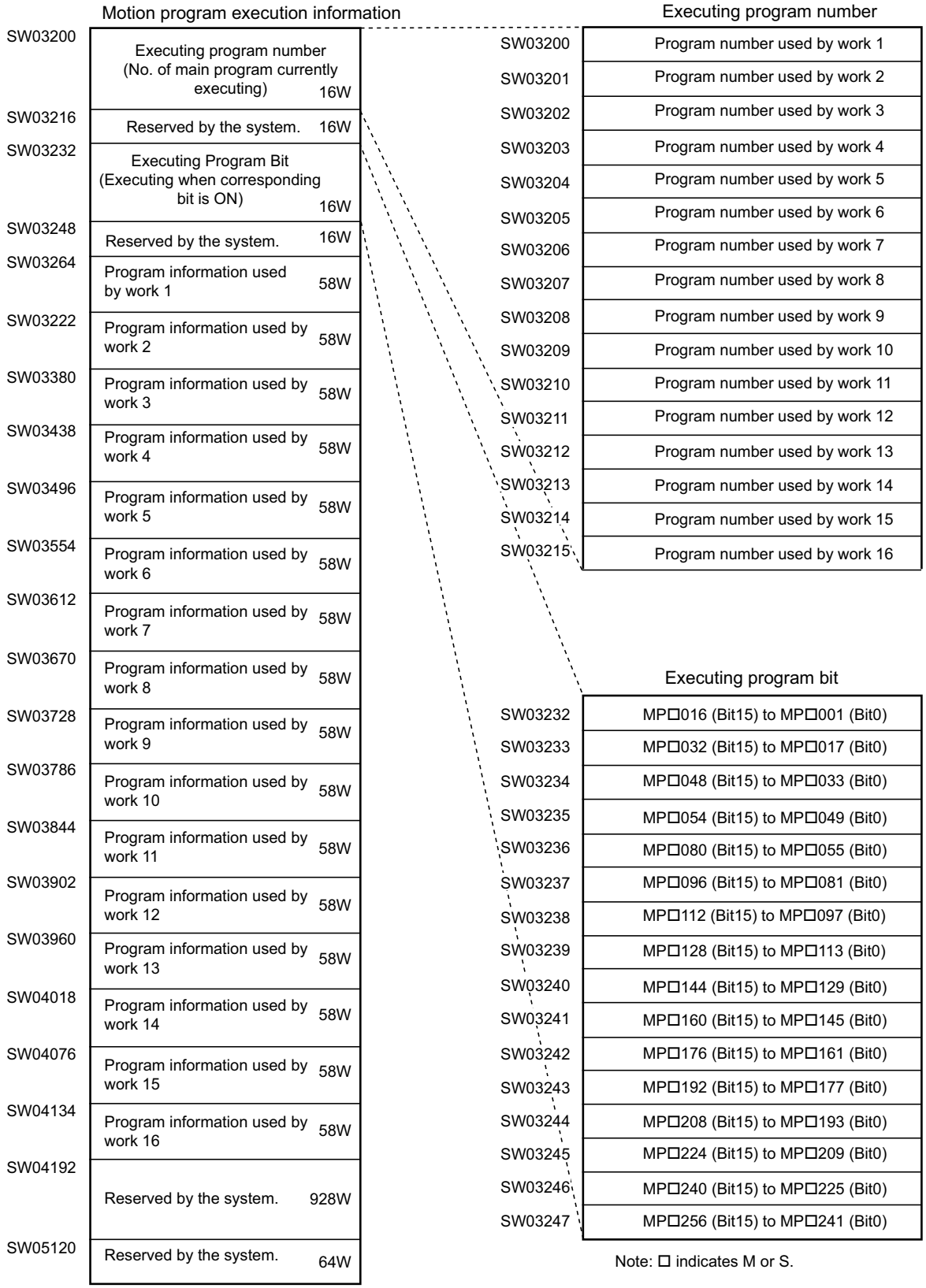
Using S register (SW03200 to SW04191) allows you to monitor the motion program execution information.
The way to monitor it is shown as follows:

[a] A motion program registered in the M-EXECUTOR program execution definition

When a motion program is registered in the M-EXECUTOR program execution definition, the same system work number as the definition No. is used.
For example, a motion program is registered as “Definition No.” =3, the used system work number is “System Work”=3. In this case, the execution information for the motion program can be monitored in “Program Information Using Work 3” (=SW03380 to SW03437).

For more information on the register area of the motion program execution information, refer to the subsequent pages.

■ Register Areas for Motion Program Execution Information



Note: □ indicates M or S.

■ Details of Program Information Used by Work n

Program information used by work n

+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

Parallel 0 information
- Executing program number
- Executing block number
- Error code

5.2.3 Sequence Program

A sequence program is a program described with motion language of text format.
The following table shows two types of sequence programs.

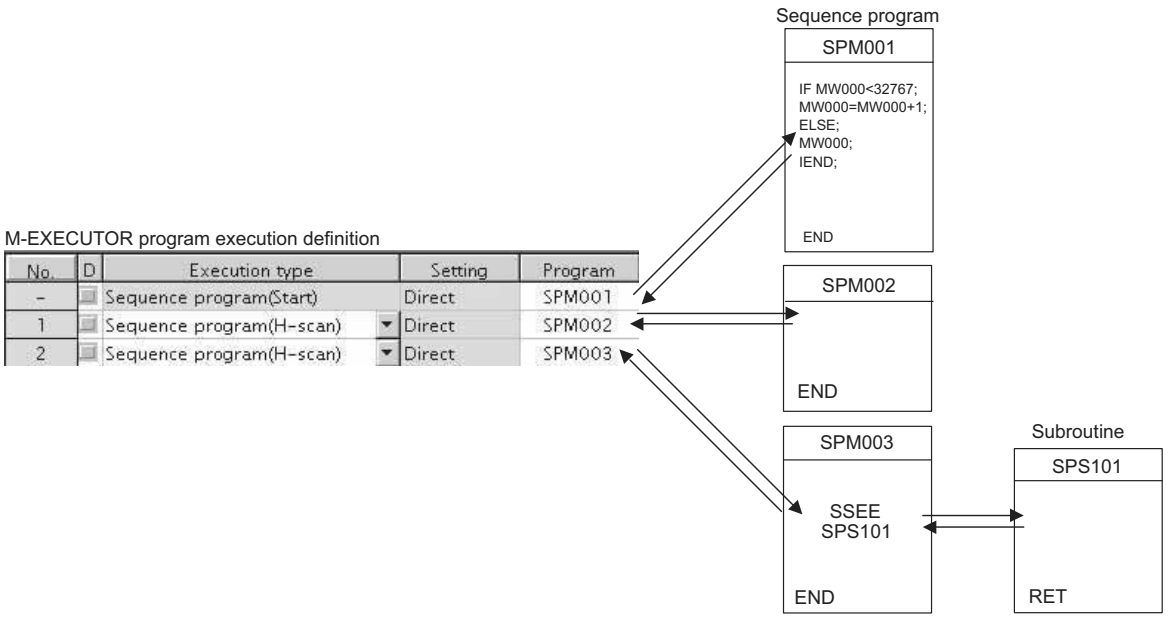
Category	Designation Method	Features	Number of Programs
Main program	SPM□□□ (□□□=1 to 256)	Calling from the M-EXECUTOR program execution definition	Up to 256 programs of the following types can be created: • Main motion program • Sub motion program • Main sequence program • Sub sequence program
Sub program	SPS□□□ (□□□=1 to 256)	Calling from the main program	

■ The program numbers of sequence programs are managed in the same manner as the motion program numbers. Assign a different number for each program number.

- Motion program MPM□□□: Program number of MPS□□□
- Sequence program SPM□□□: Program number of SPS□□□

(1) How to Run a Sequence Program

A sequence program is executed by registering it in the M-EXECUTOR program execution definition.
Sequence programs are executed in ascending numeric order.
The following figure shows an execution example.



When the execution type is set to "**Sequence Program (H scan)**" or "**Sequence Program (L scan)**", the program is executed at the time the definition is saved. When the execution type is set to **Sequence Program (Start)**, the program is executed when the power supply is turned ON again next time.

(2) How to Designate a Sequence Program

You can only designate a sequence program directly. Indirect designation is unavailable.
Use the program number (SPM□□□) when designating a sequence program to execute.

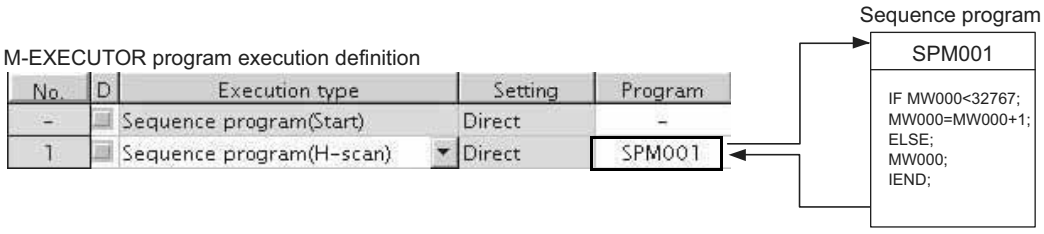


Fig. 5.3 Calling a Sequence Program

(3) Work Register

Monitor a sequence program through a work register.
A work register, similar to the motion program registered in M-EXECUTOR, has status flags in the M-EXECUTOR control register.
The following table shows the work register configuration of the sequence program.

Work Register	Content
Status	Status flag of a sequence program

[a] Status Flag of Sequence Program

The status flags of a sequence program allow you to know the execution status of the sequence program.
The following table explains the detailed contents of status flags.
[Status]

Bit No.	Status
0	Program running
1	(Reserved)
2	(Reserved)
3	(Reserved)
4	(Reserved)
5	(Reserved)
6	(Reserved)
7	(Reserved)
8	Program alarm is occurring
9	Stopping at breakpoint
A	(reserved)
B	In debug mode (EWS debug operation)
C	Program type 1: Sequence program
D	Start request history
E	(Reserved)
F	(Reserved)

■ Sequence program alarm

When referencing a sub sequence program (SSEE command execution) and an error is detected, “Bit8: Program alarm is occurring” is turned ON. If the error is cleared, it is turned OFF.
Error details are as follows:

Error Details
Called program is unregistered
Called program is not a sequence program
Called program is not a sub program (main program is called)
Called program number is over
Nest over error

5.3 Registers

This section describes the types of registers used in MP2400 user programs and how to use them.

5.3.1 Types of Registers

(1) Registers

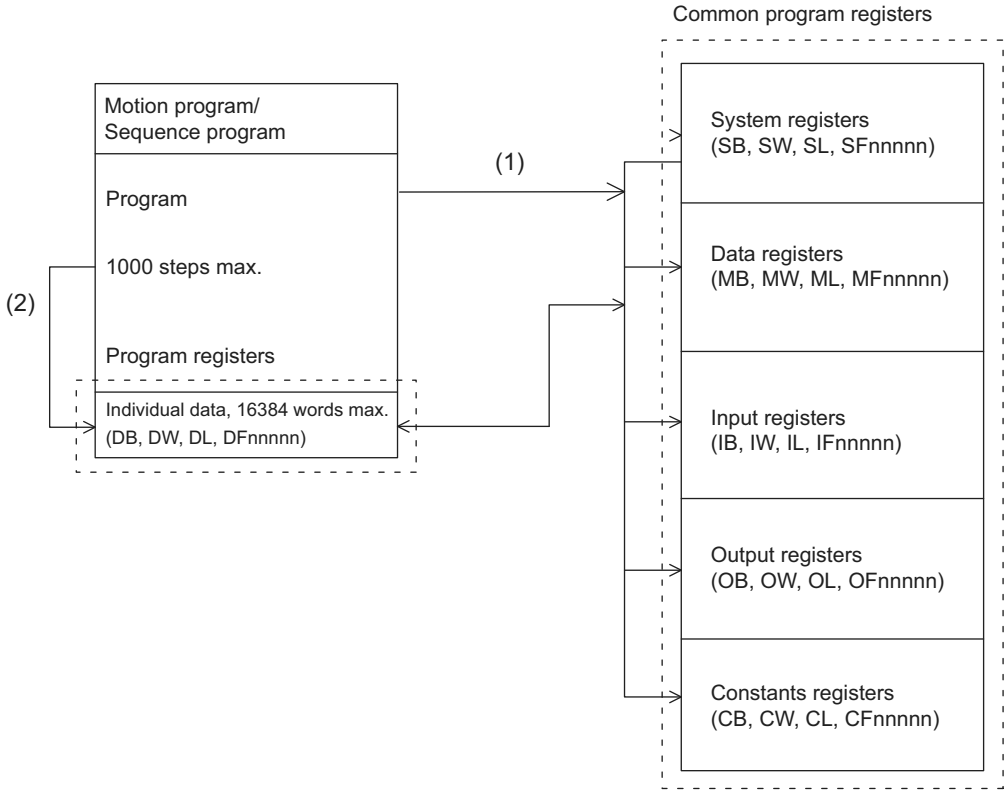
Registers used by user program. Each program can use the registers outlined in the following table.

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 programs
M	Data registers	MB, MW, ML, MFnnnnn (MAnnnnn)	MW00000 to MW65534	Registers shared by all programs. Used, e.g., as an interface between programs.	
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.	
D	D registers	DB, DW, DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each program. Can be used only by corresponding program. The usage range is set by the user using MPE720.	Unique to each program

Note: 1. n: Decimal number; h: Hexadecimal number
2. 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* on page 5-28.)
3. Up to 32 D registers (32 words, DW0000 to DW0031) can be used when creating drawings, but this can be changed in the MPE720 Motion Properties Window. Refer to the *Machine Controller MP900/MP2000 Series User's Manual MPE720 Software for Programming Device (SIEPC88070005)* or, refer to *Engineering Tool for MP2000 Series Machine Controller MPE720 Ver.6.0 User's Manual* (manual number: SIEPC88070030) for details.
4. S and M register data has a battery backup to ensure the data is held even if the MP2400 power is turned OFF and ON. Other register data is saved to flash memory, so when the MP2400 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) Register Ranges in Programs

The following figure shows programs and register call ranges.

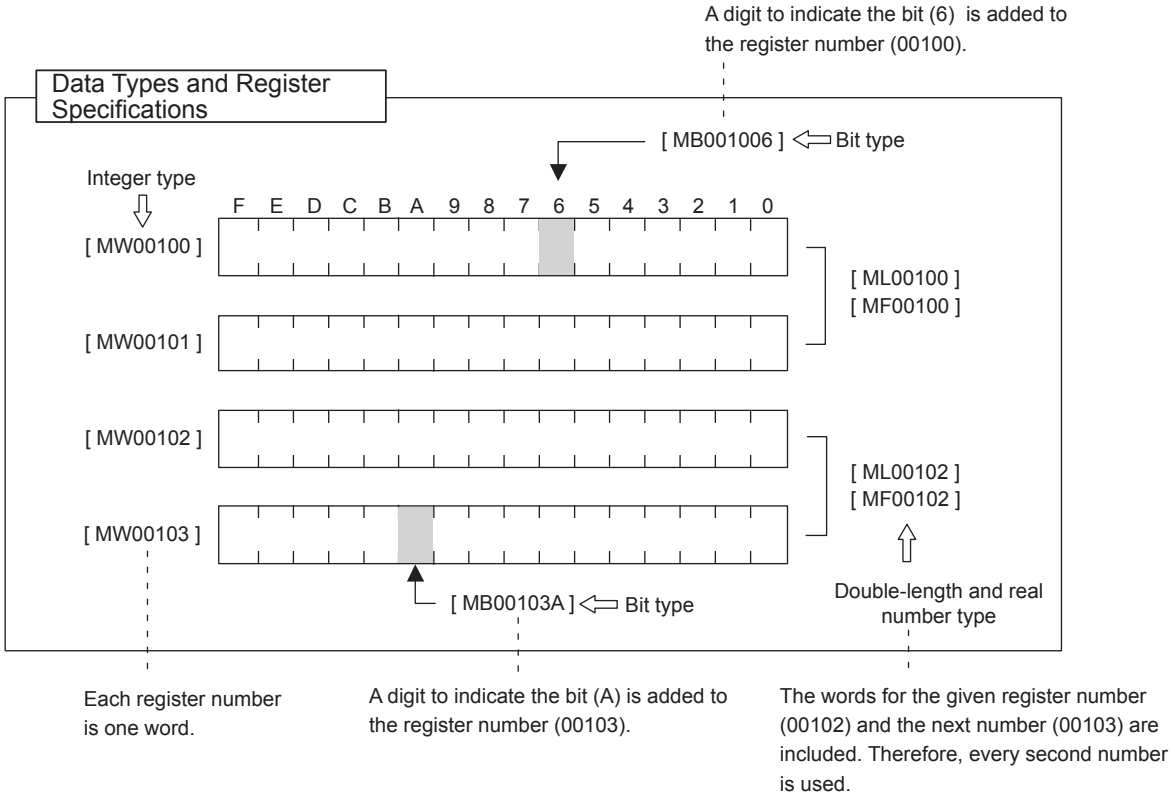


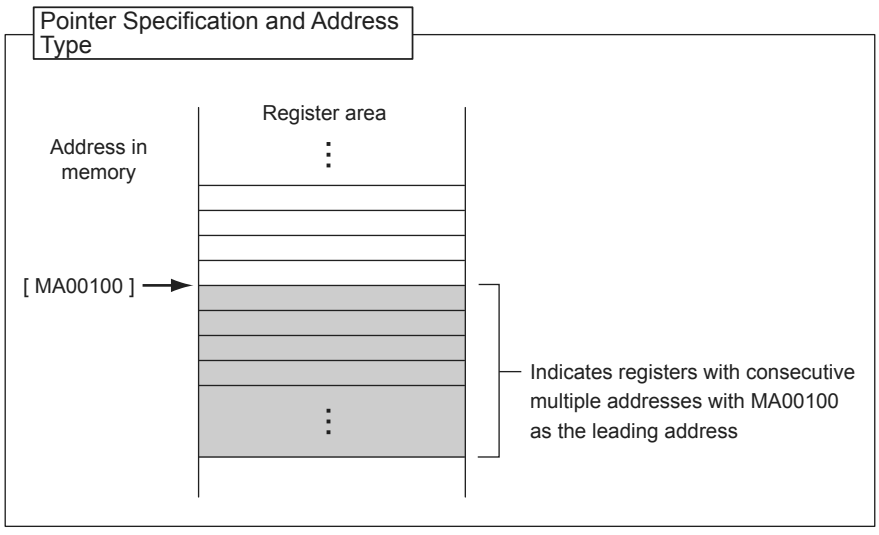
(1): Registers that are common to all programs can be called from any drawing or function.
(2): Registers that are unique to each program can be called only from within the drawing.

5.3.2 Data Types

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.

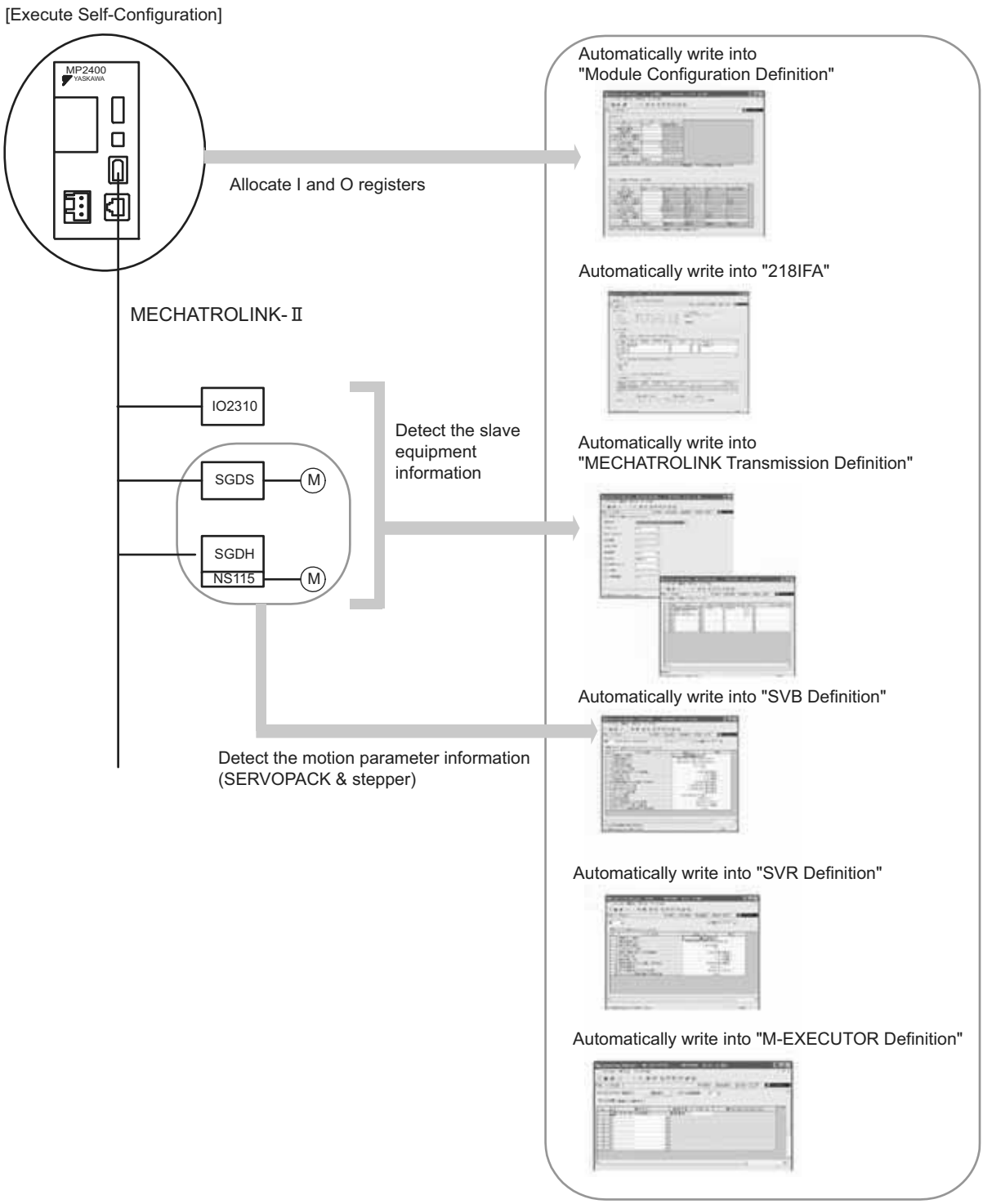
Type	Data types	Numeric Value Range	Remarks
B	Bit	0, 1	Used by relay circuits.
W	Integer	–32768 to +32767 (8000H) (7FFFH)	Used for numeric value operations. The values in parentheses ( ) indicate use with logical operations.
L	Double-length integer	–2147483648 to +2147483647 (80000000H) (7FFFFFFFH)	Used 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.





5.4 Self-configuration

The self-configuration function automatically recognizes all slave data for slaves connected to the MECHATROLINK network of MP2400, and automatically generates a definition file.
Self-configuration greatly simplifies the procedure needed to start the system.
Refer to *5.4.2 Definition Information Updated with Self-Configuration* for items that are automatically generated.



5.4.1 How to Execute Self-Configuration

The following two methods are available for executing the self-configuration.

- Execute the self-configuration (from DIP switch)
- Execute the self configuration (from MPE720)

Now, this section explains each way to execute the self-configuration:

(1) Procedure Using the DIP Switch

Self-configuration can be executed from the Basic Module DIP switch.

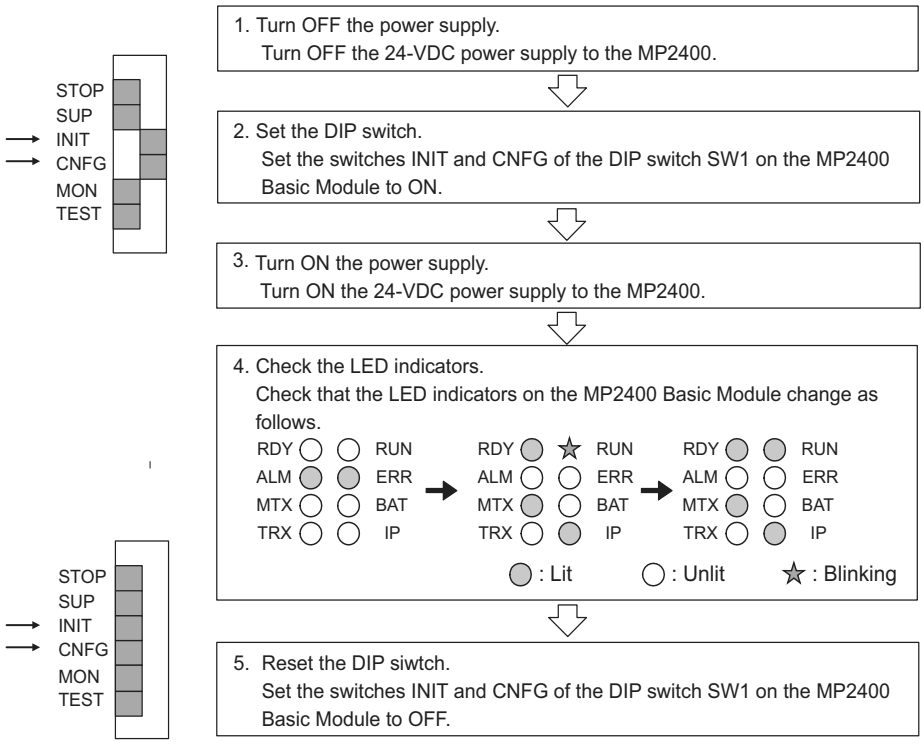
[a] When Executing the Self-Configuration First Time after Connecting Equipment

By performing the operation below, the self-configuration for all modules is newly executed, and all new definition files are created.
Before performing the operation, turn ON the power supply of equipment such as SERVOPACK.

■ Caution

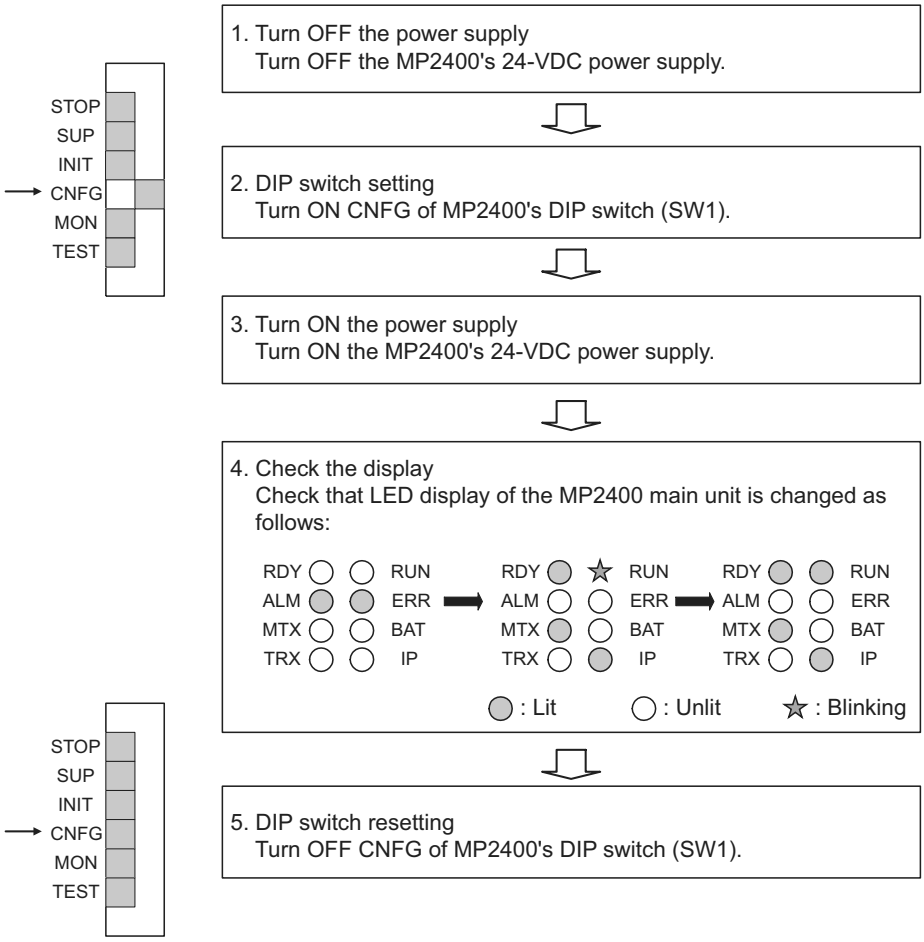
Note that this operation can clear the following data in MP2400.

- All definition files, all user programs, and all registers



[b] Self-configuration after Adding Devices Such as SERVOPACKs

By performing the following operation, a definition for an axis newly detected in the MECHATROLINK transmission is created. The definitions for already mapped axes are not updated.
Before performing the operation, turn ON the power supply of devices such as SERVOPACK.



Note: Since a register mapping was manually changed after the self-configuration was last executed last time, input/output addresses may be changed by executing subsequent self-configurations.
Also, when SVR is set to Disable, SVR may be reset to Enable.
To retain the changed register mapping, etc., manually map a register to the additional devices instead of using self-configuration, and then update the definition file.

■ INIT Switch and RAM Data

RAM data will be cleared if the INIT switch of the DIP switch on the MP2400 Basic Module is ON and the power is turned ON. Flash memory data is read and overwritten when the INIT switch is OFF and the power is turned ON. Therefore, to protect RAM data, always save data to the MP2400 flash memory before turning OFF the power when writing or editing programs.

■ Turning OFF Power After Executing Self-configuration

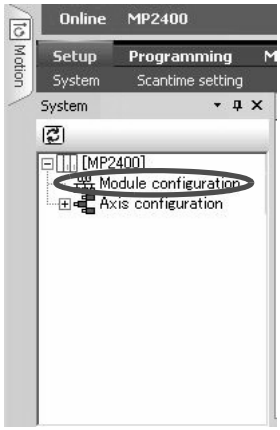
Do not turn OFF the 24-VDC power supply to the MP2400 after executing self-configuration until the definitions data has been saved to flash memory in the MP2400. If the power is somehow turned OFF before the data is saved to flash memory, re-execute the self-configuration.

(2) Procedure Using MPE720

Executing self-configuration from MPE720 allows self-configuration for all modules or for individual Modules. The function is same for both.
When self-configuration is carried out from MPE720, a definition for any axis newly detected in the MECHATROLINK transmission is created. The definitions for already mapped axes are not updated.

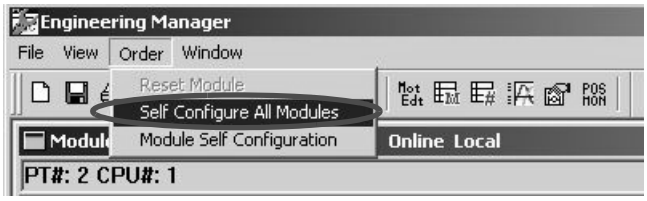
This section explains ways to execute the self-configuration:
By performing the following operation, the self-configuration for MP2400 basic modules is executed.
Before performing the operation, turn ON the power supply of equipment such as SERVOPACK.

1. Double-click ***System - Module Configuration***.

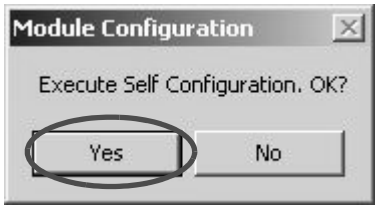


The **Engineering Manager** Window will open and the **Module Configuration** Window will appear.

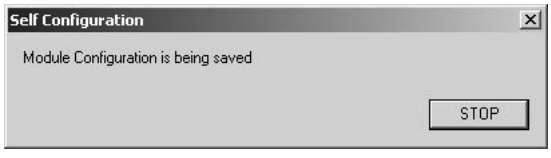
2. Select ***Order - Self Configure All Modules*** to execute self-configuration.



3. Click **Yes** for the following message.



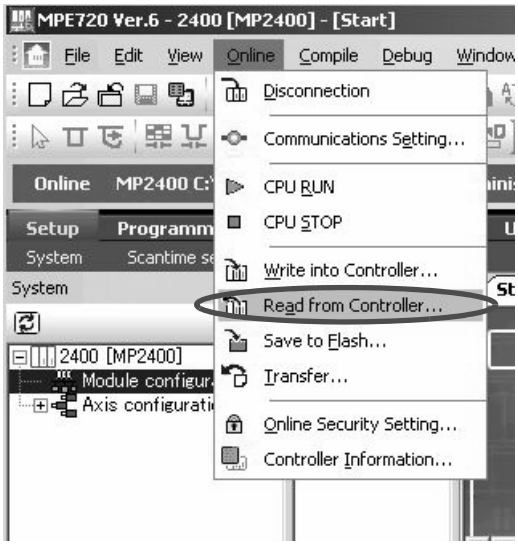
4. While running the self-configuration, the following message is shown.



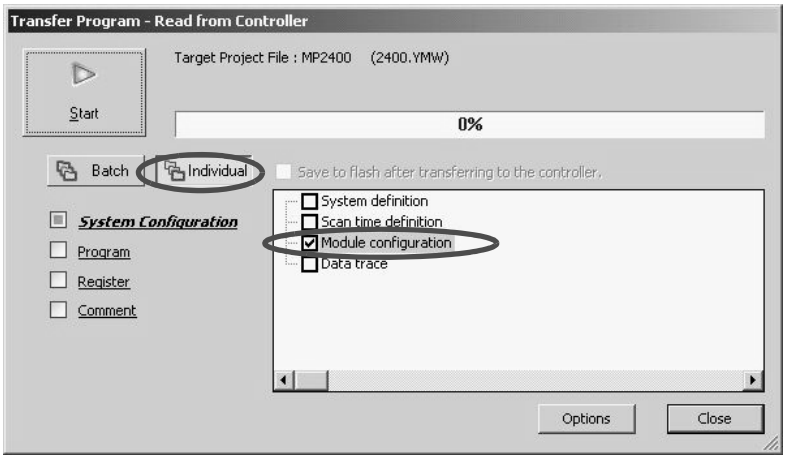
5. If the following warning message is shown after performing step 4, the module configuration definitions for CPU and MPE720 may differ from each other. Continue to perform step 6. When the message is

not shown, go to step 9.

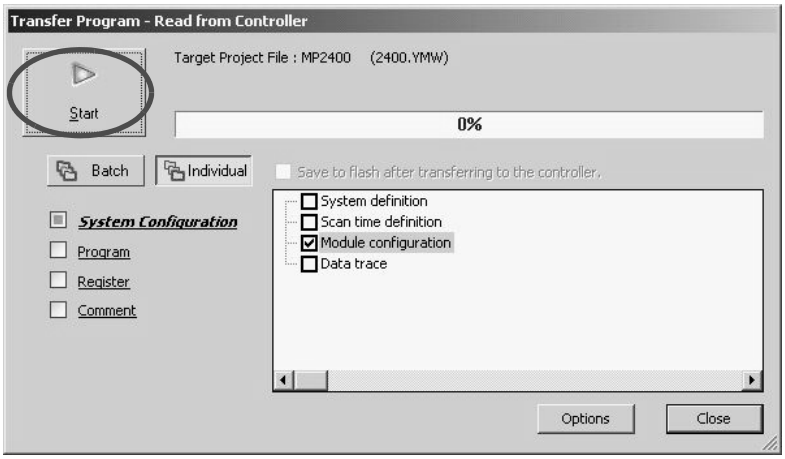
6. Select ***Online(O) - Read from Controller(A)***.



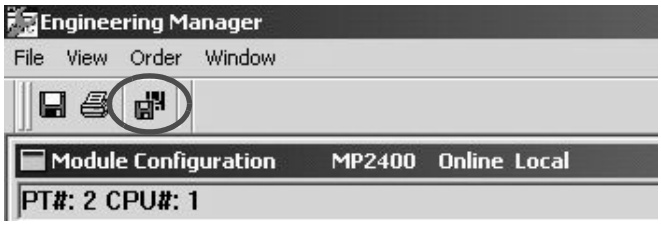
7. Click **Individual**, and only check **Module Configuration**.



8. Click **Start** to read the module configuration definition from a controller.



9. Click the **Save & FLASH Save** Button to flash save the definition information.



10. Check that the definition is successfully created in the **Module Configuration** Window.

5.4.2 Definition Information Updated with Self-Configuration

Now, the definition information updated during executing the self-configuration and the module configuration definition example based on the module combination are as follows:

(1) Definition Data of MP2400 Basic Module

[a] I/O Allocations

Item		Allocation
218IFA		• Start I/O register: IW0000/OW0000 • End I/O register: IW07FF/OW07FF (Input register: IW0000 to IW07FF Output register: OW0000 to OW07FF)
SVB	MECHATROLINK	• Start I/O register: IW0800/OW0800 • End I/O register: IW0BFF/OW0BFF (Input register: IW0800 to IW0BFF Output register: OW0800 to OW0BFF)
	Motion Parameter	• Start motion register: IW8000/OW8000 • End motion register: IW87FF/OW87FF (Input register: IW8000 to IW87FF Output register: OW8000 to OW87FF)
SVR	Motion Parameter	• Start motion register: IW8800/OW8800 • End motion register: IW8FFF/OW8FFF (Input register: IW8800 to IW8FFF Output register: OW8800 to OW8FFF)
M-EXECUTOR		• Start I/O register: IW0C00/OW0C00 • End I/O register: IW0C3F/OW0C3F (Input register: IW0C00 to IW0C3F Output register: OW0C00 to OW0C3F)

[b] 218IFA Definition

Item	Allocation
Local IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Gateway IP Address	0.0.0.0
Module Name Definition	“CONTROLLER NAME”
System Port (engineering port)	9999 (UDP)
Check & Monitor Time of MEMOBUS response	0 s
Retransmit Count	0

Note: The self-configuration allows you to connect with MPE720 for engineering transmission. In order to carry out MEMOBUS message transmission, manually use an automatic reception and I/O message communication separately.

[c] SVB Module Definitions

MECHATROLINK transmission definitions are automatically set according to the detected communication method and the number of slaves.
For more information on self-configuration for SVB module, refer to Chapter 3 of *Machine Controller MP2000-series SVB/SVB-01 Motion Module User's Manual* (manual number: SIEPC88070033).

■ Master

Item		MECHATROLINK-II (32-byte mode)				MECHATROLINK-II (17-byte mode)		MECHATROLINK-I
	Maximum Slave Station Number	1 to 8	9	10 to 16	17 to 21	1 to 14	15	
Number of Transmit Bytes		31 bytes				16 bytes		–
Communication Cycle		1ms	1ms	2ms	2ms	1ms	1ms	2ms
Number of Retry Stations		1	0	5	21: Maximum station number	1	0	14
Number of Slave Stations		8	9	16	Maximum station number	14	15	14

■ Slave

Item	MECHATROLINK-II (32-byte mode)	MECHATROLINK-II (17-byte mode)	MECHATROLINK-I
Number of Transmit Bytes	–	–	–
Communication Cycle	1ms	1ms	2ms
Number of Slave Stations	30	30	15

Note: To use MP2400/SVB as a Slave, before executing the self-configuration, the parameter setting for MECHATROLINK transmission definition must be set to Slave in MPE720.

[d] SVR Definition

Type	No.	Name	Allocation
Fixed Parameter	0	Selection of Operation Modes	Axis unused
	1	Function Selection Flag 1	0000h
	4	Reference Unit Selection	pulse
	5	Number of Digits below Decimal Point	3
	6	Travel Distance per Machine Rotation	10000 reference unit
	8	Servo Motor Gear Ratio	1 rev (rotation)
	9	Machine Gear Ratio	1 rev (rotation)
	10	Infinite Length Axis Reset Position (POSMAX)	360000 reference unit
	34	Rated Motor Speed	3000 min^{-1}
	36	Number of Pulses per Motor Rotation	65536 pulse/rev
	42	Feedback Speed Movement Averaging Time Constant	10 ms
Setting Parameter	OW□□00	RUN Command Setting	0000h
	OW□□03	Function Setting 1	0011h
	OW□□08	Motion Command	0: No command
	OW□□09	Motion Command Control Flag	0000h
	OW□□0A	Motion Subcommand	0: No command
	OL□□0C	Torque/Thrust Reference Setting	0.00 %
	OL□□10	Speed Reference Setting	3000 10**n reference unit/min
	OL□□16	Secondly Speed Compensation	0.00 %
	OL□□1C	Position Reference Setting	0 reference unit
	OW□□31	Speed Compensation	0.00 %
	OL□□36	Straight Line Acceleration/ Acceleration Time Constant	0 ms
	OL□□38	Straight Line Deceleration/ Deceleration Time Constant	0 ms
	OW□□3A	Filter Time Constant	0.0 ms
	OW□□3B	Bias Speed for Index Deceleration/ Acceleration Filter	0 reference unit/s
	OW□□3D	Width of Starting Point Position Output	100 reference unit
	OL□□44	STEP Travel Distance	1000 reference unit
	OL□□48	Zero Point Position in Machine Coordinate System Offset	0 reference unit
	OL□□4A	Work Coordinate System Offset	0 reference unit
	OL□□4C	Number of POSMAX Turns Presetting Data	0 turn
	OW□□5C	Fixed Parameter Number	0

[e] M-EXECUTOR Definition

Item	Allocation
Number of Program Definitions	8
Program Allocation	None
Control Register Allocation	None

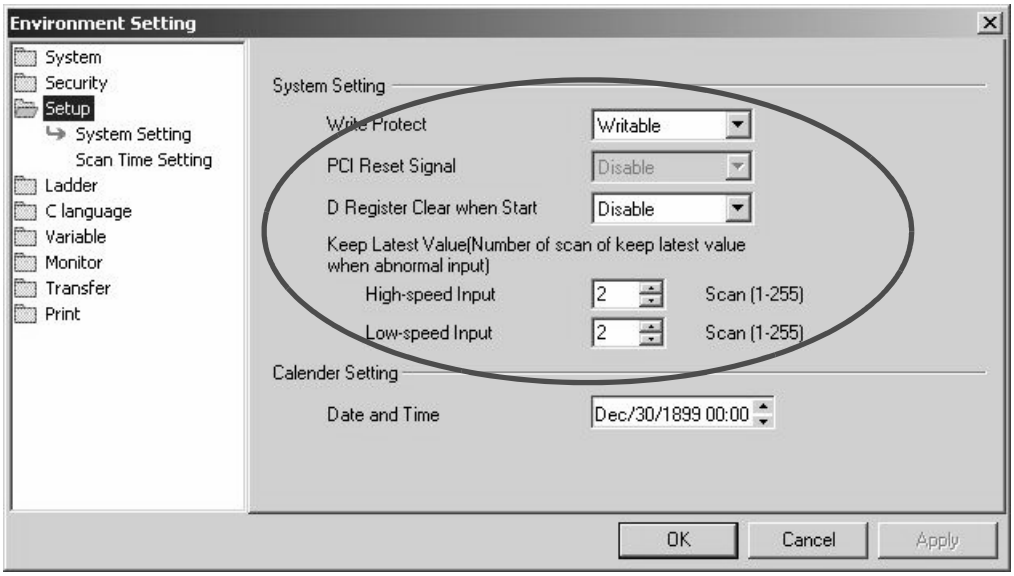
5.5 Precaution on Using MP2400

This section explains precautions when a user definition file is configured/changed and when setting a scan time.

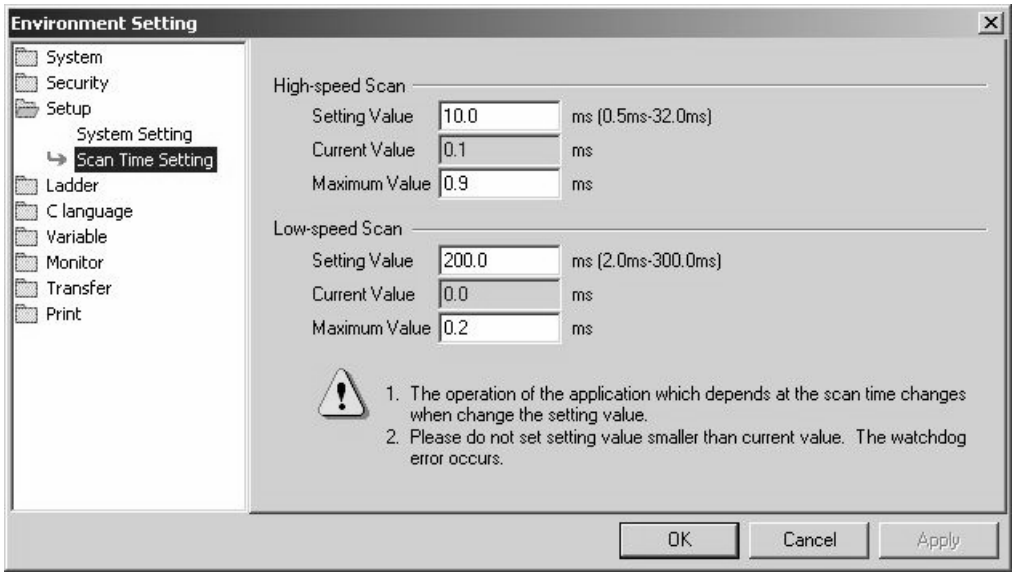
5.5.1 Precautions when User Definition File is Configured/Changed

System settings, scan time settings, and module configuration definitions must be saved in flash memory (flash save). When a system setting, scan time setting, or module configuration definition is configured/changed, be sure to use MPE720 to flash save it. Note that when the MP2400 power supply is turn ON again without flash saving, the configured/changed data may be lost.

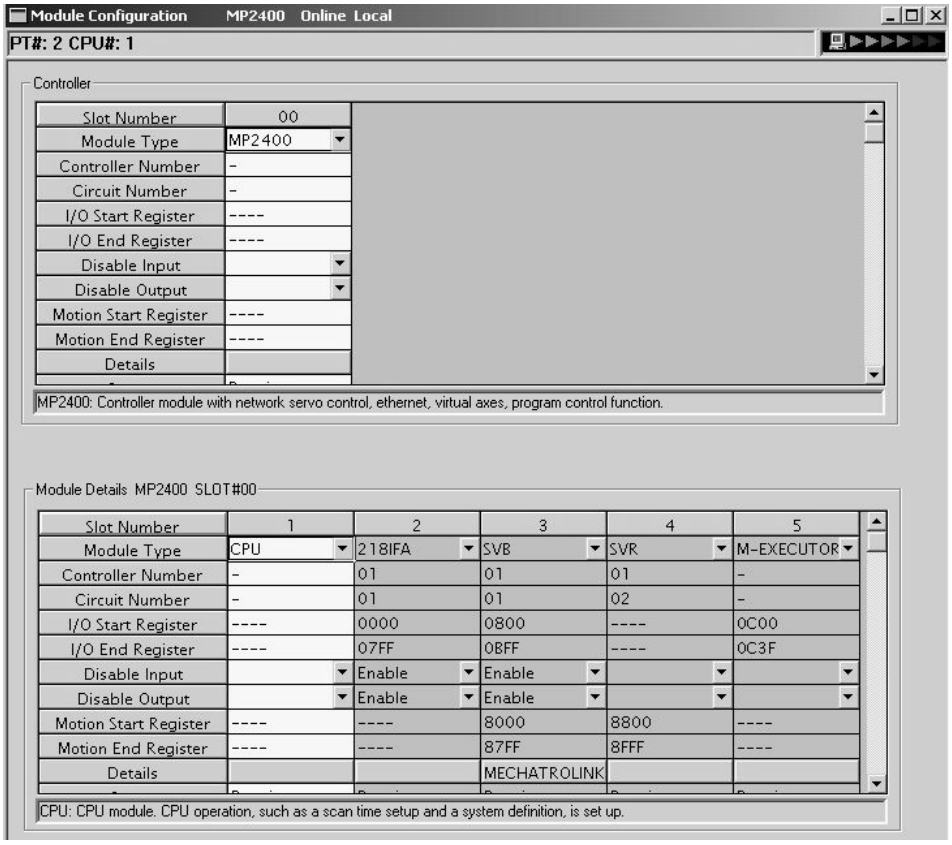
- System Setting



- Scan Time Setting



• Module Configuration Definition



5.5.2 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 MP2400 OFF and ON.

5.5.3 Setting and Changing the Scan Time

(1) Precautions When Setting or Changing the Scan Time

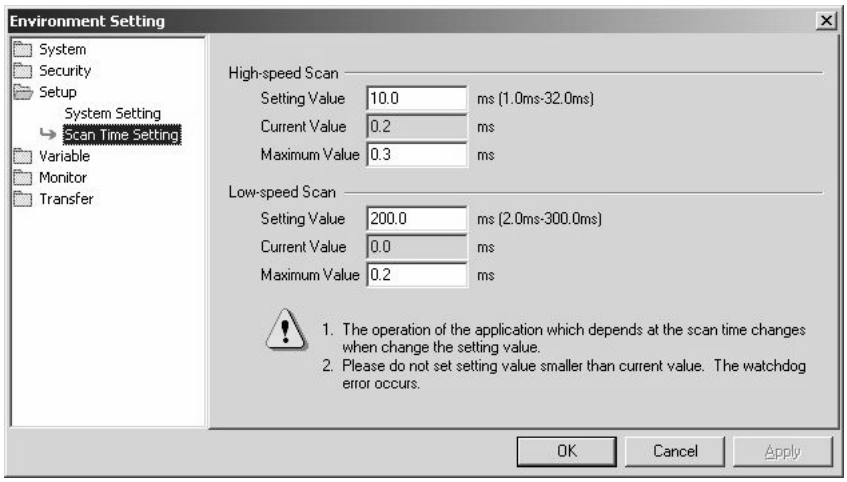
The scan time can be set and changed in the **Scan Time Setting** Window in the **Environmental Setting** Dialog Box on the MPE720.

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.

Note: 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 MP2400 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 MP2400. 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)

MEMO

6

Ethernet Communications

This chapter explains how to communicate with devices (PLC, touch panel, etc.) connected to the MP2400 by Ethernet.

6.1 Communication Methods

The following table provides the appropriate mode of communication for each remote device and purpose.

Remote Equipment	Purpose	Communication Method	Remarks
Other MP Series	When other MP series equipment reads/writes the coil state or register content of MP2400	Uses the Extended MEMOBUS communication protocol. The remote equipment (master) side creates a ladder program using a MSG-SND function. The MP2400 (slave) side uses an automatic receive function. (You do not need to create a ladder program.) ⇒ Refer to *6.2.1 When the MP2400 Acts as Slave (automatic receive function is used)*	MP2400 can communicate with only one master using the automatic receive function.
	When MP2400 reads/writes the coil state or register content of other MP series equipment	Uses the Extended MEMOBUS communication protocol. The MP2400 (master) side uses an I/O message communication function. (You do not need to create a ladder program.) The remote equipment (slave) side creates a ladder program using a MSG-RCV function. ⇒ Refer to *6.2.2 When MP2400 Acts as Master (I/O message communication function is used)*	Only the holding register (M register) is capable of reading/writing using an I/O message communication function. It can communicate with only one slave.
Touch Panel	When a touch panel reads/writes the coil state or register content of MP2400	Uses the Extended MEMOBUS communication protocol. Set the protocol for the touch panel side to the Extended MEMOBUS protocol. The MP2400 (slave) side uses an automatic receive function. (You do not need to create a ladder program.) ⇒ Refer to *6.3 Communication with Touch Panel*.	
PLC Manufactured by Mitsubishi Electric Corporation	When a PLC Manufactured by Mitsubishi Electric Corporation reads/writes the MP2400 register content.	Uses the MELSEC communication protocol. The remote equipment (master) side creates a ladder program using a BUFSND function. The MP2400 (slave) side uses an automatic receive function. (You do not need to create a ladder program.) ⇒ Refer to *6.4.1 When the MP2400 Acts as Slave (automatic receive function is used)*	The MP2400 can communicate with only one master when using the automatic receive function.
	When an MP2400 reads/writes the relay state or register content of PLC Manufactured by Mitsubishi Electric Corporation.	Uses the MELSEC communication protocol. The MP2400 (master) side uses an I/O message communication function. (You do not need to create a ladder program.) The remote equipment (slave) side needs to set the network parameters. (You do not need to create a ladder program.) ⇒ Refer to *6.4.2 When the MP2400 Acts as Master (I/O message communication function is used)*	The MP2400 can communicate with only one slave when using the I/O message communication function.

6.2 Communication with Other MP Series

When Ethernet communication is carried out between the MP2400 and other MP series, the Extended MEMOBUS protocol is used as a communication protocol. The Extended MEMOBUS protocol allows the master to read/write the slave register contents.
This chapter explains communications when an MP2400 acts as a slave and a master respectively.
When the MP2400 acts as a slave, this chapter explains communications using an automatic receive function.
When the MP2400 acts as a master, this chapter explains communications using an I/O message communication function.

6.2.1 When the MP2400 Acts as Slave (automatic receive function is used)

This section explains how to communicate with the MP2300 message transmit function (MSG-SND) using the MP2400 automatic receive function.

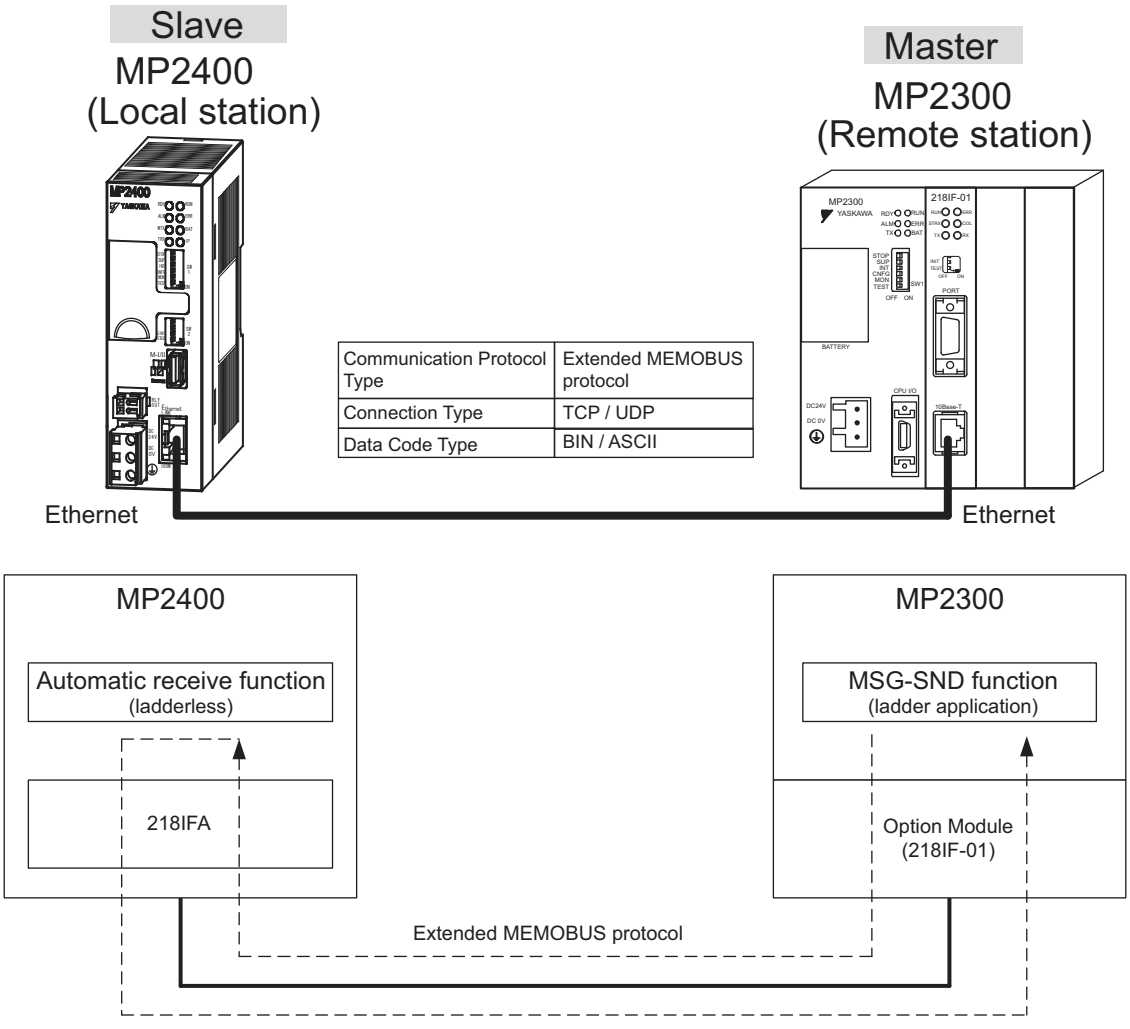
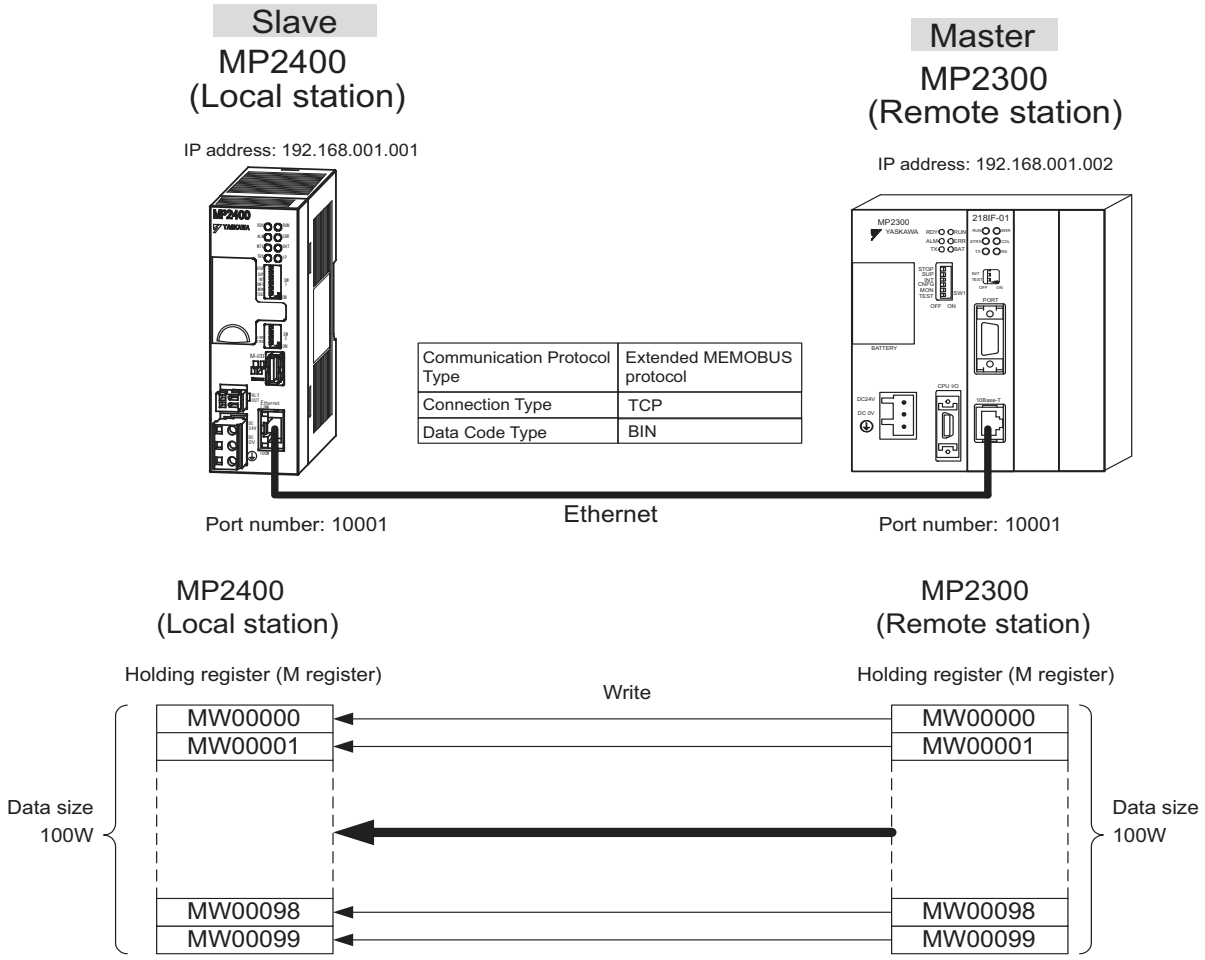


Fig. 6.1 Message Flow with MP2300 when Automatic Receive Function Is Used

■ Setting Example

The following figure illustrates how the content of the MP2300 (master) holding register (MW00000 to MW00099) is written into the MP2400 (slave) holding register (MW00000 to MW00099).

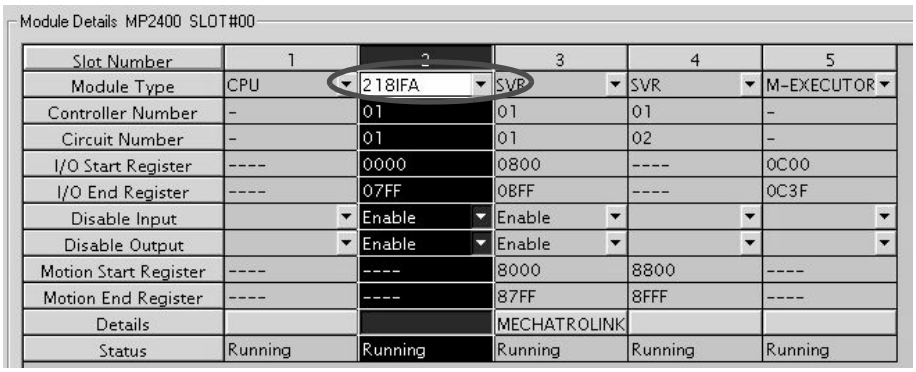


The setup procedure is explained in the following pages.

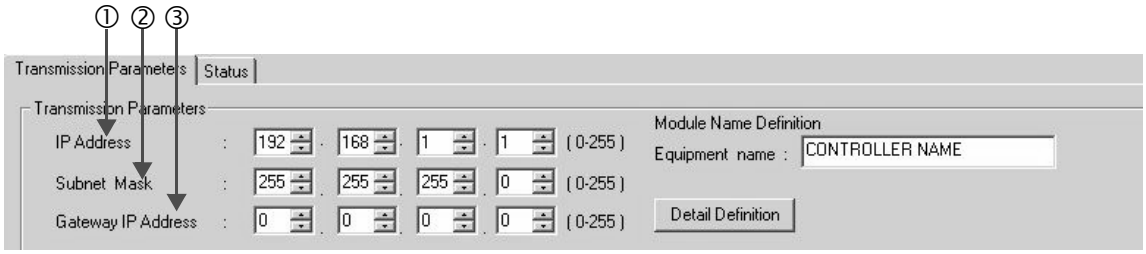
(1) How to Set up the MP2400 Side

If the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the **218IFA** Tab in the **Module Details** Window of the module configuration definition.



2. Set transmission parameters.



■ How to set up transmission parameters

① Set **IP Address** (to "192.168.001.001," for example).
② Set **Subnet Mask** (to "255.255.255.000," for example).
③ Set **Gateway IP Address** (to "000.000.000.000," for example).

■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

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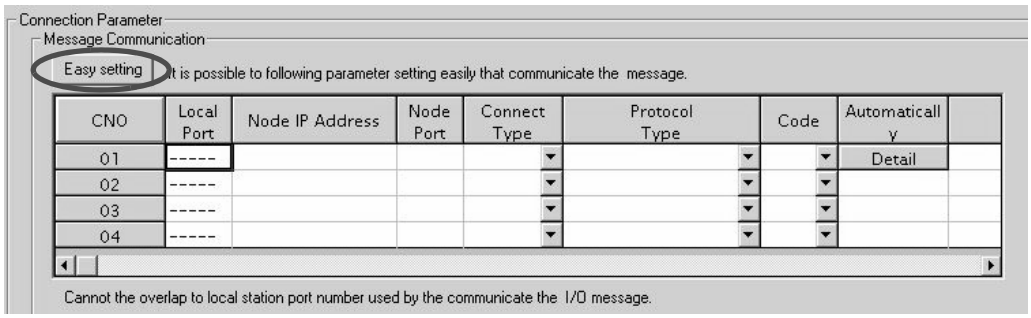
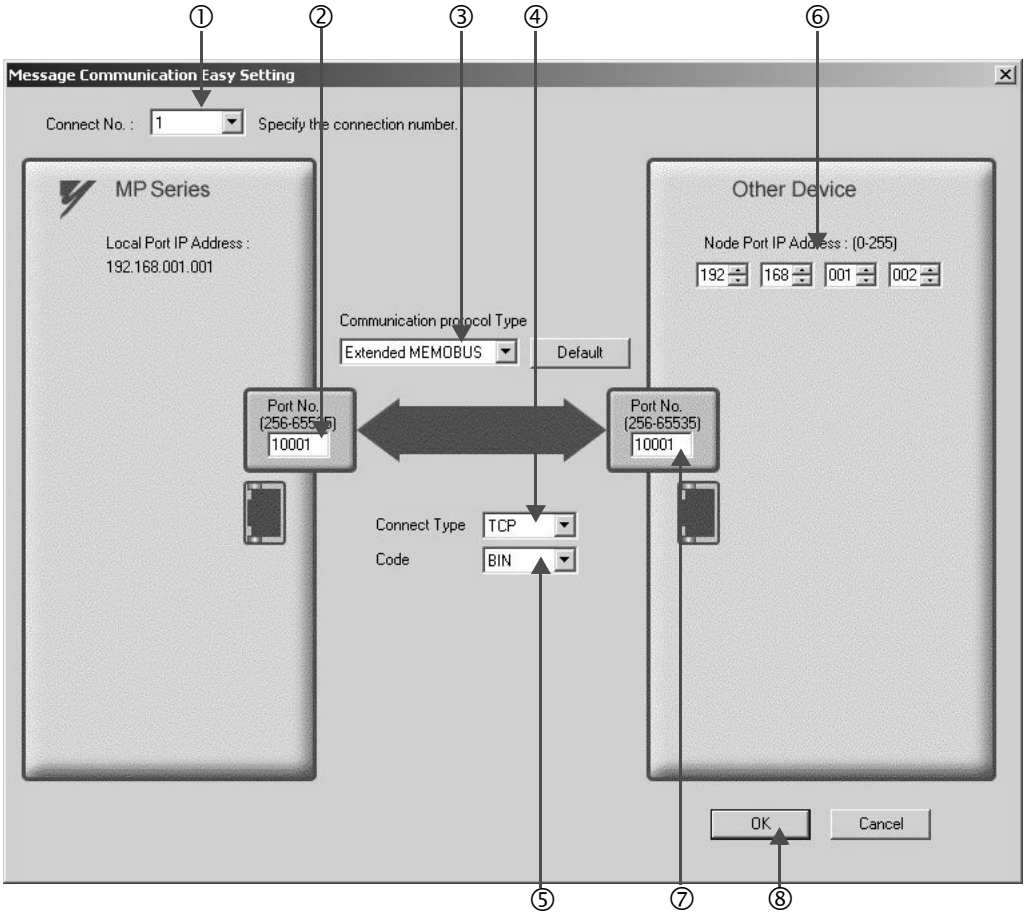
3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



4. Set a communication setting in the **Message Communication Easy Setting** Window.



■ How to set up in the **Message Communication Easy Setting** Window

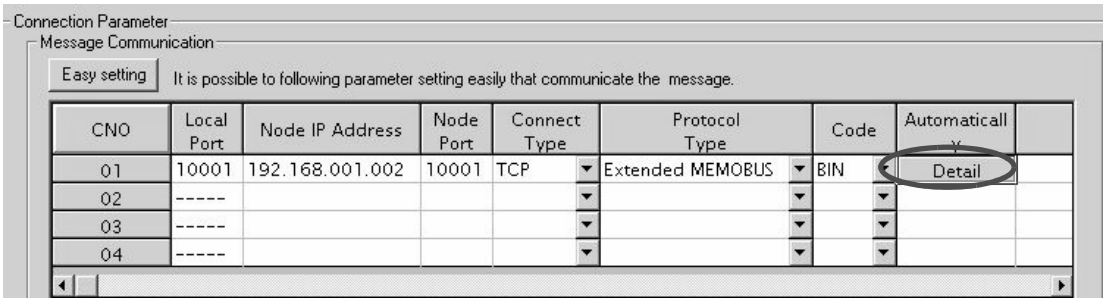
① When automatic receive is used, select "1" for the **Connect No.**
② Set **Port No.** of the MP2400 side ("10001," for example).
③ Select **Extended MEMOBUS** for the **Communication Protocol Type**, and click **Default** Button.
④ Select **Connect Type** (TCP, for example).
⑤ Select **Code** (BIN, for example).
⑥ Set **Node Port IP Address** for the other device (MP2300) to be connected (to "192.168.001.002," for example).
⑦ Set **Port No.** of the other device (MP2300) to be connected (to "10001," X for example).
⑧ Click **OK** Button.

5. Click **Yes** in the confirmation dialog of the parameter setting.

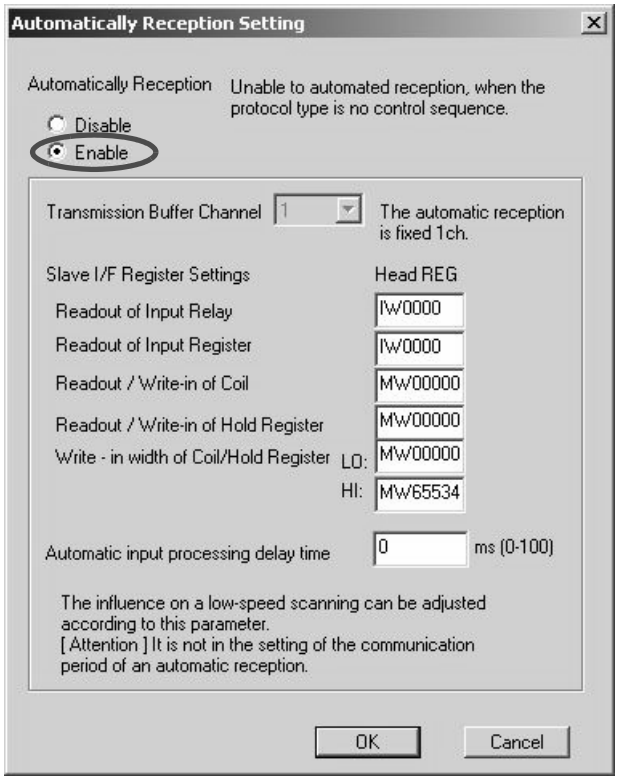
■ Caution

Note that when a parameter with the same connection number is already set and you click **Yes** in the confirmation dialog of the parameter setting, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

6. Check the setting value and click the **Detail** Button of the **Automatically**.



7. Click **Enable** in the **Automatically Reception Setting** Dialog Box and then click the **OK** Button.



Note: For more information on Slave Side I/F Register Settings and Automatic input precessing delay time, refer to *2.2.4 (4) (b) ■ Automatic Receive Setting Screen for Message Communication* on page 2-22.

Now, the automatic receive function is set up when the MP2400 acts as a slave.

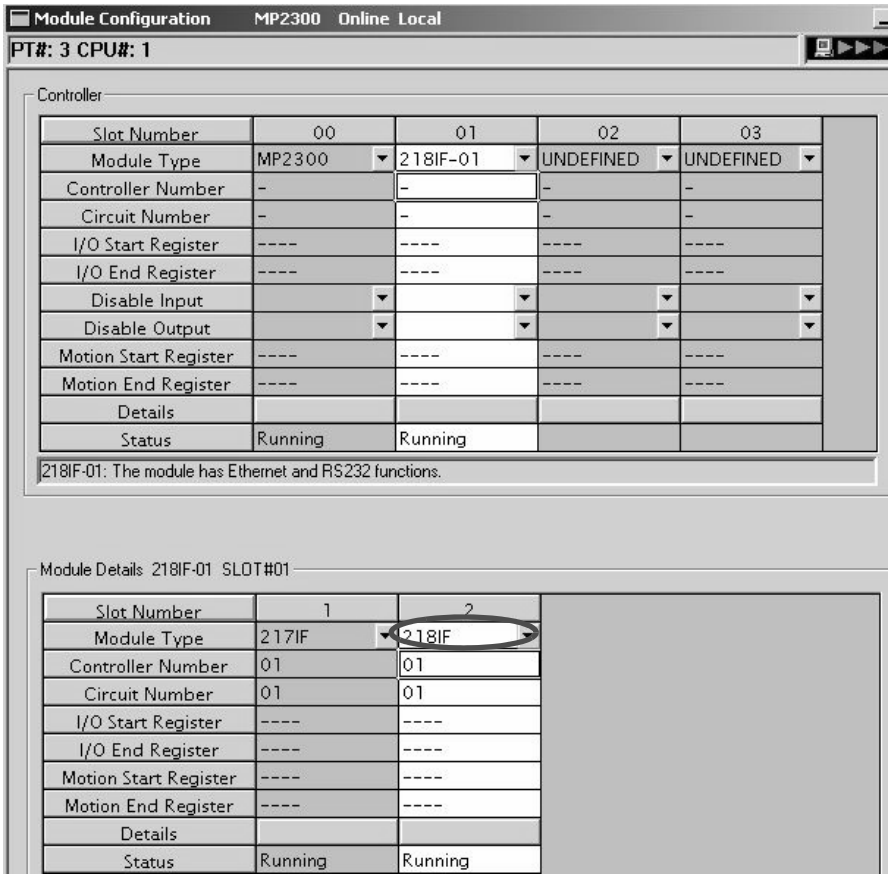
■ Caution

When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power is turned ON again.

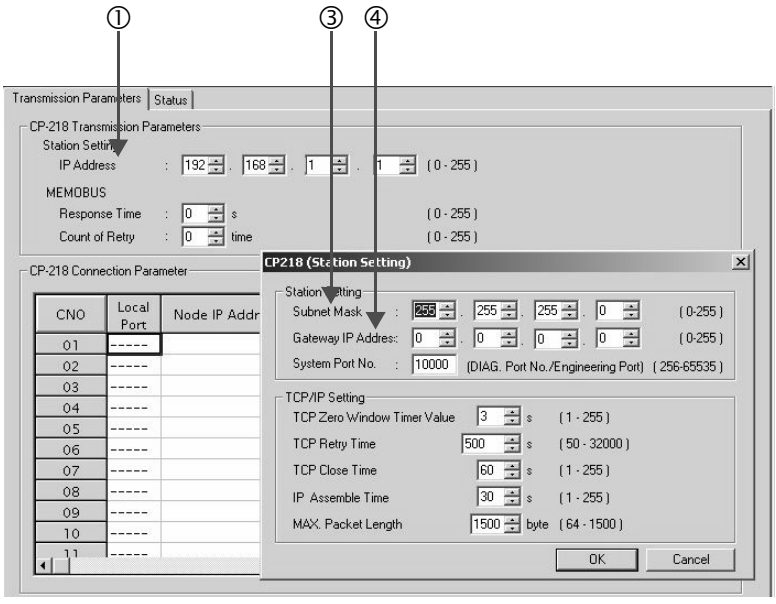
(2) How to Set up the Remote Device (MP2300) to Be Connected

If the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the **218IF** Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



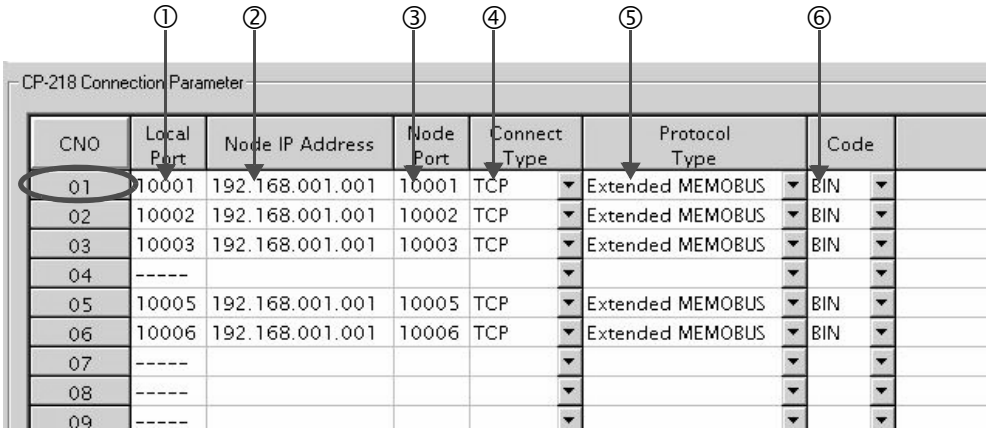
■ How to set up transmission parameters

① Set **IP Address** (“192.168.001.001,” for example).
② Click **Edit**, and then click **Local Station: TCP/IP Setting** in the Engineering Manager Window.
③ Set **Subnet Mask** (“255.255.255.000,” for example).
④ Set **Gateway IP Address** (“000.000.000.000,” for example).

■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

3. Set connection parameters.



■ How to set up with a connection number 01 in the connection parameter setting screen

① Set **Local Port** to the port number used in the MP2300 side (“10001,” for example).
② Set **Node IP Address** to the IP address configured in the MP2400 side.
③ Set **Node Port** to the port number configured in the MP2400 side (“10001,” for example).
④ Select **Connect Type** (TCP, for example).
⑤ Select **Extended MEMOBUS** for **Protocol Type**.
⑥ Select **Code** (BIN, for example).

■ Caution

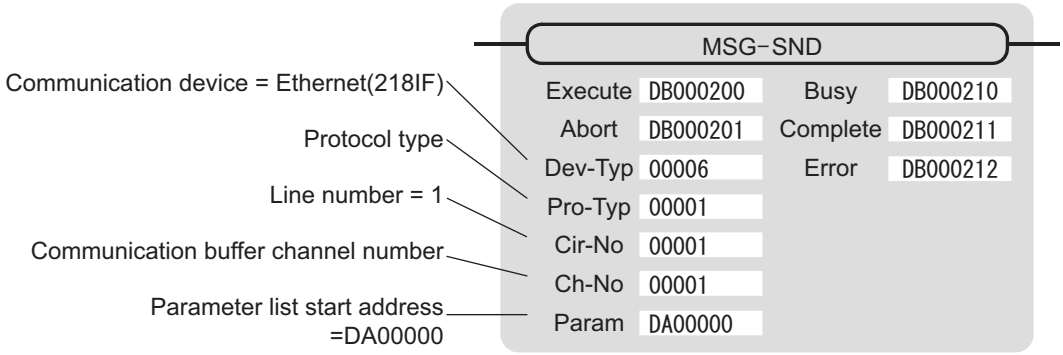
When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power turned ON again.

4. Create a ladder program with a message transmit function (MSG-SND).

A ladder program for transmitting messages to/from the remote equipment (MP2300) side is shown as follows:

■ Message transmit function (MSG-SND)

Required for transmitting messages. Message transmission is carried out by describing and executing this message transmit function in a ladder program.



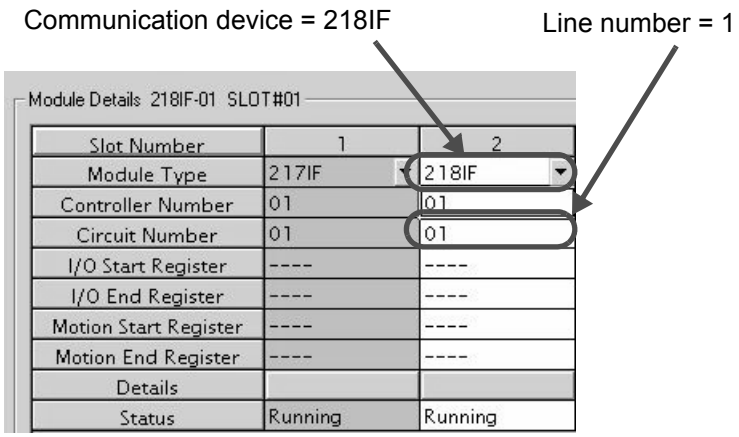


Fig. 6.2 MPE720 Module Configuration Definition Window

■ Input/output definitions for message transmit functions

The input/output definitions for the message transmit function are explained as follows:

Table 6.1 Input/Output Definitions for Message Transmit Functions

I/O Definition	No.	Name	Setting Example	Explanation
Input Item	1	Execute	DB000200	Executes a transmission When the Execute bit is ON, the message is transmitted.
	2	Abort	DB000201	Aborts a transmission When the Abort bit is ON, the message transmission is forcibly stopped.
	3	Dev-Typ	00006	Communication device type Specify the type of the communication device used in transmission. When Ethernet (218IF) is used, specify “6”.
	4	Pro-Typ	00001	Communication protocol Specify the type of the communication protocol. MEMOBUS(*1) = 1, non-procedure 1(*2) = 2, non-procedure 2(*2) = 3
	5	Cir-No	00001	Circuit number Specify the circuit number of the communication device. Specify it in accordance with the circuit number displayed in the MPE720 module configuration definition screen.
	6	Ch-No	00001	Communication buffer channel number Specify the channel number of the communication buffer. When Ethernet (218IF) is used, specify it in the range between “1” and “10”. * Set up a unique channel number in the circuit.
	7	Param	DA00000	Parameter list start address Specify the start address of the parameter list. For the Parameter List, 17 words are automatically assigned from the configured address.
Output Item	1	Busy	DB000210	In process Busy is turned ON while executing a message transmission or forced abort process.
	2	Complete	DB000211	Process completed When a message transmission or abort process is properly completed properly, Complete will turn ON only for one scan.
	3	Error	DB000212	Error occurred When an error occurs, the Error bit will turn ON only for one scan.

* 1. When transmitting in MEMOBUS, Extended MEMOBUS, MELSEC, or MODBUS/TCP protocol, set the communication protocol (Pro-Typ) to MEMOBUS(=1). The communication device automatically converts the protocol.
* 2. Non-procedure 1: In non-procedural communications, data is transmitted on a per-word basis.
Non-procedure 2: In non-procedural communications, data is transmitted on a per-byte basis.

■ Parameter list setting example for the message transmit function

An example of a parameter list setting when writing 100 words of data from MW00000 to the destination using the connection with a connection number = 1 follows:

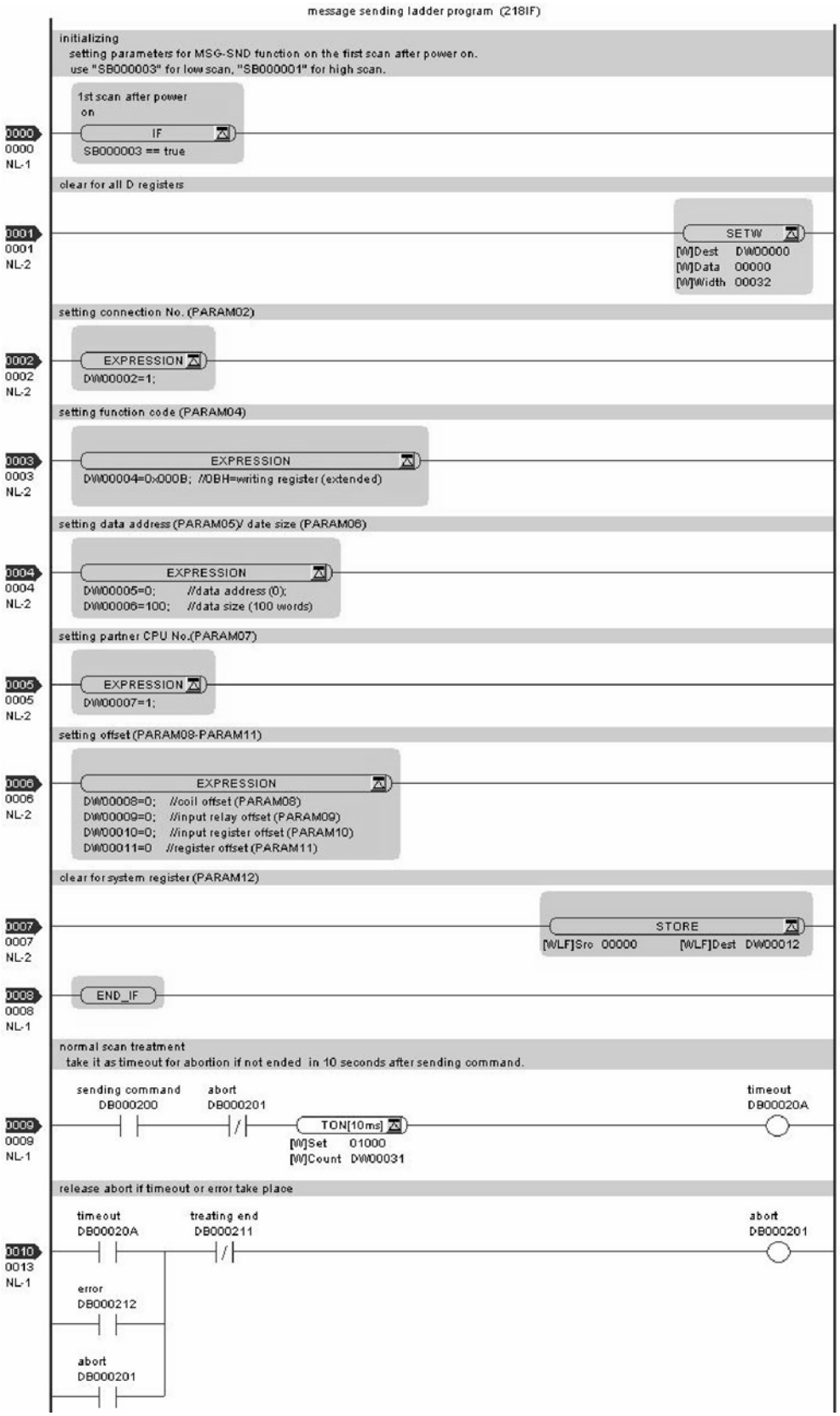
Table 6.2 Sample Parameter List Setting (parameter list start address Param=DA00000)

Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00001	PARAM02	IN	Connection number = 1
DW00003	–	PARAM03	IN	Option (Setting unnecessary)
DW00004	000BH	PARAM04	IN	Function code = 0BH (Writes to holding register)
DW00005	00000	PARAM05	IN	Data address = 0 (Starting from MW00000)
DW00006	00100	PARAM06	IN	Data size = 100 (100 words)
DW00007	00001	PARAM07	IN	Remote CPU number = 1
DW00008	00000	PARAM08	IN	Coil offset = 0 word
DW00009	00000	PARAM09	IN	Input relay offset = 0 word
DW00010	00000	PARAM10	IN	Input register offset = 0 word
DW00011	00000	PARAM11	IN	Holding register offset = 0 word
DW00012	–	PARAM12	SYS	Reserved by the system. (Zero clear at startup)
DW00013	–	PARAM13	SYS	Reserved by the system.
DW00014	–	PARAM14	SYS	Reserved by the system.
DW00015	–	PARAM15	SYS	Reserved by the system.
DW00016	–	PARAM16	SYS	Reserved by the system.

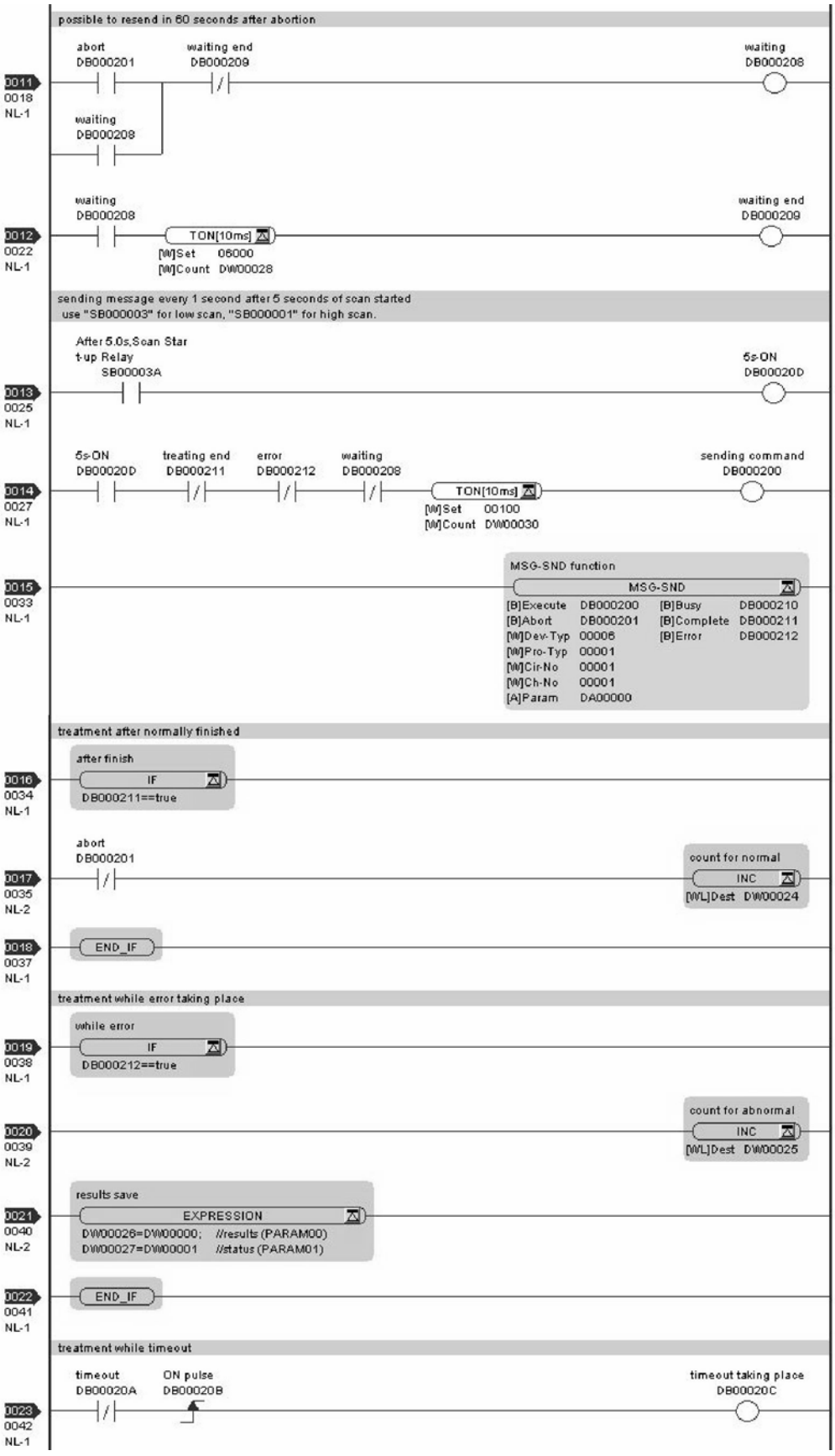
Note: N: Input, OUT: Output, SYS: For system use

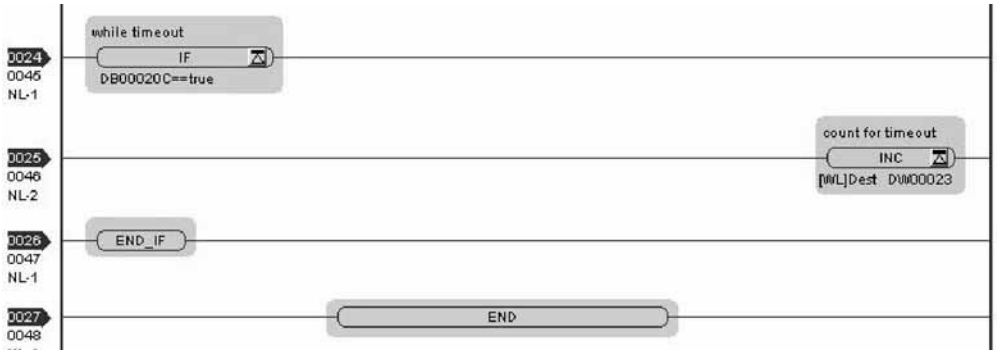
■ Example of Using the Message Transmit Function in a Ladder Program

Here is one example of the message transmit function through Ethernet (218IF).



6.2.1 When the MP2400 Acts as Slave (automatic receive function is used)





The communication setting and the ladder program creation are now finished, when MP2300 acts as a master.

(3) How to Start Communications

1. The MP2400 side starts to receive the messages.

When the automatic receive function is used, the message receive operation starts automatically.

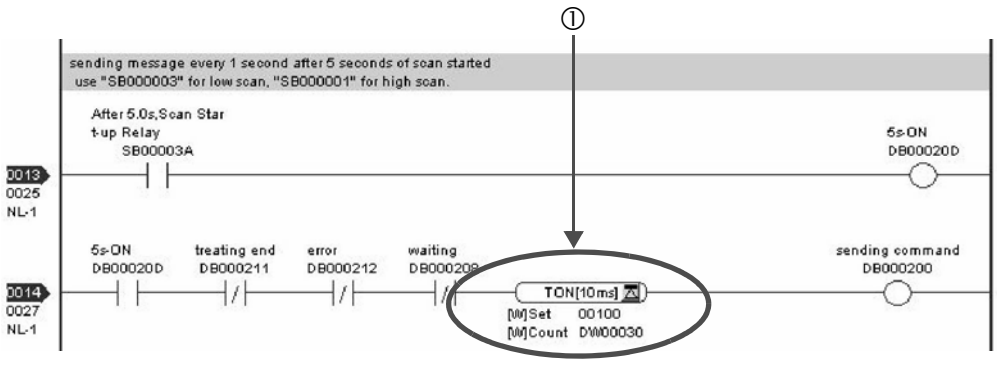
2. Turn Execute ON for the message transmit function in the MP2300 side to transmit messages.

Messages are transmitted by turning ON the register (DB000200, for example), configured in Execute of the message transmit function, starting communication with the MP2400.

Table 6.3 Input/Output Definition for Message Transmit Function

I/O Definition	No.	Name	Setting Example	Content
Input Item	1	Execute	DB000200	Executes a transmission When Execute is ON, the message transmission will be carried out.

The sample ladder program is created to transmit a message every one second when five seconds have elapsed after the low-speed scan (or high-speed scan) startup.
To change the message transmission interval, change the timer value ①.



6.2.2 When MP2400 Acts as Master (I/O message communication function is used)

This section explains how to communicate with the MP2300 message receive function (MSG-RCV) using the MP2400 I/O message communication function.

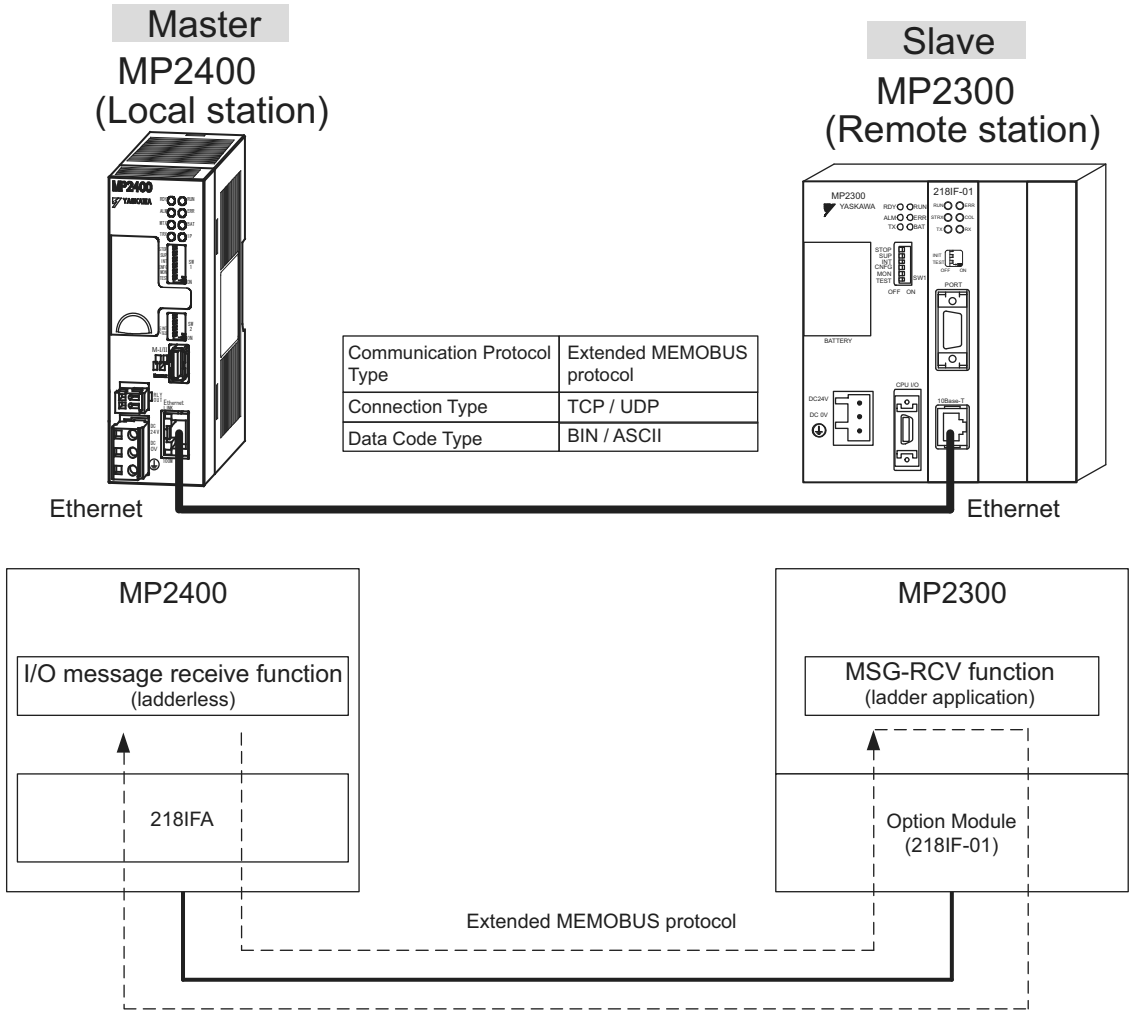


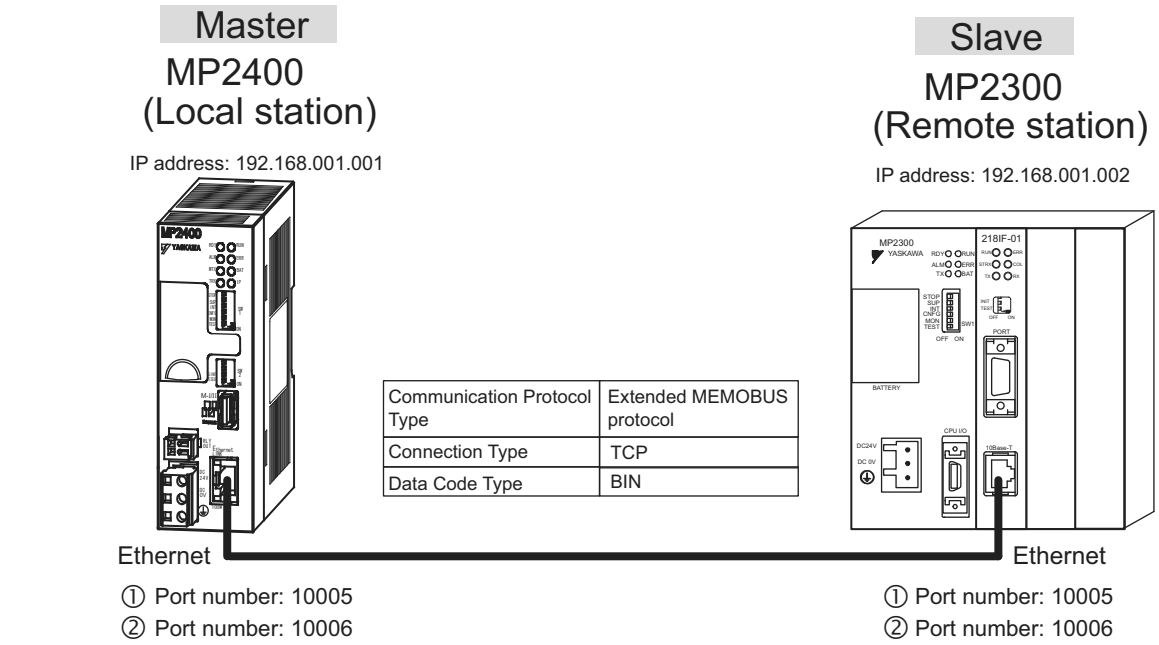
Fig. 6.3 Message Flow with MP2300 when I/O Message Communication Function Is Used

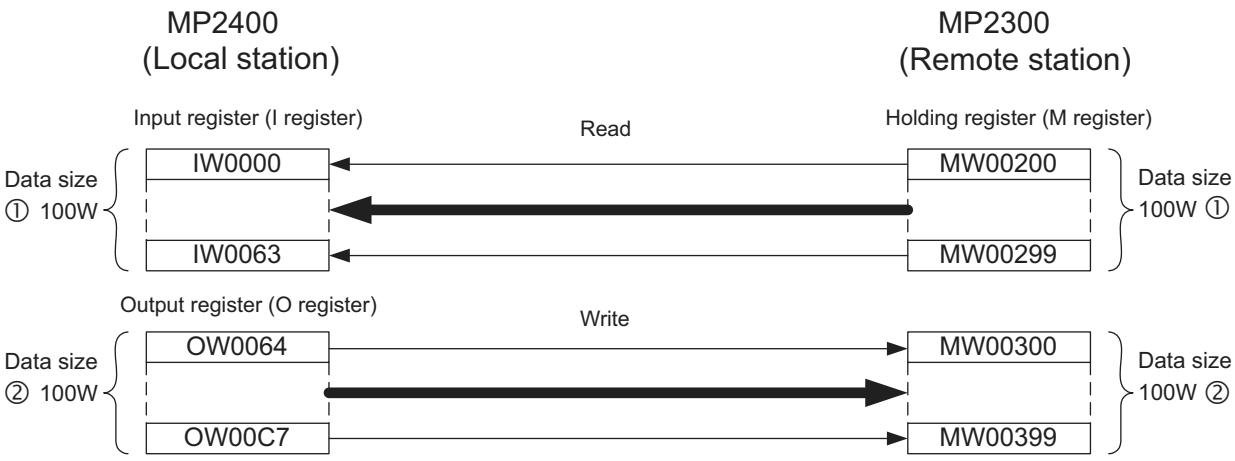
■ I/O Message Communication

I/O message communication implements out 1:1 communication.
In addition, you can read and write only the holding register in the case of "Communication Protocol Type: Extended MEMOBUS" used in the communication with MP series.

■ Setting Example

The following figure illustrates one example of reading the contents of the holding register (MW00200 to MW00299) of MP2300 (slave) into an input register (IW0000 to IW0063) of MP2400 (master) and writing the contents of an output register (OW0064 to OW00C7) of MP2400 (master) into a holding register (MW00300 to MW00399) of MP2300 (slave).



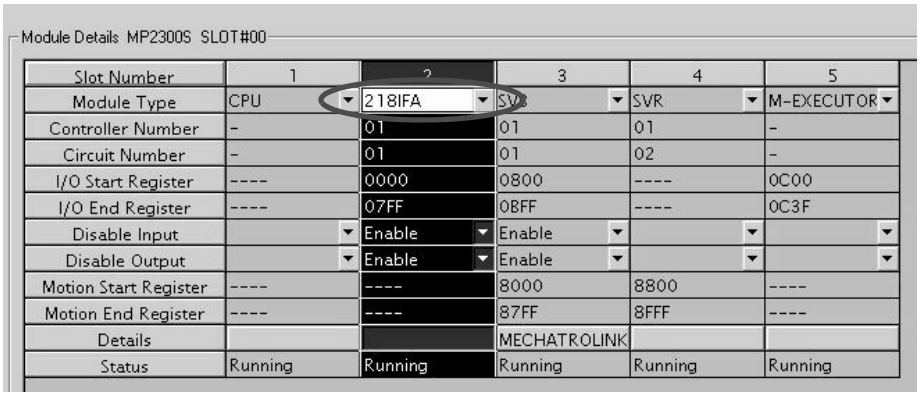


The particular setup procedure is explained in the subsequent pages.

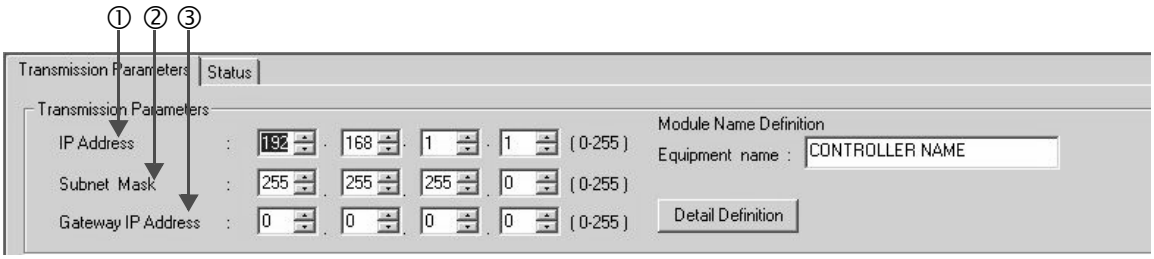
(1) How to Set up the MP2400 Side

If the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the 218IFA Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



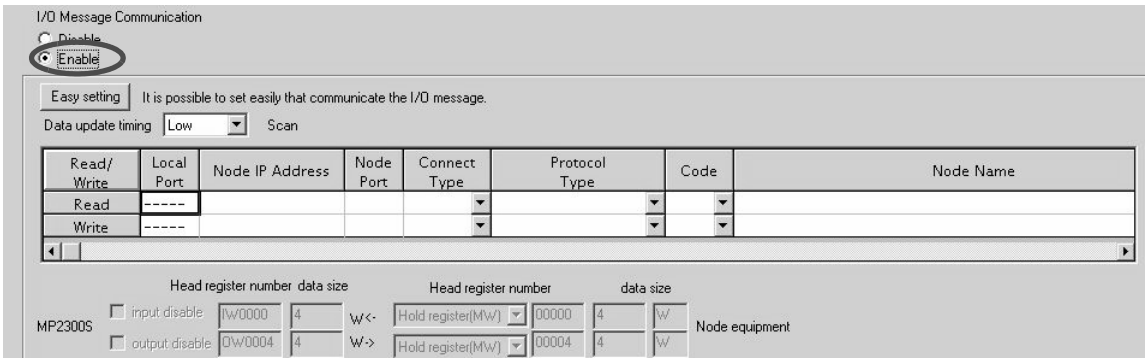
■ How to set up transmission parameters

① Set **IP Address** ("192.168.001.001," for example).
② Set **Subnet Mask** ("255.255.255.000," for example).
③ Set **Gateway IP Address** ("000.000.000.000," for example).

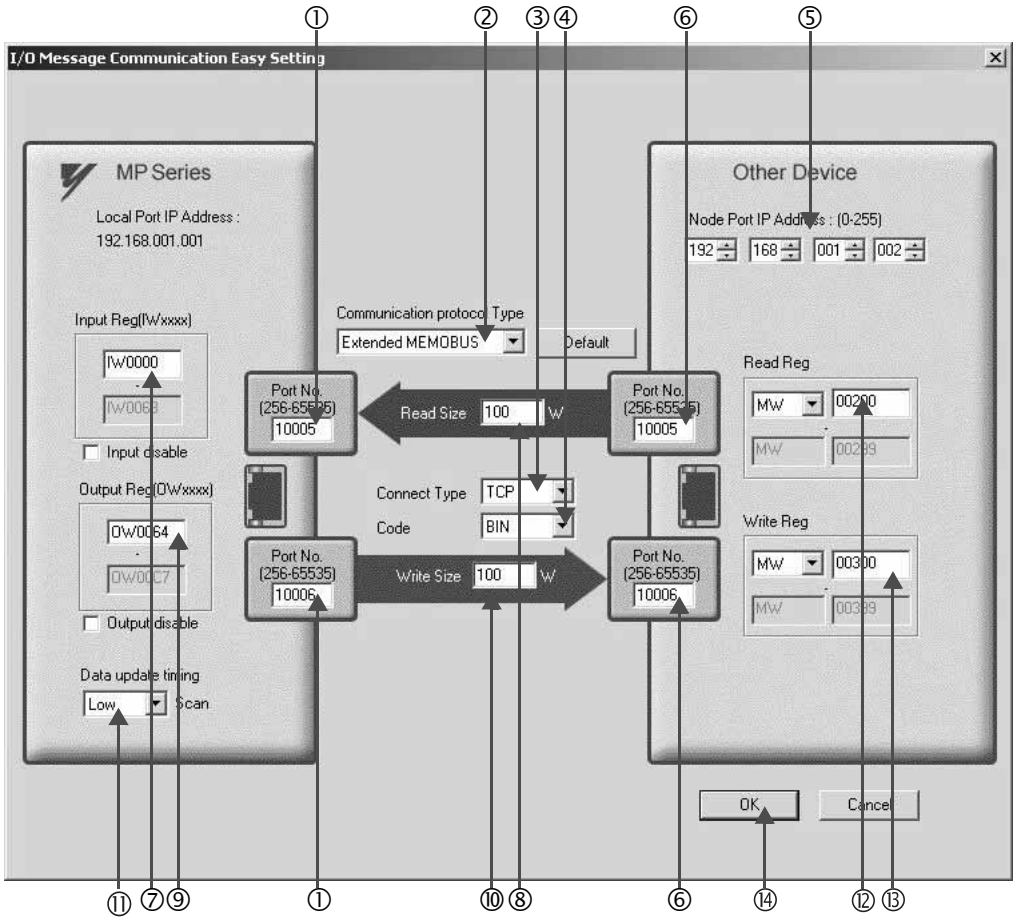
■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

3. Click **Enable** in the **I/O Message Communication** of the connection parameter setting.



4. Set a communication setting in the **I/O Message Communication Easy Setting** Window.



■ How to set up in the **I/O Message Communication Easy Setting** Window

① Set **Port No.** of the MP2400 side ("10005, 10006," X for example).
② Select **Extended MEMOBUS** for **Communication Protocol Type**, and click the **Default** Button.

■ Caution

When the communication protocol is Extended MEMOBUS, the register type that can select both read and write is fixed at the Holding Register (MW).

③ Select **Connect Type** (TCP, for example).
④ Select **Code** (BIN, for example).
⑤ Set **Remote IP Address** for the other device (MP2300) to be connected ("192.168.001.002," for example).
⑥ Set **Port No.** of the other device (MP2300) to be connected ("10005, 10006," for example).

■ Caution

In I/O message communication, as a message is transmitted from each port number for register read/write, a connected remote device needs the message receive functions to receive two messages.

⑦ Set a storage area (**Input Reg**) of data read by MP2400 (IW0000, for example).
⑧ Set the **Read Size** of data to be the read by the MP2400 (“100” W, for example).
⑨ Set a storage area (**Output Reg**) of data written by the MP2400 (OW0064, for example).
⑩ Set the **Write Size** of data written by the MP2400 (“100” W, for example).
⑪ Set an I/O data update timing (**Data update timing**) for CPU and built-in Ethernet (“Low” scan, for example).

■ Data Update Timing

Data update timing indicates when to send and receive data between the CPU and built-in Ethernet. Communication with the remote device is carried out asynchronously, so note that a message is not necessarily transmitted to the remote equipment at each set data update time.

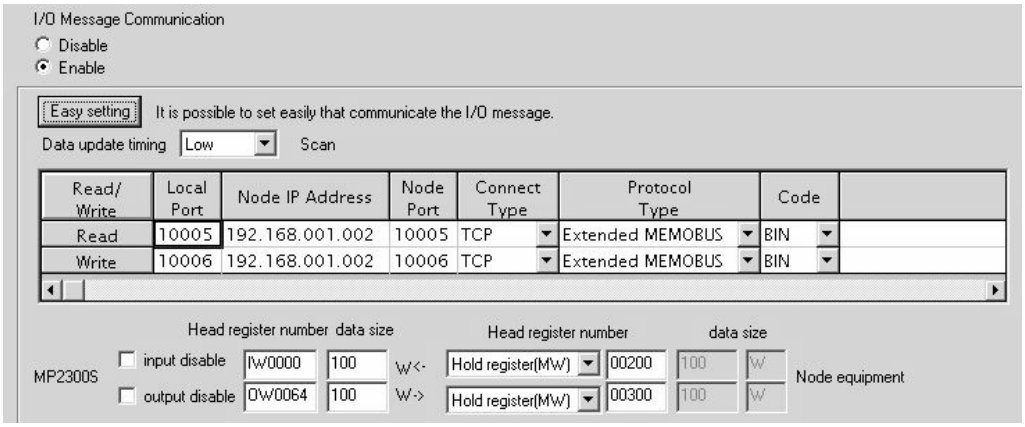
⑫ Set the register type and start address (**Read Reg**) of the remote device (MP2300) read by the MP2400 (“MW00200,” for example).
⑬ Set the register type and start address (**Write Reg**) of the remote device (MP2300) written by the MP2400 (“MW00300,” for example).
⑭ Click **OK**.

5. Click **Yes** in the parameter setting confirmation window.

■ Caution

Note that when a parameter with the same connection number is already set and you click **Yes** in the parameter setting confirmation window, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

6. Check the setting values.



The I/O message communication is now set up, when MP2400 acts as a master.

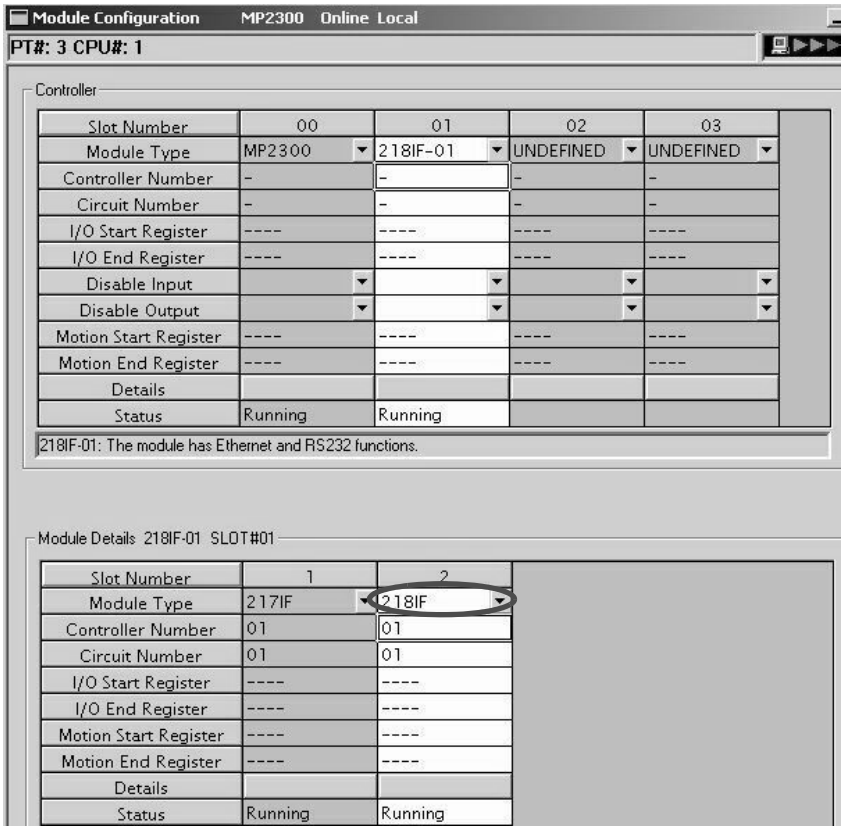
■ Caution

When any transmission or connection parameter is changed, the change will be not reflected after FLASH has been saved and the power supply is turned ON again.

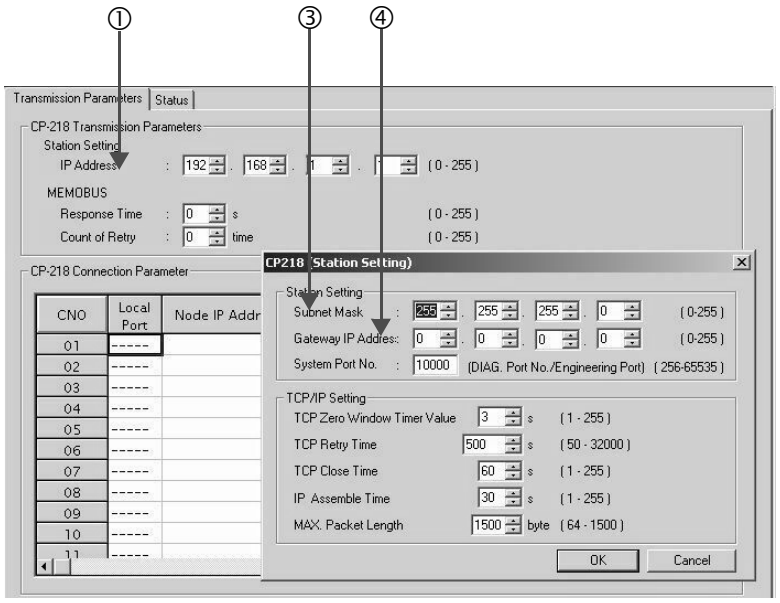
(2) How to Set up the Remote Device (MP2300) to Be Connected

When the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the **218IF** Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



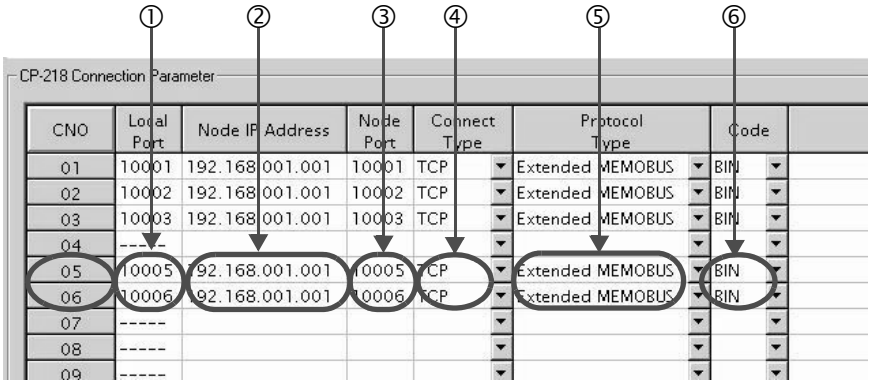
■ How to set up transmission parameters

① Set **IP Address** (“192.168.001.001”, for example).
② Click **Edit**, and then click **Local Station: TCP/IP Setting** in the **Engineering Manager** Window.
③ Set **Subnet Mask** (“255.255.255.000”, for example).
④ Set **Gateway IP Address** (“000.000.000.000”, for example).

■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

3. Set connection parameters.



■ How to set up in the **CP-218 Connection Parameter** Window with connection numbers 05, 06

① Set **Local Port** (the port number “10005, 10006” used in the MP2300 side, for example).
② Set **Node IP Address** (the IP address “192.168.001.001” configured in the MP2400 side, for example).
③ Set **Node Port** (the port number “10005, 10006” configured in the MP2400 side, for example).
④ Select **Connect Type** (TCP, for example).
⑤ Select **Extended MEMOBUS** for **Protocol Type**.
⑥ Select **Code** (BIN, for example).

■ Caution

When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

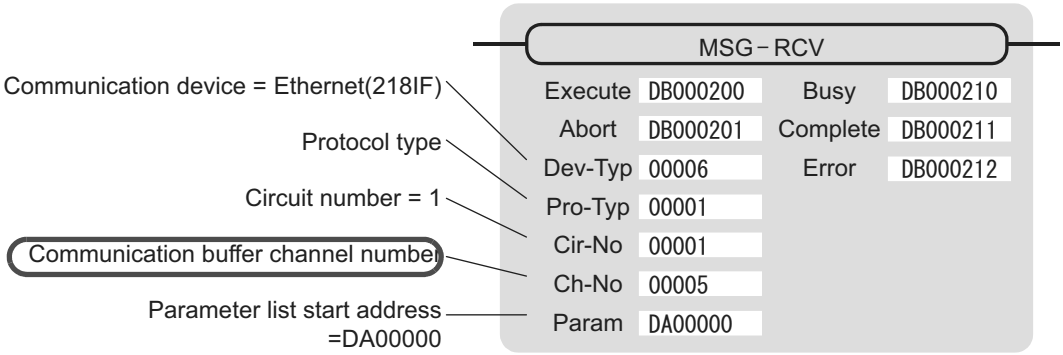
4. Create a ladder program with a message receive function (MSG-RCV) in it.

An example of a ladder program for receiving messages in the remote equipment (MP2300) side follows:

■ Message receive function (MSG-RCV)

Required for receiving messages. Message reception is carried out by inputting and executing this message receive function in a ladder program.

In addition, in order to support Read and Write by MP2400, two message receive functions should be provided. Here, the input item and parameters (Communication buffer channel number and Connection number) of the message receive function need to accord with the MP2400 side settings.



Note: Similarly, a message receive function with the communication buffer channel number = 6 is required.

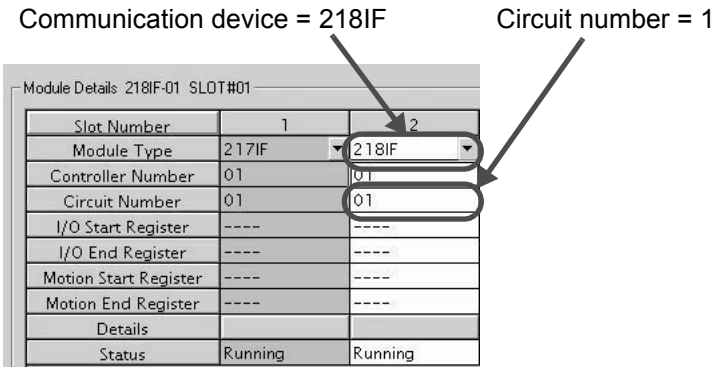


Fig. 6.4 MPE720 Module Configuration Definition Window

■ Input/output definition contents for message receive functions

The input/output definition content for message receive function is as follows:

Table 6.4 Input/Output Definitions for Message Receive Functions

I/O Definition	No.	Name	Setting Example	Content
Input Item	1	Execute	DB000200	Executes a reception When Execute is ON, message reception is carried out.
	2	Abort	DB000201	Forcibly aborts a reception When Abort is ON, the message reception is forcibly stopped.
	3	Dev-Typ	00006	Communication device type Specify the type of the communication device used in reception. When Ethernet (218IF) is used, specify "6."
	4	Pro-Typ	00001	Communication protocol Specify the type of the communication protocol. MEMOBUS(*1) = 1, non-procedure 1(*2) = 2, non-procedure 2(*2) = 3
	5	Cir-No	00001	Circuit number Specify a circuit number of the communication device. Specify it in accordance with the circuit number displayed in the MPE720 module configuration definition screen.
	6	Ch-No	00005 & 00006	Communication buffer channel number Specify the channel number of a communication buffer. When Ethernet (218IF) is used, specify it in the range between "1" and "10." * Set up a unique channel number in the line.
	7	Param	DA00000	Parameter list start address Specify the start address of the parameter list. For the Parameter List, 17 words are automatically assigned from the configured address.
Output Item	1	Busy	DB000210	In process Busy will be ON while executing a message reception or forced abort process.
	2	Complete	DB000211	Process completed When a message reception or forced abort process is properly completed, Complete will turn ON only for one scan.
	3	Error	DB000212	Error When an error occurs, Error will turn ON only for one scan.

* 1. When transmitting in MEMOBUS, Extended MEMOBUS, MELSEC, or MODBUS/TCP protocol, set the communication protocol (Pro-Typ) to MEMOBUS (=1). The communication device automatically converts the protocol.
* 2. Non-procedure 1: In non-procedural communication, data is received on a per-word basis.
Non-procedure 2: In non-procedural communication, data is received on a per-byte basis.

■ Parameter list setting example for message receive function

An example of a parameter list setting when receiving messages from a transmit source using the connection with connection numbers = 5 and 6 follows:

Table 6.5 Parameter List Setting Example 1 (parameter list start address Param = DA00000)

Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00005	PARAM02	IN	Connection number = 5 (For receiving read operation)
DW00003	–	PARAM03	OUT	Option
DW00004	–	PARAM04	OUT	Function code
DW00005	–	PARAM05	OUT	Data address
DW00006	–	PARAM06	OUT	Data size
DW00007	–	PARAM07	OUT	Remote CPU number
DW00008	00000	PARAM08	IN	Coil offset = 0 word
DW00009	00000	PARAM09	IN	Input relay offset = 0 word
DW00010	00000	PARAM10	IN	Input register offset = 0 word
DW00011	00000	PARAM11	IN	Holding register offset = 0 word
DW00012	00000	PARAM12	IN	Writable address lower limit = MW00000
DW00013	65534	PARAM13	IN	Writable address upper limit = MW65534
DW00014	–	PARAM14	SYS	Reserved by the system. (Zero clear at startup)
DW00015	–	PARAM15	SYS	Reserved by the system.
DW00016	–	PARAM16	SYS	Reserved by the system.

Note: N: Input, OUT: Output, SYS: For system use

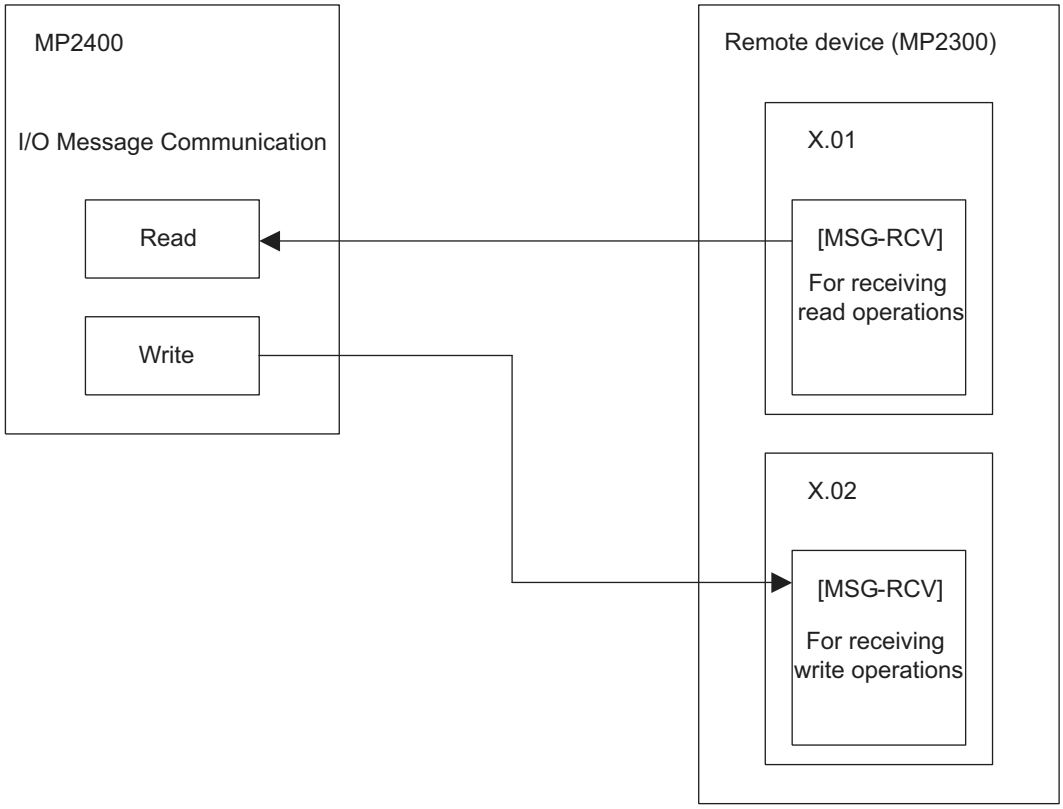
Table 6.6 Parameter List Setting Example 2 (parameter list start address Param = DA00000)

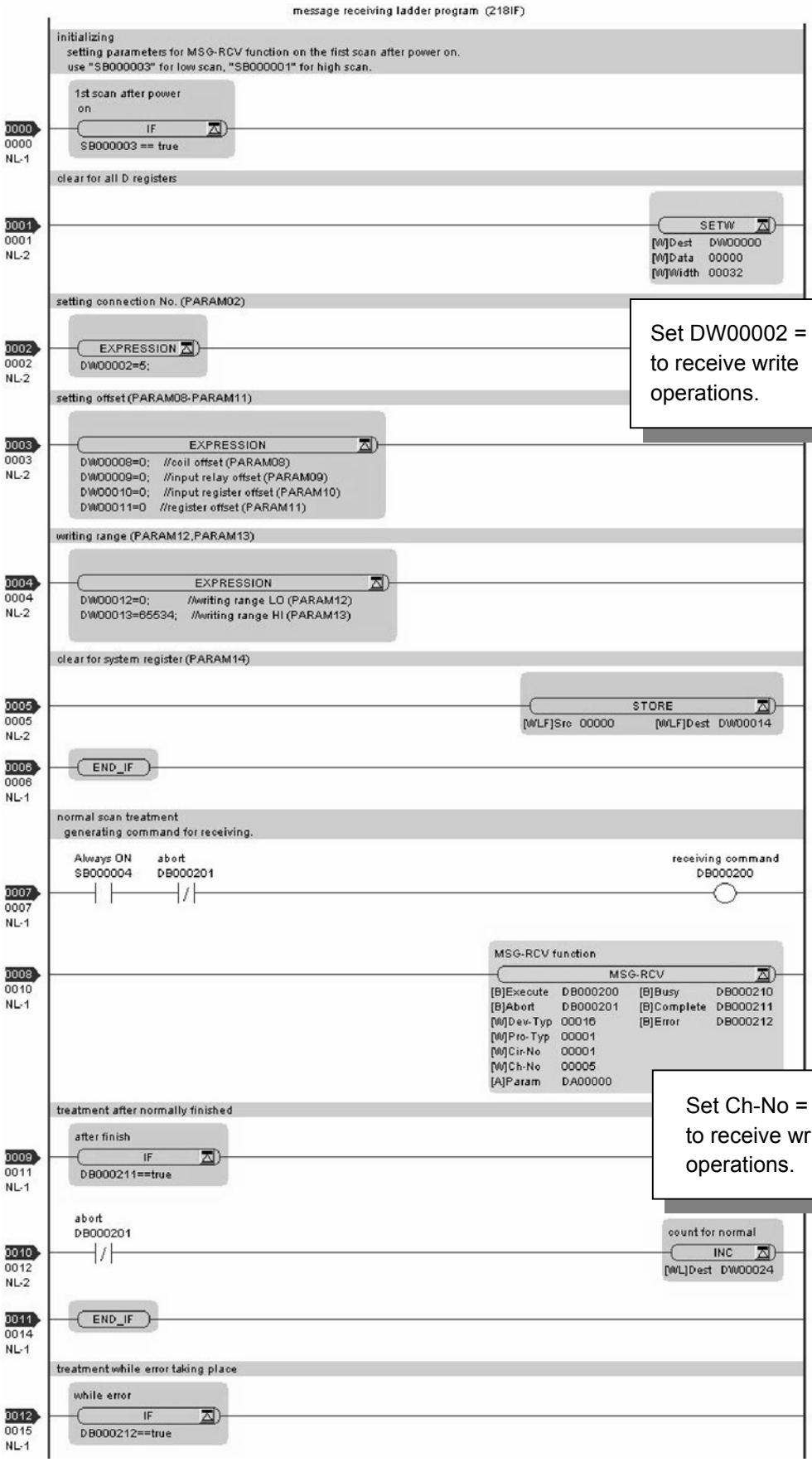
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00006	PARAM02	IN	Connection number = 6 (For receiving write operation)
DW00003	–	PARAM03	OUT	Option
DW00004	–	PARAM04	OUT	Function code
DW00005	–	PARAM05	OUT	Data address
DW00006	–	PARAM06	OUT	Data size
DW00007	–	PARAM07	OUT	Remote CPU number
DW00008	00000	PARAM08	IN	Coil offset = 0 word
DW00009	00000	PARAM09	IN	Input relay offset = 0 word
DW00010	00000	PARAM10	IN	Input register offset = 0 word
DW00011	00000	PARAM11	IN	Holding register offset = 0 word
DW00012	00000	PARAM12	IN	Writable address lower limit = MW00000
DW00013	65534	PARAM13	IN	Writable address upper limit = MW65534
DW00014	–	PARAM14	SYS	Reserved by the system. (Zero clear at startup)
DW00015	–	PARAM15	SYS	Reserved by the system.
DW00016	–	PARAM16	SYS	Reserved by the system.

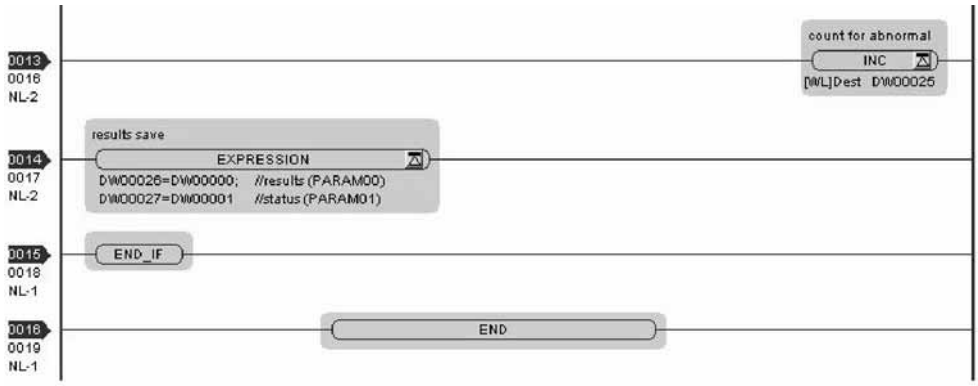
Note: N: Input, OUT: Output, SYS: For system use

■ Example of Using the Message Receive Function in a Ladder Program

Here is one example of using the message receive function through Ethernet (218IF). In addition, this ladder program is for receiving read operation. A ladder program for receiving write operations is required separately.




message receiving ladder program (218IF)
initializing
setting parameters for MSG-RCV function on the first scan after power on.
use "SB000003" for low scan, "SB000001" for high scan.
1st scan after power on
IF
SB000003 == true
clear for all D registers
SETW
[W]Dest DW00000
[W]Data 00000
[W]Width 00032
setting connection No. (PARAM02)
EXPRESSION
DW00002=5;
Set DW00002 = 6 to receive write operations.
setting offset (PARAM08-PARAM11)
EXPRESSION
DW00008=0; //coil offset (PARAM08)
DW00009=0; //input relay offset (PARAM09)
DW00010=0; //input register offset (PARAM10)
DW00011=0 //register offset (PARAM11)
writing range (PARAM12,PARAM13)
EXPRESSION
DW00012=0; //writing range LO (PARAM12)
DW00013=65534; //writing range HI (PARAM13)
clear for system register (PARAM14)
STORE
[W/LF]Src 00000
[W/LF]Dest DW00014
END_IF
normal scan treatment
generating command for receiving.
Always ON SB000004
abort DB000201
receiving command DB000200
MSG-RCV function
MSG-RCV
[B]Execute DB000200
[B]Abort DB000201
[W]Dev-Typ 00016
[W]Pro-Typ 00001
[W]Cir-No 00001
[W]Ch-No 00005
[A]Param DA00000
[B]Busy DB000210
[B]Complete DB000211
[B]Error DB000212
Set Ch-No = 6 to receive write operations.
treatment after normally finished
after finish
IF
DB000211==true
abort
DB000201
count for normal
INC
[W/L]Dest DW00024
END_IF
treatment while error taking place
while error
IF
DB000212==true



The communication setting and the ladder program creation are now finished, when MP2300 acts as a slave.

(3) How to Start Communication

1. The MP2300 side starts to receive the messages.

As the sample ladder program starts the message receive operation just after the system startup, you are not required to do anything. In normal operation, accept the default.

2. The MP2400 side transmits messages.

When an I/O message communication function is used, message transmit operation status automatically.

6.3 Communication with Touch Panel

This section explains how to communicate with a touch panel supporting for the Extended MEMOBUS protocol using the MP2400 automatic receive function.
In this section, GP3000 series manufactured by Digital Electronics Corp. is used as a touch panel supporting for the Extended MEMOBUS protocol.

6.3.1 When MP2400 Acts as Slave

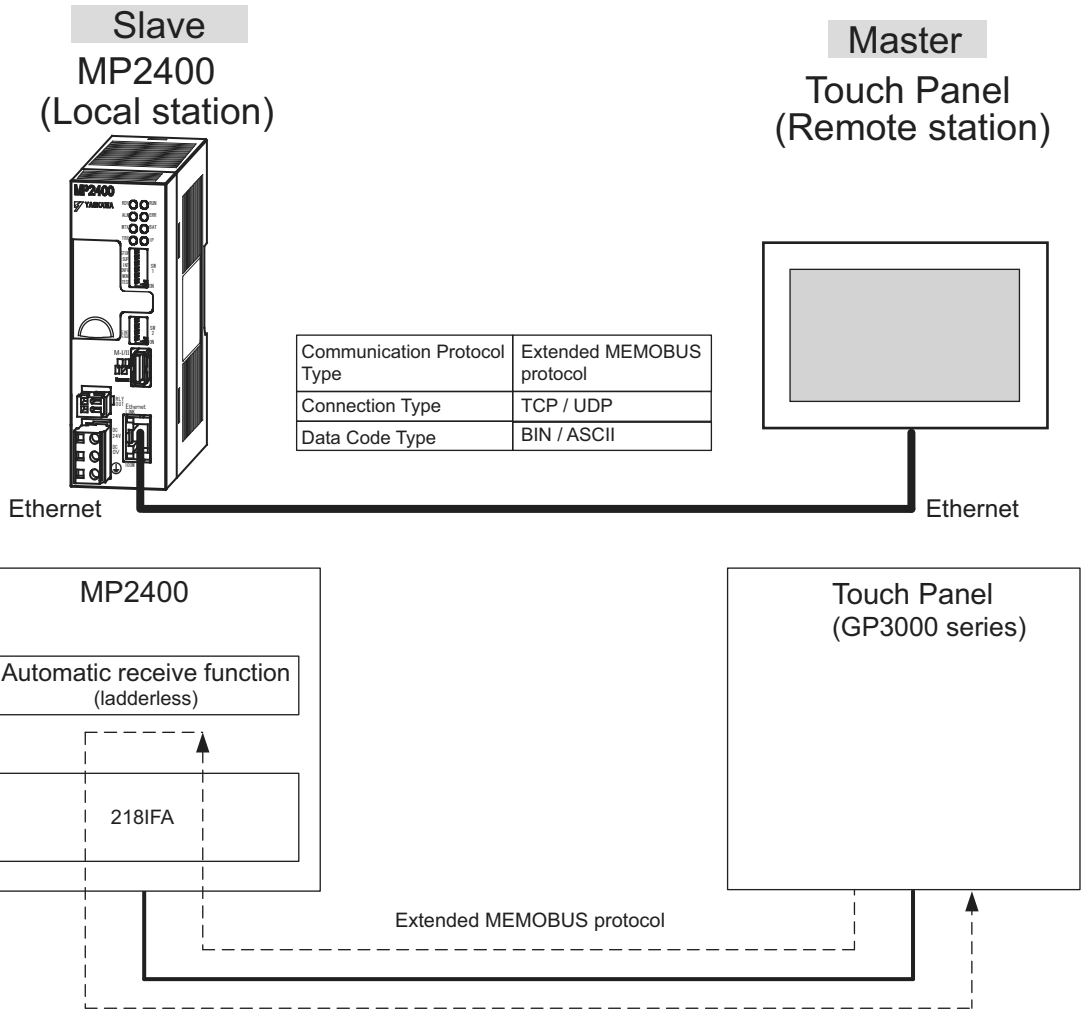
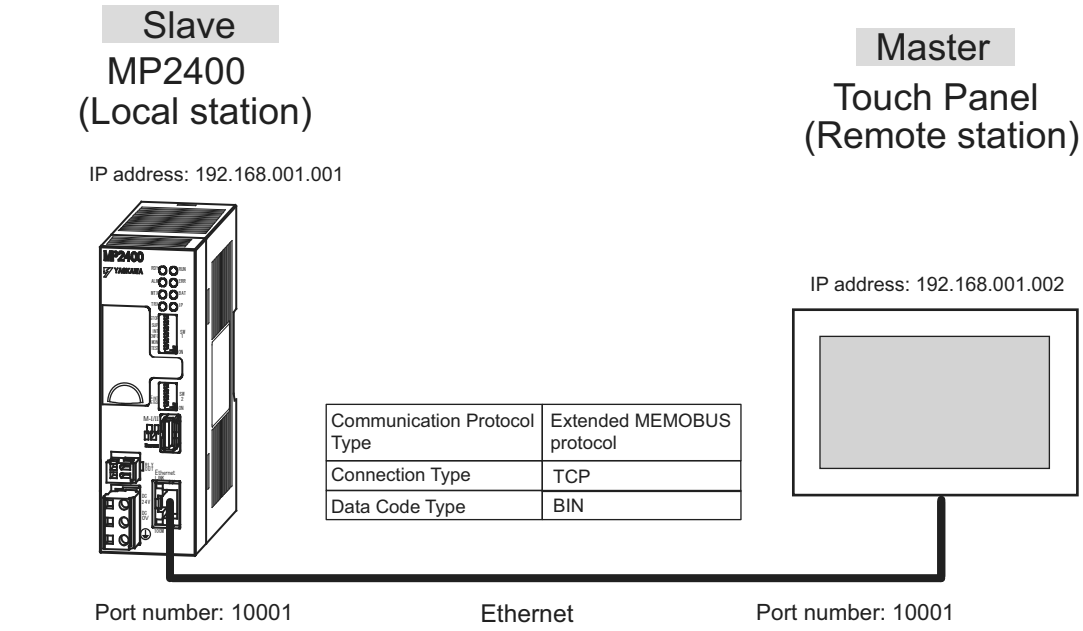
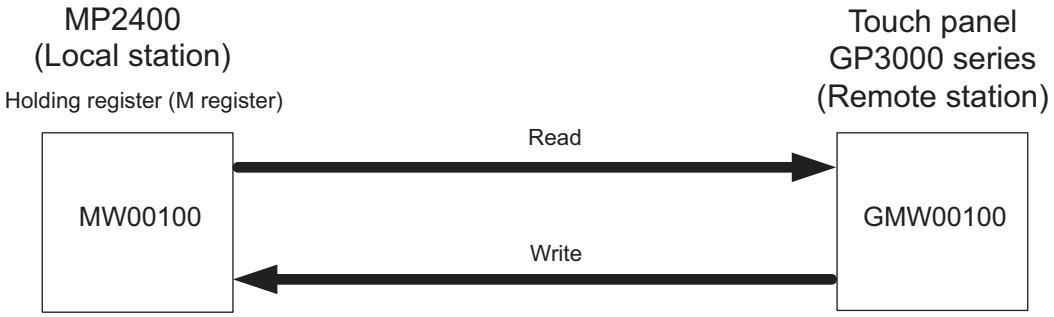


Fig. 6.5 Message Flow with Touch Panel (GP3000 series) when Automatic Receive Function Is Used

■ Setting Example

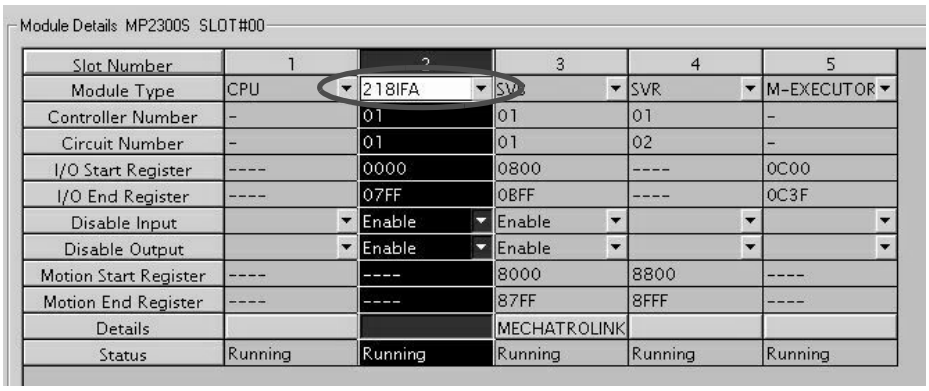
The following figure shows an example which displays the content of the MP2400 (slave) holding register (MW00100) on a touch panel and writes values from the touch panel to the same register.



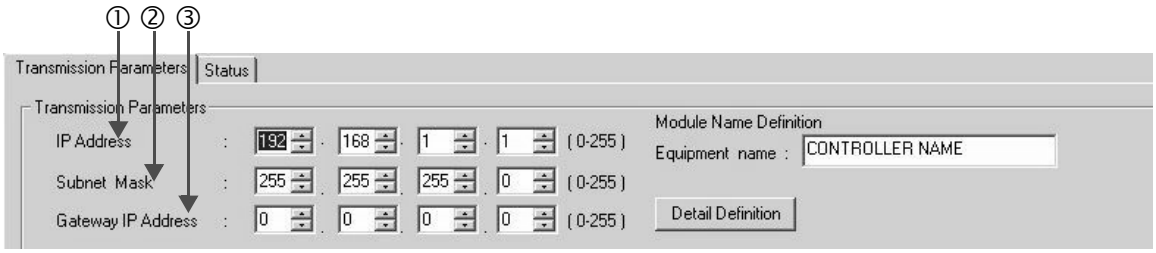


(1) How to Set up the MP2400 Side

1. Double-click the **218IFA** Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



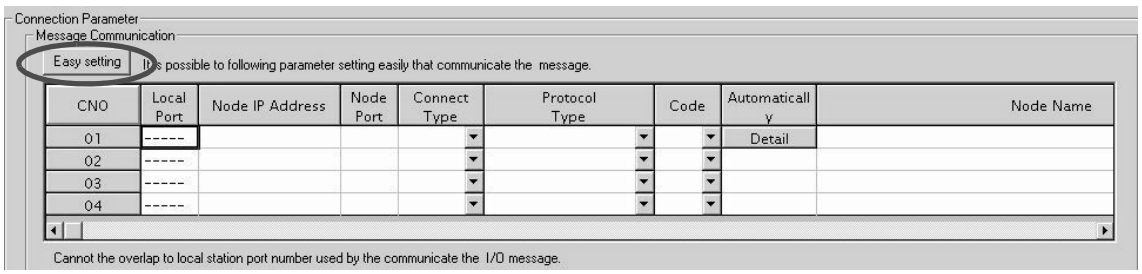
■ How to set up transmission parameters

① Set **IP Address** ("192.168.001.001," for example).
② Set **Subnet Mask** ("255.255.255.000," for example).
③ Set **Gateway IP Address** ("000.000.000.000," for example).

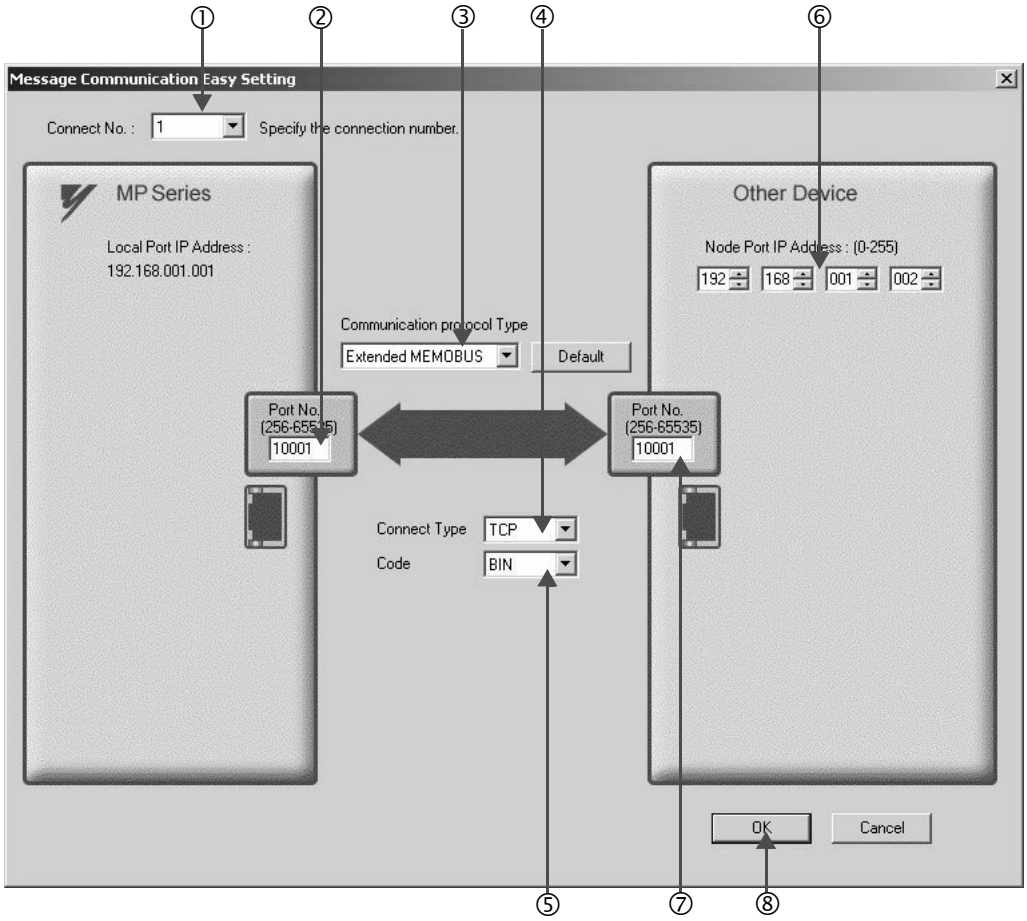
■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



4. Set a communication setting in the **Message Communication Easy Setting** Window.



■ How to set up in the **Message Communication Easy Setting** Window

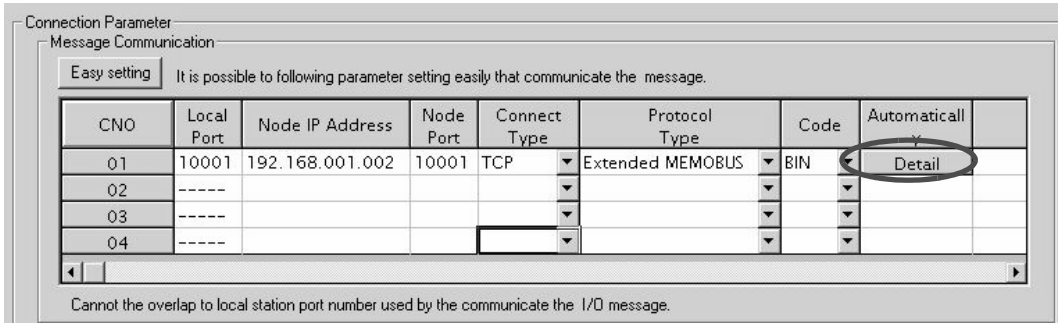
① When automatic receive is used, select "1" for the **Connect No.**
② Set **Port No.** of MP2400 side ("10001," for example).
③ Select **Extended MEMOBUS** for **Communication Protocol Type**, and click the **Default** Button.
④ Select **Connect Type** (TCP, for example).
⑤ Select **Code** (BIN, for example).
⑥ Set **Node Port IP Address** for the other device (MP2300) to be connected ("192.168.001.002," for example).
⑦ Set **Port No.** of the other device (MP2300) to be connected ("10001," for example).
⑧ Click **OK**.

5. Click **Yes** in the parameter setting confirmation dialog box.

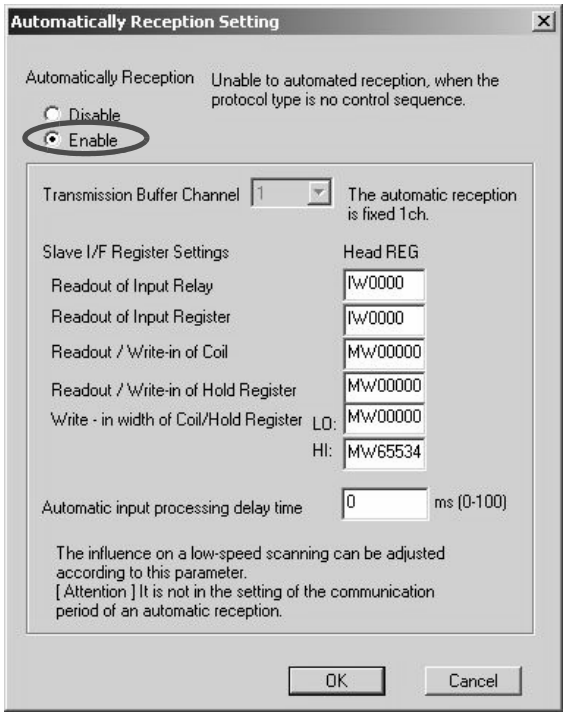
■ Caution

Note that when a parameter with the same connection number is already set and you click **Yes** in the parameter setting confirmation dialog, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

6. Check the setting value and click the **Detail** Button in the **Automatically** column.



7. Check **Enable** in the **Automatically Reception Setting** Window and then click the **OK** Button.



Note: For more information on Slave Side I/F Register Setting and Automatic Receive Process Delay Time, refer to *2.2.4 (4) (b) ■ Automatic Receive Setting Screen for Message Communication* on page 2-22.

The automatic receive function for connecting the MP2400 to the touch panel is now set up.

■ Caution

When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

(2) How to set up a touch panel

This section explains the GP-Pro EX side set up procedure for connecting the MP2400 to an indicator (GP3000 series) and the screen creation example.

Note: The indicator (GP3000 series) and GP-Pro EX are manufactured by Digital Electronics Corp. Contact Digital Electronics Corp. for more information.

[a] How to Set up GP-Pro EX

1. Start up GP-Pro EX.

2. Create a new project.

3. Set its indicator type. Set the indicator type in accordance with the model in use.

Here, we explain the setting when AGP-3600T is used.

Table 6.7 Indicator Type Setting (example)

Series	GP3000 series
	AGP33** series
Model	AGP-3600T
Installation Method	Horizontal model

4. Set up connected equipment.

Table 6.8 Connected Equipment

Manufacturer	YASKAWA Electric Corporation
Series	MEMOBUS Ethernet

5. Set up the way to connect.

Table 6.9 Connection Method

Port	Ethernet (TCP)

6. Select the **Connected Equipment Setting** from the **System** Tab to display the connected equipment setting screen.

7. Set the communication setting.

Table 6.10 Communication Setting

Port Number*	10001
Timeout	3(sec)
Retry	0
Transmit Weight	0(ms)

* For more information on the port number, refer to the following.

■ Port Number

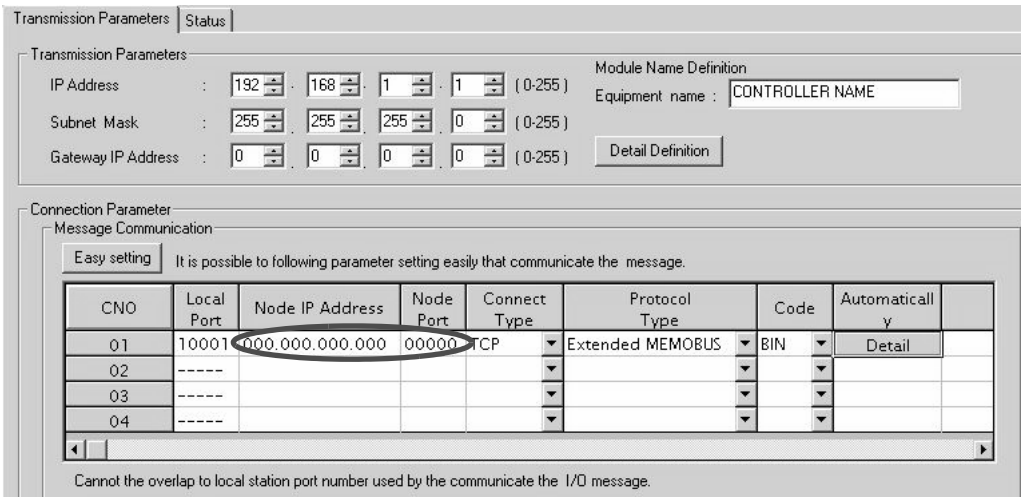
- If you don't check Automatic Assignment of the port number in the communication setting screen, the automatic assignment will be disabled, and the GP3000 series port number will be fixed at the setting value.

- If you check Automatic Assignment of the port number in the communication setting screen, automatic assignment will be enabled, and the GP3000 series port number will be assigned in each case.
  When you use Automatic Assignment, set *Unpassive open mode* in the 218IFA screen of MPE720.
  For more information about *Unpassive open mode*, refer to *2.2.4 (b) 218IFA Module Detailed Window* on page 2-16.
  For information on the relationship between GP-Pro EX and MPE720 settings, see the table below.

MPE720 Side Setting / GP-Pro EX Side Setting	Unpassive open Mode	Fixed Value Setting
Automatic Assignment Enable	√	–
Automatic Assignment Disable	√	√

Note: √: connectable, – : unconnectable

- How to set up *Unpassive open mode* of the MP2400 (reference)
  Set **Node IP Address** to 000.000.000.000 and the **Node Port** to 0 to enter into the *Unpassive open mode*.



8. Click the setup button of the connected PLC1 for each device setting to display the setting screen for each device.

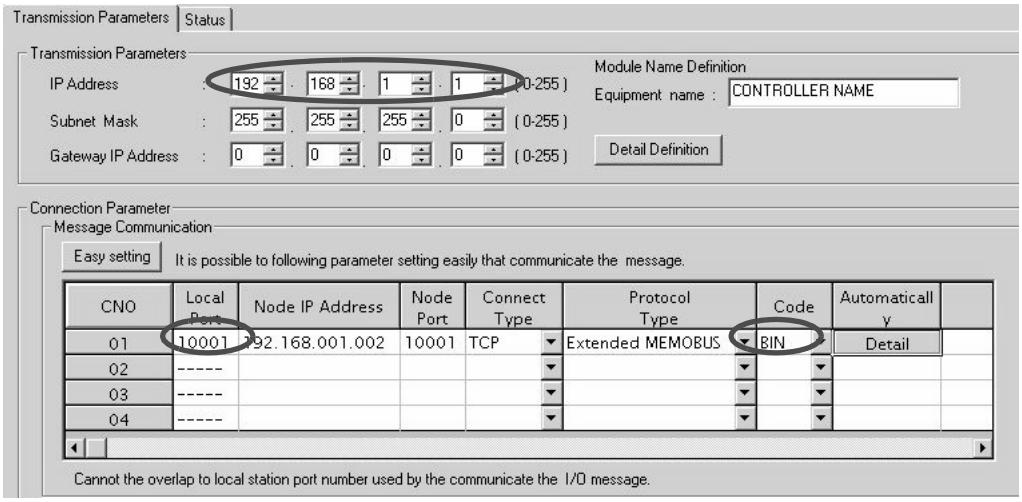
9. Set up the setting screen for each device.

In the setting screen for each device, set up a connected device (in this case, the MP2400).
Set the IP address, port number and data code in the same manner as the 218IFA screen of the MP2400.

Table 6.11 Each Device Setting

IP Address	192.168.001.001
Port Number	10001
Data Code	binary

- 218IFA screen (reference)



The setting is finished for now.
Create a screen and transfer the project to an indicator as required.

■ Caution

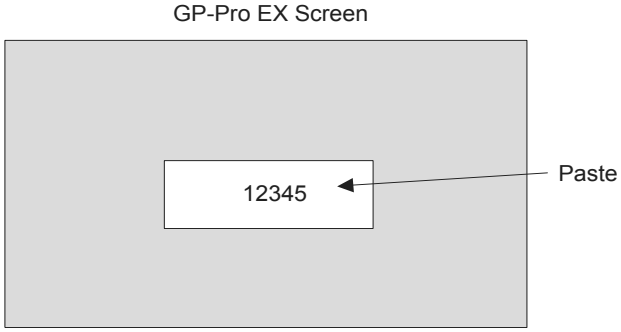
- Set up a unique IP address in the network.
  The MP2400 side IP address is set to “192.168.1.1” in self-configuration.
  For the IP address, check with your network administrator.

Note: Set the GP3000 series IP address in the off-line mode of the indicator.
Contact Digital Electronics Corp. for more information.

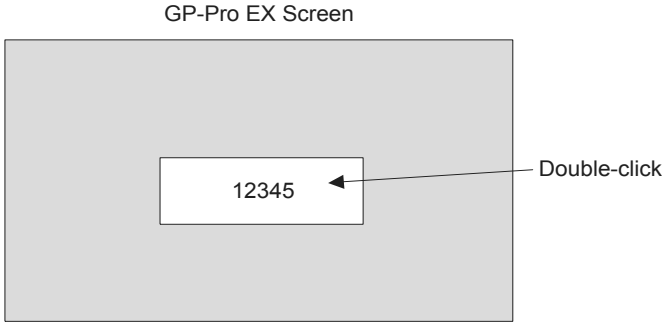
[b] Screen Creation Example

1. Create a base screen.

2. Select Data Indicator from the toolbar to paste it on the screen.



3. Double-click the Data Indicator pasted on the screen.



4. Set as follows in the detailed setting screen of Data Indicator and click OK.

Table 6.12 Data Indicator Detailed Setting

Display Data	Numeric display
Monitor Word Address	GMW00100

■ Relationship between GP-Pro EX address display and MP2400 register

Device	GP-Pro EX Address Display	MP2400 Register
Coil (bit)	GMB□□□□□□	MB□□□□□□
Coil (word)	GMW□□□□□	MW□□□□□
Input Relay (bit)	GIB□□□□□	IB□□□□□
Input Relay (word)	GIW□□□□	IW□□□□

(3) How to Start Communication

1. The MP2400 side starts to receive the messages.

When the automatic receive function is used, the message receive operation starts automatically, and you are not required to do anything.

2. Start up the touch panel (GP3000 series) to display the main screen.

After the system startup of the touch panel, communication with MP2400 will start.

Note: Contact Digital Electronics Corp. for more information.

6.4 Communication with PLC Manufactured by Mitsubishi Electric Corporation (MELSEC protocol)

In Ethernet communication between the MP2400 and MELSEC (Q, A series) general-purpose PLC manufactured by Mitsubishi Electric Corporation, the MELSEC protocol (MELSEC ACPU common command) is used as a communication protocol.
Using the MELSEC protocol allows a master to read/write the slave register content.
This chapter explains communication when the MP2400 acts as a slave and a master respectively.
For using the MP2400 as a slave, we explain communication using the automatic receive function.
For using the MP2400 as a master, we explain communication using the I/O message communication function.

6.4.1 When the MP2400 Acts as Slave (automatic receive function is used)

This section explains how to carry out a fixed buffer communication with the BUFSND command (with procedure) of the MELSEC Q series using the MP2400 automatic receive function.

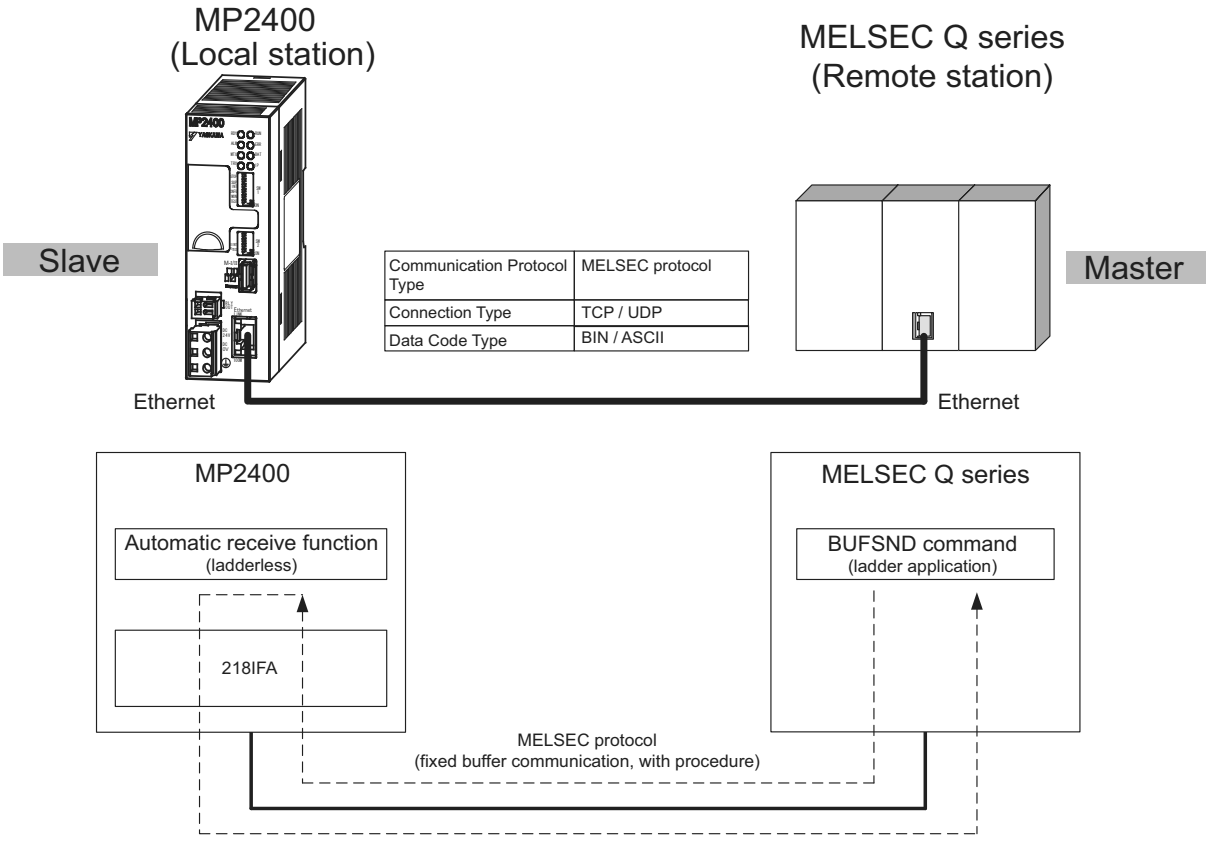


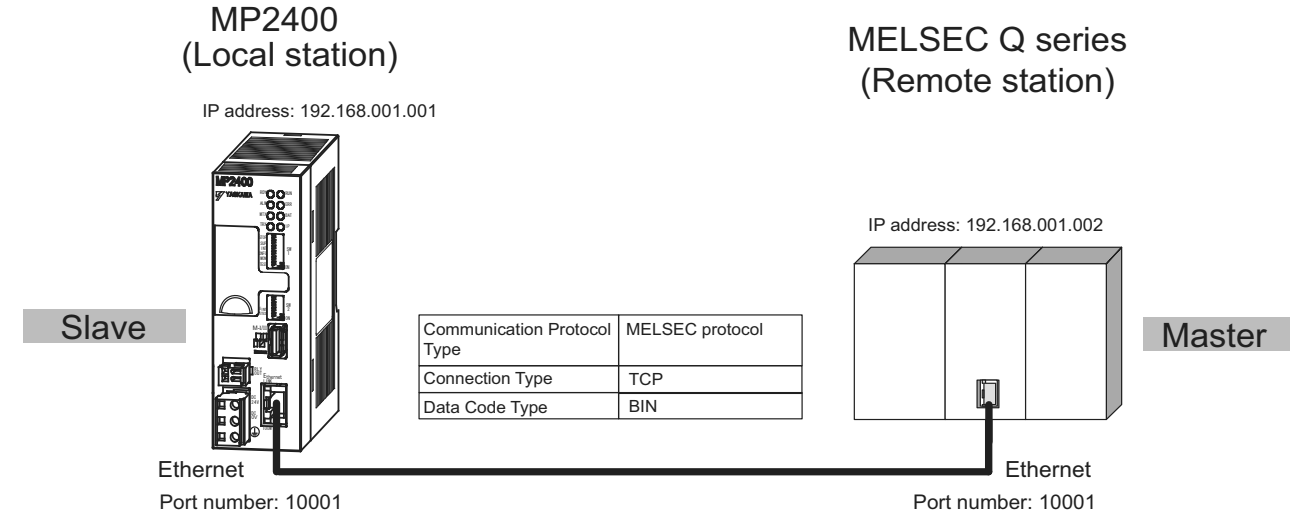
Fig. 6.6 Message Flow with the MELSEC Q Series when the Automatic Receive Function Is Used

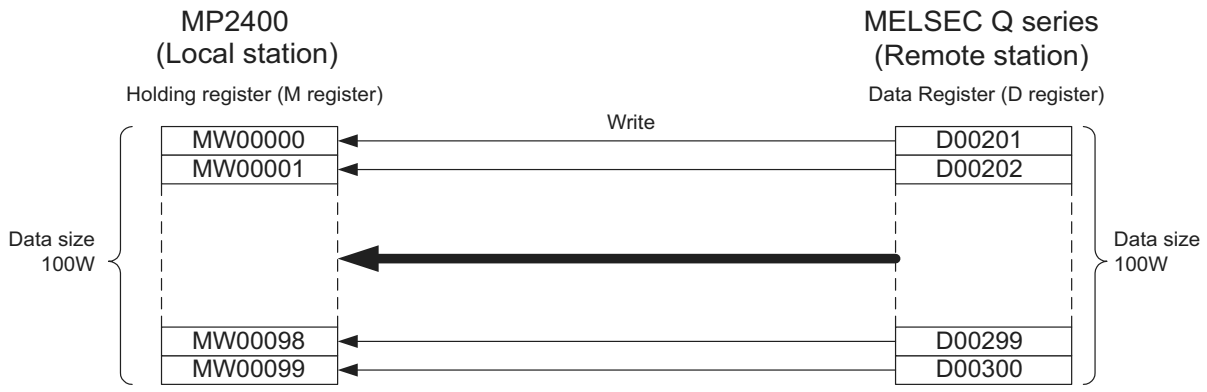
■ Caution

Communication using the automatic receive function is 1:1 communication.
Also, when "Communication Protocol Type: MELSEC" is used in communication with the MELSEC Q series, the MELSEC Q series (master) side can read/write the holding register of the MP2400 (slave) using fixed buffer communication.
However, when the MP2400 acts as a slave, you cannot use the inter-CPU or random access communication, because of the MELSEC specifications.

■ Setting Example

The following figure illustrates one example of writing the contents of the data register (D00201 to D00300) of MELSEC Q series (master) into the MP2400 (slave) holding register (MW00000 to MW00099).



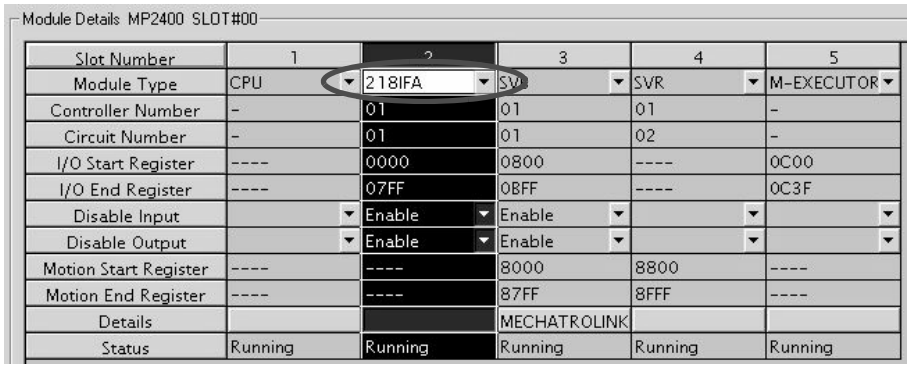


The particular setup procedure is explained in the subsequent pages.

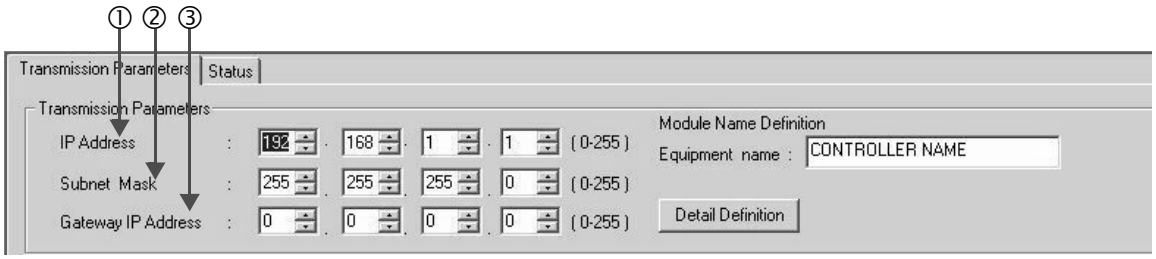
(1) How to Set up the MP2400 Side

If the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the **218IFA** Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



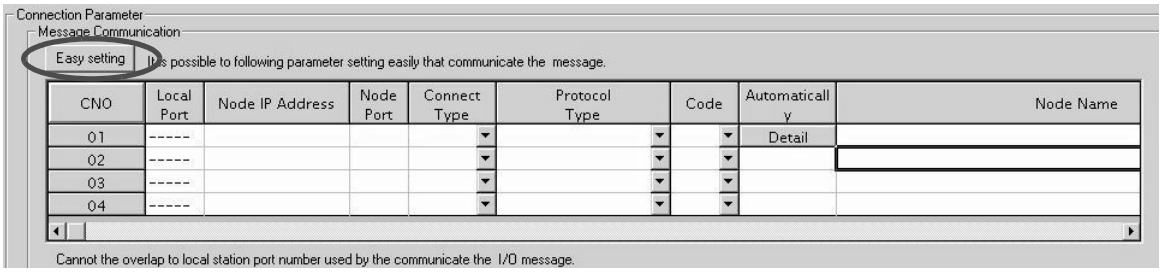
■ How to set up transmission parameters

① Set **IP Address** ("192.168.001.001," for example).
② Set **Subnet Mask** ("255.255.255.000," for example).
③ Set **Gateway IP Address** ("000.000.000.000," for example).

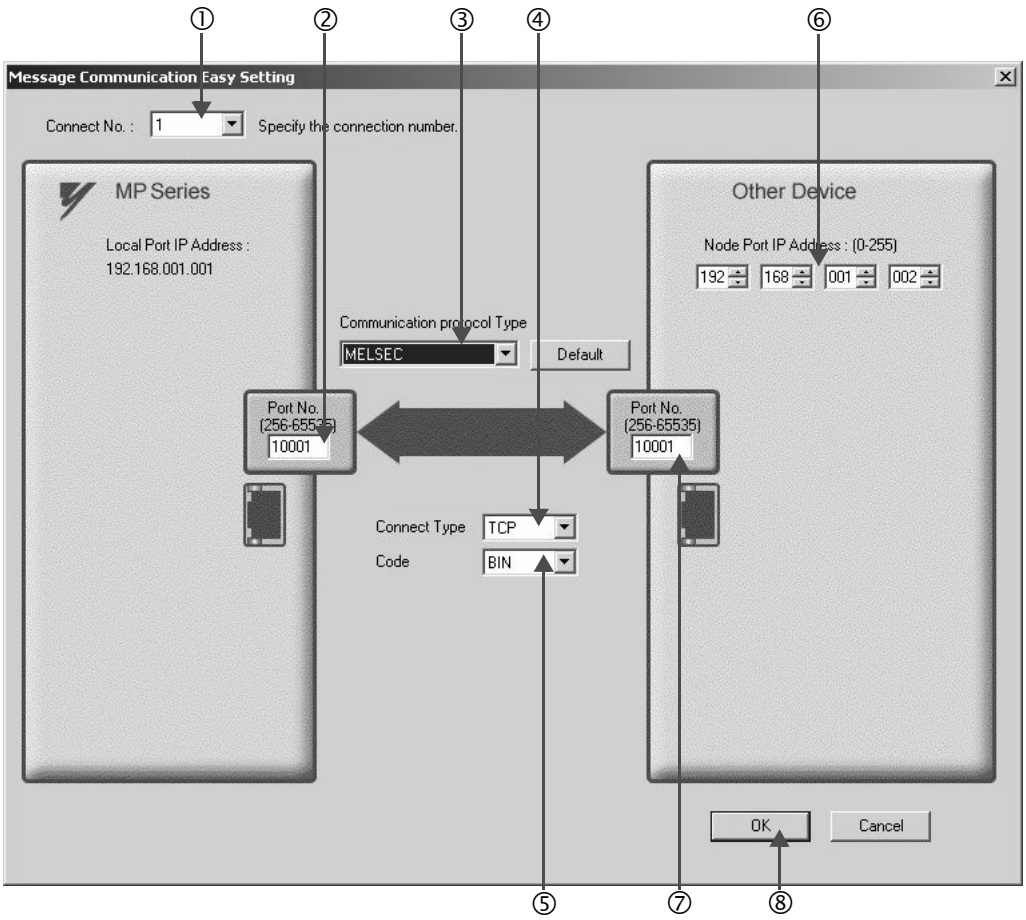
■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



4. Set up the communication settings in the **Message Communication Easy Setting** Window.



■ How to set up in the **Message Communication Easy Setting** Window

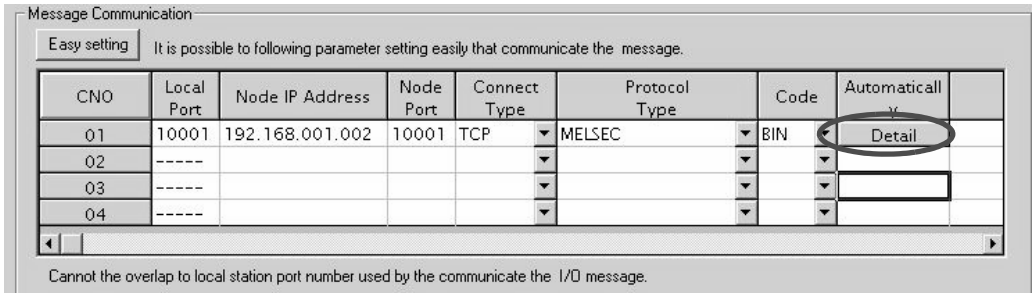
① When automatic receive is used, select "1" for the **Connect No.**
② Set **Port No.** of MP2400 side ("10001," for example).
③ Select **MELSEC** for **Communication Protocol Type**, and click the **Default** Button.
④ Select **Connect Type** (TCP, for example).
⑤ Select **Code** (BIN, for example).
⑥ Set **Node port IP Address** for the other device (MELSEC Q series) to be connected ("192.168.001.002," for example).
⑦ Set **Port No.** of the other device (MELSEC Q series) to be connected ("10001," for example).
⑧ Click **OK**.

5. Click **Yes** in the parameter setting confirmation dialog box.

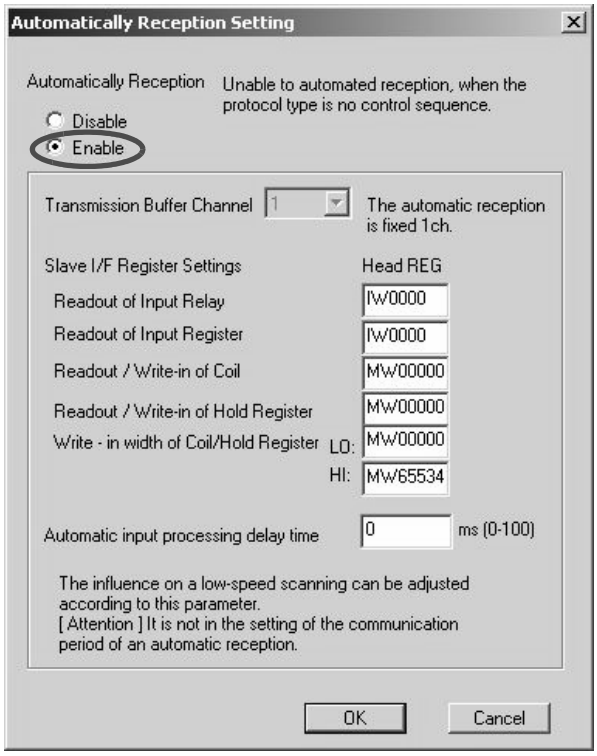
■ Caution

Note that when a parameter with the same connection number is already set and you click **Yes** in the parameter setting confirmation dialog, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

6. Check the setting value and click the **Detail** Button in the **Automatically** column.



7. Click **Enable** in the **Automatically Reception Setting** Window and then click the **OK** Button.



Note: For more information on Slave Side I/F Register Setting and Automatic Receive Process Delay Time, refer to *2.2.4 (4) (b) ■ Automatic Receive Setting Screen for Message Communication* on page 2-22.

The automatic receive function is now set up, when MP2400 acts as a slave.

■ Caution

When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

(2) How to Set up the Remote Device (MELSEC Q series) to Be Connected

This section explains the MELSEC Q series side procedure to set up for connecting the MP2400 with the MELSEC Q series.

Note: MELSEC Q series are manufactured by Mitsubishi Electric Corporation.
Contact Mitsubishi Electric Corporation for more information.

1. Start up GX Developer.

2. Create a new project.

3. Set up network parameters (MELSECNET/Ethernet).

Table 6.13 Network Parameter Setting (example)

Setting Item	Setting Details
Network Type	Ethernet
Start I/O No.	Any
Network No.	Any
Group No.	Any
Exchange Number	Any
Mode	Online

4. Set up Ethernet operation.

Table 6.14 Ethernet Operation Setting (example)

Setting Item	Setting Details
Communication Data Code Setting	Binary code communication
Initial Timing Setting	Any
IP Address	192.168.1.2
Transmit Frame Setting	Ethernet (V2.0)
TCP Alive Check Setting	Any
Permit Writing during RUN	Permitted

5. Set the open setting.

Table 6.15 Open Setting (example)

Setting Item	Setting Details (connection number=1)
Protocol	TCP
Open System	Active
Fixed Buffer	Transmit
Procedure to Communicate with Fixed Buffer	With procedure
Pairing Open	Any
Check Alive	Any
Local Port Number	2711H (10001)
Remote IP Address for Communication	192.168.1.1
Remote Port Number for Update	2711H (10001)

■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

■ Complement

Set up an initial setting and a router relay parameter below, if needed:

- Initial setting
  Set a timer relevant configuration when TCP is selected as a protocol. In most cases, accept the default.
  Set up if changes such as a shortened a TCP retransmit timer are required.
- Router relay parameter
  Set up when you use a subnet mask pattern or default gateway.

6. Create a ladder program for communication.

■ Procedure overview to communicate using a ladder program

① Use an OPEN command to establish a connection with the remote device.
② Use a BUFSND command to write the register content configured by parameters below to the MP2400 holding register (M register).
Setting example:When the BUFSND command is used to set the device start number for storing the transmit data to "D00200"
D00200 (transmit data length):100W
D00201 to D00300 (transmit data): Written into MW00000 to MW00099
③ If necessary, use a CLOSE command to close the operation.

Note: Contact Mitsubishi Electric Corporation for more information on the ladder program.

The setting is finished for now. If necessary, transfer the settings to the PLC after setting all parameters.

(3) How to Start Communication

1. The MP2400 side starts to receive the messages.

When an automatic receive function is used, the message receive operation starts automatically, so you are not required to do anything.

2. Use an OPEN command in the MELSEC Q series side to establish a connection with the MP2400, and use a BUFSND command to transmit messages.

When messages are transmitted from the MESLSEC Q series, communication with the MP2400 will start.

6.4.2 When the MP2400 Acts as Master (I/O message communication function is used)

This section explains how to carry out the communications between CPU and the MELSEC Q series using the MP2400 I/O message communication function.

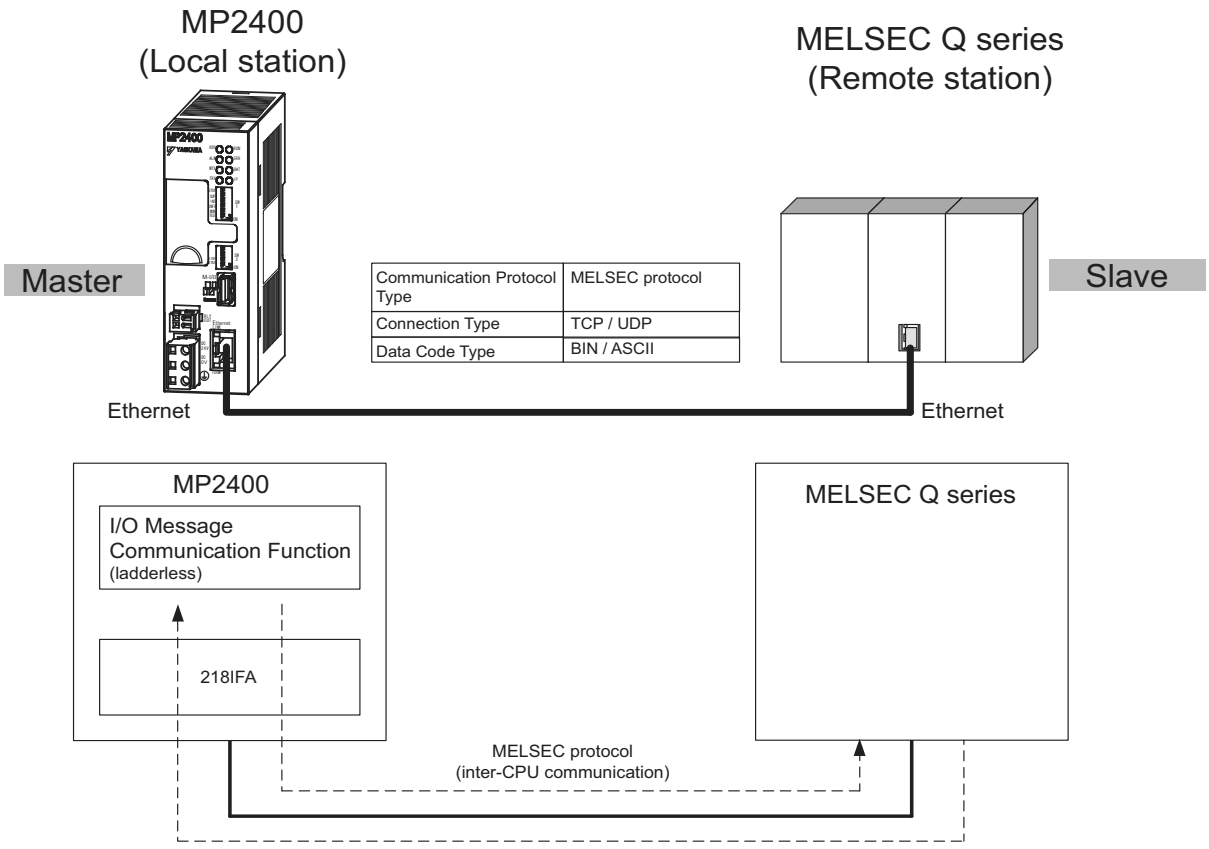


Fig. 6.7 Message Flow with MELSEC Q series when I/O Message Communication Function Is Used

■ Caution

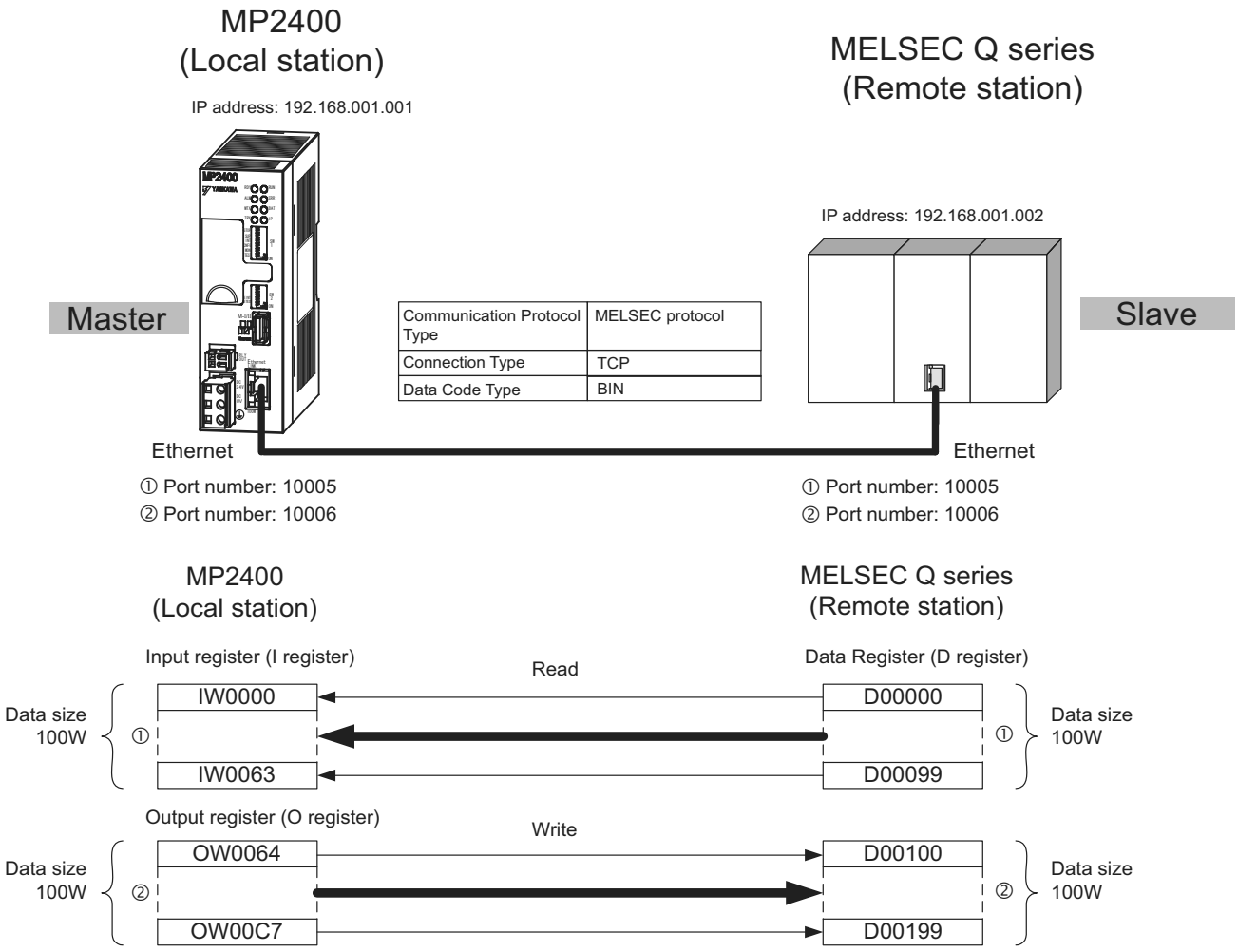
I/O message communication is 1:1 communication.
In addition, you can read and write the registers below using inter-CPU communication when "Communication Protocol Type: MELSEC" is used in the communication with the MELSEC series.

- Bit device register - - - - X, Y (read only), M, B
- Word device register - - - D, W, R

Note: A bit device register reads or writes on a per-word (16 bit) basis.

■ Setting Example

The following figure illustrates one example of reading the content of the data register (D00000 to D00099) of the MELSEC Q series (slave) into an input register (IW0000 to IW0063) of the MP2400 (master) and writing the content of an output register (OW0064 to OW00C7) of the MP2400 (master) in a data register (D00100 to D00199) of the MELSEC Q series (slave).

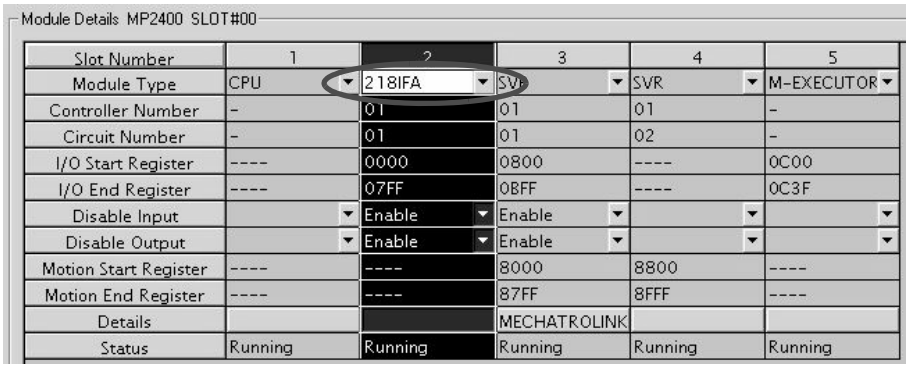


A particular setup procedure is explained in the subsequent pages.

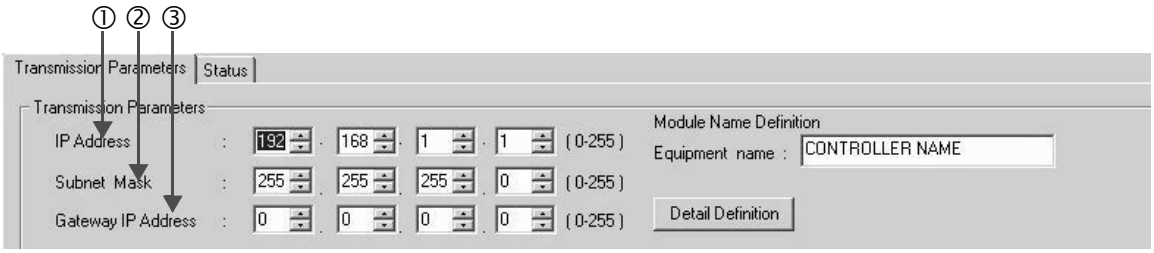
(1) How to Set up the MP2400 Side

If the setting of transmission parameters (IP address, subnet mask) is already completed, start from step 3.

1. Double-click the **218IFA** Tab in the **Module Details** of the module configuration definition.



2. Set transmission parameters.



■ How to set up transmission parameters

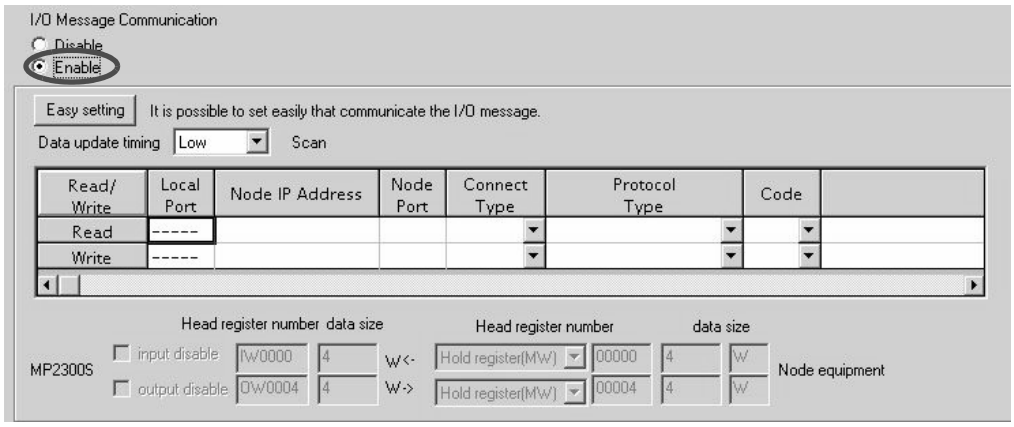
① Set **IP Address** (“192.168.001.001,” for example).
② Set **Subnet Mask** (“255.255.255.000,” for example).
③ Set **Gateway IP Address** (“000.000.000.000,” for example).

■ Caution

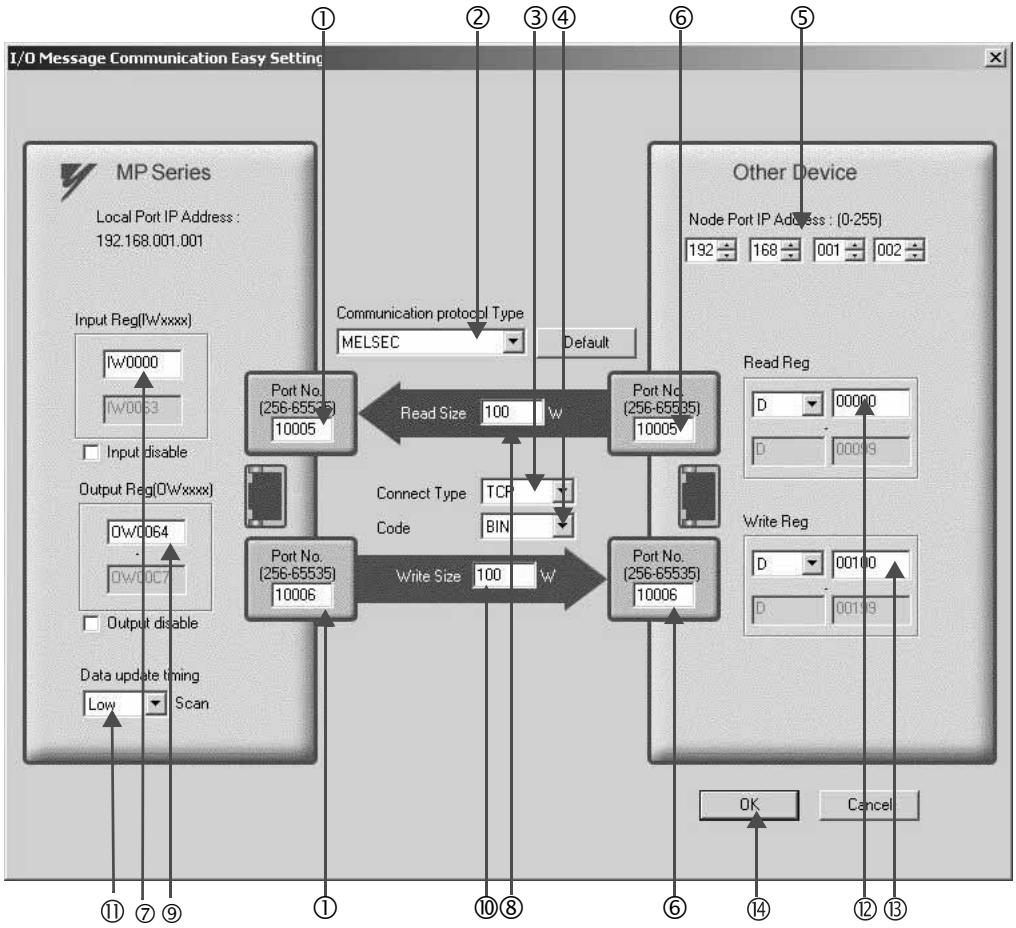
Set up a unique IP address in the network.
For the IP address, check with your network administrator.

---

3. Click **Enable** in the **I/O Message Communication** of the connection parameter setting.



4. Set-up a communication settings in the **I/O Message Communication Easy Setting** Window.



■ How to set up in the **I/O Message Communication Easy Setting** Window

① Set **Port No.** of MP2400 side (“10005, 10006,” for example).
② Select **MELSEC** for **Communication Protocol Type**, and click the **Default** Button.

■ Caution

When the communication protocol is MELSEC, the register type for the default read/write is "Word Device Register: D."

③ Select **Connect Type** (TCP, for example).
④ Select **Code** (BIN, for example).
⑤ Set **Node Port IP Address** for the other device (MELSEC Q series) to be connected ("192.168.001.002," for example).
⑥ Set **Port No.** of the other device (MELSEC Q series) to be connected ("10005, 10006," for example).

■ Caution

In I/O message communications, since a message is transmitted from each port number for register read/write, a connected remote device needs the two receive connections for receiving messages.

⑦ Set a storage area (**Input Reg**) for data read by the MP2400 (IW0000, for example).
⑧ Set **Read Size** of data to be read by the MP2400 ("100" W, for example).
⑨ Set a storage area (**Output Reg**) for data written by MP2400 (OW0064, for example).
⑩ Set **Write Size** of data written by the MP2400 ("100" W, for example).
⑪ Set an I/O data update timing (**Data update timing**) for the CPU and built-in Ethernet ("Low" scan, for example).

■ Data Update Timing

Data update timing indicates when to give and receive data between the CPU and built-in Ethernet. Communication with the remote device is carried out asynchronously, so note that a message is not necessarily transmitted to the remote device at each data update timing.

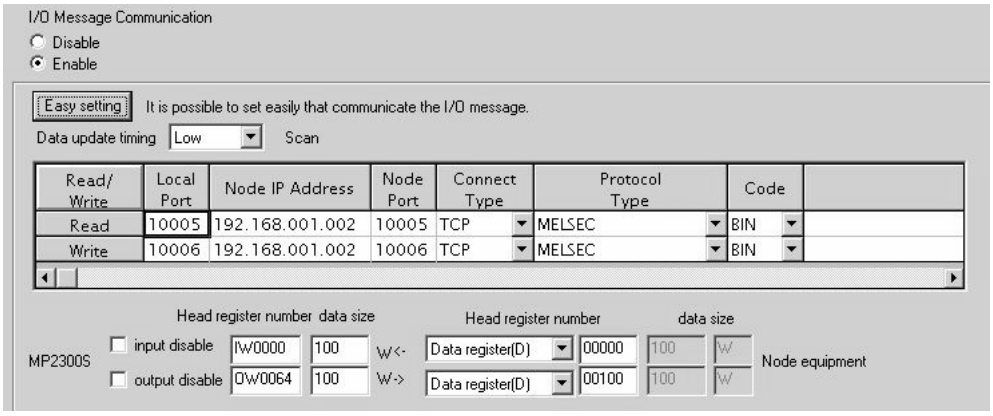
⑫ Set the register type and start address (**Read Reg**) of the remote device (MELSEC Q series) read by the MP2400 ("D00000," for example).
⑬ Set the register type and start address (**Write Reg**) of the remote device (MELSEC Q series) written by the MP2400 ("D00100," for example).
⑭ Click **OK**.

5. Click **Yes** in the parameter setting confirmation dialog box.

■ Caution

Note that when a parameter with the same connection number is already set and you click **Yes** in the parameter setting confirmation dialog, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

6. Check the setting values.



The I/O message communication is now set up, when the MP2400 acts as a master.

■ Caution

When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

(2) How to Set up the Remote Equipment (MELSEC Q series) to Be Connected

This section explains the MELSEC Q series side procedure to set up for connecting the MP2400 with the MELSEC Q series.

Note: MELSEC Q series are products manufactured by Mitsubishi Electric Corporation.
Contact Mitsubishi Electric Corporation for more information.

1. Start up GX Developer.

2. Create a new project.

3. Set up network parameters (MELSECNET/Ethernet).

Table 6.16 Network Parameter Setting (example)

Setting Item	Setting Details
Network Type	Ethernet
Start I/O No.	Any
Network No.	Any
Group No.	Any
Exchange Number	Any
Mode	Online

4. Set up Ethernet operation.

Table 6.17 Ethernet Operation Setting (example)

Setting Item	Setting Details
Communication Data Code Setting	Binary mode communication
Initial Timing Setting	Always waiting OPEN
IP Address	192.168.1.2
Transmit Frame Setting	Ethernet (V2.0)
TCP Alive Check Setting	Any
Permit Writing during RUN	Permitted

5. Set the open setting.

Table 6.18 Open Setting (example)

Setting Item	Setting Details (connection number=1)	Setting Details (connection number=2)
Protocol	TCP	TCP
Open System	Fullpassive	Fullpassive
Fixed Buffer	Any	Any
Procedure to Communicate with Fixed Buffer	Any	Any
Pairing Open	Any	Any
Check Alive	Any	Any
Local Port Number	2715H (10005)	2716H (10006)
Remote IP Address for Communication	192.168.1.1	192.168.1.1
Remote Port Number for Update	2715H (10005)	2716H (10006)

■ Caution

Set up a unique IP address in the network.
For the IP address, check with your network administrator.

The setting is finished for now. If necessary, transfer the settings to the PLC after setting all parameters.

■ Complement

Set up an initial setting and a router relay parameter below, if needed:

- Initial setting
  Set a timer relevant configuration when TCP is selected as a protocol. In most cases, accept the default.
  Set up if changes such as a shortened TCP retransmit timer are required.
- Router relay parameter
  Set up when you use a subnet mask pattern or default gateway.

(3) How to Start Communication

1. The MELSEC Q series starts to receive messages.

The message receive operation starts automatically, so you are not required to do anything.

2. The MP2400 side transmits messages.

When an I/O message communication function is used, the message transmit operation starts automatically, so you are not required to do anything.

7

Maintenance, Inspection, and Troubleshooting

This chapter explains daily and regular inspection items to ensure that the MP2400 can always be used at its best conditions.

7.1 Inspection Items

This section summarizes daily and regular inspection items that must be performed by the customer.

7.1.1 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	LED Indicators	RDY	Check whether the indicator is lit.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	Refer to *7.2 Troubleshooting* on page 7-5.
		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.)	
		ERR	Check whether the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	
		ALM	Check whether the indicator is not lit.	The indicator must be not lit. (It is abnormal if the indicator is lit.)	
		MTX	Check whether the indicator lights during communication.	The indicator must be lit. (It is abnormal if the indicator is not lit.)	
		BAT	Check whether the indicator is not lit.	The indicator must not be lit. (The battery voltage is too low if the indicator is lit.)	Replace the battery.

7.1.2 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 MP2400 may malfunction or break down.
  Contact your Yaskawa representative.

No.	Inspection Item		Inspection Details	Criteria	Action
1	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 MP2400 is used inside a panel, treat the temperature inside the panel as the ambient temperature.
		Ambient Humidity		30% to 95% RH	
		Atmosphere		There must be no corrosive gases.	
2	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.
3	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.
4	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.
5	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.

7.1.3 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.

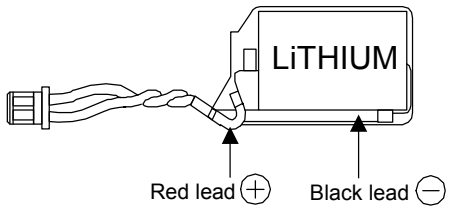


Fig. 7.1 JZSP-BA01 (Battery with Cable)

- This battery is not commercially available. Contact your Yaskawa representative.

(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 MP2400 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 MP2400 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 MP2400. Then, insert the replacement battery into the battery holder.

6. Check if the BAT indicator on the MP2400 is unlit.

7. Close the battery cover. This completes replacing the battery.

7.2 Troubleshooting

This section describes the basic troubleshooting methods and provides a list of errors.

7.2.1 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	

↓

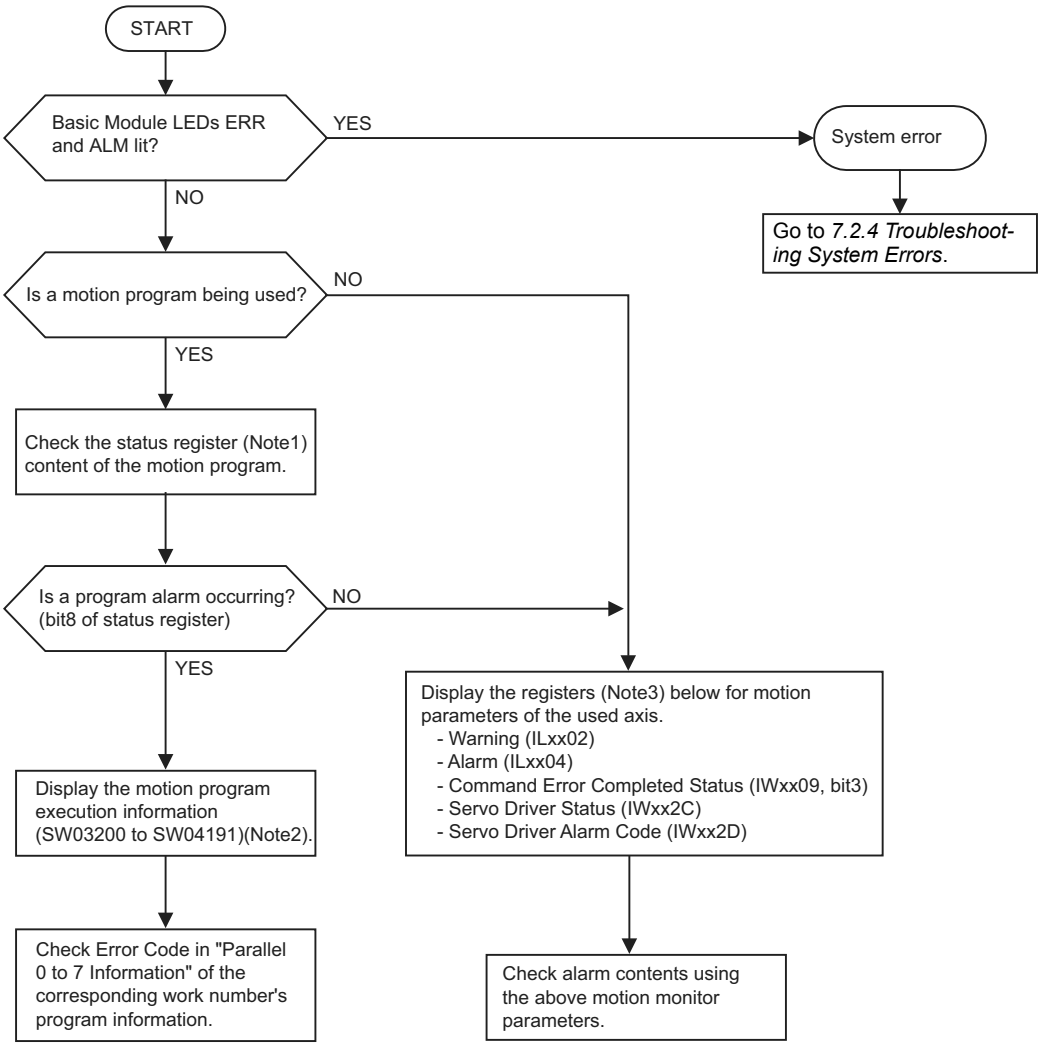
Step 2	Monitor the system to see if the problem changes for the following operations.
• Switching the Controller to STOP status • Resetting alarms • Turning the power supply OFF and ON	

↓

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?	

7.2.2 MP2400 Error Check Flowchart

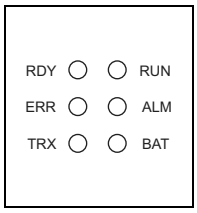
Find corrective actions for the problem using the following flowchart, if the cause of the problem is thought to be the MP2400 or SERVOPACK.



Note: 1. Refer to *5.2.2 (4) Work Register* .
2. Refer to *5.2.2 (6) Monitor the motion program execution information using S register*.
3. Refer to *7.2.6 List of Causes for Command Error Completed Status* and *7.2.7 Troubleshooting Motion Errors*.

7.2.3 LED Indicators

(1) LED Indicators



The status of the LED indicators on the front of the MP2400 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 MP2400, as well as relevant error information when the LED indicator status indicates an error.

Classification	LED Indicator					Indicator Details	Countermeasures
	RDY	RUN	ALM	ERR	BAT		
Normal operation	Not lit	Not lit	Lit	Lit	Not lit	Hardware reset status	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 *7.2.4 Troubleshooting System Errors* on page 7-8 and correct any system errors.
	Not lit	Not lit	Not lit	Not lit	Not lit	Initialization	
	Not lit	Lit	Not lit	Not lit	Not lit	Drawing A (DWG.A) being executed.	
	Lit	Not lit	Not lit	Not lit	Not lit	User program stopped. (Offline Stop Mode)	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.
	Lit	Lit	Not lit	Not lit	Not lit	User program being executed normally.	This is the normal status.
Errors	Not lit	Not lit	Not lit	Lit	Not lit	A serious error has occurred.	Refer to *7.2.4 (4) Correcting User Program Errors* on page 7-11.
	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 violation (read) exception 14: LTB protection violation (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 *7.1.3 Replacing the Basic Module Battery* on page 7-4 and replace the Battery.
	Lit	Lit	Lit	Not lit	Not lit	Operation error I/O error	Refer to *7.2.4 (5) [c] Program User Operation Error Status* on page 7-16 and *7.2.4 (5) [e] System I/O Error Status* on page 7-18.

7.2.4 Troubleshooting System Errors

The LED indicators on the front of the Basic Module can be used to determine MP2400 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.

SW00000	System Service Register	
SW00030	System Status	→ *7.2.4 (5) [a] System Status* on page 7-14
SW00050	System Error Status	→ *7.2.4 (5) [b] System Error Status* on page 7-15
SW00080	User Operation Error Status	→ *7.2.4 (5) [c] Program User Operation Error Status* on page 7-16
SW00090	System Service Execution Status	→ *7.2.4 (5) [d] System Service Execution Status* on page 7-18
SW00110	User Operation Error Status Details	→ *7.2.4 (5) [c] Program User Operation Error Status* on page 7-16
SW00190	Alarm Counter and Alarm Clear	→ *7.2.4 (5) [e] System I/O Error Status* on page 7-18
SW00200	System I/O Error Status	
SW00500	Reserved by the system.	
SW00698	Interrupt Status	
SW00800	Module Information	→ *7.2.4 (5) [g] Module Information* on page 7-20
SW01312	Reserved by the system.	
SW02048	Reserved by the system.	
SW03200	Motion Program Information	→ *7.2.5 Motion Program Alarms* on page 7-21
SW05200 to SW08191	Reserved by the system.	

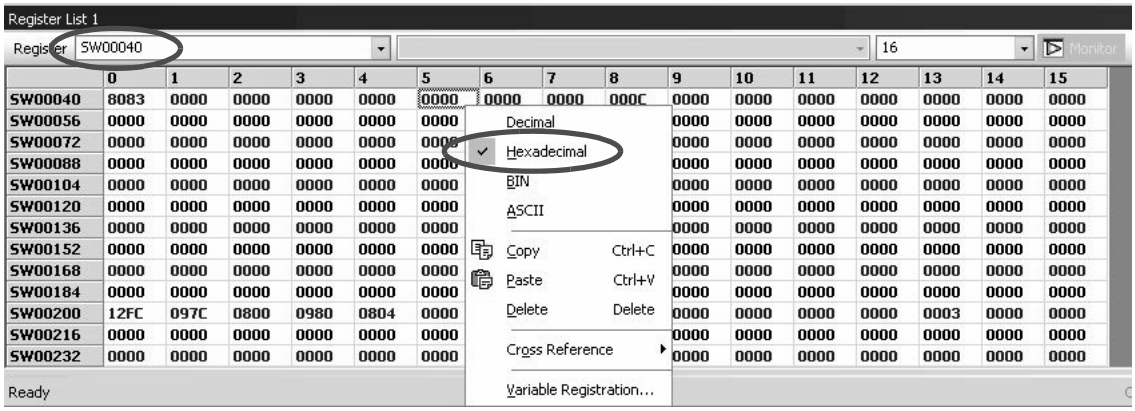
(2) Accessing System Registers

To access the contents of system registers, start the MPE720 Programming Tool and use the **Register List** function.

[a] Register List Display Procedure

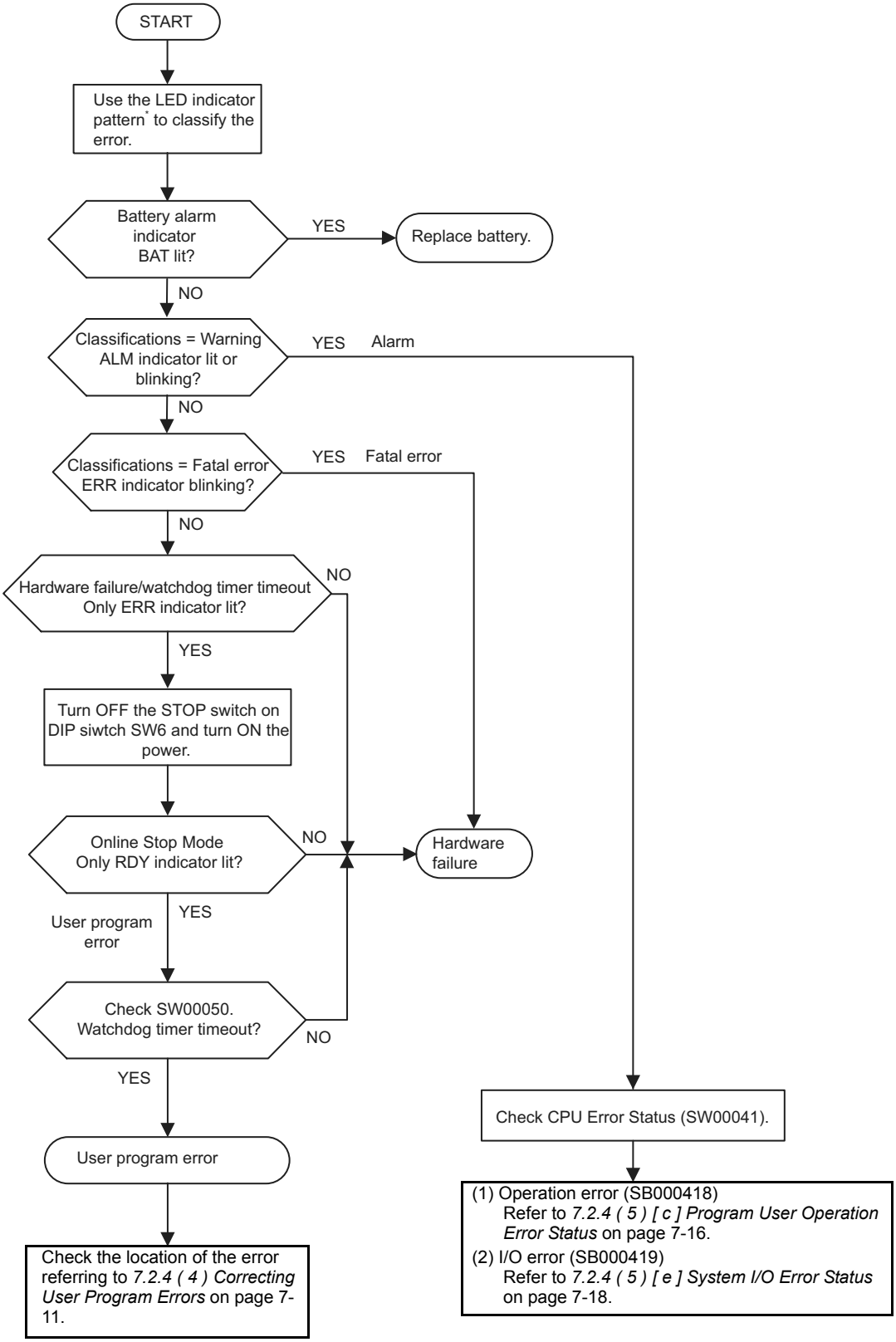
Use the following procedure to display the register list.

1. Select ***Register List*** **1** to open the **Register List** Window.
2. Input the register number of the first system register to be accessed (for example: SW00040).
3. Right click the **Register List** Window to change the mode to hexadecimal.



(3) Troubleshooting Flowchart for System Errors

A troubleshooting flowchart for system errors is provided below.



* For LED indicator pattern, refer to *7.2.3 (2) LED Indicator Meanings* on page 7-7.

(4) Correcting User Program Errors

A serious error may have occurred if the ALM and ERR indicators on the front of the MP2400 Basic Module are lit red. Set the MP2400 in stop status (STOP switch on DIP switch 1-6: 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.
↓	
(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.
↓	
(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.
↓	
(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).
↓	
(6) Investigate the type of operation error and its location.	1. Check Error Details Check error codes for drawings where the error is counted. Startup: SW00111, High-speed Scan: SW00143 Low-speed Scan: SW00175 2. Check the Program Number Check the error drawing number for the drawing number where an error occurred. Startup: SW00122, High-speed: SW00154 Low-speed: SW00186 3. Errors in Sub Program Check the Function Referencing Drawing Number and Function Referencing STEP Number. Startup: SW00123, 4; High-speed: SW00155, 6 Low-speed: SW00187, 8
↓	
(7) Determine the error occurrence location.	After the investigation of an error drawing or error function is complete, set the corresponding drawing, function, or sequence program to Disable and turn on the power supply in the RUN state to check that no error occurs. Refer to *7.2.4 (4) [a] How to Disable a User Program* on page 7-13.
↓	

Go on to the next page.

Continued on from the previous page.

(8) Investigate the I/O state	When the error cause can be assumed to be a problem with the external input data or output data from the user program, disable the corresponding I/O process to investigate a cause based on the I/O data. Refer to *7.2.4 (4) [a] How to Disable a User Program* on page 7-13.

(9) Correct Programs.	Correct the program that causes error.

(10) Investigate the scan time	If no problem is found in the program, investigate the scan time. Check to see whether the maximum value for high-speed scan time is in excess of or equal to the setting value in the scan time screen, or whether the maximum value for slow-speed scan time is in excess of the setting value. Refer to *7.2.4 (4) [b] Operation in Case of Scan Time Over* on page 7-13.

(11) Change the scan time	Change the scan time setting value. Refer to *5.5.3 Setting and Changing the Scan Time* on page 5-40.

[a] How to Disable a User Program

In the module configuration definition screen of the MPE720 online mode, open the M-EXECUTOR module definition and check D of the sequence program definition to save the definition.

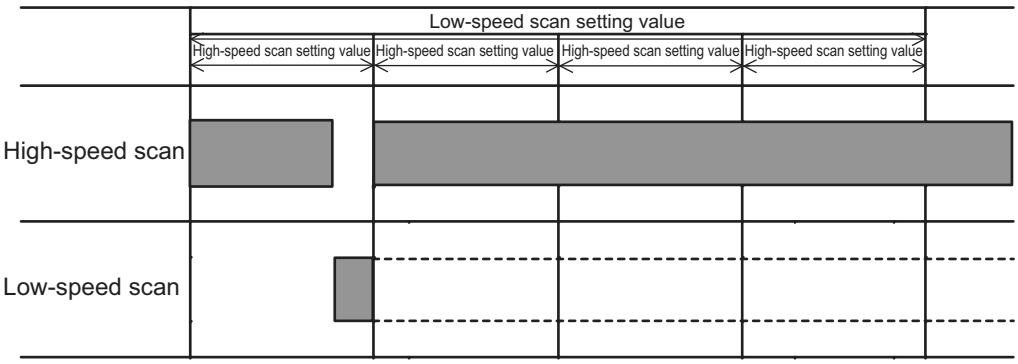
No.	D	Execution type	Setting	Program
-	☑	Sequence program(Start)	Direct	SPM001
1	☑	Sequence program(L-scan)	Direct	SPM002
2	☑	Sequence program(H-scan)	Direct	SPM003
3	☐	----------		
4	☐	----------		

■ Caution

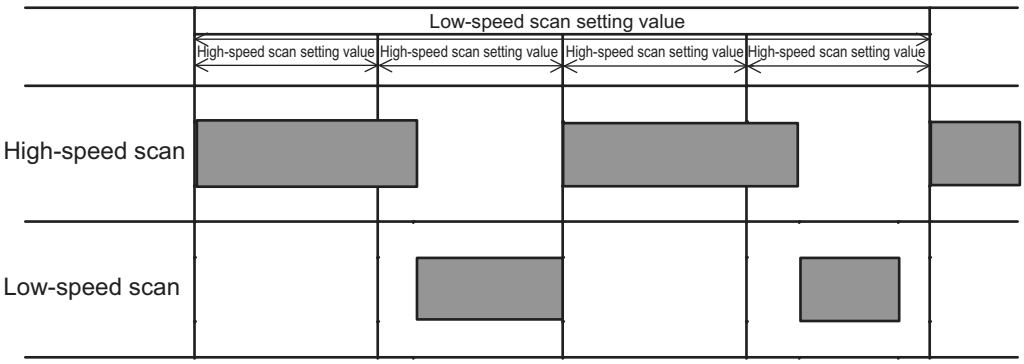
When a sequence program is disabled, the equipment may become unstable, causing personal injury or damage to the equipment. If carrying out an investigation, be aware of the behavior of the equipment when it is disabled.
After the investigation, make sure to enable the drawing, function, or sequence program again.

[b] Operation in Case of Scan Time Over

When the maximum value for high-speed scan time is equal to a setting value, a watchdog timeout error will occur because the time for performing a low-speed scan cannot be ensured.



When the maximum value for a scan time is in excess of a setting value, the scan cannot be performed at every setting value. SW00044 is added due to a high-speed scan over, SW00046 is added due to a low-speed scan over.



(5) System Register Configuration and Error Status

[a] 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.	
H Scan Over Counter	SW00044			
L Scan Over Counter	SW00046			
Reserved	SW00047			
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.	

[b] 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 prohibition exeption error	
		0820H	Slot FPU prohibition exeption error	
	SW00051	For system error analysis		
32-bit Addresses Generating Error	SW00052	For system error analysis		
	SW00053			
Program Error Task	SW00054	0000H: System 0001H: Startup	0003H: High-speed	0005H: Low-speed
Program Type	SW00055	0000H: System		000FH: Motion program/ sequence program
Program Error Number	SW00056	Motion program/sequence program: F0xxH (Hxx: program number)		
Function Calling Program Type	SW00057	Type of program that calls the program function in which an error occurred.		
			000FH: Motion program/ sequence program	0010H: Reserved by system. 0011H: Reserved by system.
Function Calling Program Number	SW00058	Number of program that calls the program function in which an error occurred. Motion program/sequence program: F0xxH (Hxx: program number)		
Function Calling Program Block Number	SW00059	Block number of the program that calls the program function in which an error occurred.		
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.		

[c] Program User Operation Error Status

Error information for user operation errors in programs is stored in registers SW00080 to SW00089 (Error Status 1) and SW00110 to SW00189 (Error Status 2).

Table 7.1 Program User Operation Error Status 1

Name	Register No.	Description
Startup Error Count Error Code	SW00080	Operation error code: See *Ladder Program User Operation Error Codes 1.*
	SW00081	
Reserved by the system.	SW00082	
	SW00083	
High-speed Error Count Error Code	SW00084	
	SW00085	
Reserved by the system.	SW00086	
	SW00087	
Low-speed Error Count Error Code	SW00088	
	SW00089	

Table 7.2 Ladder Program User Operation Error Status 2

Name	Register No.			Remarks
	Startup	High-speed Scan	Low-speed Scan	
Error Count	SW00110	SW00142	SW00174	Error Program Number Motion program/sequence program: F0xxH (Hxx: program number) Function Calling Program Number Number of the program that calls the function in which an error occurred. Function Calling Program Block Number Block number of the program that calls the function in which an error occurred.
Error Code	SW00111	SW00143	SW00175	
Error A Register	SW00112	SW00144	SW00176	
	SW00113	SW00145	SW00177	
Modification A Register	SW00114	SW00146	SW00178	
	SW00115	SW00147	SW00179	
Error F Register	SW00116	SW00148	SW00180	
	SW00117	SW00149	SW00181	
Modification F Register	SW00118	SW00150	SW00182	
	SW00119	SW00151	SW00183	
Address Generating Error	SW00120	SW00152	SW00184	
	SW00121	SW00153	SW00185	
Error Program Number	SW00122	SW00154	SW00186	
Function Calling Program Number	SW00123	SW00155	SW00187	
Function Calling Program Block Number	SW00124	SW00156	SW00188	
Reserved by the system.	SW00125	SW00157	SW00189	

Table 7.3 Program User Operation Error Codes 1

	Error Code	Error Contents		User*	System Default Value
Integer Operations	0001H	Integer operation - underflow		Yes	–32768 [–32768]
	0002H	Integer operation - overflow		Yes	32767 [32767]
	0003H	Integer operation - division error		Yes	The A register remains the same.
	0009H	Double-length integer operation - underflow		Yes	–2147483648 [–2147483648]
	000AH	Double-length integer operation - overflow		Yes	2147483647 [2147483647]
	000BH	Double-length integer operation - division error		Yes	The A register remains the same.
	010□H	Reserved by the system.		No	Default indicated above.
Real Number Operation	0010H	Integer storage - non-numeric error		Yes	Store not executed. [00000]
	0011H	Integer storage - underflow		Yes	Store not executed. [–32768]
	0012H	Integer storage - overflow		Yes	Store not executed. [+32767]
	0021H	Real number storage - underflow		Yes	Store not executed. [–1.0E+38]
	0022H	Real number storage - overflow		Yes	Store not executed. [1.0E+38]
	0023H	Real number operation - division-by-zero error		Yes	Operation not executed. The F register remains the same.
	0030H	Real number operation - invalid operation (non-numeric)		No	Operation not executed.
	0031H	Real number operation - exponent underflow		No	0.0
	0032H	Real number operation - exponent overflow		No	Maximum value
	0033H	Real number operation - division error (non-numeric 0/0)		No	Operation not executed.
	0034H	Real number storage - exponent underflow		No	Stores 0.0.
	0035H	Real number operation - stack error			
	0040H to 0059H	Standard System Functions Real number operation errors		No	Interrupt operation and output = 0.0
		0040H: SQRT	0041H: SIN	0042H: COS	0043H: TAN
		0044H: ASIN	0045H: ACOS	0046H: ATAN	0047H: EXP
		0048H: LN	0049H: LOG	004AH: DZA	004BH: DZB
		004CH: LIM	004DH: PI	004EH: PD	004FH: PID
		0050H: LAG	0051H: LLAG	0052H: FGN	0053H: IFGN
		0054H: LAU	0055H: SLAU	0056H: REM	0057H: RCHK
		0058H: BSRCH	0059H: SQRT		
		1000H or 2000H is added for an index error.			

* 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] System Service Execution Status

Table 7.4 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

Table 7.5 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

[e] 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 (IW□□□□ 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	Reserved by the system. (Slot 1 error status)
	SW00232 to SW00239	Reserved by the system. (Slot 2 error status)
	SW00240 to SW00247	Reserved by the system. (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)

[f] 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 registers as shown below.

Name	Register No.	Remarks
Slot 0 Error Status	SW00208 to SW00215	Refer to *Basic Module Error Status*.
Reserved by the system.	SW00216 to SW00223	(Depends on the mounted module and error code.)
Reserved by the system. (Slot 1 Error Status)	SW00224 to SW00231	(Depends on the mounted module and error code.)
Reserved by the system. (Slot 2 Error Status)	SW00232 to SW00239	(Depends on the mounted module and error code.)
Reserved by the system. (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.)

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.

■ Basic Module Error Status (Slot 0)

(Bit number)	F----------8	7----------0
SW00208	Error code (station error=1)	Subslot number (= 2)
(Bit number)	F----------8	7----------0
SW00213	Error code (station error=1)	Subslot number (= 3)

(Bit number)	F		3	2	1	0
SW00214	ST #15	----------	ST #3	ST #2	ST #1	Unused
SW00215	Unused	ST #30	----------		ST #17	ST #16
SW00216	Unused	----------				Unused
SW00217	Unused	----------				Unused

[g] Module Information

Name	Register No.	Contents
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	M-EXECUTOR function module ID (8430H)
	SW00813	M-EXECUTOR function module status
	SW00814 to SW00815	Reserved by the system.
	SW00816 to SW00823	Reserved by the system. (Slot 1)
	SW00824 to SW00831	Reserved by the system. (Slot 2)
	SW00832 to SW00839	Reserved by the system. (Slot 3)
	...	
	SW01008 to SW01015	Reserved by the system (Slot 26)

7.2.5 Motion Program Alarms

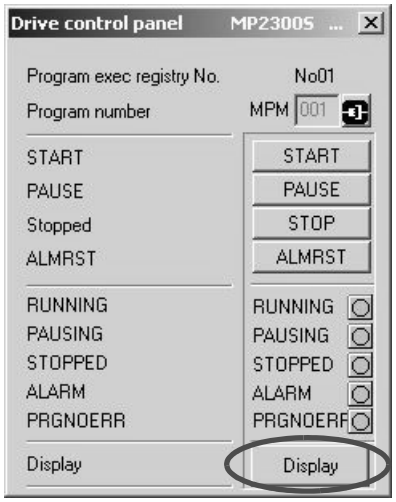
If a motion program alarm occurs, find the cause of alarm indicated by the alarm code.
The alarm code, alarm name, and its corrective actions in a motion program can be checked on the error information screen.
This section explains the error information screen and motion alarm codes:

(1) Error Information Screen

The following two options are available for displaying the error information screen.

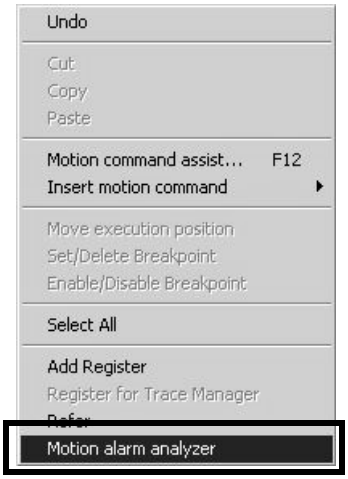
[a] Open from Operation Control Panel

Click the **Display** Button on the **Drive Control Panel** Window to display error information.

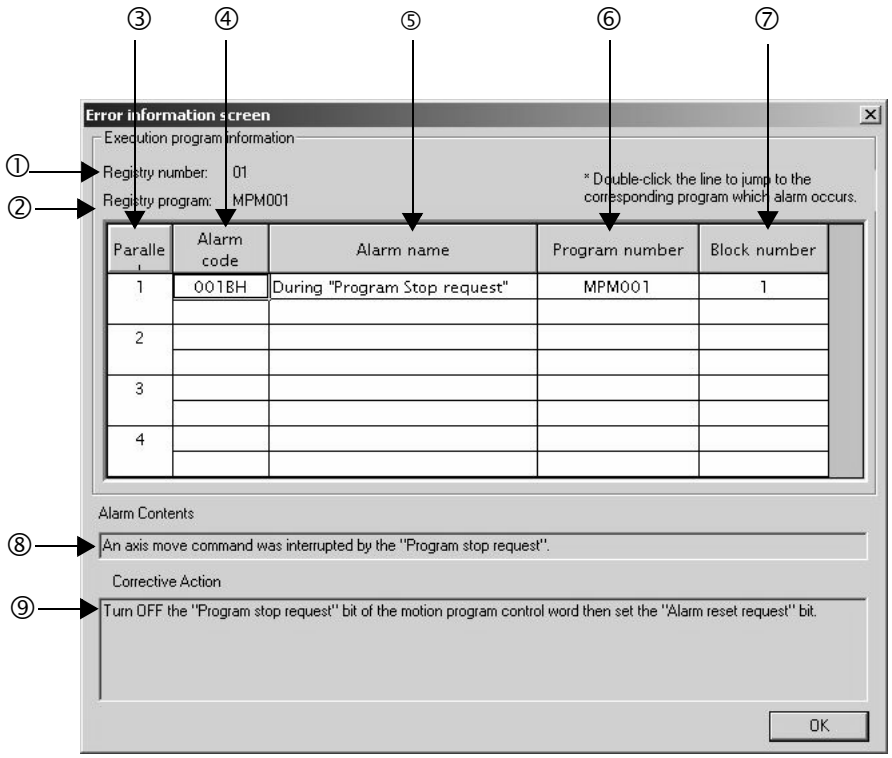


[b] Open from Right-click Menu on the Motion Editor

Select **Motion alarm analyzer** from the menu displayed by right-clicking on the motion editor.



This section explains the error information screen.



① Registry number

When an alarm occurs in a motion program registered in the M-EXECUTOR program execution definition, the M-EXECUTOR registry number is shown.

When an alarm occurs in a motion program referenced by an MSEE command from the ladder program, "---" is shown.

② Registry program

When an alarm occurs in a motion program registered in the M-EXECUTOR program execution definition, the program name registered in M-EXECUTOR is shown.

When an alarm occurs in a motion program referenced by an MSEE command from the ladder program, "---" is shown.

③ Parallel

When a parallel execution command (PFORK) is used in the motion program, multiple alarms may occur at the same time. For more information, refer to *3.1.11 Parallel Execution Command (PFORK, JOINTO, PJOINT)* of *Machine Controller MP900/MP2000 Series Users Manual, Motion Program Section* (manual number: SIE-C887-1.3).

④ Alarm code

The alarm code is shown.

⑤ Alarm name

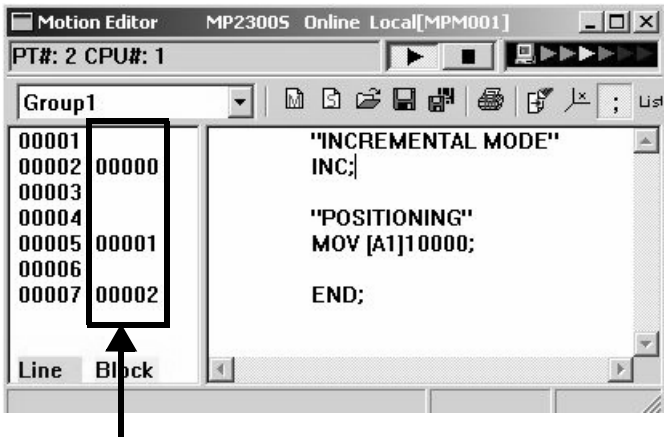
The alarm name is shown.

⑥ Program number

The name of the program where an error occurred is shown.

⑦ Block number

The number of the block where an error occurred is shown.
Double-clicking the number will bring you to the corresponding program where the error occurred.
The block number is shown in the motion editor.



⑧ Alarm Contents

The alarm content are shown.

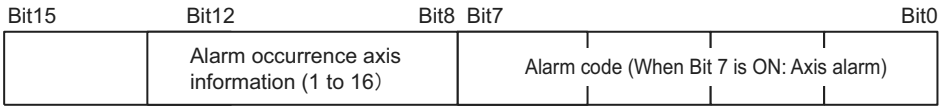
⑨ Corrective Action

Corrective actions for the alarm are shown.

(2) Motion Program Alarm Codes

(a) Configuration of Motion Program Alarms

The following diagram shows the configuration of alarms.



(b) Alarm Code List for Motion Program

The following table shows the alarm codes of motion programs.

Alarm Code	Name	Description	Corrective Actions
02h	Division error	Data divided by 0	Review the motion program.
10h	A circle instead of radius was specified	Turn number was specified instead of radius in the circular arc or helical interpolation command.	• Designate a center coordinate instead of a radius to perform the circular arc or helical interpolation command. • Never specify the turn number.
11h	Interpolation feeding speed over limit	Interpolation feeding speed exceeded the valid range of the FMX command.	Modify the interpolation feeding speed of the interpolation command
12h	No interpolation feeding speed specified	No interpolation feeding speed was specified. (once specified, this can be omitted as in the motion program)	Specify the interpolation feeding speed in the interpolation command.
13h	Range exceeded after converting acceleration parameter	Indirect acceleration parameter exceeded the valid range.	Change the indirect register value.
14h	Circular arc length exceeded LONG_MAX	Circular arc length exceeded the valid range in the circular arc or helical interpolation command.	Review the circular arc length in the circular arc or helical interpolation command.
15h	Vertical axis not specified for circular arc plane	Vertical axis was not specified in the circular arc or helical interpolation command.	Use PLN command to specify the axis.
16h	Horizontal axis not specified for circular arc plane	Horizontal axis was not specified in the circular arc or helical interpolation command.	Use PLN command to specify the axis.
17h	Specified axis over limit	Too many axes were configured in the circular arc (two axes) or helical (three axes) interpolation command.	Modify the axis in the circular arc or helical interpolation command.
18h	Turn number over limit	Turn number exceeded the valid range in the circular arc or helical interpolation command.	Modify the turn number in the circular arc or helical interpolation command.
19h	Radius exceeded LONG_MAX	Radius exceeded the valid range in the circular arc or helical interpolation command.	Review the radius in the circular arc or helical interpolation command.
1Ah	Center point error	Improper center point was specified in the circular arc or helical interpolation command.	Specify the center point properly in the circular arc or helical interpolation command.
1Bh	Running emergency stop command	Axis move command stopped due to a program stop request.	Turn OFF the program stop request for the motion program control signal, and turn ON the alarm reset request.
1Ch	Linear interpolation moving amount exceeded LONG_MAX	Moving amount exceeded the valid range in the linear interpolation command.	Review the moving amount in the linear interpolation command.
1Dh	FMX undefined	FMX command not executed in the motion program containing an interpolation command.	Perform an FMX command. The FMX command is required in each program containing an interpolation command.
1Eh	Address T out of range	Designation exceeded the valid range in the IAC/IDC/FMX commands.	Review the setting in the IAC/IDC/FMX command.
1Fh	Address P out of range	Designation exceeded the valid range in the IFP command.	Review the setting in the IFP command.

Alarm Code	Name	Description	Corrective Actions
21h	PFORK execution error	A motion command was instructed simultaneously at the second line in the PFORK of both a source motion program and a subprogram.	Review the source motion program or subprogram.
22h	Indirect register range error	Specified register address exceeds the register size range.	Review the motion program.
23h	Moving amount out of range	Axis moving amount with decimal point for an axis move command exceeded the possible range.	Review the axis moving amount.
80h	Use of logical axis prohibited	Multiple motion commands instructed against the same axis at the same time.	Review the motion program.
81h	Designation exceeded POSMAX in the infinite length axis	Moving distance designation exceeded POSMAX in the infinite length axis.	• Modify a fixed parameter “Maximum infinite length axis counter” • Review the motion program.
82h	Axis moving distance exceeded LONG_MAX	Axis moving distance designation exceeded the valid range.	Review the motion program.
84h	Duplicated motion command	Multiple commands ware executed against a single axis.	Check whether another program gave a command to the same axis at the same time. If so, review the program.
85h	Motion command response error	A motion command response different from that instructed by the motion command is reported from a motion module.	• Remove the alarm cause from the destination axis. • If the servo is not turned ON, turn ON the servo. • Check whether another program gave a command to the same axis at the same time. If so, review the program.
87h	VEL setting data out of range	An instruction in the VEL command exceeded the valid range.	Review the VEL command.
88h	INP setting data out of range	An instruction in the INP command exceeded the valid range.	Review the INP command.
89h	ACC/SCC/DCC setting data out of range	An instruction in the ACC/SCC/DCC command exceeded the valid range.	Review the ACC/SCC/DCC command.
8Ah	No time specified in the MVT command	T designation in the MVT command was zero.	Review the MVT command.
8Bh	Command execution disabled	A motion command which cannot be executed by the destination motion module was instructed.	Review the motion program.
8Ch	Distribution incompleted	A motion command was executed when a motion module was not in the Distribution Completed state.	Review the motion program so that a motion command is executed in the Distribution Completed state.
8Dh	Motion command abnormally aborted	Motion module fell into the “Motion command abnormally aborted” state.	• Release the destination axis error. • Review the motion program.

7.2.6 List of Causes for Command Error Completed Status

The Command Error Completed Status (IW□□09, bit 3) turns ON when the set motion command cannot be executed for some reasons or the execution of motion command ended with error. The cause for which this bit turns ON differ depending on motion command.
The following table shows the causes of Command Error Completed Status by motion command.

Motion Command Code		Cause of Command Error Occurrence	Warning (W:) and Alarm (A:) That Occur at Command Error Occurrence
1	Positioning (POSING)	The positioning moving amount exceeds the allowable range.	A: Excessive Positioning Moving Amount
		The axis is a ABS infinite-length, and the zero point return setting is not completed	A: Zero Point Not Set
		In servo OFF status	A: Servo OFF
		Alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
2	External Positioning (EX_POSING)	The positioning moving amount exceeds the allowable range.	A: Excessive Positioning Moving Amount
		The axis is a ABS infinite-length, and the zero point return setting is not completed	A: Zero Point Not Set
		In servo OFF status	A: Servo OFF
		Alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
		The selected external signal is out of the setting range.	W: Setting Parameter Error
3	Zero Point Return (ZRET)	In machine lock status	–
		In servo OFF status	1: Servo OFF
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter reading or writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 is occurring in the SERVOPACK.	W: Servo Driver Error
		The selected zero point return method is out of the setting range.	W: Setting Parameter Error
		POT method is selected for zero point return, but the approach speed is a negative value.	W: Setting Parameter Error
		NOT method is selected for zero point return, but the approach speed is a positive value.	W: Setting Parameter Error
		During zero point return using DEC1 + Phase-C, ZERO signal, or Phase-C method, the OT signal in zero point return direction was ON.	OT Alarm or OT Warning in Zero Point Return Direction
4 · 5	Interpolation (INTERPOLATE) Interpolation last segment (ENDOF_INTERPOLATE)	The commanded moving distance for one scan exceeds the segment that can be commanded to the MECHATROLINK SERVOPACK, or the speed feed forward value exceeds the allowable maximum speed.	A: Excessive Speed
		The axis is ABS infinite length, and the zero point return (setting) is not completed.	A: Zero Point Not Set
		In servo OFF status	A: Servo OFF
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error

Motion Command Code		Cause of Command Error Occurrence	Warning (W:) and Alarm (A:) That Occur at Command Error Occurrence
6	Latch (LATCH)	The commanded moving amount for one scan exceeds the segment that can be commanded to the MECHATROLINK SERVOPACK, or the speed feed forward value exceeds the allowable maximum speed.	A: Excessive Speed
		The axis is ABS infinite length, and the zero point return (setting) is not completed.	A: Zero Point Not Set
		In servo OFF status	A: Servo OFF
		An alarm is occurring.	–
		The selected latch signal is out of the setting range.	W: Setting Parameter Error
7	JOG Operation (FEED)	In machine lock status	–
		In servo OFF status	A: Servo OFF
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
8	STEP operation (STEP)	Positioning moving amount exceeds the allowable value.	A: Excessive Positioning Moving Amount
		In servo OFF status	A: Servo OFF
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
9	Zero Point setting (ZSET)	An alarm is occurring.	–
		Asynchronized communication status	A: Servo Driver Synchronization Communication Error
10 · 11	Change Acceleration Time (ACC) Change Deceleration Time (DCC)	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		Executed while the distribution has not been completed (DEN = OFF)	–
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
12	Change Filter Time Constant (SCC)	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		Executed while the distribution has not been completed (DEN = OFF)	A: Filter Time Constant Change Error
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
13	Change Filter Type (CHG_FILTER)	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		Executed while the distribution has not been completed (DEN = OFF).	A: Filter Time Constant Change Error
		The selected filter type is out of the setting range.	W: Setting Parameter Error
14 • 15 • 16	Change Speed Loop Gain (KVS) Change Position Loop Gain (KPS) Change Speed Feed Forward (KFS)	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error

Motion Command Code		Cause of Command Error Occurrence	Warning (W:) and Alarm (A:) That Occur at Command Error Occurrence
17 • 18	Read SERVOPACK Parameter (PRM_RD) Write SERVOPACK Parameter (PRM_WR)	An alarm is occurring.	–
		Asynchronized communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter reading was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
		SERVOPACK parameter number or size is out of the setting range.	W: Setting Parameter Error
19 • 20	Monitor SERVOPACK Alarms (ALM_MON) Monitor SERVOPACK Alarm History (ALM_HIST)	The command to the SERVOPACK was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Servo driver alarm monitor number is out of setting range.	W: Setting Parameter Error
21	Clear SERVOPACK Alarm History (ALMHIST_CLR)	The command to the SERVOPACK was not completed within the specified time.	A: Servo Driver Command Timeout Error
22	Reset Absolute Encoder (ABS_RST)	This command was used for Σ-I SERVOPACK.	–
		Executed while servo is ON.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		The command to the SERVOPACK was not completed within the specified time.	A: Servo Driver Command Timeout Error
23	Speed Reference (VELO)	Commanded when having been connected to MECHATROLINK-I	–
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
24	Torque Reference (TRQ)	Commanded when having been connected to MECHATROLINK-I	–
		An alarm is occurring	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
25	Phase Reference (PHASE)	The axis is ABS infinite length, and the zero point return (setting) is not completed.	A: Zero Point Not Set
		In servo OFF status	A: Servo OFF
		An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
26	Change Position Loop Integration Time Constant (KIS)	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
	Others Parameter Automatic Updating when Execution of Move Command Starts *	An alarm is occurring.	–
		Asynchronous communication status	A: Servo Driver Synchronization Communication Error
		SERVOPACK parameter writing was not completed within the specified time.	A: Servo Driver Command Timeout Error
		Warning A.94 or A.95 occurred in the SERVOPACK.	W: Servo Driver Error
		The distribution was not completed (DEN = OFF).	–

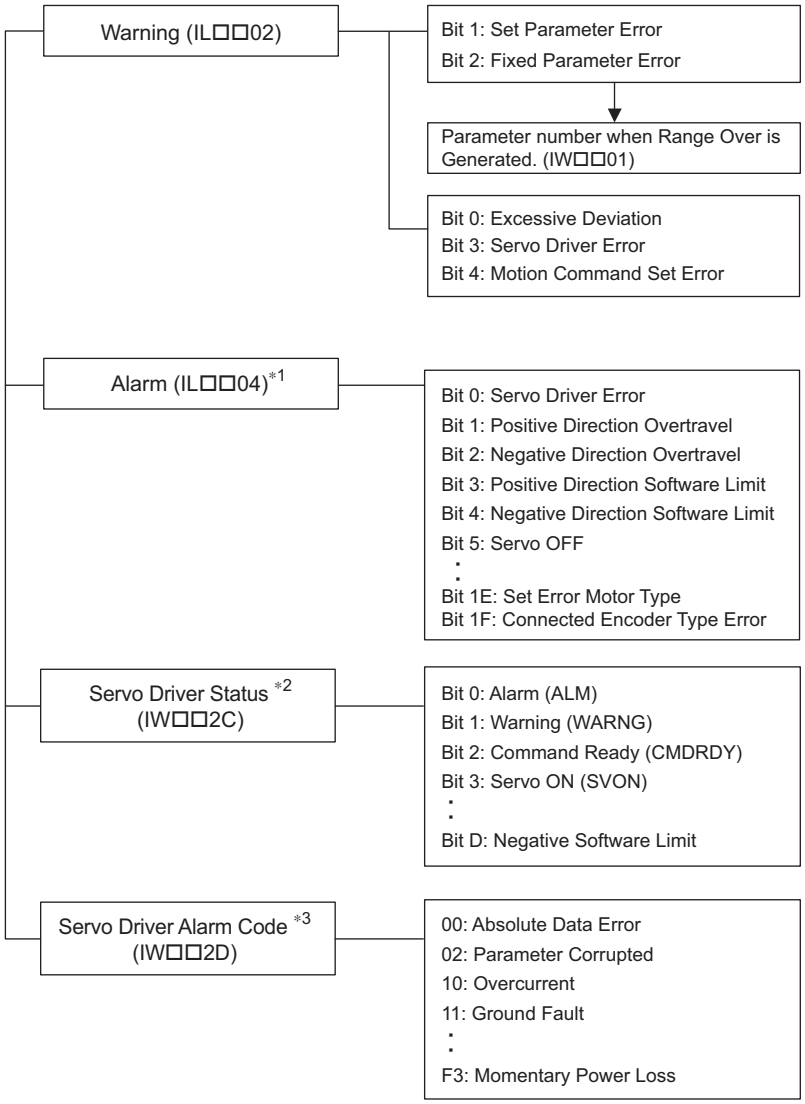
* When the fixed parameter Automatic Updating of Parameter was enabled, and the setting of Filter Time Constant, Acceleration Rate/Time, or Deceleration Rate/Time was changed at the time a move command was set

7.2.7 Troubleshooting Motion Errors

This section explains the details and remedies for errors that occur in motion control functions.

(1) Overview of Motion Errors

Motion errors in the MP2000-series Machine Controller 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 Machine Controller Basic Module's MECHATROLINK-I or MECHATROLINK-II functionality are shown below.



* 1. Refer to *7.2.7 (2) [a] Alarm (ILoo04) List*.
* 2. Refer to *7.2.7 (3) [a] Servo Driver Status (IWoo2C) List*.
* 3. Refer to *7.2.7 (3) [b] Servo Driver Alarm Code (IWoo2D)*.

(2) Motion Error Details and Corrections

The following tables show the contents of the axis alarms (IL□□04) (subsection a) and axis alarm details (subsection b).

[a] Alarm (IL□□04) List

IL□□04	Alarm Contents	IL□□04	Alarm Contents
Bit 0	Servo Driver Error	Bit 10	Servo Driver Synchronization Communications Error
Bit 1	Positive Direction Overtravel	Bit 11	Servo Driver Communication Error
Bit 2	Negative Direction Overtravel	Bit 12	Servo Driver Command Time-out Error
Bit 3	Positive Direction Software Limit	Bit 13	Excessive ABS Encoder Rotations
Bit 4	Negative Direction Software Limit	Bit 14	Reserved
Bit 5	Servo OFF	Bit 15	Reserved
Bit 6	Positioning Time Over	Bit 16	Not used
Bit 7	Excessive Positioning Moving Amount	Bit 17	Not used
Bit 8	Excessive Speed	Bit 18	Not used
Bit 9	Excessive Deviation	Bit 19	Not used
Bit A	Filter Type Change Error	Bit 1A	Not used
Bit B	Filter Time Constant Change Error	Bit 1B	Not used
Bit C	Not used	Bit 1C	Not used
Bit D	Zero Point Unsetting	Bit 1D	Not used
Bit E	Not used	Bit 1E	Motor Type Set Error
Bit F	Not used	Bit 1F	Connected Encoder Type Error

[b] 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 Completed Status in the Motion 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 *7.2.7 [b] Servo Driver Status and Servo Driver Error Codes* on page 7-36 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.

[c] Bit 1: Positive Direction Overtravel and Bit 2: Negative Direction 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 Completed Status in the Motion Command Status (IW□□09, bit 3) will turn ON. • Machine Controller 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.)

■ Precautions

- 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

[d] Bit 3: Positive Direction Software Limit and Bit 4: Negative Direction 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 Completed Status in the Motion 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.)

[e] 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 Completed Status in the Motion 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.

[f] Bit 6: Positioning Time Over

Detection Timing	• Positioning was not completed within Positioning Completion Cheek Time (OW□□26) after completing pulse distribution.
Processing when Alarm Occurs	• The current command was ended forcibly. • The Command Error Completed Status in the Motion Command Status (IW□□0,9 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. Or, there is oscillation. • The Positioning Completion Cheek Time (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 Positioning Completion Cheek Time (OW□□26).

- The above check is not performed if the Positioning Completion Cheek Time (OW□□26) is set to 0.

[g] Bit 7: Excessive Positioning Moving Amount

Detection Timing	• Positioning command is executed.
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Completed Status in the Motion 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.

[h] Bit 8: Excessive Speed

Detection Timing	• A move command is executed.
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Completed Status in the Motion Command Status (IW□□09, bit 3) will turn ON.
Error and Cause	• The speed (moving amount output for one scan in case of interpolation) commanded to MECHATROLINK servo exceeds the upper limit.
Correction	• Check the settings for speed reference, interpolation command moving amount per scan, and speed compensation.

[i] Bit 9: Excessive Deviation

Detection Timing	• Always except during speed control and torque control
Processing when Alarm Occurs	• The move command is not executed. • The Command Error Completed Status in the Motion 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 Error Count Alarm Detection (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 Error Count Alarm Detection (OL□□22). • Check the motor capacity.

- The above check is not performed if the Error Count Alarm Detection (OL□□22) is set to 0.

[j] Bit A: 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 Completed Status in the Motion Command Status (IW□□09, bit 3) will turn ON.
Error and Cause	• An error occurs if the Change Filter Type command is executed before the specified pulse distribution has not been completed (i.e., when IW□□0C, bit 0 was OFF).
Correction	• Correct the program to execute the Change Filter Type command after Discharging Completed status (i.e., that IW□□0C, bit 0 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.

[k] Bit B: 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 Completed Status in the Motion Command Status (IW□□09, bit 3) will turn ON.
Error and Cause	• An error occurs if the SCC command is executed before the specified pulse distribution has not been completed (i.e., when IW□□0C0, bit 0 was OFF).
Correction	• Correct the program to execute the SCC command after Discharging 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.

[l] Bit D: Zero Point Unsetting

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 Response Code (OW□□08). Commands: Positioning, External Positioning, Interpolation, Interpolation with position detection function, phase reference
Processing when Alarm Occurs	• The set command will not be executed. • The Command Error Completed Status in the Motion 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.

[m] Bit 10: Servo Driver Synchronization Communications Error

Detection Timing	• Detected by the communication control section when communication are synchronized between the Machine Controller and SERVOPACK.
Processing when Alarm Occurs	• The current command will be aborted.
Error and Cause	• Data of either Machine Controller or servo was not correctly updated.
Correction	• Check the MECHATROLINK cable and reset the alarm.

[n] Bit 11: Servo Driver Communication Error

Detection Timing	• Detected by the communication control section when communication is not synchronized between the Machine Controller 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, there is nois interference to the communication line or the power supply to the SERVOPACK was turned OFF.
Correction	• Check the MECHATROLINK cable and reset the alarm. • If this error frequently occurs, refer to *MECHATROLINK-II Installation Manual* (manual number: SIEPS 80000030) to correct wiring and eliminate noise interference.

[o] Bit 12: Servo Driver Command Time-out 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.

[p] Bit 13: Excessive ABS Encoder Rotations

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.

[q] Bit 1E: Set Error Motor Type

Detection Timing	• Detected when the communication with the SERVOPACK is established.
Processing when Alarm Occurs	• None
Error and Cause	• The motor type setting (rotary/linear) of the Machine Controller fixed parameter does not agree with that of SERVOPACK parameter (Start Selection Pn000.3 for SGDH, Rotary/Linear for SGDS).
Correction	• Check the setting and model of the SERVOPACK.

[r] Bit 1F: Connected Encoder Type Error

Detection Timing	• Detected when the communication with the SERVOPACK is established.
Processing when Alarm Occurs	• None
Error and Cause	• The motor type setting (rotary/linear) of the Machine Controller fixed parameter does not agree with the motor type connected to the SERVOPACK.
Correction	• Check the motor.

(3) Servo Driver Status and Servo Driver Error Codes

[a] Servo Driver Status (IW□□2C) List

The status of a SERVOPACK for MECHATROLINK communication can be monitored in Monitor Parameter (IW□□2C).
The list of Monitor Parameter (IW□□2C) is provided in the following table.

Bit No.	Status	Description
Bit 0	Alarm (ALM)	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 Supply 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 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	Locating Complete (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	Command Profile Complete (DEN)	OFF: Pulse distribution is being performed for positioning command. ON: Pulse distribution for positioning commands has been completed
Bit 9	Torque Restriction (T_LIM)	OFF: A torque limit is not being applied. ON: A torque limit is being applied.
Bit A	Latch Complete (L_CMP)	OFF: Latch not completed. ON: Latch completed.
Bit B	Locating neighborhood (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	–

[b] Servo Driver 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 Driver Alarm Code (monitoring parameter IW□□2D).
The Servo alarm codes are listed in the following tables.

■ Σ-I Series

Name	Register Number	Code	Meaning
Servo Driver 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

■ Σ-II Series

Name	Register Number	Code	Meaning
Servo Driver 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	Fully-closed Loop Phase-A or -B Broken
		C7	Fully-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 Driver 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)

■ Σ-III Series

Name	Register Number	Code	Meaning
Servo Driver 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 Driver 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	Fully-closed Serial Encoder Checksum Alarm
		880	Fully-closed Serial Encoder Data Alarm
		8A0	Fully-closed Serial Encoder Scale Error
		8A1	Fully-closed Serial Encoder Module Error
		8A2	Fully-closed Serial Encoder Sensor Error (Incremental Value)
		8A3	Fully-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	Fully-closed Serial Conversion Unit Communication Error (Reception Failure)

Name	Register Number	Code	Meaning
Servo Driver Alarm Code (cont'd)	IW□□2D (cont'd)	CF2	Fully-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.

Appendices

Appendix A System Registers Lists

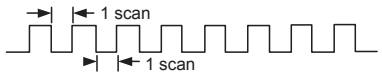
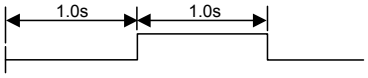
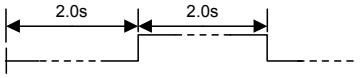
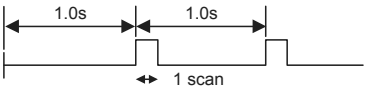
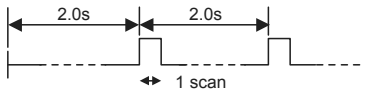
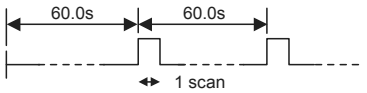
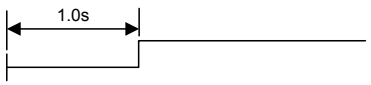
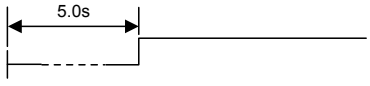
A.1 System Service Registers

(1) Shared by All Drawings

Name	Register No.	Remarks
Reserved (Reserved for the system)	SB000000	(Not used)
High-speed Scan	SB000001	ON for only the first scan after high-speed scan is started.
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)

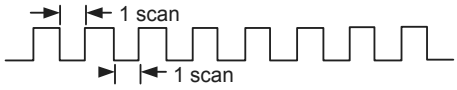
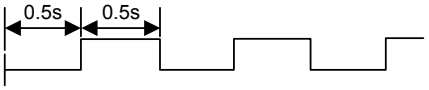
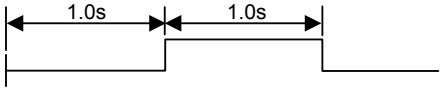
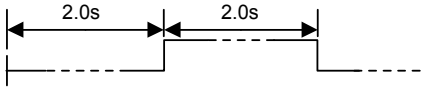
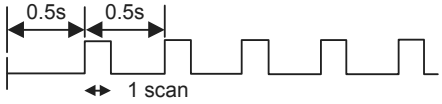
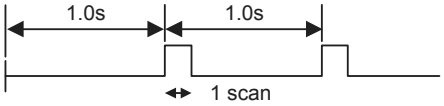
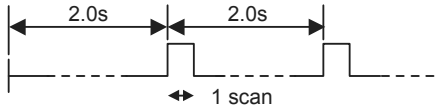
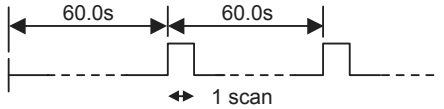
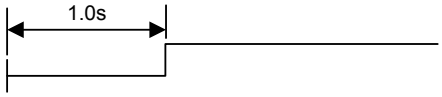
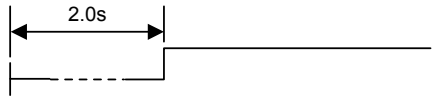
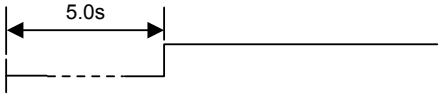
(2) DWG.H Only

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	

■ 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	

A.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.

A.3 Program Software Numbers and Remaining Program Memory Capacity

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	SL00026	Bytes
Total Memory Capacity	SL00028	Bytes

Appendix B SERVOPACK Parameter Data Flow

In systems connected to MECHATROLINK, SERVOPACK parameters can be read directly from the MP2400. (Refer to *11.6 Parameters That Are Automatically Updated* in the Machine Controller MP2000 series Built-in SVB/SVB-01 Motion Module User's Manual (manual no.: SIEPC88070033). This means that parameters are saved in the memory area of both the MP2400 and the SERVOPACK. It is thus necessary to consider the relationship between the settings in both memory areas.

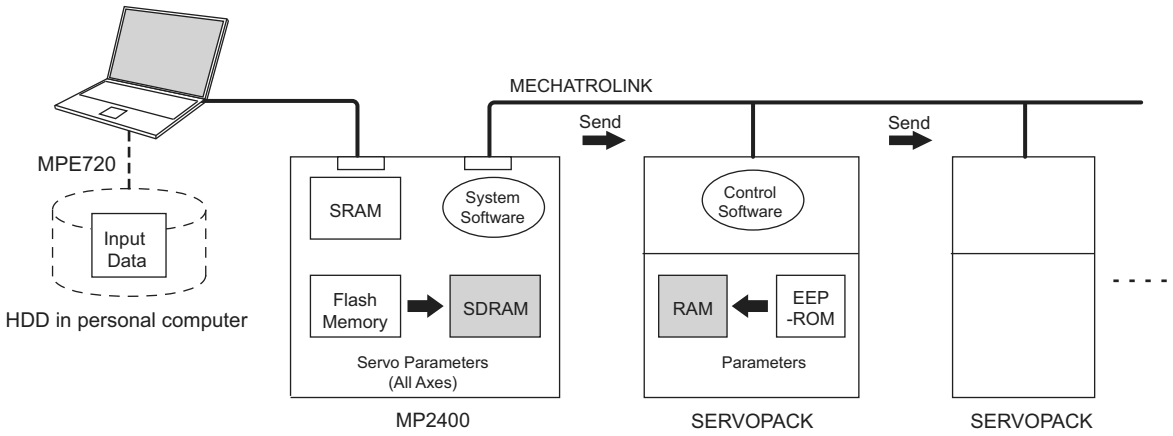
B.1 Operations and Parameter Data Flow

(1) Power ON

1. Parameter data saved in the SERVOPACK's EEPROM*1 is copied to SERVOPACK's RAM*2.

2. Parameter data saved in the MP2400's flash memory*1 for all axes is copied to SDRAM*2.
Some gain-related settings are sent from the MP2400 to SERVOPACK RAM.

* 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.

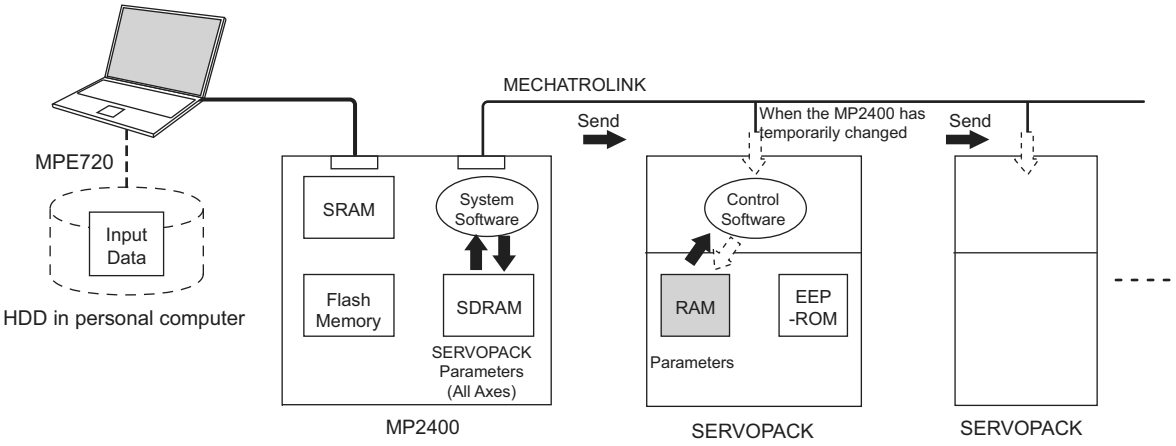


- Indicates data has been written (same below).

(2) Normal Operation

1. Control software of the SERVOPACK operates based on the parameter data held in SERVOPACK's RAM.

2. Some of MP2400 setting parameters and commands temporarily change SERVOPACK parameters. Refer to *Chapter 4* in the Machine Controller MP2000-series SVB/SVB-01 Motion Module User's Manual (manual no. SIEPC88070033) for details. RAM in the SERVOPACK are written.

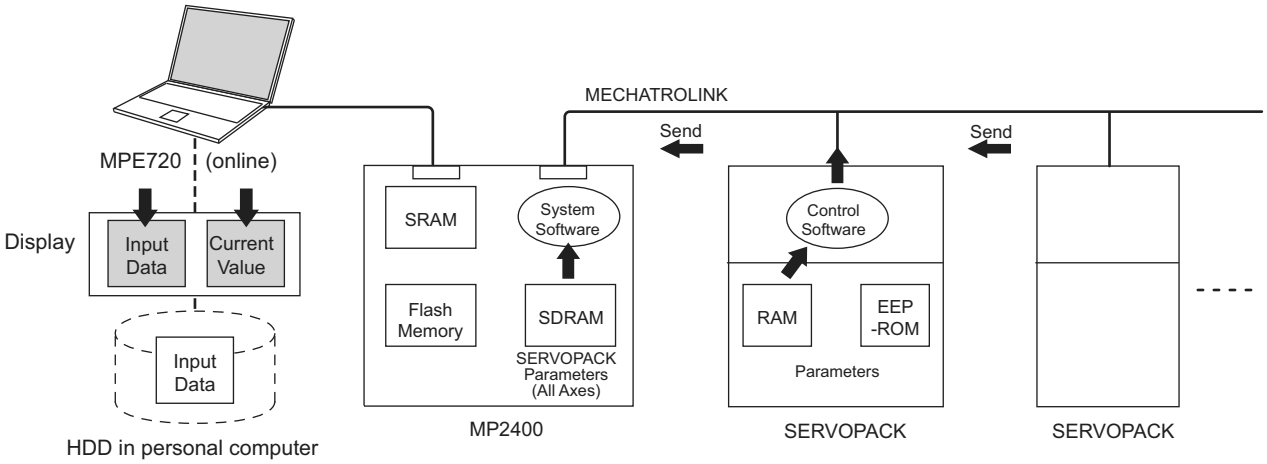


- Parameters held in the SERVOPACK's RAM are displayed on a Digital Operator connected to the SERVOPACK. They are also written to EEPROM when the DATA/ENTER Key is pressed.

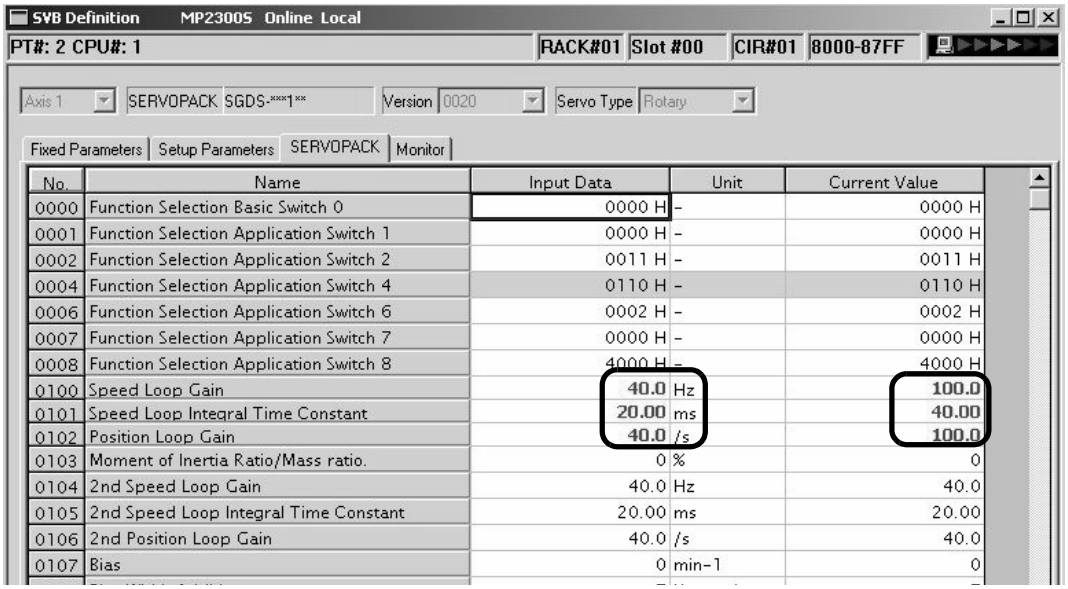
(3) When the SERVOPACK Tab Page Is Open

The data flow for SERVOPACK parameters is as follows when the SERVOPACK Tab Page is open in the SVB Definitions Window on the MPE720:

1. 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 MP2400's SDRAM values to the ***Input Data*** in the **SERVOPACK** Tab Page.



2. 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 Value
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	-	0011 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

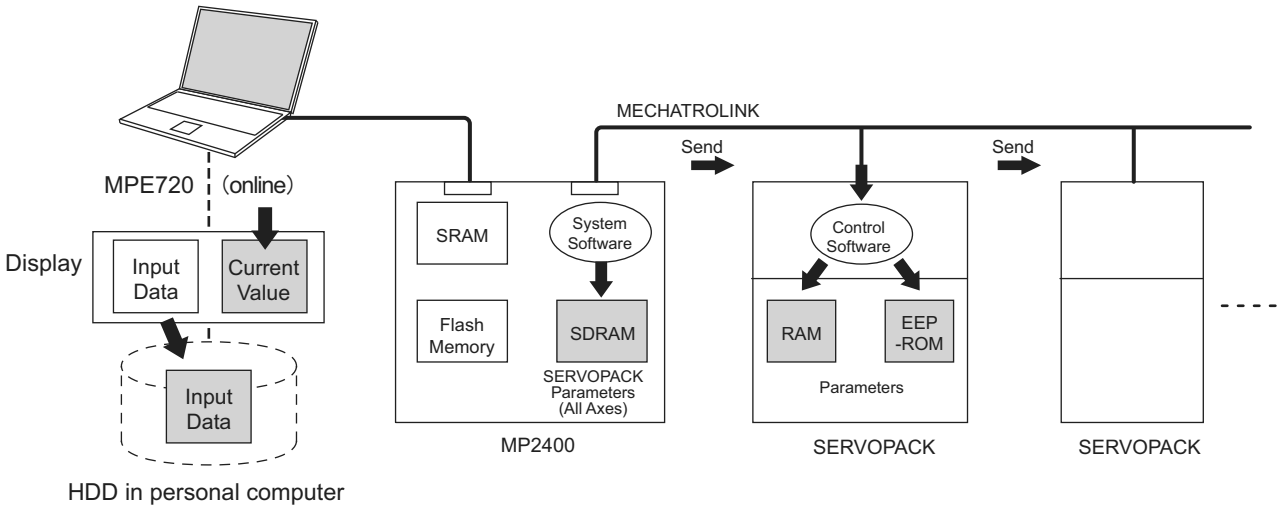
(4) SERVOPACK Parameters Saved in the MPE720

The data flow for SERVOPACK parameters is as follows when ***File - Save*** is selected from the **SERVOPACK** Tab Page (refer to *2.2.5 (5)SVB Definition* on page 2-43 for details on how to open the SERVOPACK Tab page):

1. The MPE720 writes all the parameters in **Input Data** currently displayed on **SERVOPACK** Tab Page of the relevant axis to the followings.

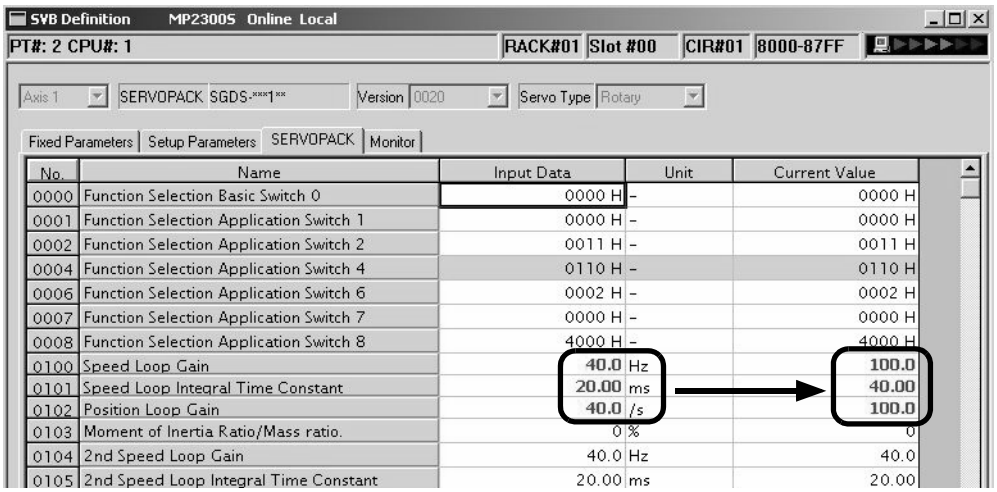
- HDD (hard disk) of the personal computer
- SDRAM of MP2400
- RAM and EEPROM of the SERVOPACK

2. 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.

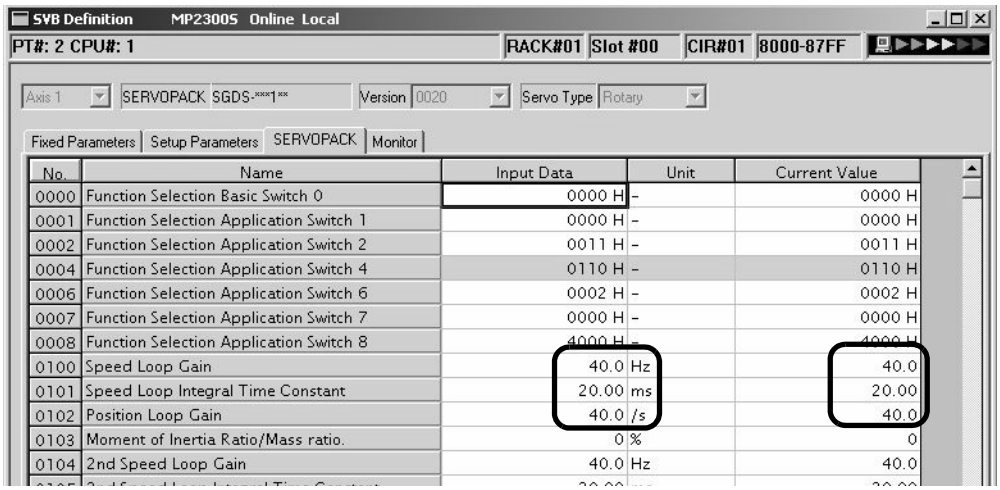


3. The following figure shows a display example after having executed save operation on the **SERVOPACK** Tab in the **SVB Definition** Window. After having saved the data, the values in **Input Data** of all the parameters become the same as the values in **Current Value** on the **SERVOPACK** Tab.

Before saving



After saving

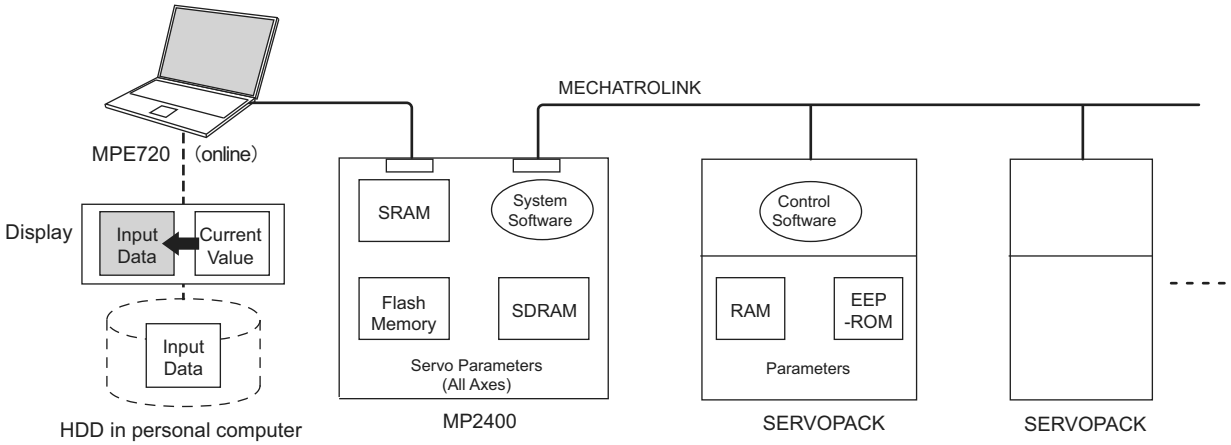


- The saving operation of SERVOPACK parameters can be used for writing data after SERVOPACK replacement because it writes all the parameters of the relevant axis.

(5) Copying Current Values to Set Values (Input Data) in the SERVOPACK Tab

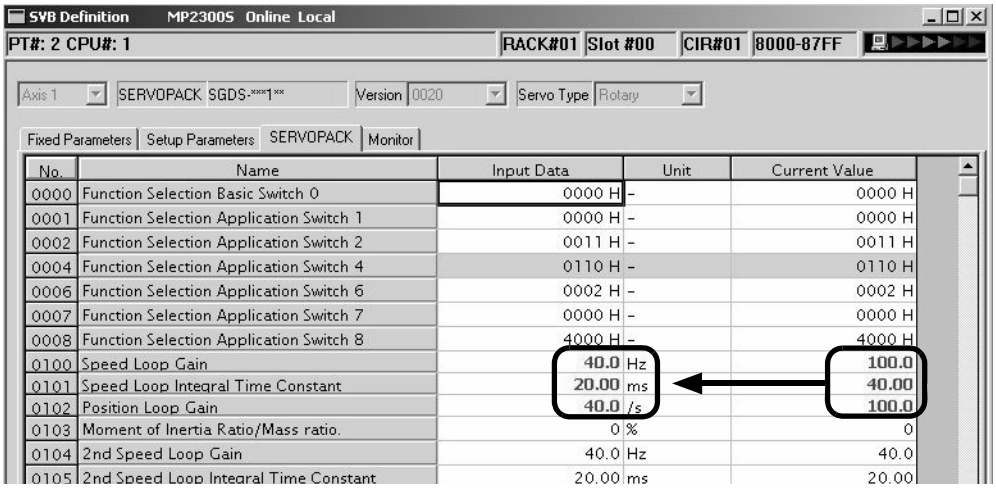
The data flow for SERVOPACK parameters is as follows when selecting ***Edit - Copy Current Value*** from the **SERVOPACK** Tab in the SVB Definition Window on the MPE720:

1. The MPE720 copies the values currently displayed in **Current Value** to **Input Data** on the **SERVOPACK** Tab and displays.

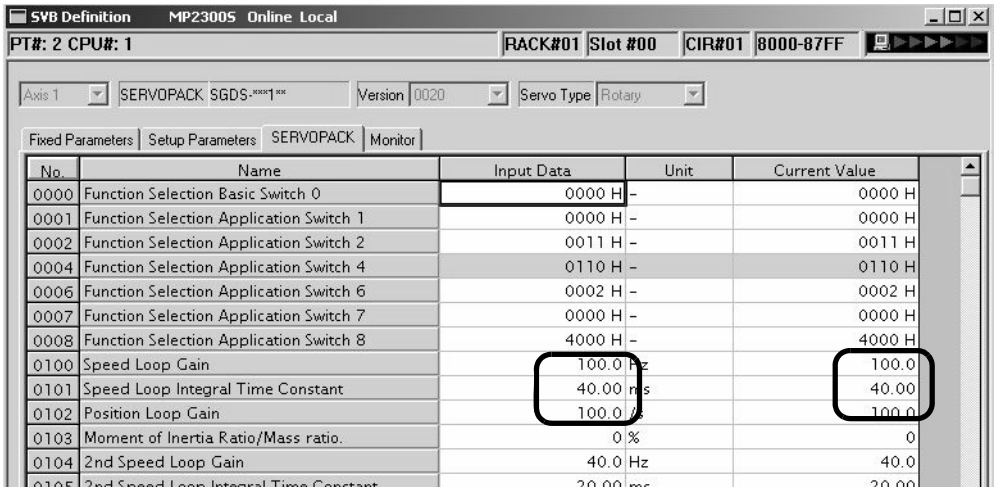


2. The following figure shows a display example after having selected ***Edit - Copy Current Value*** on the **SERVOPACK** Tab in the **SVB Definition** Window. The values in **Current Value** are copied to **Input Data**.

Before copying



After copying



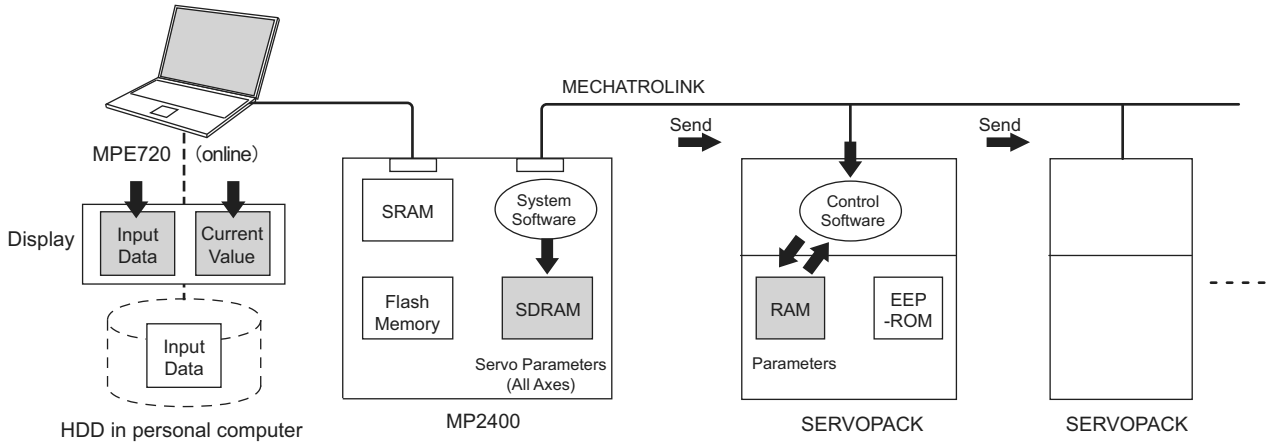
(6) Changing Parameters in the SERVOPACK Tab Page

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:

1. 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.)

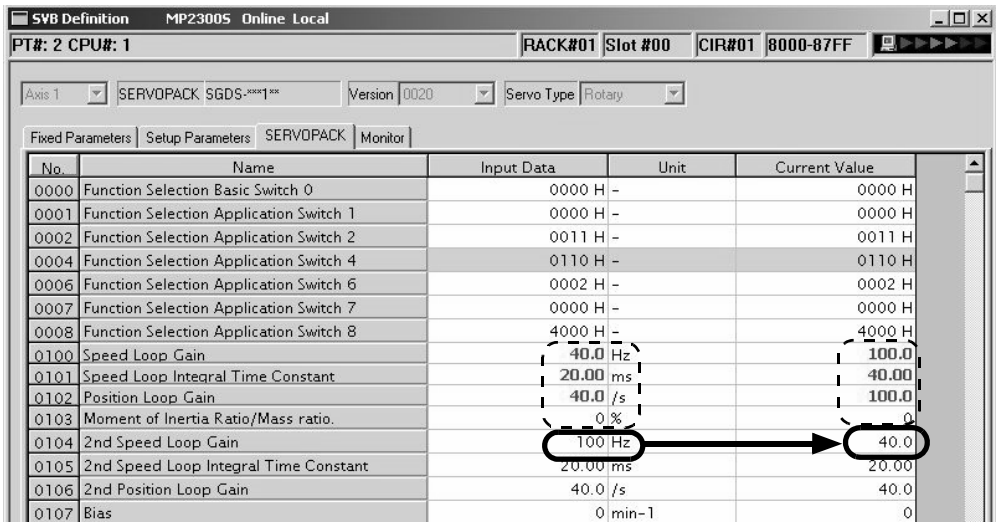
- **Input Data** (set data) on the **SERVOPACK** Tab Page
- SDRAM of the MP2400
- RAM of the SERVOPACK

2. 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.



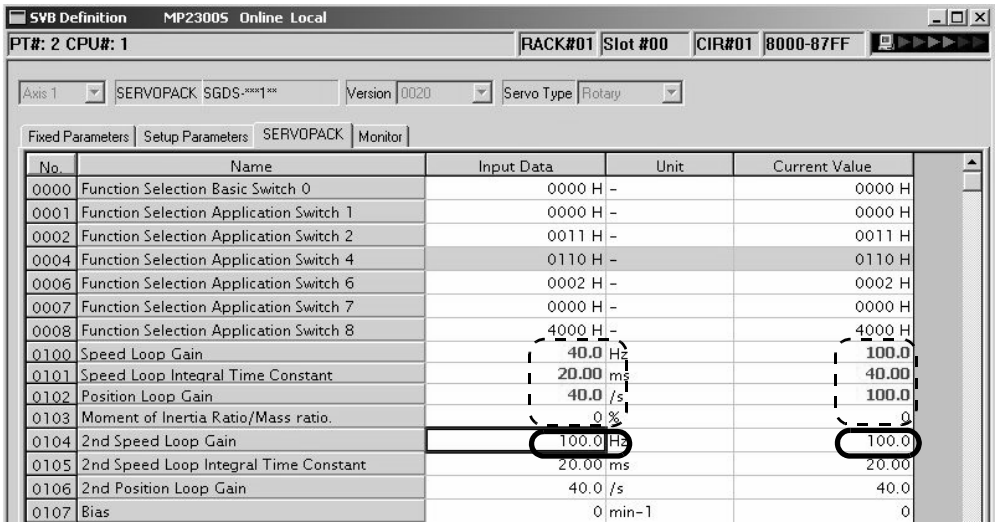
3. The following figure shows a display example after having changed the value (*2nd Speed Loop Gain*) in **Input Data** on the **SERVOPACK** Tab. After having pressed the **Enter** Key, the values of **Speed Loop Gain, Speed Loop Integral Time Constant**, and **Position Loop Gain** (boxed in dotted 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



No.	Name	Input Data	Unit	Current Value
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	-	0011 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	100	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

After having pressed ENTER Key

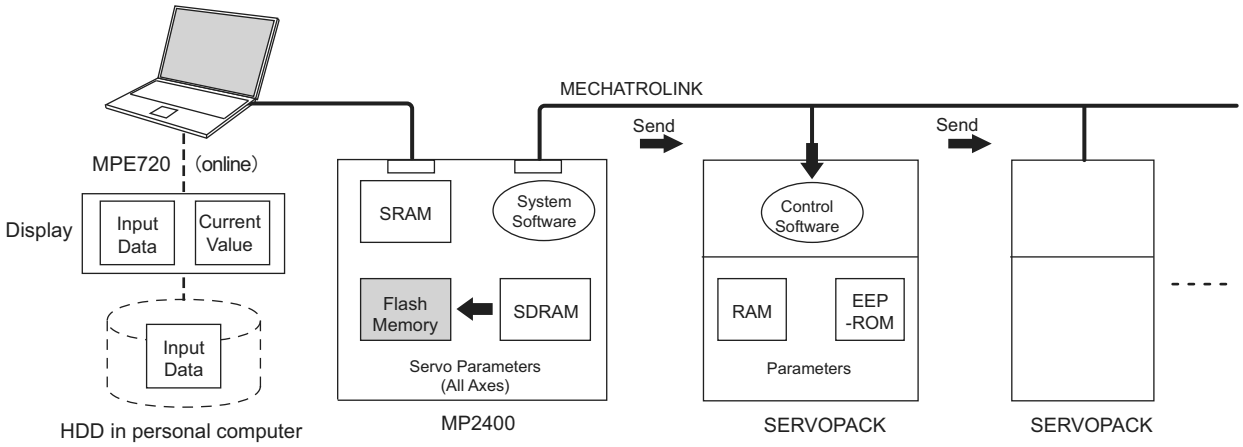


No.	Name	Input Data	Unit	Current Value
0000	Function Selection Basic Switch 0	0000 H	-	0000 H
0001	Function Selection Application Switch 1	0000 H	-	0000 H
0002	Function Selection Application Switch 2	0011 H	-	0011 H
0004	Function Selection Application Switch 4	0110 H	-	0110 H
0006	Function Selection 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	100.0	Hz	100.0
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

(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.

1. The MP2400 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.

■ Precautions When Saving SERVOPACK Parameters

Before executing a saving operation in the **SERVOPACK** Tab Page, except during SERVOPACK replacement, always select ***Edit - Current Value - Setting Value*** to copy the values in **Current Value** to **Input Data**.

Appendix C 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.

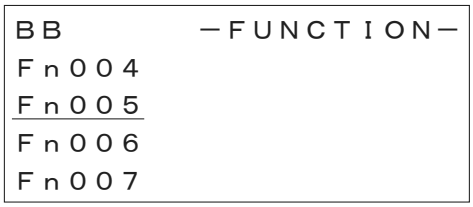
- SERVOPACKs that are being used for the first time do not need to be initialized.

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 ∧ or ∨ Keys to select Fn005.

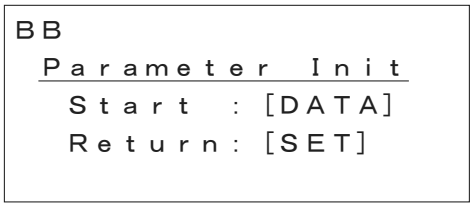


5. Press the DATA Key to switch to the Fn005 parameter initialization execution display.

* 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.



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.

Appendix D 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* in the *Machine Controller MP2000-series SVB/SVB-01 Motion Module User's Manual* (manual no. SIEPC88070033) for the procedure for absolute-position detection.

D.1 Σ-V SERVOPACK

Note: For details on Σ-V series SERVOPACKs, refer to *Σ-V series User's Manual Design and Maintenance* (manual no.: SIEP S800000 45).

Follow the setup procedure below using a Digital Operator.

Step	Display Example	Description
1	BB –FUNCTION– Fn006:AlmHist Clr Fn008:Mturn Clr Fn009:Ref Adj Fn00A:Vel Adj	Press the MODE/SET Key to open the Utility Function Mode main menu, and select Fn008 using the ∧ or ∨ Key.
2	BB Multiturn Clear PGCL1	Press the DATA Key. The display is switched to the execution display of Fn008 (Absolute encoder multiturn reset and encoder alarm reset). 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.
3	BB Multiturn Clear PGCL5	Keep pressing the ∧ Key until "PGCL1" is changed to "PGCL5."
4	Done Multiturn Clear PGCL5	Press the DATA Key. "BB" in the status display changes to "Done."
5	BB –FUNCTION– Fn006:AlmHist Clr Fn008:Mturn Clr Fn009:Ref Adj Fn00A:Vel Adj	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.

D.2 Σ-III SERVOPACK

- Refer to the following manuals for information on Σ-III series SERVOPACKs:
  Σ-III Series SGM□S/SGDS User's Manual (Manual No. SIEP S80000000),
  Σ-III Series SGM□S/SGDS User's Manual for MECHATROLINK-II Communications (Manual No. SIEP S80000011),
  and Σ-III Series SGM□S/SGDS Digital Operator Instructions Manual (Manual No. TOBP S80000001)

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 ∧ Key or ∨ 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.

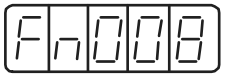
D.3 Σ-II SERVOPACK

- Refer to the following manuals for information on Σ-II SERVOPACKs.
  Σ-II Series SGM□H/SGDH User's Manual (SIEP S8000000 05)
  Σ-II Series SGM□/SGDB/SGM□H/SGDM User's Manual (SIEP S800000 15)

(1) Initialization Using a Hand-held Digital Operator

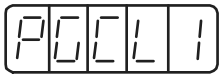
1. Press the DSPL/SET Key to select the Auxiliary Function Mode.

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.



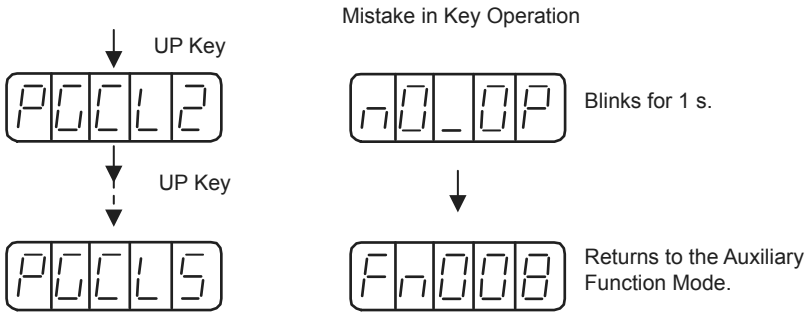
3. Press the DATA/ENTER Key.

The following display will appear.



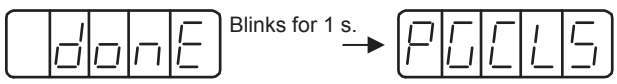
4. The rightmost digit will be incremented each time the UP (∧) Key is pressed. Press the UP (∧) Key several times until "PGCL5" is displayed.

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 multiturn data for the absolute encoder.



This completes initializing the absolute encoder. Reset the SERVOPACK to turn the power supply OFF and then back ON.

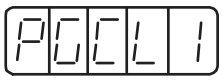
(2) Initialization Using the Built-in Panel Operator

1. Press the MODE/SET Key to select the Auxiliary Function Mode.

2. Press the UP (▲) and DOWN (▼) Keys to select parameter Fn008.

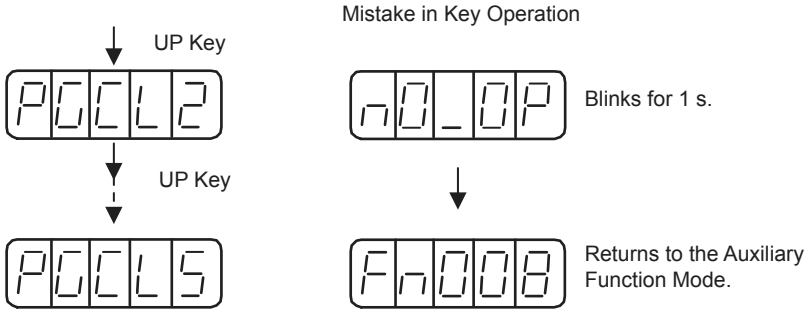
3. Press the DATA/ENTER Key for more than one second.

The following display will appear.



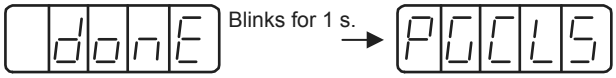
4. The rightmost digit will be incremented each time the UP (▲) Key is pressed. Press the UP (▲) Key several time until “PGCL5” is displayed.

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 multiturn data for the absolute encoder.



This completes initializing the absolute encoder. Reset the SERVOPACK to turn the power supply OFF and then back ON.

D.4 Σ-I SERVOPACK

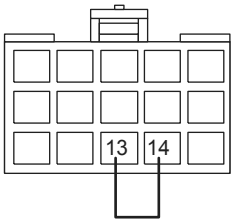
- Refer to the following manuals for information on Σ-I SERVOPACKS.
  Σ Series SGMΞ/SGD User's Manual (Manual No. SIE-S800-26.3)
  Σ Series SGMΞ/SGDB High-speed Field Network MECHATROLINK-compatible AC Servo Driver User's Manual (Manual No. SIE-S800-26.4)

(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 MP2400.

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 MP2400.

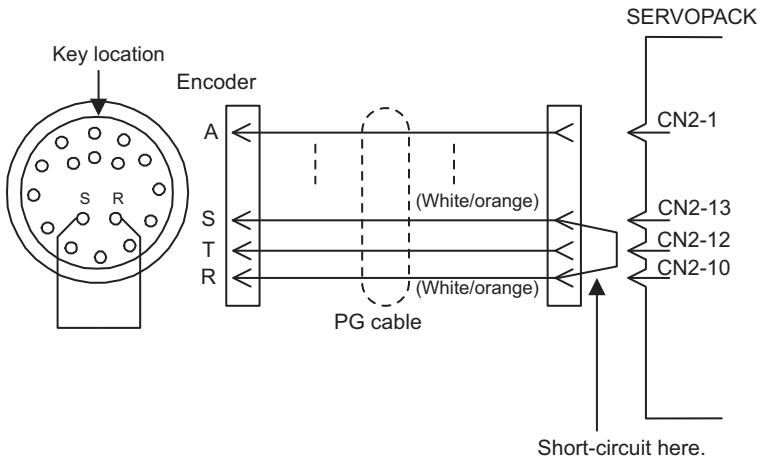
2. Discharge the large-capacity capacitor in the encoder using one of the following methods.

■ 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.

Appendix E Motion Parameter Details

E.1 Fixed Parameter List

The following table provides a list of SVB and SVR motion fixed parameters.

Slot Number	Name	Contents	SVB	SVR
0	Selection of Operation Modes	0: Normal Operation Mode	Yes	Yes
		1: Axis Unused	Yes	Yes
		2: Simulation Mode	Yes	
		3: Servo Driver Transmission Reference Mode	Yes	
		4 and 5: Reserved	–	–
1	Function Selection Flag 1	Bit 0: Axis Selection (0: Finite length axis/1: Infinite length axis) • Set to 0 for linear type.	Yes	Yes
		Bit 1: Soft Limit (Positive Direction) Enable/Disable	Yes	
		Bit 2: Soft Limit (Negative Direction) Enable/Disable	Yes	
		Bit 3: Overtravel Positive Direction Enable/Disable	Yes	
		Bit 4: Overtravel Negative Direction Enable/Disable	Yes	
		Bits 5 to 7: Reserved	–	–
		Bit 8: Interpolation Segment Distribution Processing	Yes	
		Bit 9: Simple ABS Rotary Pos. Mode (Simple Absolute Infinite Axis Position Control) (0: Disabled/1: Enabled) • Set to 0 for linear type.	Yes	
		Bit A: User Constants Self-writing Function	Yes	
		Bits B to F: Reserved		
2	Function Selection Flag 2	Bit 0: Communication Abnormality Detection Mask	Yes	
		Bit 1: WDT Abnormality Detection Mask	Yes	
		Bits 2 to F: Reserved for system use.	–	–
3	–	Reserved	–	–
4	Reference Unit Selection	0: pulse, 1: mm, 2: deg, 3: inch, 4:μm • For linear type, only valid for 0: pulse, 1: mm, 4: μm. When 2: deg, 3: inch is set, converted into 1: mm.	Yes	Yes
5	Number of Digits below Decimal Places	1 = 1 digit	Yes	Yes
6	Travel Distance per Machine Rotation (Rotary Motor)	1 = 1 reference unit	Yes	Yes
	Linear Scale Pitch (Linear Type)	1 = 1 reference unit	Yes	Yes
8	Servo Motor Gear Ratio	1 = 1 rotation (This setting is ignored if a linear motor is selected.)	Yes	Yes
9	Machine Gear Ratio	1 = 1 rotation (This setting is ignored if a linear motor is selected.)	Yes	Yes
10	Infinite Length Axis Reset Position (POSMAX)	1 = 1 reference units • Invalid for linear type.	Yes	Yes
12	Positive Software Limit Value	1 = 1 reference unit	Yes	
14	Negative Software Limit Value	1 = 1 reference unit	Yes	
16	Backlash Compensation Amount	1 = 1 reference unit	Yes	
18 to 29	–	Reserved	–	–
30	Encoder Selection	0: Incremental Encoder 1: Absolute Encoder 2: Absolute Encoder (Incremental encoder is used.) 3: Reserved	Yes	
31 to 33	–	Reserved	–	–

(cont'd)

Slot Number	Name	Contents	SVB	SVR
34	Rated Motor Speed (Rotary Motor)	1 = 1 rpm	Yes	Yes
	Rated Speed (Linear Type)	1 = 0.1 m/s, 0.1 mm/s	Yes	Yes
36	Number of Pulses per Motor Rotation (Rotary Motor)	1 = 1 pulse/rev Set the value after multiplication.	Yes	Yes
	Number of Pulses per Linear Scale Pitch (Linear Type)	1 = 1 pulse/scale pitch	Yes	Yes
38	Maximum Number of Absolute Encoder Turns Rotation	1 = 1 rotation • Set to 0 when a direct drive motor is being used.	Yes	
40 to 41	–	Reserved	–	–
42	Feedback Speed Movement Averaging Time Constant	1 = 1 ms	Yes	Yes

E.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 *2.2.6 SVR Virtual Motion Module* on page 2-45 for information on SVR.

Register No.	Name	Contents	SVB	SVR
OW□□00	RUN Command Setting	Bit 0: Servo ON (0: OFF/1: ON)	Yes	Yes
		Bit 1: Machine Lock (0: Normal operation/1: Machine locked)	Yes	
		Bits 2 to 3: Reserved		
		Bit 4: Latch Detection Demand (0: OFF/1: ON)	Yes	
		Bit 5: Reserved for system use.		
		Bit 6: POSMAX Turn Number Presetting Demand (0: OFF/1: ON) • Set to 0 for linear type.	Yes	Yes
		Bit 7: Request ABS Rotary Pos. Load (Absolute System Infinite Length Position Information LOAD) (0: OFF/1: ON) • Set to 0 for linear type.	Yes	
		Bit 8: Forward Outside Limiting Torque/Thrust Input (Forward External Limiting Torque/Thrust Input) (0: OFF/1: ON)	Yes	
		Bit 9: Reverse Outside Limiting Torque/Thrust Input (Reverse External Limiting Torque/Thrust Input) (0: OFF/1: ON)	Yes	
		Bit A: Reserved		
		Bit B: Integration Reset (0: OFF/1: ON)	Yes	
		Bits C to D: Reserved		
		Bit E: Communication Reset (0: OFF/1: ON)	Yes	
		Bit F: Alarm Clear (0: OFF/1: ON)	Yes	Yes
OW□□01	Mode Setting 1	Bit 0: Excessive Deviation Error Level Setting (0: Alarm/1: Warning)	Yes	
		Bits 1 to 2: Reserved		
		Bit 3: Speed Loop P/PI Switch	Yes	
		Bit 4: Gain Switch	Yes	
		Bit 5: Gain Switch 2	Yes	
		Bits 6 to F: Reserved		
OW□□02	Mode Setting 2	Bit 0: Monitor 2 Enabled	Yes	
		Bits 1 to 3: Reserved		
		Bits 4: Reserved		
		Bits 5 to 7: Reserved		
		Bits 8 to 15: Stop Mode Selection	Yes	
OW□□03	Function Setting 1	Bits 0 to 3: Speed Unit Selection 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
		Bits 4 to 7: Acceleration/Deceleration Degree Unit Selection 0: Reference units/s^2 1: ms	Yes	Yes
		Bits 8 to B: Filter Type Selection 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

(cont'd)

Register No.	Name	Contents	SVB	SVR
OW□□04	Function Setting 2	Bits 0 to 3: Latch Detection Signal Selection		
		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 Setting		
		0: –		
		1: –		
		2: Phase-C Pulse Input Signal	Yes	
		3: /EXT1	Yes	
		4: /EXT2	Yes	
		5: /EXT3	Yes	
		Bits 8 to B: Reserved		
		Bits C to F: Bank Selector	Yes	
OW□□05	Function Setting 3	Bit 1: Phase Reference Creation Calculation Disable (0: Enabled/1: Disabled)	Yes	
		Bits 2 to A: Reserved		
		Bit B: Zero Point Return Input Signal (0: OFF/1: ON)	Yes	
		Bits C to F: Reserved		
OW□□06 to OW□□07	–	Reserved	–	–
OW□□08	Motion Command	0: NOP (No Command) 1: POSING (Position Mode)(Positioning) 2: EX_POSING (Latch Target Positioning)(External Positioning) 3: ZRET (Zero Point Return) 4: INTERPOLATE (Interpolation) 5: ENDOF_ INTERPOLATE (Last Interpolation Segment) 6: LATCH (Interpolation Mode with Latch Input) 7: FEED (Jog Mode) 8: STEP (Relative Position Mode)(Step Mode) 9: ZSET (Set Zero Point) 10: ACC (Change Acceleration Time) 11: DCC (Change Deceleration Time) 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 User Constant)(Read SERVOPACK Parameter) 18: PRM_WR (Write User Constant)(Write SERVOPACK Parameter) 19: ALM_MON (Alarm Monitor) 20: ALM_HIST (Alarm History Monitor) 21: ALMHIST_CLR (Clear Alarm History) 22: ABS_RST (Absolute Encoder Reset) 23: VELO (Speed Reference) 24: TRQ (Torque/Thrust Reference) 25: PHASE (Phase Reference) 26: KIS (Change Position Loop Integral Time Constant) 27: PPRM_WR (Stored Parameter Write)	Yes	Yes

(cont'd)

Register No.	Name	Contents	SVB	SVR
OW□□09	Motion Command Control Flag	Bit 0: Holds a Command. (0: OFF/1: ON)	Yes	Yes
		Bit 1: Interrupt a Command. (0: OFF/1: ON)	Yes	Yes
		Bit 2: Moving Direction (JOG/ STEP) (0: Forward rotation/1: Reverse rotation)	Yes	Yes
		Bit 3: Zero Point Return Direction Selection (0: Reverse rotation/1: Forward rotation)	Yes	
		Bit 4: Latch Zone Effective Selection (0: Disabled/1: Enabled)	Yes	
		Bit 5: Position Reference Type (0: Incremental Addition Mode/1: Absolute Mode)	Yes	Yes
		Bit 6: Phase Compensation Type (0: Incremental Addition Mode/1: Absolute Mode)	Yes	
		Bits 7 to F: Reserved		
OW□□0A	Motion Subcommand	0: NOP (No Command)	Yes	Yes
		1: PRM_RD (Read User Constant)(Read SERVOPACK Parameter) 2: PRM_WR (Write User Constant)(Write SERVOPACK Parameter) 3: Reserved 4: SMON (Status Monitor)	Yes	
		5: FIXPRM_RD (Read Fixed Parameters)	Yes	Yes
OW□□0B	–	Reserved		
OL□□0C	Torque/Thrust Reference Setting	Unit is according to OW□□03, bits 12 to 15 (Torque Unit).	Yes	Yes
OW□□0E	Speed Limit Setting at the Torque/Thrust Reference	1 = 0.01% (percentage of rated speed)	Yes	
OW□□0F	–	Reserved		
OL□□10	Speed Reference Setting	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes
OW□□12 to OW□□13	–	Reserved	–	–
OL□□14	Positive Side Limiting Torque/Thrust Setting at the Speed Reference	Unit is according to OW□□03, bits C to F (Torque Unit).	Yes	
OL□□16	Secondly Speed Compensation	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	Yes
OW□□18	Override	1 = 0.01%	Yes	
OW□□19 to OW□□1B	–	Reserved	–	–
OL□□1C	Position Reference Setting	1 = 1 reference unit	Yes	Yes
OL□□1E	Width of Positioning Completion	1 = 1 reference unit	Yes	
OL□□20	NEAR Signal Output Width	1 = 1 reference unit	Yes	
OL□□22	Error Count Alarm Detection	1 = 1 reference unit	Yes	
OL□□24	–	Reserved for system use.	–	–
OW□26	Position Complete Cheek Time	1 = 1 ms	Yes	
OW□□27	–	Reserved for system use.		
OL□□28	Phase Correction Setting	1 = 1 reference unit	Yes	
OL□□2A	Latch Zone Lower Limit Setting	1 = 1 reference unit	Yes	

(cont'd)

Register No.	Name	Contents	SVB	SVR
OL□□2C	Latch Zone Upper Limit Setting	1 = 1 reference unit	Yes	
OW□□2E	Position Loop Gain	1 = 0.1/s	Yes	
OW□□2F	Speed Loop Gain	1 = 1 Hz	Yes	
OW□□30	Speed Feedforward Amends	1 = 0.01% (percentage of distribution segment)	Yes	
OW□□31	Speed Compensation	1 = 0.01% (percentage of rated speed)	Yes	Yes
OW□□32	Position Integration Time Constant	1 = 1 ms	Yes	
OW□□33	–	Reserved	–	–
OW□□34	Speed Integration Time Constant	1 = 0.01 ms	Yes	
OW□□35	–	Reserved	–	–
OL□□36	Straight Line Acceler-ation/ Acceleration Time Constant	Unit is according to OW□□03, bits 4 to 7 (Speed Unit).	Yes	Yes
OL□□38	Straight Line Decel-eration/ Deceleration Time Constant	Unit is according to OW□□03, bits 4 to 7 (Speed Unit).	Yes	Yes
OW□□3A	Filter Time Constant	1 = 0.1 ms	Yes	Yes
OW□□3B	Bias Speed for Index Deceleration/Accel-eration Filter	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).		Yes
OW□□3C	Zero Point Return Method	0: DEC1 + C (DEC 1 and C-Phase) 1: ZERO (Zero signal) 2: DEC1 + ZERO (DEC 1 and zero signal) 3: C (C-pulse)	Yes	
		4 to 10: Reserved	–	–
		11: C Pulse 12: POT & C Pulse 13: POT Only 14: HOME LS & C Pulse 15: HOME Only	Yes	
		16: NOT & C Pulse 17: NOT Only 18: INPUT & C Pulse 19: INPUT Only	Yes	
OW□□3D	Width of Starting Point Position Output	1 = 1 reference unit	Yes	Yes
OL□□3E	Approach Speed	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	
OL□□40	Creep Rate	Unit is according to OW□□03, bits 0 to 3 (Speed Unit).	Yes	
OL□□42	Zero Point Return Travel Distance	1 = 1 reference unit	Yes	
OL□□44	STEP Travel Distance	1 = 1 reference unit	Yes	Yes
OL□□46	External Positioning Final Travel Distance	1 = 1 reference unit	Yes	
OL□□48	Zero Point Position in Machine Coordinate System Offset	1 = 1 reference unit	Yes	Yes
OL□□4A	Work Coordinate System Offset	1 = 1 reference unit	Yes	Yes
OL□□4C	Number of POSMAX Turns Presetting Data	1 = 1 reference unit • Invalid for linear type.	Yes	Yes

(cont'd)

Register No.	Name	Contents	SVB	SVR
OW□□4E	Servo User Monitor Setting	Bits 0 to 3: Monitor 1 (Setting impossible) Bits 4 to 7: Monitor 2 Bits 8 to B: Monitor 3 (Setting impossible) Bits C to F: Monitor 4	Yes	
OW□□4F	Servo Driver Alarm Monitor No.	Set the number of the alarm to monitor.	Yes	
OW□□50	Servo Driver User Constant No.	Set the number of the SERVOPACK parameter.	Yes	
OW□□51	Servo Driver User Constant Number Size	Set the number of words in the SERVOPACK parameter.	Yes	
OL□□52	Servo Driver User Constant Set Point	Set the setting for the SERVOPACK parameter.	Yes	
OW□□54	Servo Driver for Assistance User Constant No.	Set the number of the SERVOPACK parameter number.	Yes	
OW□□55	Servo Driver for Assistance User Constant Size	Set the number of words in the SERVOPACK parameter.	Yes	
OL□□56	Servo Driver for Assistance User Constant Set Point	Set the setting for the SERVOPACK parameter.	Yes	
OW□□58 to OW□□5B	–	Reserved	–	–
OW□□5C	Fixed Parameter Number	Set the number of the fixed parameter to read with the FIXPRM_RD motion subcommand.	Yes	Yes
OW□□5D	–	Reserved	–	–
OL□□5E	Encoder Position When Power is OFF (Lower 2 Words)	1 = 1 pulse • Do not set in the linear type.	Yes	
OL□□60	Encoder Position When Power is OFF (Upper 2 Words)	1 = 1 pulse • Do not set in the linear type.	Yes	
OL□□62	Pulse Position When Power is OFF (Lower 2 Words)	1 = 1 pulse • Do not set in the linear type.	Yes	
OL□□64	Pulse Position When Power is OFF (Upper 2 Words)	1 = 1 pulse • Do not set in the linear type.	Yes	
OL□□66 to OL□□6E	–	Reserved	–	–
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	

E.3 Monitoring Parameter List

The following table provides a list of SVB and SVR motion monitoring parameters.

Register No.	Name	Contents	SVB	SVR
IW□□00	RUN Status	Bit 0 Motion Controller Operation Ready	Yes	Yes
		Bit 1: Running (At Servo ON)	Yes	Yes
		Bit 2: System Busy	Yes	
		Bit 3: Servo Ready	Yes	
		Bit 4: Latch Mode	Yes	
		Bits 5 to F: Reserved	–	–
IW□□01	Parameter Number When Range Over is Generated	Setting parameters: 0 or higher Fixed Parameters: 1000 or higher	Yes	Yes
IL□□02	Warning	Bit 0: Excessive Deviation	Yes	
		Bit 1: Set Parameter Error (Setting Parameter Error)	Yes	Yes
		Bit 2: Fixed Parameter Error	Yes	Yes
		Bit 3: Servo Driver Error	Yes	
		Bit 4: Motion Command Set Error	Yes	Yes
		Bit 5: Reserved (AD Conversion Error)	–	–
		Bit 6: Positive Direction Overtravel	Yes	
		Bit 7: Negative Direction Overtravel	Yes	
		Bit 8: Servo ON Incomplete	Yes	
		Bit 9: Servo Driver Communication Warning	Yes	
		Bits A to 1F: Reserved		
IL□□04	Alarm	Bit 0: Servo Driver Error	Yes	
		Bit 1: Positive Direction Overtravel	Yes	
		Bit 2: Negative Direction Overtravel	Yes	
		Bit 3: Positive Direction Software Limit	Yes	
		Bit 4: Negative Direction 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: Excessive Deviation	Yes	
		Bit A: Filter Type Change Error	Yes	
		Bit B: Filter Time Constant Change Error	Yes	
		Bit C: Reserved	–	–
		Bit D: Zero Point Unsetting • Invalid for linear type.	Yes	
		Bit E: Reserved	Yes	
		Bit F: Reserved	Yes	
		Bit 10: Servo Driver Synchronization Communications Error	Yes	
		Bit 11: Servo Driver Communication Error	Yes	
		Bit 12: Servo Driver Command Time-out Error	Yes	
		Bit 13: Excessive ABS Encoder Rotations • Invalid for linear type.	Yes	
		Bits 14 to 1D: Reserved	–	–
		Bit1E: Motor Type Set Error		
		Bit1F: Connected Encoder Type Error		
IL□□06	–	Reserved	–	–
IW□□08	Motion Command Response Code	Same as OW□□08 (Motion Command).	Yes	Yes

(cont'd)

Register No.	Name	Contents	SVB	SVR
IW□□09	Motion Command Status	Bit 0: Command Execution Flag	Yes	Yes
		Bit 1: Command Hold Completed	Yes	Yes
		Bit 2: Reserved	–	–
		Bit 3: Command Error Completed Status (Command Error Occurrence)	Yes	Yes
		Bits 4 to 6: Reserved	–	–
		Bit 7: Reset Absolute Encoder Completed	Yes	
		Bit 8: Command Execution Completed	Yes	Yes
		Bits 9 to F: Reserved	–	–
IW□□0A	Subcommand Response Code	Same as OW□□0A (Motion Subcommand).	Yes	Yes
IW□□0B	Subcommand Status	Bit 0: Command Execution Flag	Yes	Yes
		Bits 1 to 2: Reserved	–	–
		Bit 3: Command Error Completed Status (Command Error Occurrence)	Yes	Yes
		Bits 4 to 7: Reserved	–	–
		Bit 8: Command Execution Completed	Yes	Yes
		Bits 9 to F: Reserved	–	–
IW□□0C	Position Management Status	Bit 0: Distribution Completed	Yes	Yes
		Bit 1: Positioning Completed	Yes	Yes
		Bit 2: Latch Completed	Yes	
		Bit 3: NEAR Position	Yes	Yes
		Bit 4: Zero Point Position	Yes	Yes
		Bit 5: Zero Point Return (Setting) Completed	Yes	Yes
		Bit 6: During Machine Lock	Yes	
		Bit 7: Reserved	–	–
		Bit 8: ABS Rotary Pos. Load Complete (ABS System Infinite Length Position Control Information Load Completed) Invalid for linear type.	Yes	
		Bit 9: POSMAX Turn Preset Complete (TPRSE) • Invalid for linear type.	Yes	Yes
		Bits A to F: Reserved		
IW□□0D	–	Reserved	–	–
IL□□0E	Target Position in Machine Coordinate System (TPOS)	1 = 1 reference unit	Yes	Yes
IL□□10	Calculated Position in Machine Coordinate system (CPOS)	1 = 1 reference unit	Yes	Yes
IL□□12	Machine Coordinate System Reference Position (MPOS)	1 = 1 reference unit	Yes	Yes
IL□□14	CPOS for 32 bit	1 = 1 reference unit	Yes	Yes
IL□□16	Machine Coordinate System Feedback Position (APOS)	1 = 1 reference unit	Yes	Yes
IL□□18	Machine Coordinate System 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
IL□□1E	Number of POSMAX Turns	1 = 1 turn • Invalid for linear type.	Yes	Yes

(cont'd)

Register No.	Name	Contents	SVB	SVR
IL□□20	Speed Reference Output Monitor	pulse/s	Yes	
IL□□22 to IL□□2A	–	Reserved	–	–
IW□□2C	Servo Driver Status	Bit 0: Alarm (ALM) Bit 1: Warning (WARNG) Bit 2: Command Ready (CMDRDY) Bit 3: Servo ON (SVON) Bit 4: Main Power Supply ON (PON) Bit 5: Machine Lock (MLOCK) Bit 6: Zero Position (ZPOINT) Bit 7: Locating Completed (Positioning Completed)(PSET) Bit 8: Command Profile Complete (Distribution Completed) (DEN) Bit 9: Torque Restriction (T_LIM) Bit A: Latch Complete (L_CMP) Bit B: Locating Neighborhood (NEAR Position) (NEAR) Bit C: Positive Software Limit (P_SOT) Bit D: Negative Software Limit (N_SOT)	Yes	
		Bits E to F: Reserved	–	–
IW□□2D	Servo Driver Alarm Code	Stores the alarm code from the SERVOPACK.	Yes	
IW□□2E	Servo Driver I/O Monitor	Bit 0: Forward Side Limit Switch Input Bit 1: Reverse Side Limit Switch Input Bit 2: Deceleration Dog Switch Input Bit 3: Encoder Phase-A Signal Input Bit 4: Encoder Phase-B Signal Input Bit 5: Encoder Phase-C Signal Input Bit 6: EXT1 Signal Input Bit 7: EXT2 Signal Input Bit 8: EXT3 Signal Input Bit 9: Brake State Output Bit A: Reserved Bit B: Reserved 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	
IW□□2F	Servo Driver 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	
IL□□30	Servo Driver User Monitor 2	Stores the result of the selected monitor.	Yes	
IL□□32	Servo Driver User Monitor 3	Reserved		
IL□□34	Servo Driver User Monitor 4	Stores the result of the selected monitor.	Yes	
IW□□36	Servo Driver User Constant No. (SERVOPACK Parameter No. for MECHATORLINK Command Area)	Stores the number of the parameter being processed.	Yes	
IW□□37	Supplementary Servo Driver User Constant No. (SERVOPACK Parameter No. for MECHATROLINK Subcommand Area)	Stores the number of the parameter being processed.	Yes	

(cont'd)

Register No.	Name	Contents	SVB	SVR
IL□□38	Servo Driver User Constant Reading Data (SERVOPACK Parameter Reading Data for MECHATROLINK Command Area)	Stores the data of the parameter being read.	Yes	
IL□□3A	Supplementary Servo Driver User Constant Reading Data (SERVOPCK Parameter Reading Data for MECHATROLINK Subcommand Area)	Stores the data of the parameter being read.	Yes	
IW□□3F	Motor Type	Stores the type of motor actually connected. 0: Rotation type 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	Feedback torque/thrust	Unit is according to OW□□03, bits 12 to 15 (Torque Unit).	Yes	Yes
IW□□44 to IW□□55	–	Reserved	–	–
IL□□56	Fixed Parameter Monitor	Stores the data of the fixed parameter when FIXPRM-RD has been specified in the Motion Subcommand.	Yes	Yes
IW□□58 to IW□□5C	–	Reserved	–	–
IL□□5E	Encoder Position When the Power is OFF (Lower 2 Words)	1 = 1 pulse	Yes	
IL□□60	Encoder Position When the Power is OFF (Upper 2 Words)	1 = 1 pulse	Yes	
IL□□62	Pulse Position When the Power is OFF (Lower 2 Words)	1 = 1 pulse	Yes	
IL□□64	Pulse Position when the Power is OFF (Upper 2 Words)	1 = 1 pulse	Yes	
IW□□66 to IW□□6F	–	Reserved	–	–
IW□□70 to IW□□7F	Response Buffer for Transparent Command Mode	Stores the response data when MECHATROLINK Servo commands are specified directly.	Yes	

Appendix F How to Set up Communication Process

This section explains how to set up a communication process connecting the MPE720 and MP2400.
In MPE720 Ver6, set the communication process on the MPE720 screen.
Prepare the following equipment to carry out this procedure:

F.1 Preparation

(1) Controller

Product Name	Model	Q'ty
MP2400	JEPMC-MP2400-E	1

(2) Personal Computer

Product Name	Model	Q'ty
MPE720	CPMC-MPE770 (Ver.6.04 or later)	1
Ethernet Communication Cable	Any Commercial product Ethernet cross cable (category 5 or more)	1
Personal Computer Main Unit	Any Commercial product	1

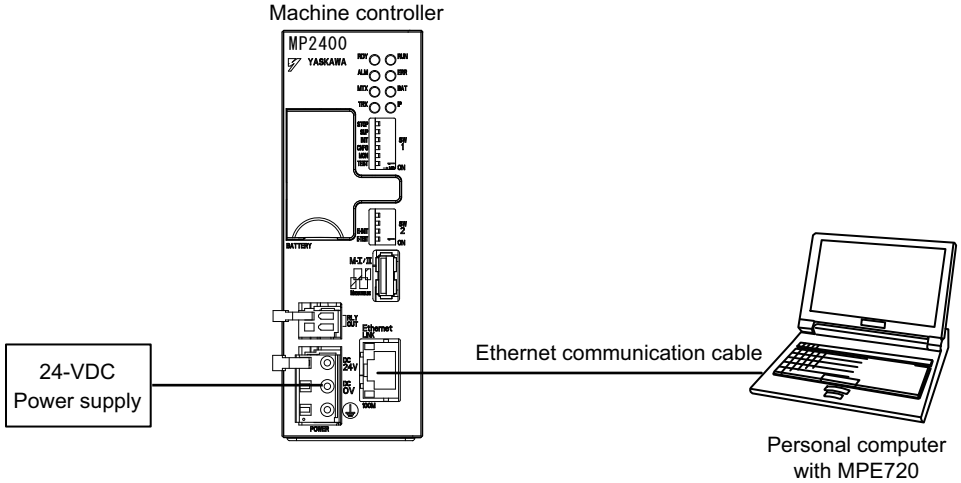
(3) Necessary Others

Name	Specification	Q'ty
24-VDC Power Supply	Current capacity 2A or more	1

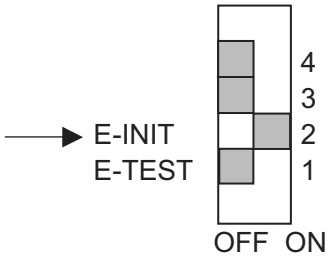
F.2 Procedure

1. Turn OFF the MP2400 24-VDC power supply.

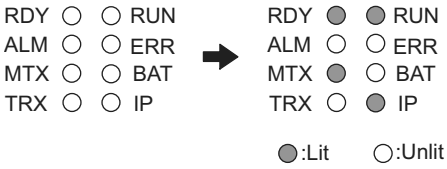
2. Wire MPE720 and MP2400.



3. Turn ON E-INIT of DIP switch (SW2) in the MP2400 main unit.

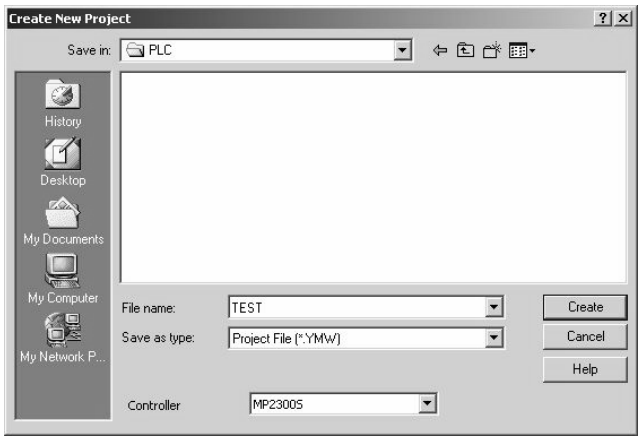


4. Turn ON the 24-VDC power supply of the MP2400, and confirm that the RDY, RUN, and IP LEDs are lit on the MP2400 main unit.
When the IP LED is lit, you can confirm that the MP2400 side has successfully retrieved an IP address.

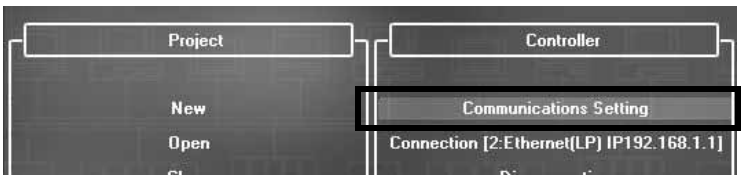


5. Double-click the icon on the personal computer desktop to start up MPE720 Ver6.

6. Create a new PLC folder.



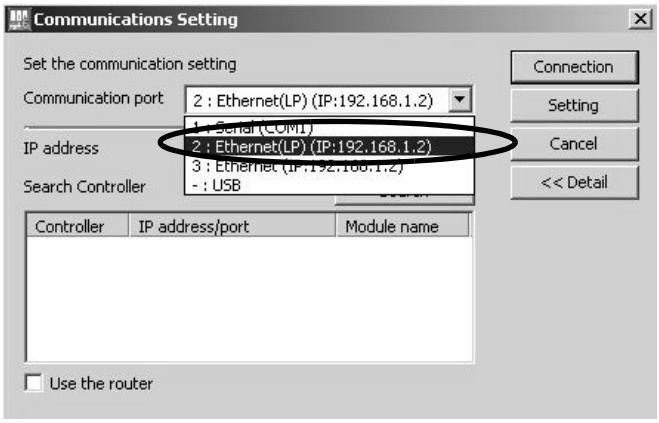
7. Click **Communications Setting**.



8. Select **Ethernet (LP) (IP:192.168.1.2)** as the communication port.

Personal computer IP address

Note: You can check the personal computer IP address in the control panel.



■ Difference between Ethernet (LP) and Ethernet

The LP of Ethernet (LP) is short for "Long packet." Compared with Ethernet, Ethernet (LP) transmits and receives larger packets at one time, resulting in high-speed data transfer. Available communication ports may differ depending on the module of the connected controller. Select the communication port according to the table below.

Module of the Connected Controller Side	Name	Communication Port to Be Selected in MPE720
218IF-01	218IF	Ethernet
218IF-02	218IFB	Ethernet (LP)
MP2400 Built-in Ethernet	218IFA	

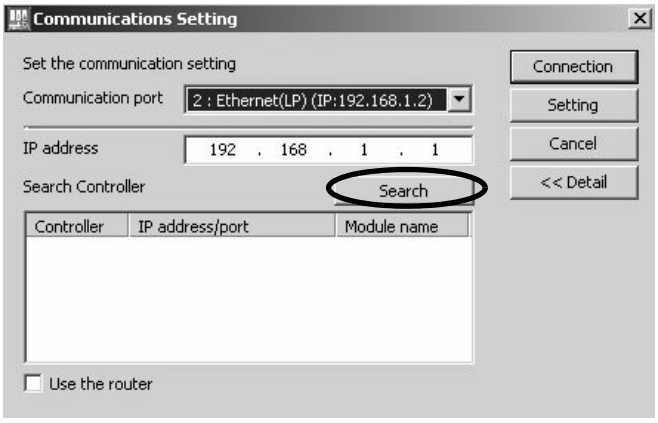
■ When there are multiple LAN ports on the personal computer

If there are multiple LAN ports on the personal computer, multiple IP addresses will be shown in the communication port. Select the IP address of the LAN port to which the cable is connected.

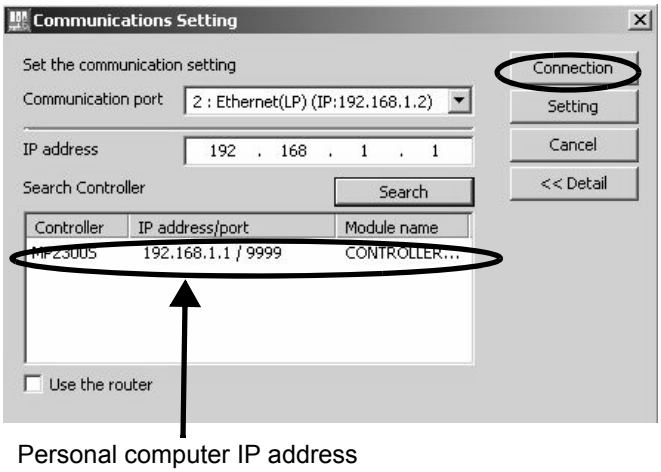
■ Controller search function

When Ethernet is selected in the communication port, the controller search function will be unavailable.

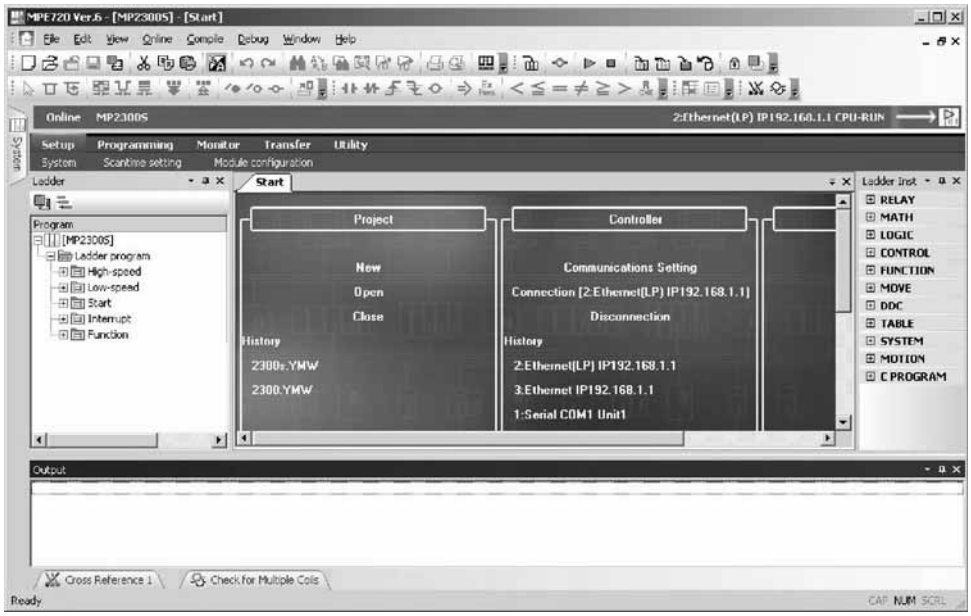
9. Click the **Search** Button.



10. A controller search list will appear. Select the found controller and click the **Connection** Button.



11. MPE720 connects to the controller.



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Revision History

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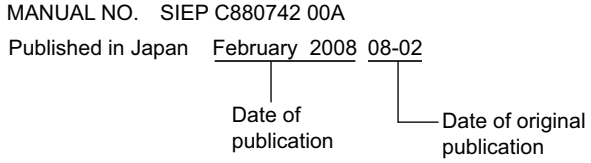

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