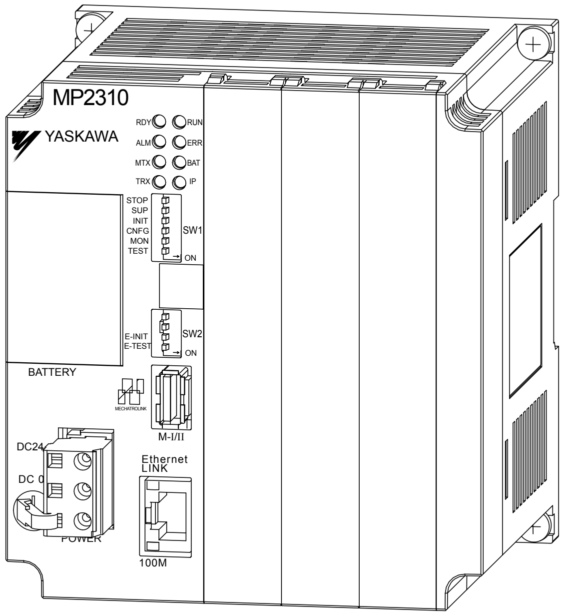
YASKAWA

Machine Controller MP2310

Basic Module

USER'S MANUAL

Model: JEPMC-MP2310-E



Overview 1

Specifications and Functions 2

Mounting and Wiring 3

System Start Up and Easy Programming 4

Outline of Motion Control Systems 5

Ethernet Communications 6

Maintenance and Inspection 7

Troubleshooting 8

Appendices A

MANUAL NO. SIEP C880732 01B

Using this Manual

The MP2310 is a compact Machine Controller that contains the power supply, the CPU, I/O, and the communication functions in one single unit.
Please read this manual to ensure correct usage of the MP2310 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:

- MP2310: MP2310 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 and Inspection	–	–	–	–	√	√
Chapter 8 Troubleshooting	–	–	–	–	√	√
Appendices A to G	–	–	√	–	√	√

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

■ Terms Used to Describe "Torque"

Although the term "torque" is commonly used when describing rotary servomotors and "force" or "thrust" are used when describing linear servomotors, this manual uses "torque" when describing both (excluding parameters).

■ 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 MP2310. Refer to these manuals as required.

Manual Name	Manual Number	Contents
Machine Controller MP2000 Series Built-in SVB/ SVB-01 Motion Module User's Manual	SIEP C880700 33	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	SIEP C880700 03	Describes the application methods and modules to be connected.
Machine Controller MP2000 Series Communication Module User's Manual	SIEP C880700 04	Describes the functions, specifications, and application methods of the MP2000-series 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	SIEP C880700 30	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□/SGDB 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□□/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-V series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor Analog Voltage and Pulse Train Reference	SIEP S800000 45	Describes the models, specifications, wiring, trial operation, adjustment, function application methods, maintenance, and inspection of the Σ-V 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.

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Safety Information

The following conventions are used to indicate precautions in this manual. These precautions are provided to ensure the safe operation of the MP2310 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 MP2310. 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 MP2310. • Do not attempt to modify the MP2310 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 MP2310 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 MP2310 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 MP2310 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 MP2310 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 MP2310 or place heavy objects on the MP2310.
  There is a risk of injury.
- Do not block the air exhaust port or allow foreign objects to enter the MP2310.
  There is a risk of element deterioration inside, an accident, or fire.
- Always mount the MP2310 in the specified orientation.
  There is a risk of an accident.
- Do not subject the MP2310 to strong shock.
  There is a risk of an accident.

■ Wiring

⚠ CAUTION

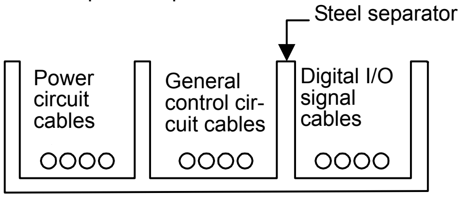
- Check the wiring to be sure it has been performed correctly.
  There is a risk of motor run-away, injury, or an accident.
- Always use a power supply of the specified voltage.
  There is a risk of burning.
- In places with poor power supply conditions, take all steps necessary to ensure that the input 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 MP2310 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 MP2310 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 MP2310. 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 MP2310, 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 MP2310 as general industrial waste.

■ General Precautions

Observe the following general precautions to ensure safe application.
• The products shown in illustrations in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual. • The drawings presented in this manual are typical examples and may not match the product you received. • If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.

Warranty

(1) Details of Warranty

■ Warranty Period

The warranty period for a product that was purchased (hereafter called “delivered product”) is one year from the time of delivery to the location specified by the customer or 18 months from the time of shipment from the Yaskawa factory, whichever is sooner.

■ Warranty Scope

Yaskawa shall replace or repair a defective product free of charge if a defect attributable to Yaskawa occurs during the warranty period above. This warranty does not cover defects caused by the delivered product reaching the end of its service life and replacement of parts that require replacement or that have a limited service life.
This warranty does not cover failures that result from any of the following causes.

1. Improper handling, abuse, or use in unsuitable conditions or in environments not described in product catalogs or manuals, or in any separately agreed-upon specifications
2. Causes not attributable to the delivered product itself
3. Modifications or repairs not performed by Yaskawa
4. Abuse of the delivered product in a manner in which it was not originally intended
5. Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from Yaskawa
6. Events for which Yaskawa is not responsible, such as natural or human-made disasters

(2) Limitations of Liability

1. Yaskawa shall in no event be responsible for any damage or loss of opportunity to the customer that arises due to failure of the delivered product.
2. Yaskawa shall not be responsible for any programs (including parameter settings) or the results of program execution of the programs provided by the user or by a third party for use with programmable Yaskawa products.
3. The information described in product catalogs or manuals is provided for the purpose of the customer purchasing the appropriate product for the intended application. The use thereof does not guarantee that there are no infringements of intellectual property rights or other proprietary rights of Yaskawa or third parties, nor does it construe a license.
4. Yaskawa shall not be responsible for any damage arising from infringements of intellectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

(3) Suitability for Use

1. It is the customer's responsibility to confirm conformity with any standards, codes, or regulations that apply if the Yaskawa product is used in combination with any other products.
2. The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
3. Consult with Yaskawa to determine whether use in the following applications is acceptable. If use in the application is acceptable, use the product with extra allowance in ratings and specifications, and provide safety measures to minimize hazards in the event of failure.
   - Outdoor use, use involving potential chemical contamination or electrical interference, or use in conditions or environments not described in product catalogs or manuals
   - Nuclear energy control systems, combustion systems, railroad systems, aviation systems, vehicle systems, medical equipment, amusement machines, and installations subject to separate industry or government regulations
   - Systems, machines, and equipment that may present a risk to life or property
   - Systems that require a high degree of reliability, such as systems that supply gas, water, or electricity, or systems that operate continuously 24 hours a day
   - Other systems that require a similar high degree of safety
4. Never use the product for an application involving serious risk to life or property without first ensuring that the system is designed to secure the required level of safety with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
5. The circuit examples and other application examples described in product catalogs and manuals are for reference. Check the functionality and safety of the actual devices and equipment to be used before using the product.
6. Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

(4) Specifications Change

The names, specifications, appearance, and accessories of products in product catalogs and manuals may be changed at any time based on improvements and other reasons. The next editions of the revised catalogs or manuals will be published with updated code numbers. Consult with your Yaskawa representative to confirm the actual specifications before purchasing a product.

Contents

Using this Manual - - - - - - - - - - iii
Safety Information - - - - - - - - - - vi
Safety Precautions - - - - - - - - - - vii
Warranty - - - - - - - - - - xi

1 Overview- - - - - - - - - - 1-1

1.1 MP2310 Features - - - - - - - - - - 1-2

1.2 MP2310 Configuration - - - - - - - - - - 1-3
1.2.1 Basic Module Appearance - - - - - - - - - - 1-3
1.2.2 MP2310 Modules - - - - - - - - - - 1-4

1.3 System Configuration - - - - - - - - - - 1-5
1.3.1 Example - - - - - - - - - - 1-5

1.4 MECHATROLINK-compatible Devices - - - - - - - - - - 1-7
1.4.1 SERVOPACKs - - - - - - - - - - 1-7
1.4.2 Modules - - - - - - - - - - 1-7

1.5 Cables and Accessories - - - - - - - - - - 1-8
1.5.1 Cables - - - - - - - - - - 1-8
1.5.2 Accessories and Options - - - - - - - - - - 1-9
1.5.3 Software (Programming Tool) - - - - - - - - - - 1-9

2 Specifications and Functions- - - - - - - - - - 2-1

2.1 Specifications - - - - - - - - - - 2-2
2.1.1 General Specifications - - - - - - - - - - 2-2
2.1.2 Product Specifications - - - - - - - - - - 2-3
2.1.3 Function Lists - - - - - - - - - - 2-4

2.2 Basic Module - - - - - - - - - - 2-7
2.2.1 Outline of Functions- - - - - - - - - - 2-7
2.2.2 External Appearance, LED Indicators, and Switch Settings - - - - - - - - - - 2-7
2.2.3 Specifications - - - - - - - - - - 2-10
2.2.4 218IFA Module (Ethernet) - - - - - - - - - - 2-11
2.2.5 Built-in SVB Module- - - - - - - - - - 2-29
2.2.6 SVR Virtual Motion Module- - - - - - - - - - 2-44
2.2.7 M-EXECUTOR Module (Motion Program Executor) - - - - - - - - - - 2-47

2.3 Option Module - - - - - - - - - - 2-58
2.3.1 Option Module Overview List - - - - - - - - - - 2-58

2.4 External Appearance - - - - - - - - - - 2-60
2.4.1 Basic Module - - - - - - - - - - 2-60

3 Mounting and Wiring - - - - - - - - - - 3-1

3.1 Mounting MP2310 - - - - - - - - - - 3-2
3.1.1 Method - - - - - - - - - - 3-2
3.1.2 MP2310 Mount Direction - - - - - - - - - - 3-5
3.1.3 Replacing and Adding Optional Modules - - - - - - - - - - 3-6

3.2 Basic Module Connections - - - - - - - - - - 3-9
3.2.1 Connectors - - - - - - - - - - 3-9
3.2.2 Power Supply Connector - - - - - - - - - - 3-10
3.2.3 MECHATROLINK Connectors - - - - - - - - - - 3-11
3.2.4 Ethernet Connector Details- - - - - - - - - - 3-15

3.2.5 System Connection Example - - - 3-19

4 System Start Up and Easy Programming - - - 4-1

4.1 System Startup Overview - - - 4-2

4.2 Preparation (step 1) - - - 4-3

4.2.1 Wiring - - - 4-3
4.2.2 Self Configuration - - - 4-5
4.2.3 Test Operation - - - 4-6

4.3 Programming (step 2) - - - 4-9

4.3.1 Initializing the M-EXECUTOR Module - - - 4-9
4.3.2 Programming Procedure - - - 4-12

4.4 Executing Motion (step 3) - - - 4-14

4.4.1 Registering Program Execution - - - 4-14
4.4.2 Starting a Motion Program Using the Operation Control Panel - - - 4-15

4.5 Starting Motion Program from an External Signal - - - 4-16

4.5.1 Overview - - - 4-16
4.5.2 Required Equipment - - - 4-16
4.5.3 Creation Procedure - - - 4-18

5 Outline of Motion Control Systems - - - 5-1

5.1 Startup Sequence and Basic Operation - - - 5-2

5.1.1 DIP Switch Settings - - - 5-2
5.1.2 Startup Sequence - - - 5-3
5.1.3 Startup Sequence Operation Details - - - 5-4

5.2 User Programs - - - 5-5

5.2.1 Types and Execution Timing of User Program - - - 5-5
5.2.2 Motion Programs - - - 5-6
5.2.3 Sequence Program - - - 5-26
5.2.4 Ladder Drawings (DWG) - - - 5-29

5.3 Registers - - - 5-34

5.3.1 Types of Registers - - - 5-34
5.3.2 Data Types - - - 5-37
5.3.3 How to Use Subscripts i, j - - - 5-38
5.3.4 Register Designation - - - 5-39

5.4 Self-configuration - - - 5-40

5.4.1 How to Execute Self-Configuration - - - 5-41
5.4.2 Definition Information Updated with Self-Configuration - - - 5-49

5.5 Precaution on Using MP2310 - - - 5-52

5.5.1 Precautions when User Definition File is Configured/Changed - - - 5-52
5.5.2 Setting or Changing Module Configuration Definition Files - - - 5-53
5.5.3 Setting and Changing the Scan Time - - - 5-54

6 Ethernet Communications - - - 6-1

6.1 Communication Methods - - - 6-2

6.2 Communication with Other MP Series - - - 6-3

6.2.1 When the MP2310 Acts as Slave (automatic receive function is used) - - - 6-3
6.2.2 When the MP2310 Acts as a Slave (ladder program which uses a MSG-RCV function) - - - 6-16
6.2.3 When MP2310 Acts as Master (I/O message communication function is used) - - - 6-34
6.2.4 When the MP2310 Acts as Master (ladder program which uses MSG-SND function) - - - 6-47

6.3 Communication with Touch Panel - - - 6-63
6.3.1 When MP2310 Acts as Slave - - - 6-63

6.4 Communication with PLC Manufactured by Mitsubishi Electric Corporation (MELSEC protocol) - - - 6-73
6.4.1 When the MP2310 Acts as Slave (automatic receive function is used) - - - 6-73
6.4.2 When the MP2310 Acts as Master (I/O message communication function is used) - - - 6-80

7 Maintenance and Inspection - - - 7-1

7.1 Daily Inspections - - - 7-2

7.2 Regular Inspections - - - 7-3

7.3 Replacing the Basic Module Battery - - - 7-4

8 Troubleshooting - - - 8-1

8.1 Basic Flow of Troubleshooting - - - 8-2

8.2 LED Indicator Meanings - - - 8-3

8.3 Problem Classification - - - 8-4
8.3.1 Overview - - - 8-4
8.3.2 MP2310 Error Check Flowchart - - - 8-5

8.4 Troubleshooting Details - - - 8-6
8.4.1 Operation Errors - - - 8-6
8.4.2 I/O Errors - - - 8-9
8.4.3 Watchdog Timer Timeout Errors - - - 8-10
8.4.4 Module Synchronization Errors (Ver. 2.75 or Later) - - - 8-10
8.4.5 System Errors - - - 8-11

Appendices

Appendix A System Registers Lists - - - A-2
A.1 System Service Registers - - - A-2
A.2 System Status - - - A-5
A.3 System Error Status - - - A-6
A.4 User Operation Error Status - - - A-8
A.5 System Service Execution Status - - - A-9
A.6 User Operation Error Status Details - - - A-10
A.7 System I/O Error Status - - - A-11
A.8 Compact Flash Card-Related System Registers (CPU-02 and CPU-03 Modules for the MP2200 Only) - - - A-12
A.9 Interrupt Status - - - A-13
A.10 Module Information - - - A-14
A.11 MPU-01 System Status - - - A-15
A.12 Motion Program Information - - - A-16

Appendix B SERVOPACK Parameter Data Flow - - - A-19
B.1 Operations and Parameter Data Flow - - - A-19

Appendix C Initializing SERVOPACKs - - - A-28

Appendix D Initializing the Absolute Encoder - - - A-29
D.1 Σ-V SERVOPACK - - - A-29
D.2 Σ-III SERVOPACK - - - A-30
D.3 Σ-II SERVOPACK - - - A-31
D.4 Σ-I SERVOPACK - - - A-33

Appendix E Motion Parameter Details - - - - - - - - - - A-35
E.1 Fixed Parameter List - - - - - - - - - - A-35
E.2 Setting Parameter List - - - - - - - - - - A-37
E.3 Monitoring Parameter List - - - - - - - - - - A-42
Appendix F How to Set up Communication Process - - - - - - - - - - A-46
F.1 Preparation - - - - - - - - - - A-46
F.2 Procedure - - - - - - - - - - A-46
Appendix G MSG-SND/ MSG-RCV Functions - - - - - - - - - - A-50
G.1 Message Transmit Function (MSG-SND) - - - - - - - - - - A-50
G.2 Message Receive Function (MSG-RCV) - - - - - - - - - - A-84
G.3 Communication Buffer Channel - - - - - - - - - - A-115
INDEX
Revision History

1

Overview

This chapter explains an overview and features of the MP2310 Machine Controller.

1.1 MP2310 Features - - - - 1-2

1.2 MP2310 Configuration - - - - 1-3
- 1.2.1 Basic Module Appearance - - - - 1-3
- 1.2.2 MP2310 Modules - - - - 1-4

1.3 System Configuration - - - - 1-5
- 1.3.1 Example - - - - 1-5

1.4 MECHATROLINK-compatible Devices - - - - 1-7
- 1.4.1 SERVOPACKs - - - - 1-7
- 1.4.2 Modules - - - - 1-7

1.5 Cables and Accessories - - - - 1-8
- 1.5.1 Cables - - - - 1-8
- 1.5.2 Accessories and Options - - - - 1-9
- 1.5.3 Software (Programming Tool) - - - - 1-9

1.1 MP2310 Features

The MP2310 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).

■ Scalability Ensured in Preparation for Three Optional Slots

- Three optional slots ensures scalability. The existing optional modules of MP2000 series are available.
- An optional module allows the use of various open networks, such as CC-Link, DeviceNet, and PROFIBUS.
- Connecting three SVB-01 modules to the optional slots allows the synchronized control of up to 64 axes of servos.

■ Simple Programming

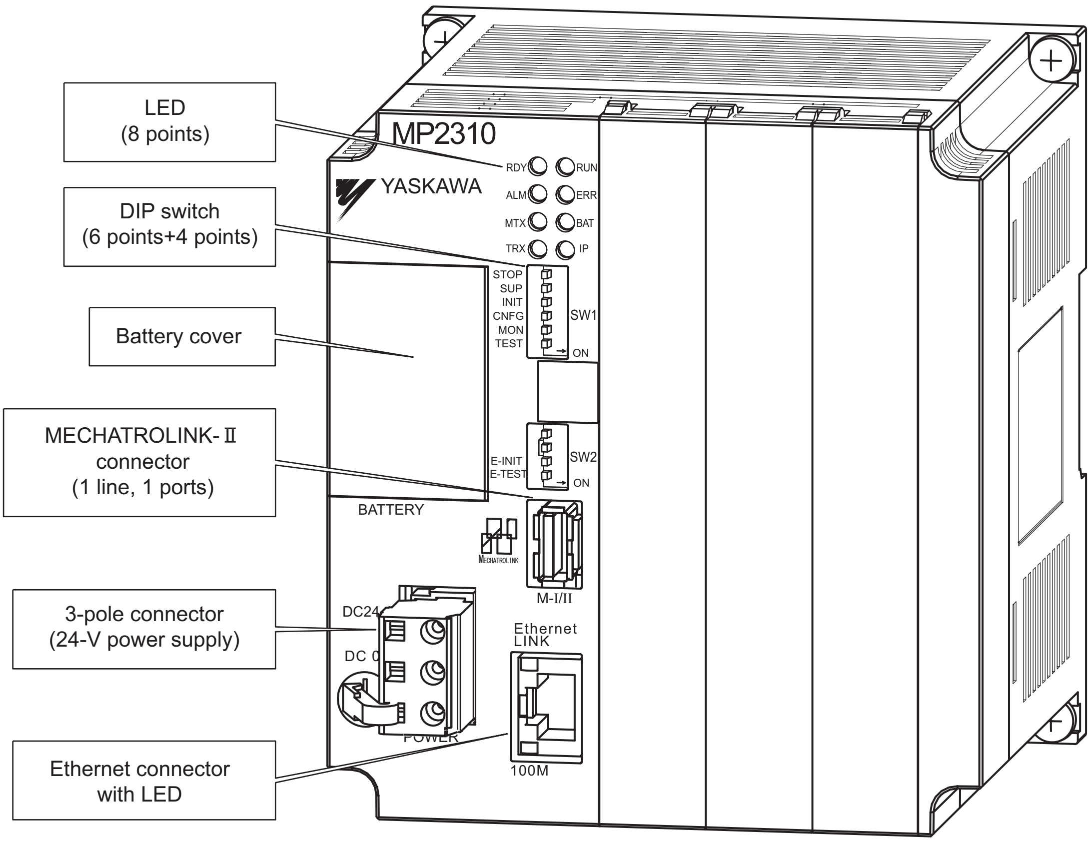
- The operation procedures needed before performing a motion operation are significantly reduced.
- You can start up a motion program from an upper PLC without the need for programming, simply by creating the motion program and registering execution orders.

1.2 MP2310 Configuration

The MP2310 is configured with one Basic Module and an optional slot.

1.2.1 Basic Module Appearance

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



1.2.2 MP2310 Modules

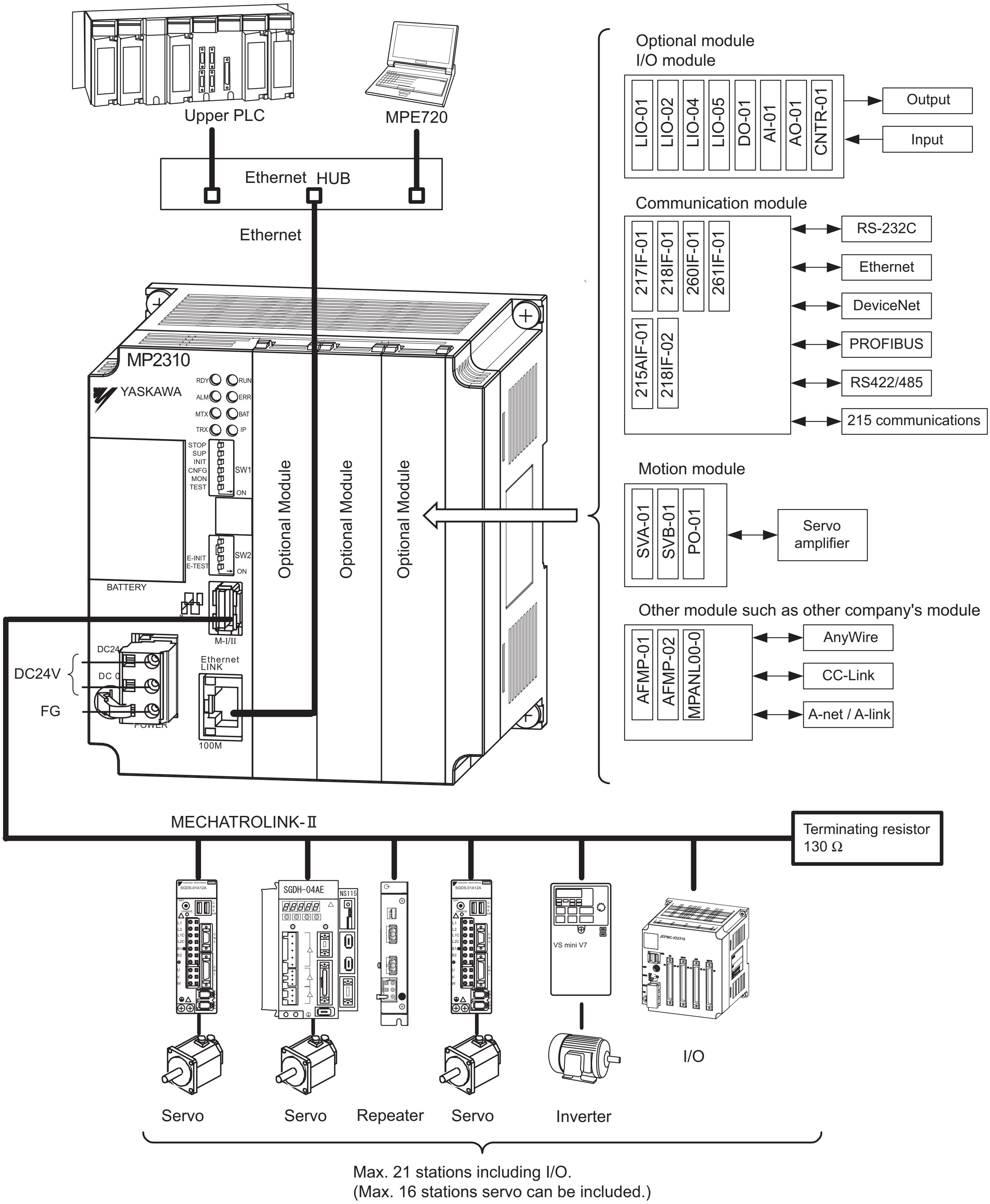
The following table shows the names and specifications of the Basic Module and Optional Modules.

Group		Name	Descrip-tion	Model	Specifications
Basic Module		Basic Module	MP2310	JAPMC-MP2310-E	MECHATROLINK-I and -II Interface Ethernet communications
Optional Modules	Motion Modules	MECHATROLINK Motion Module	SVB-01	JAPMC-MC2310	MECHATROLINK-I and -II, Interface 16 axes maximum
		Analog Output Motion Module	SVA-01	JAPMC-MC2300	Analog output, 2 axes maximum
		Pulse Output Motion Module	PO-01	JAPMC-PL2310	Pulse output, max. 4 axes
	I/O Modules	I/O Module	LIO-01	JAPMC-IO2300	16 inputs, 16 outputs (sink mode output) 1 pulse input
		I/O Module	LIO-02	JAPMC-IO2301	16 inputs, 16 outputs (source mode output) 1 pulse input
		I/O Module	LIO-04	JAPMC-IO2303	32 inputs, 32 outputs (sink mode output)
		I/O Module	LIO-05	JAPMC-IO2304	32 inputs, 32 outputs (source mode output)
		Output Module	DO-01	JAPMC-DO2300	64 outputs (sink mode output)
		Analog Input Module	AI-01	JAPMC-AN2300	Analog input, 8 channels
		Analog Output Module	AO-01	JAPMC-AN2310	Analog input, 4 channels
		Counter Module	CNTR-01	JAPMC-PL2300-E	Reversible counter, 2 channels
	Communica-tion Modules	Ethernet Communica-tion Module	218IF-01	JAPMC-CM2300	RS-232C and Ethernet communication
		Ethernet Communica-tion Module	218IF-02	JAPMC-CM2302-E	RS-232C and Ethernet communication (100 Mbps)
		General-purpose Serial Communication Module	217IF-01	JAPMC-CM2310	RS-232C and RS422/485 communication
		DeviceNet Communication Module	260IF-01	JAPMC-CM2320	RS-232C and DeviceNet communication
		PROFIBUS Communication Module	261IF-01	JAPMC-CM2330	RS-232C and PROFIBUS communication
		MPLINK/CP-215 Communication Module	215AIF-01	JAPMC-CM2330 JAPMC-CM2361	RS-232C, MPLINK, and CP-215 communi-cations

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 1-7 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 MP2310 and the SVB-01 Module are listed below.

1.4.1 SERVOPACKs

Model Number	Details	MECHATROLINK-I	MECHATROLINK-II
SGDV-□□□□11 SGDV-□□□□	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 MP2310 Basic Module and Optional Modules.

Module	Connector Name	Application	Model	Specifications
MP2310 Basic Module	Ethernet	Ethernet communication cable	Provided by customers.	–
MP2310 Basic Module and SVB-01	M-I/II	MECHATROLINK-I cable	JEPMC-W6010-□□ *with a MECHATROLINK connector and loose wires	Used between the devices listed below SVB-01 and SGD-□□□N SVB-01 and SGDB-□□AN
		MECHATROLINK-I terminator	JEPMC-W6020	–
		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□□ SVB-01 and SGDV-□□□□11 SVB-01 and SGDV-□□□□15
			JEPMC-W6003-□□ *with MECHATROLINK connectors on both ends *with ferrite core	
		MECHATROLINK-II terminator	JEPMC-W6022	–
SVA-01	CN/1 CN/2	Cable for analog reference input SERVOPACK	JEPMC-W2040-□□	Used between the devices listed below SVA-01 and SGDM/SGDH SVA-01 and SGDS-□□□01□ SVA-01 and SGDS-□□□02□
LIO-01 LIO-02	I/O	External I/O cable	JEPMC-W2061-□□ *Loose wires on one end	Used between LIO-01/02 and external I/O device
LIO-04 LIO-05	CN/1, CN/2	External I/O cable	JEPMC-W6060-□□ *Loose wires on one end	Used between LIO-04/05 and external I/O device
DO-01	CN/1, CN/2	External output cable	JEPMC-W6060-□□ *Loose wires on one end	Used between DO-01 and external I/O device
AI-01	CN/1, CN/2	Analog input cable	JEPMC-W6080-□□ *Loose wires on one end	Used between AI-01 and analog external input device
AO-01	CN/1	Analog output cable	JEPMC-W6090-□□ *Loose wires on one end	Used between AO-01 and analog external output device
CNTR-01	CN/1	Cable for CNTR-01 Module	JEPMC-W2063E-□□ *Loose wires on one end	Used between CNTR-01 and external I/O device
Communication Module	PORT (Common to all communication modules)	RS-232C communication cable	JEPMC-W5310-□□	Used between RS-232C port and 25-pin male D-sub connector
			JEPMC-W5311-□□	Used between RS-232C port and DOS/V
218IF-01	10Base-T	Ethernet communication cable	Use a commercially available cable.	Cross cable (Category 3 min.)
218IF-02	100Base-TX			Cross cable (Category 5 min.)
217IF-01	RS422/485	RS422/485 communication cable		Module-side connector: 1010214-52A2JL (manufactured by Sumitomo 3M)
				Cable-side connector: 10114-3000VE (manufactured by Sumitomo 3M)
				Shell: 10314-52A0-008 (manufactured by Sumitomo 3M)
260IF-01	DeviceNet	DeviceNet communication cable		Module-side connector: MSTB2-5/5-GF-5.08AM (manufactured by Phoenix Contact K.K.)
261IF-01	PROFIBUS	PROFIBUS communication cable		Module-side connector: 17LE-13090-27(D33C) (manufactured by DDK Ltd.)

1.5.2 Accessories and Options

Name	Accessory/Optional	Model	Remarks
Battery	Accessory	JZSP-BA01	ER3VC + exclusive use connector (BA000517)
Power Supply Connector	Accessory	721-203/026	Cable side
DIN Rail Mounting Parts	Optional	JEPMC-OP300	1 pair
Cover for Optional Slot	Optional	JEPMC-OP2300	Front cover for the unused slot.
Terminator (Terminating Resistor)	Optional	JEPMC-W6022	Q'ty: 1

1.5.3 Software (Programming Tool)

The MPE720, programming tool for MP2310, 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)

MEMO

2

Specifications and Functions

This chapter explains detailed specifications for the Basic Module and Optional Modules of the MP2310.

2.1 Specifications - 2-2

2.1.1 General Specifications - 2-2
2.1.2 Product Specifications - 2-3
2.1.3 Function Lists - 2-4

2.2 Basic Module - 2-7

2.2.1 Outline of Functions - 2-7
2.2.2 External Appearance, LED Indicators, and Switch Settings - 2-7
2.2.3 Specifications - 2-10
2.2.4 218IFA Module (Ethernet) - 2-11
2.2.5 Built-in SVB Module - 2-29
2.2.6 SVR Virtual Motion Module - 2-44
2.2.7 M-EXECUTOR Module (Motion Program Executor) - 2-47

2.3 Option Module - 2-58

2.3.1 Option Module Overview List - 2-58

2.4 External Appearance - 2-60

2.4.1 Basic Module - 2-60

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 MP2310.

Items		MP2310
External Dimensions		120 mm × 130 mm × 108 mm
Number of Optional Slots		3 slots
Number of Control Axes	Number of Basic Control Axes	16 axes
	Maximum Number of Control Axes	64 axes (when three SVB-01 are added.)
	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)
Scan Interval Setting	High-speed Scan	0.5 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
Memory Capacity	SDRAM	32 MB
	SRAM	2 MB (Battery backup)
	FLASH	12 MB
	Program Capacity	7.5 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	Ladder diagram: Relay circuit Text-type language: Numeric operations, logic operations, etc.
Scan	Two scan levels: High-speed scan and low-speed scan High-speed scan time setting: 0.5 to 32 ms (Integral multiple of MECHATROLINK communication cycle) Low-speed scan time setting: 2 to 300 ms (Integral multiple of MECHATROLINK communication cycle)
User Drawings, Functions and Motion Programs	Startup drawings (DWG.A): 64 drawings max. Up to three hierarchical drawing levels Interrupt processing drawings (DWG.I): 64 drawings max. Up to three hierarchical drawing levels High-speed scan process drawings (DWG.H): 200 drawings max. Up to three hierarchical drawing levels Low-speed scan process drawings (DWG.L): 500 drawings max. Up to three hierarchical drawing levels Number of steps: Up to 1,000 steps per drawing User functions: Up to 500 functions Motion programs and sequence programs: A total of up to 256
	Revision history of drawings and motion programs Security function for drawings and motion programs
Data Memory	Common data (M) registers: 64 kwords System (S) registers: 8 kwords Drawing local (D) registers: Up to 16 kwords per drawing Drawing constant (#) registers: Up to 16 kwords per drawing Input (I) registers: 32 kwords (including internal input registers) Output (O) registers: 32 kwords (including internal output registers) Constant (C) registers: 16 kwords
Trace Memory	Data trace: 128 kwords (32 kwords × 4 groups), 16 points defined
Memory Backup	Program memory: Flash memory: 8 MBytes (User area: 5.5 MBytes) definition files, ladder programs, motion programs, etc. Data other than battery backup data Data memory: Battery backup: 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
Instructions	Program control instructions: 14 instructions Direct I/O instructions: 2 instructions Relay circuit instructions: 14 instructions (including set and reset coils) Logic operation instructions: 3 instructions Numeric operation instructions: 16 instructions Numeric conversion instructions: 9 instructions Numeric comparison instructions: 7 instructions Data manipulation instructions: 14 instructions Basic function instructions: 10 instructions Table data manipulation instructions: 11 instructions DDC instructions: 13 instructions System functions: 9 instructions

(2) Motion Control Function Specifications

The following table lists the motion control function specifications for the MP2310.

Item			Specifications
Interface			MECHATROLINK-I, MECHATROLINK-II
Number of Controlled Axes/Module			Up to 16 axes (up to 64 axes when three SVB Modules are mounted)
Control Specifica-tions	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 posi-tion detection function	Yes
		JOG operation	Yes
		STEP operation	Yes
		Parameter changes during motion com-mand 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

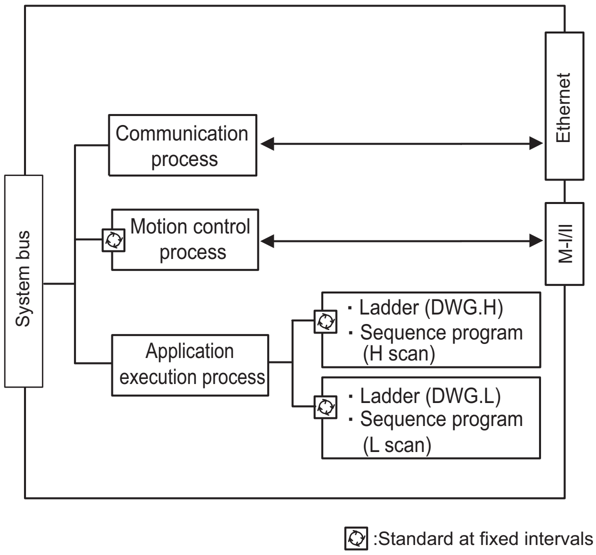
Item	Specifications	
Applicable SERVOPACKs	■ MECHATROLINK-I • SERVOPACKs SGD-□□□N SGDB-□□AN SGDH-□□□E ＋ NS100 SGDS-□□□1□□ SGDV-□□□□11 SGDV-□□□□15	■ MECHATROLINK-II • SERVOPACKs SGDH-□□□E ＋ NS115 SGDS-□□□1□□ SGDV-□□□□11 SGDV-□□□□15
Encoders	• Incremental Encoder • Yaskawa Absolute Encoder	

2.2 Basic Module

This section describes the functions, the external appearance, the LED indicators, the setting switches, and the hardware specifications of the MP2310 Basic Module and also describes the virtual motion module (SVR).

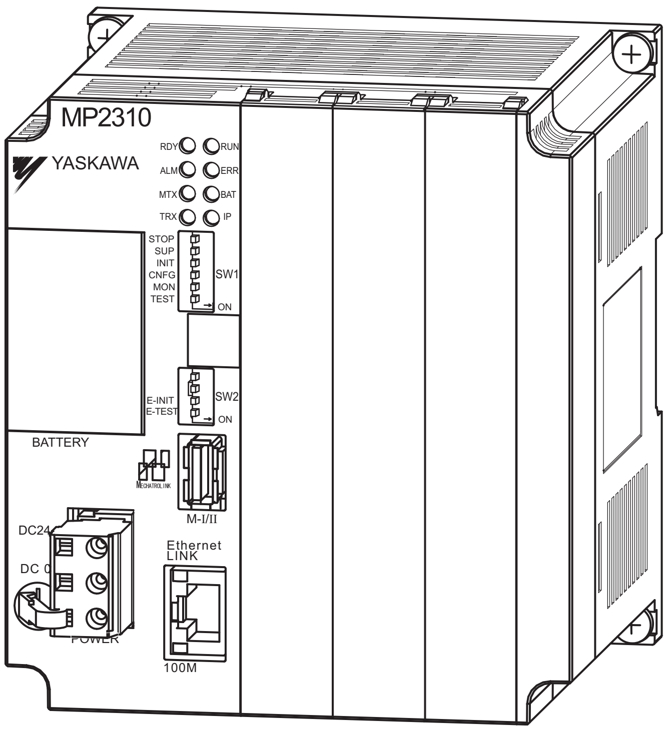
2.2.1 Outline of Functions

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.

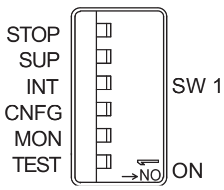
	Indicator	Color	Status
	RDY	Green	Lit during normal operation.
	RUN	Green	Lit during execution of user program.
	ALM	Red	Lit/blinking when warning occurs.
	ERR	Red	Lit/blinking when malfunction occurs.
	MTX	Green	Lit when submitting MECHATROLINK-I/ MECHATROLINK-II data
	BAT	Red	Lit during battery alarm.
	TRX	Green	Lit when transmitting or receiving Ethernet data.
	IP	Green	Lit after the IP address has successfully been set./ Blinking when the Ethernet Module is faulty.

- For details on indicator meanings, refer to *8.2 LED Indicator Meanings* on page 8-3.

(3) Switch Settings

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

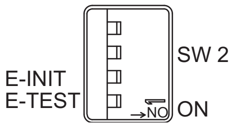
[a] SW1



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		MP2310
Model Number		JEPMC-MP2310-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)
	Allowable Power Loss Time	2 ms
	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		12 MB (User area 7.5 MBytes)
SDRAM		32 MB
SRAM		2 MB: 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
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)		120 × 130 × 108 (W × H × D)
Mass		450 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

The MP2310 built-in 218IFA module is a 10Base-T/100Base-TX Ethernet interface and a communication interface equipped as standard in the MP2310.

■ 100Mbps transmission speed is supported (100Base-TX).

■ Supports the following various communication protocols:

- Support for MEMOBUS protocol, Extended MEMOBUS protocol
- Support for MELSEC protocol (A-compatible I/E frame)
- Support for MODBUS/TCP protocol
- Support for non-procedure communication

■ 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 MP2310 IP address.

(2) Specification of 218IFA Module

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

Items		Descriptions
Communication Interface *1		10Base-T/100Base-TX
Communication Protocol *2		TCP/UDP/IP/ARP/ICMP
Maximum Number of Communication Connections		4+2 (I/O Message communication)
Maximum Number of Communication Channels		4+2 (I/O Message communication)
Message Communication (maximum)	MEMOBUS	Write: 100W Read: 125W
	Extended MEMOBUS	Write: 2043W Read: 2044W
	MELSEC	Write: 1017W Read: 1017W
	MODBUS/TCP	Write: 100W Read: 125W
	Non-procedure	Write: 2046W
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	○
	Extended MEMOBUS	○
	MELSEC	○
	MODBUS/TCP	○
Simple Function for Connecting with Engineering Tool		○

* 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

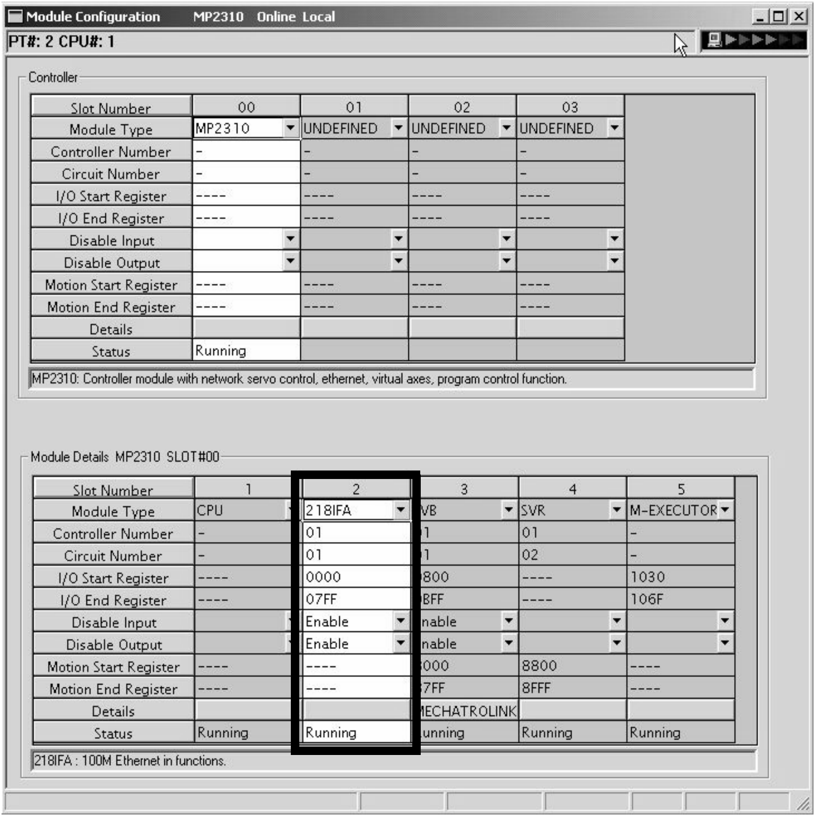
218IFA Module	Device to be connected				
	Automatic Negotiation	10Base-T Half-duplex	10Base-T Full-duplex	100Base-TX Half-duplex	100Base-TX Full-duplex
Automatic Negotiation	Depends on the remote equip-ment	Communicates in 10Base-T half-duplex mode	Unable to communicate	Communicates in 100Base-TX half-duplex 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 **MP2310** 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:

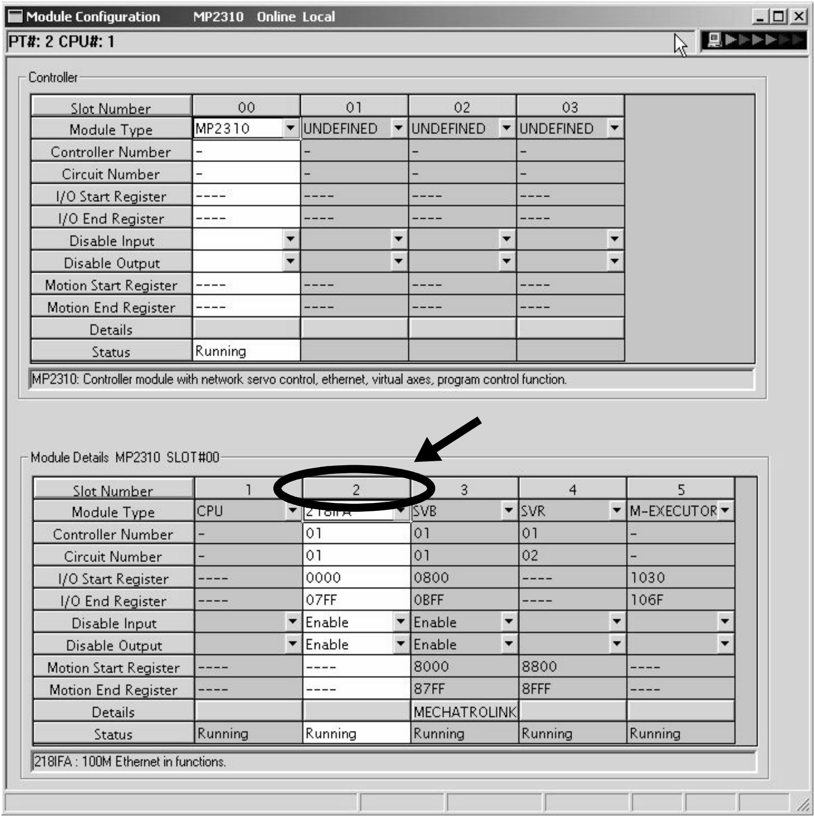
Items	Descriptions	Change
Slot Number	Sub-slot number. Double-click it to open the 218IFA detailed definition window.	–
Module Type	A module name is shown. Changing the name to UNDEFINED enables you to disable 218IFA functions.	√
Controller Number	Not used. Fixed at "–".	–
Circuit Number	Module's line 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 **MP2310** in the **Controller** area of the **Module Configuration** Window and double-clicking the cell No.2 in the **Module Details** field.

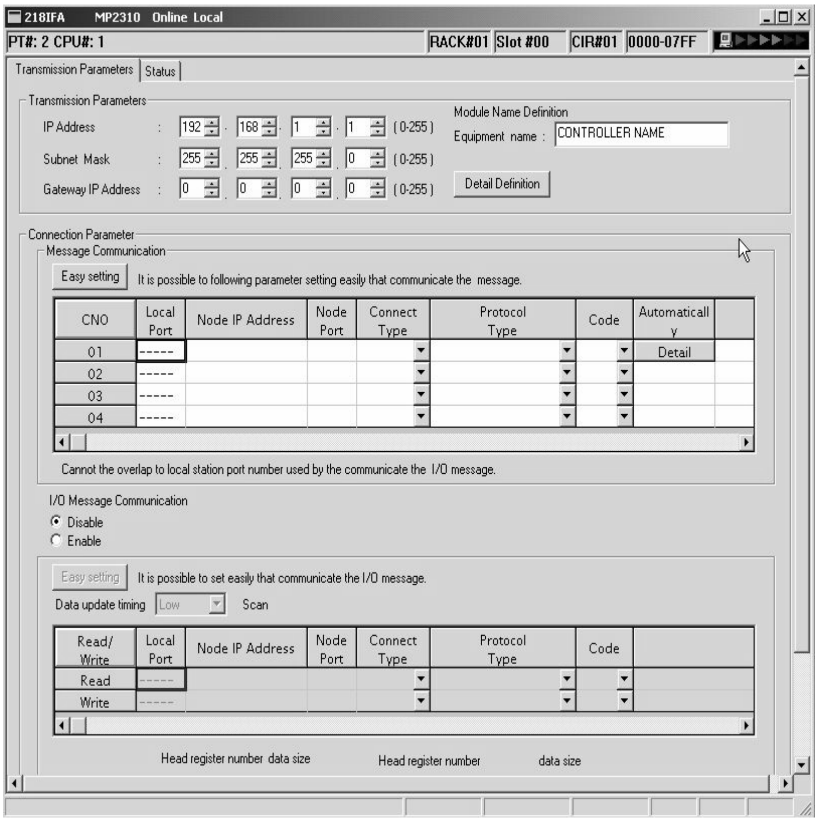


(b) 218IFA Module Detailed Window

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

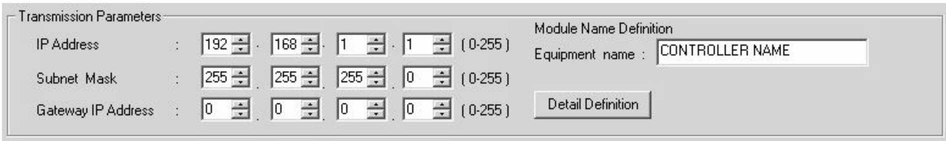
1. Parameter Setting Tab

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

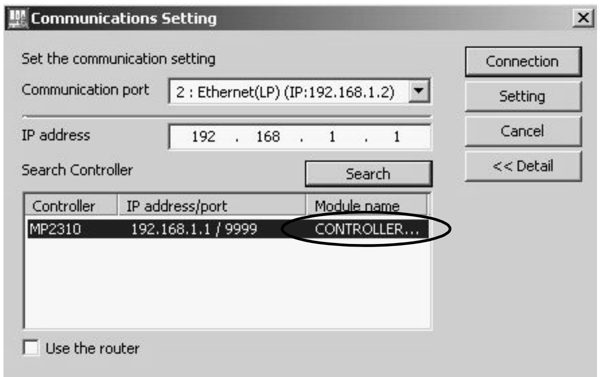


■ Transmission Parameter Setting Items

Sets local transmission parameters for 218IFA.

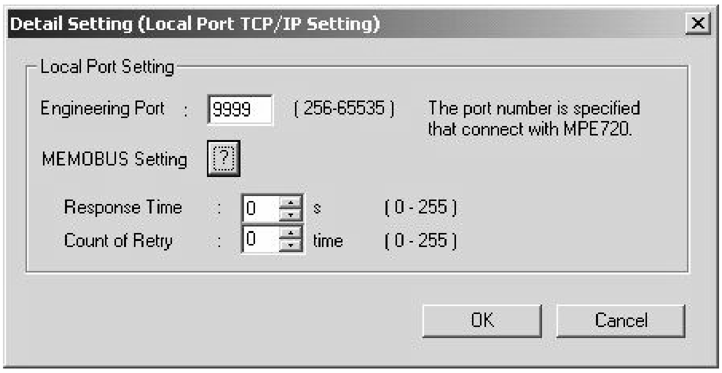


The following table shows each setting item.

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.

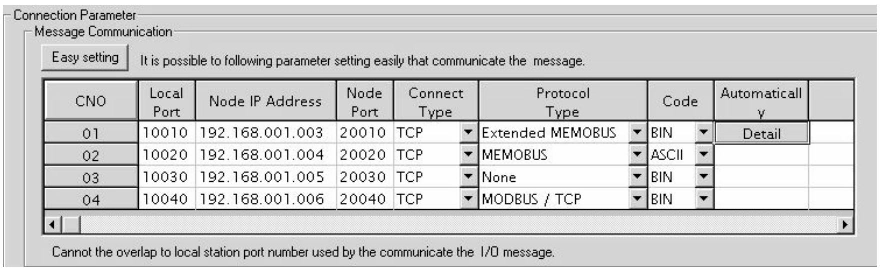


The following table shows each setting item.

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 time-out 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.

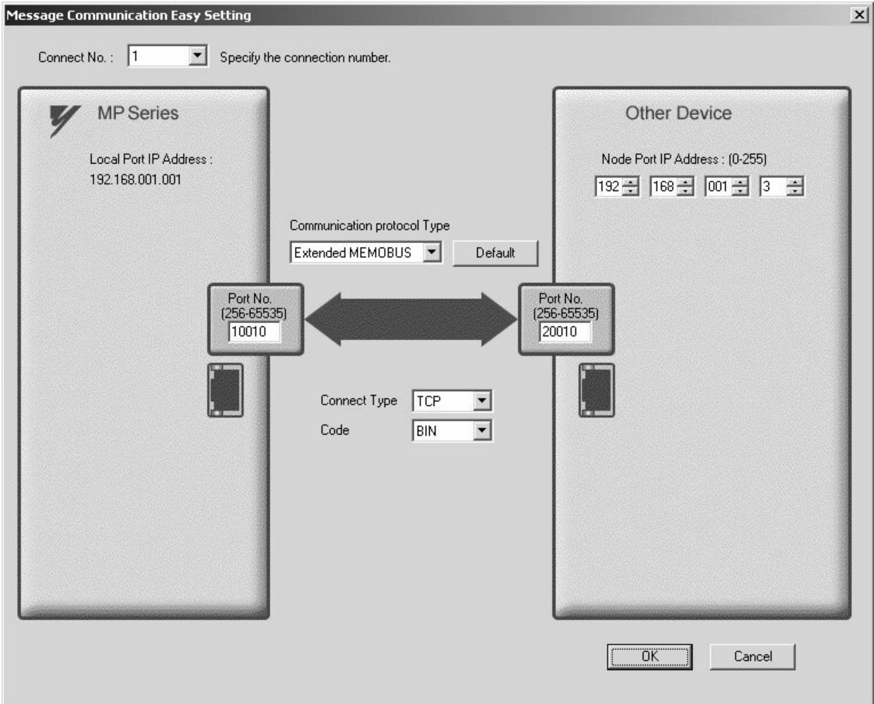
<table>
<tr><th>Item</th><th>Setting Range</th><th>Details</th><th>Default</th></tr>
<tr><td>Easy Setting</td><td>–</td><td>Opens the easy setting screen for the connection parameters. The content of the selected connection is shown.</td><td>–</td></tr>
<tr><td>Connection Number (CNO)</td><td>1 to 4</td><td>In 218IFA Ethernet communication, remote stations are distinguished by their connection numbers.
This connection number is used in remote connection number (PARAM02) of the parameter list (PARAM) of the MSG-SND/MSG-RCV function.</td><td>–</td></tr>
<tr><td>Local Port</td><td>256 to 65535</td><td>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.</td><td>0</td></tr>
<tr><td>Node IP Address</td><td>0.0.0.0 to 255.255.255.254</td><td>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.</td><td>000.000.000.000</td></tr>
<tr><td>Node Port</td><td>0 and
256 to 65535</td><td>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.</td><td>0</td></tr>
<tr><td>Connect Type</td><td>TCP,
UDP</td><td>Select a transport layer protocol.
TCP: Transmission control protocol
UDP: User datagram protocol</td><td>TCP</td></tr>
<tr><td>Protocol Type</td><td>Extended MEMOBUS,
MEMOBUS,
MELSEC,
None,
MODBUS/TCP</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>Non-procedure</td><td>General-purpose message communication. Transmits and receives continuous data intact in the specified register.</td></tr>
<tr><td>MODBUS/TCP</td><td>Industrial Ethernet protocol proposed by Modicon, Inc.</td></tr>
</table></td><td>Extended MEMOBUS</td></tr>
</table>

<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>Non-procedure</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.

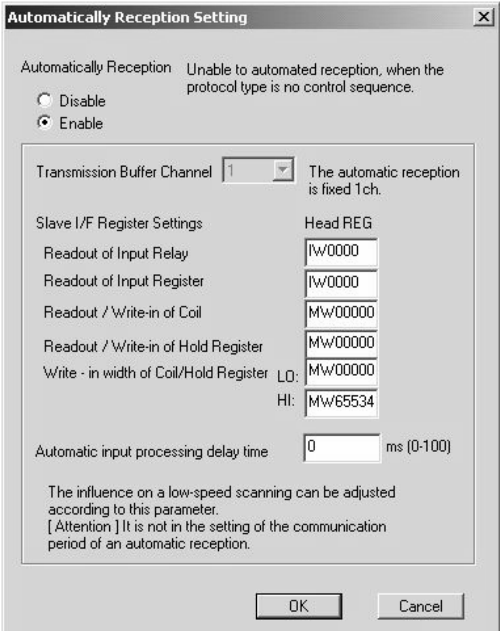
Item	Default			
	Connection Number 01	Connection Number 02	Connection Number 03	Connection Number 04
Local Port	10001	10002	10003	10004
Node IP Address	192.168.1.2	192.168.1.3	192.168.1.4	192.168.1.5
Node Port Number	10001	10002	10003	10004
Communication Protocol Type	Extended MEMOBUS			
Connect Type	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
Non-procedure	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

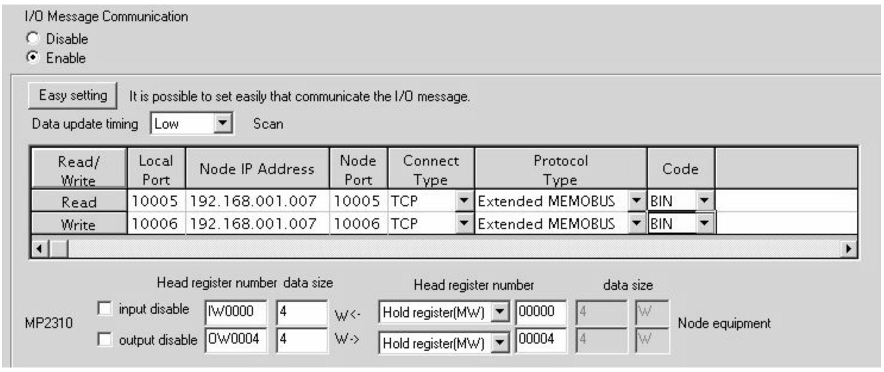
The following table provides the valid setting items for each communication protocol type.

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.

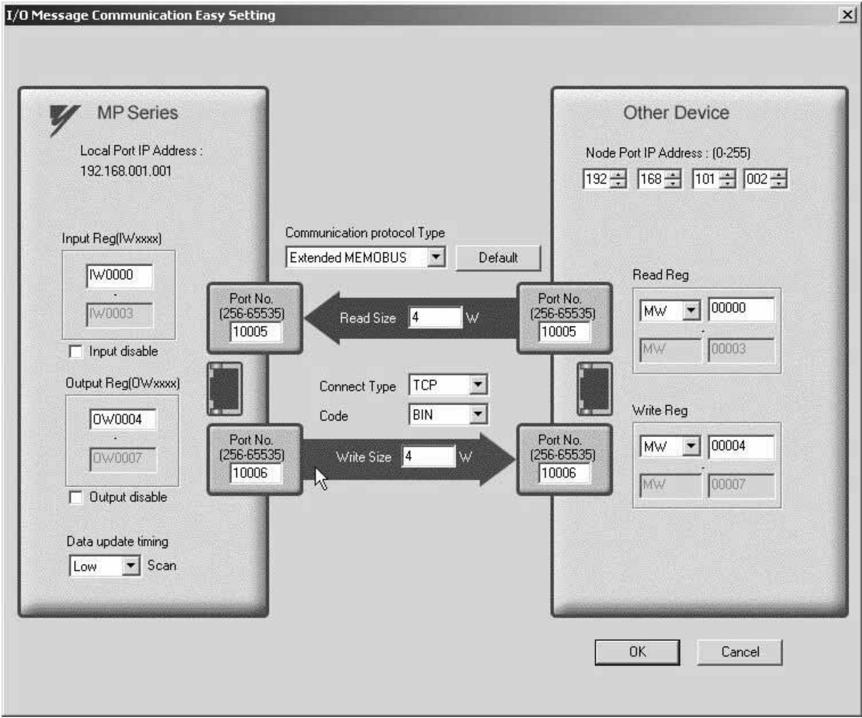
Item	Setting Range	Details	Default
I/O Message Communication Enable/Disable	Enable/Disable	Select whether to enable I/O message communications.	Disable
The setting items below can only be set when the I/O Message Communication is set to “Enable.”			
Easy Setting	–	Opens the Simple Setting screen for 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">MP2310 Head Register Number Data Size</td><td>IW0000 to IW7FFF</td><td>Set a start address of the input register of the MP2310 side for storing the data read from the remote equipment.

Note1: "□□□□" 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 □□□□ (Note1)</td></tr>
<tr><td>OW0000 to OW7FFF</td><td>Set a start address of the MP2310 side output register for referencing the data written in the remote equipment.
Note2: "□□□□" represents a start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen.</td><td>OW□□□□ + 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 MP2310 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 MP2310 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.

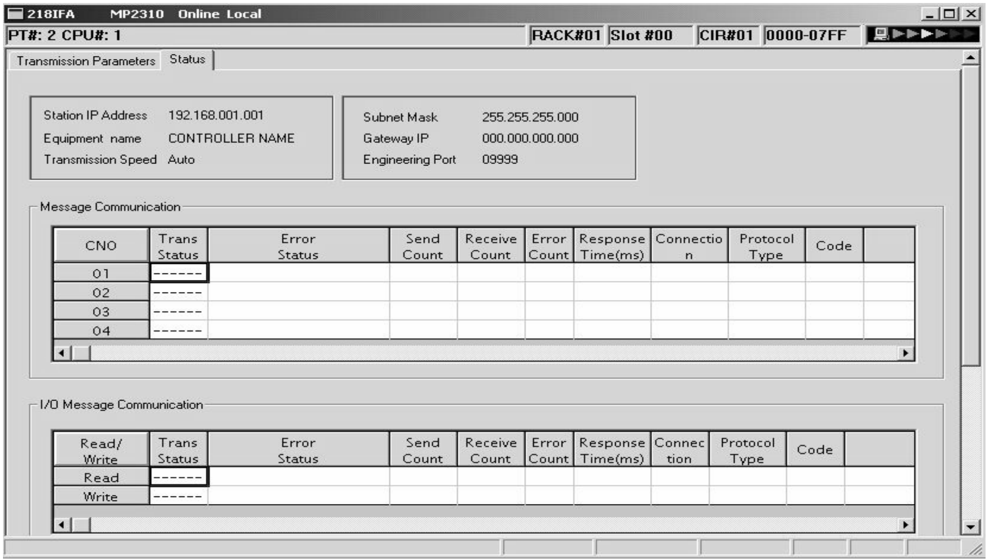
Item			Default
MP Series	Local IP Address		Values set in transmission parameter setting items are shown.
	Local Port	Read	10005
		Write	10006
	Input Register (IW □□□□)		Start I/O register number specified by the 218IFA cell in the detailed field of the module configuration definition screen.
	Input Disable		Not checked (enable)
	Output Register (OW □□□□)		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 MSG-SND function of the message communication and 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.

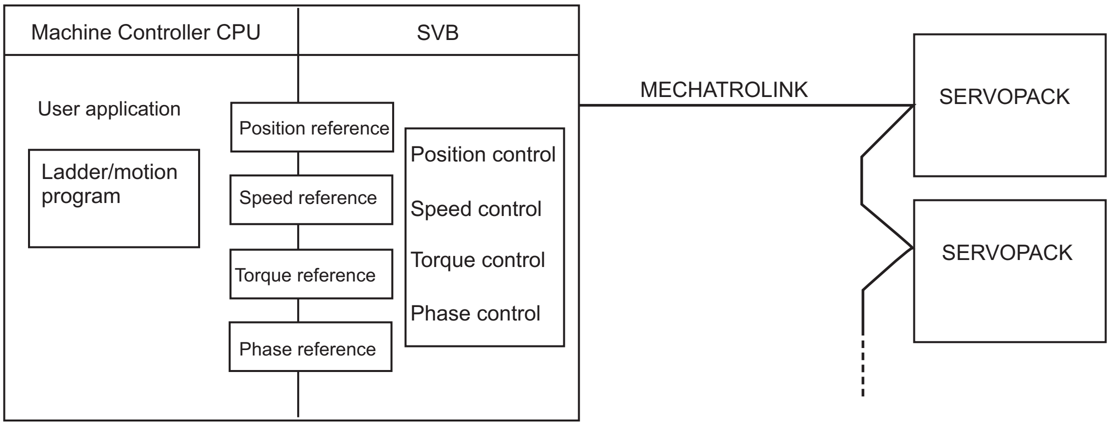
<table>
<tr><th>Error Status</th><th>State</th><th>Remarks</th></tr>
<tr><td>No Error</td><td>Normal</td><td>–</td></tr>
<tr><td>Socket Generation Error</td><td>System error</td><td>Socket generation failed</td></tr>
<tr><td rowspan="3">Local Port Number Error</td><td rowspan="3">Error in setting the local port number (the same address is bound while disconnecting the TCP connection)</td><td>Bind error (duplicated port number)</td></tr>
<tr><td>A bind error occurred while aborting using the MSG function and ending the connection.
The error occurs if Execute is turned ON within one minute after an Abort is completed.</td></tr>
<tr><td>Before the connection was completed, another function issued a command to the same remote station.</td></tr>
<tr><td>Socket Attribute Change Error</td><td>System error (in TCP)</td><td>An error occurred while setting a socket attribute.</td></tr>
<tr><td rowspan="2">Connection Error (M-SND)</td><td rowspan="2">Connection error (when actively open in TCP, a connection is rejected by the node station)</td><td>Tried to connect using the MSG-SND function, but the connection was rejected by the remote station, and the command was reset.</td></tr>
<tr><td>When disconnecting the cable, retried connecting for one minute (default value) without a response.</td></tr>
<tr><td>Connection Error (M-RCV)</td><td>Connection error (when passively open in TCP)</td><td>An error occurred while receiving the connection from the MSG-RCV function.</td></tr>
<tr><td>System Error</td><td>System error</td><td>A socket polling (select specification) error occurred while receiving data.</td></tr>
<tr><td>Data Transmit Error (TCP)</td><td>Data transmit error (in TCP, either there is no node station or a node station did not startup.)</td><td>A response transmit error occurred in the MSG-RCV function. An error also occurred in the MSG-SND function.
An error occurred only in TCP when there was no node station to transmit or a node station was rebooted.</td></tr>
<tr><td>Data Transmit Error (UDP)</td><td>Data transmit error (in UDP)</td><td>A transmit request was issued to a nonexistent socket.</td></tr>
<tr><td>Data Receive Error (TCP)</td><td>Data receive error (in TCP, a request to disconnect the connection is received from the node station)</td><td>An error occurred when disconnecting the connection from the node station. It also may occur even when close is processed properly.</td></tr>
<tr><td>Data Receive Error (UDP)</td><td>Data receive error (in UDP)</td><td>A data receive command was issued to a nonexistent socket.</td></tr>
<tr><td>Socket Option Change Error</td><td>System error</td><td>Error when changing a socket option</td></tr>
<tr><td>Data Change Error</td><td>Data change error</td><td>Protocol change error</td></tr>
</table>

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

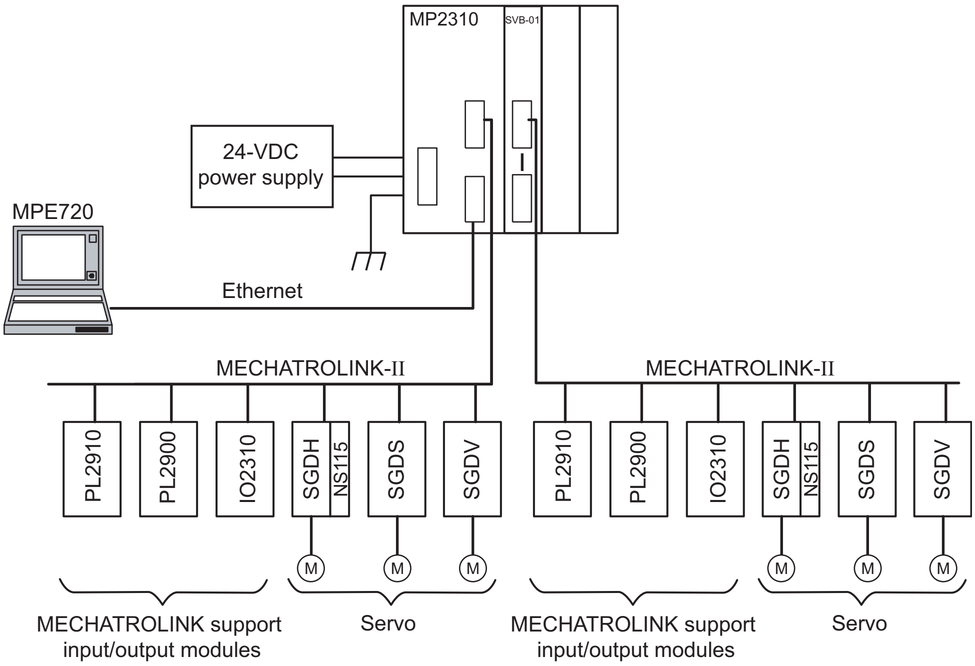
The SVB Modules are of two types: The built-in SVB (hereinafter referred to as Built-in SVB) and the Slot-mounting Optional SVB (hereinafter referred to as Optional SVB)
A built-in SVB Module is incorporated in the MP2310.
The Optional SVB is one of the optional modules for the Machine Controller. The SVB-01 Module is an Optional

[c] Features

- Up to 21 slave stations can be connected to a single Module (the SERVOPACKs can be connected up to 16 axes).
- Up to three SVB-01 Modules can be mounted in optional slot.
  Including the MP2310's built-in SVB, a total of 64 axes can be controlled.
- An SVB-01 Module used as a slave can be connected to a host controller equipped with MECHATROLINK communication functions.
- Self-configuration enables automatic allocation of setting data for the slave device that is connected to MECHATROLINK.
- SERVOPACK parameters can be managed over networks.

[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 Built-in 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 1-7 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 JEPMC-W6022 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 1-7.	
	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

Specifications and Functions

2

(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.
Synchronization between Modules		Synchronization supported (enabled when power is cycled) when high-speed scan cycle = communication cycle times n

* 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

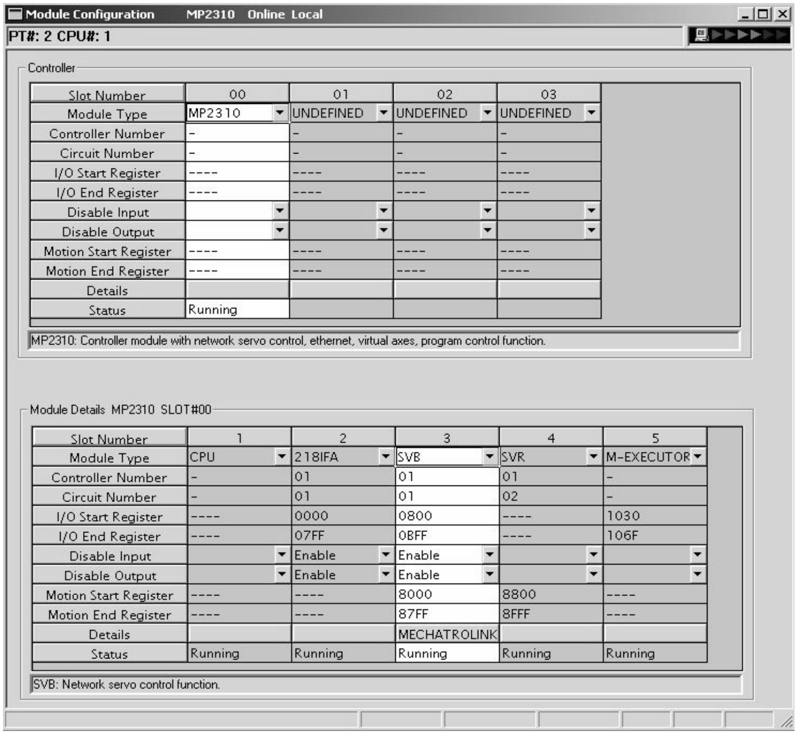
Communication Method	Transmission Distance (Total Network Length)	Maximum Number of Slave Stations
MECHATROLINK-I	50 m (can be extended to 100 m by connecting repeaters)	14
MECHATROLINK-II	30 m (can be extended to 100 m by connecting repeaters)	16 (21)*
	50 m (can be extended to 100 m by connecting repeaters)	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 **MP2310** 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

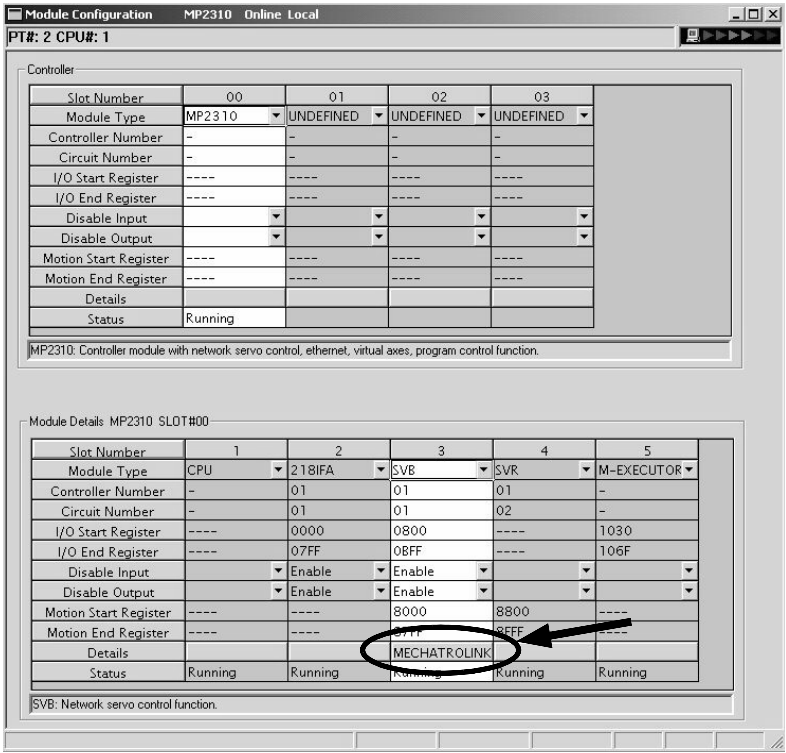
- “Possible” in the Modification line in the above table means that it is possible to change the setting of the item. Always save the setting to the flash memory after having changed the setting.
  - When changing the setting, be careful not to set the register numbers overlapped with another module.
  - 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 the **SVB** Module in the **Controller** field and double-click the **MECHATROLINK** cell in the Module **Details** field. The MECHATROLINK Transmission Definition Window will open.

- If several SVB Modules are mounted, select the SVB Module to be checked or set in the **Controller** field.
- To check or set the built-in SVB Module, select slot number **00** in the **Controller** field.



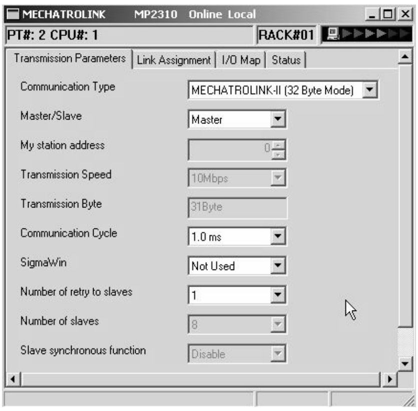
[b] MECHATROLINK Transmission Definition Window Details

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

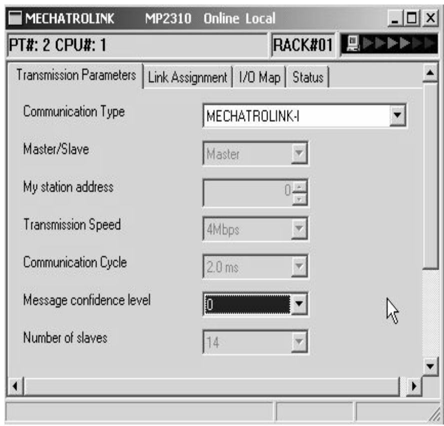
1. Transmission Parameters Tab

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 *1	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 *2	Not used for MECHATROLINK transmission.	Set to 0 (default).
SigmaWin *1	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**.

(cont'd)

Item	Display during Self-configuration	Options and Precautions on Settings
Number of Retry to Slaves *1	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.

* 1. Hidden for MECHATROLINK-I.
* 2. Hidden for MECHATROLINK-II.

■ 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

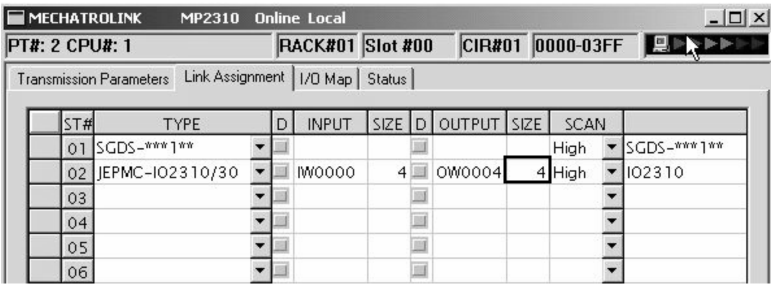
The communication cycle that can be set will differ depending on the communication type as follows.

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***.

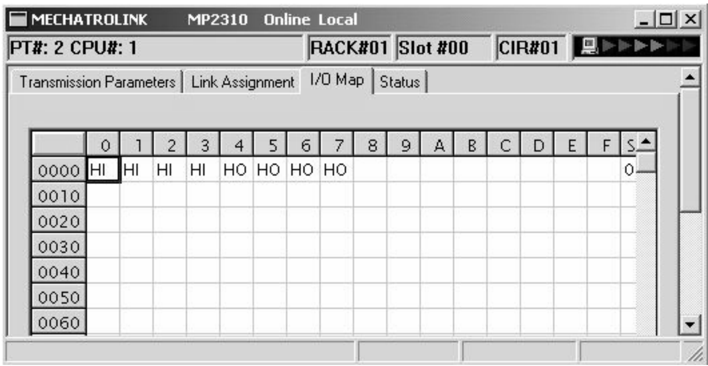
Select a correct device type in the Link Assignment Tab Page for the devices with ********I/O*** or ********SERVO*** displayed in ***TYPE***.

---

3. I/O Map Tab

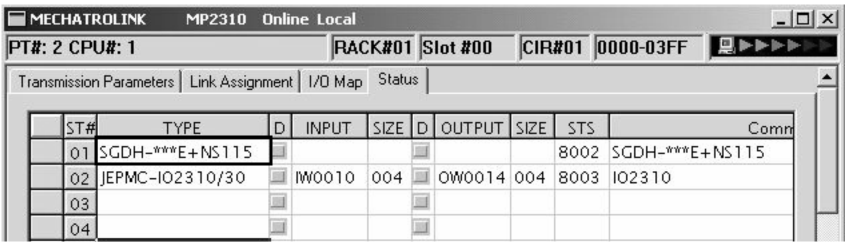
The status allocated to I/O registers is displayed.

- 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.



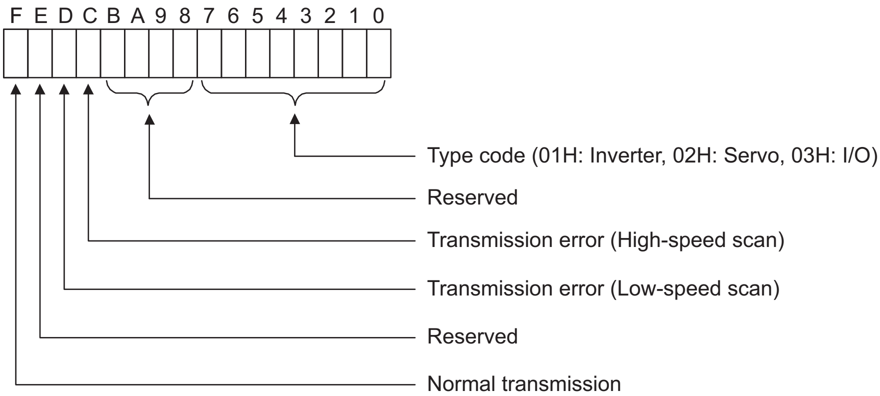
The items shown on the **Status** Tab are the same as those on the **Link Assignment** Tab except for STS.

■ 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.



Specifications and Functions

2

(5) SVB Definition

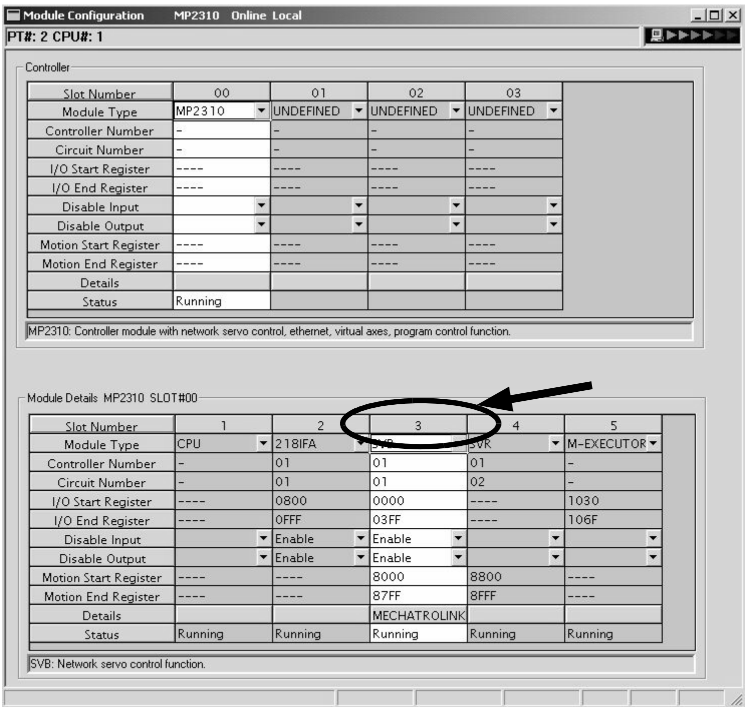
The SVB Definition file defines the motion parameters (motion fixed parameters, motion setting parameters, and motion monitoring parameters) to control motion axes such as the SERVOPACK, inverter, and stepper.

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

[a] Opening the SVB Definition Window

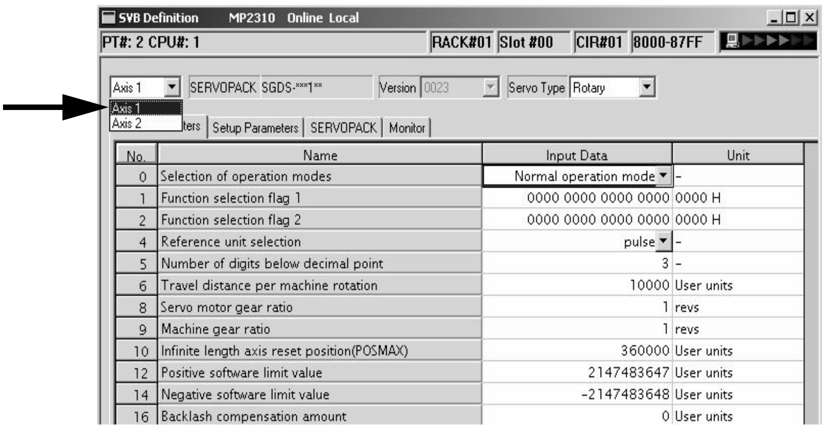
Open the SVB Definition Window by the following procedure.

1. Select ***MP2310*** 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 Built-in SVB/SVB-01 Motion Module User's manual* (manual no.: SIEPC88070033) for details.

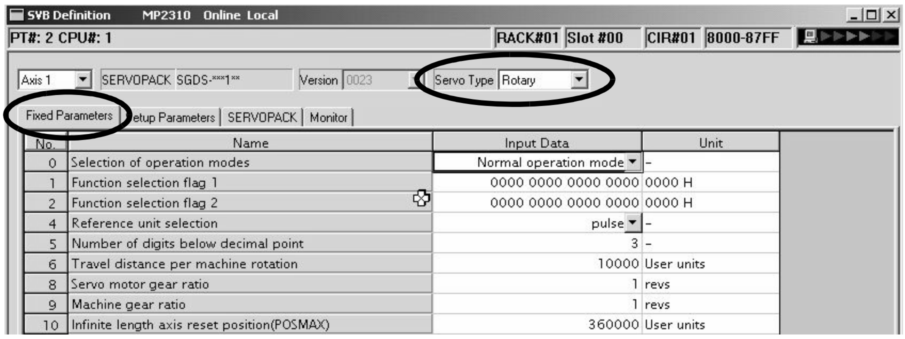


Fig. 2.1 Fixed Parameters Tab

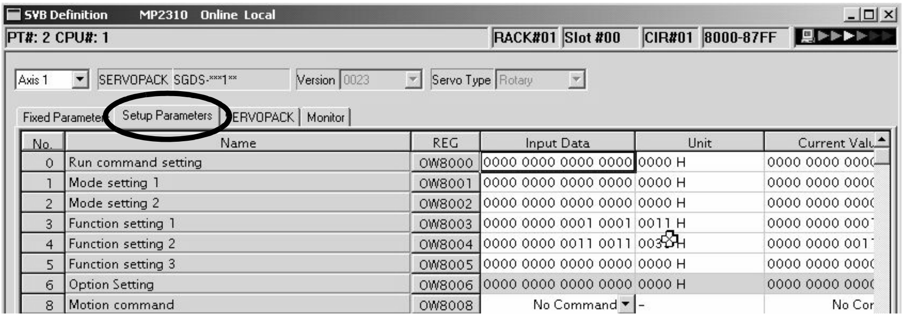


Fig. 2.2 Setup Parameters Tab

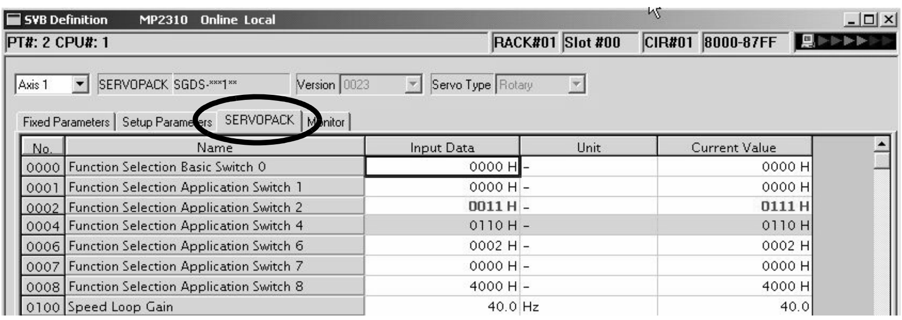


Fig. 2.3 SERVOPACK Parameters Tab

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

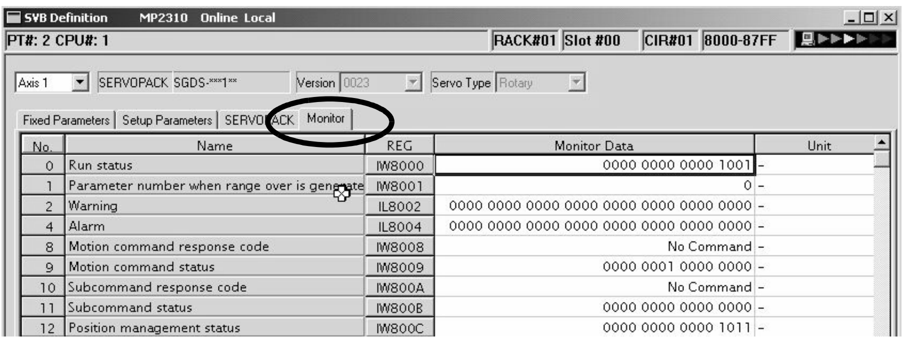


Fig. 2.4 Monitor Parameters Tab (read-only)

(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.

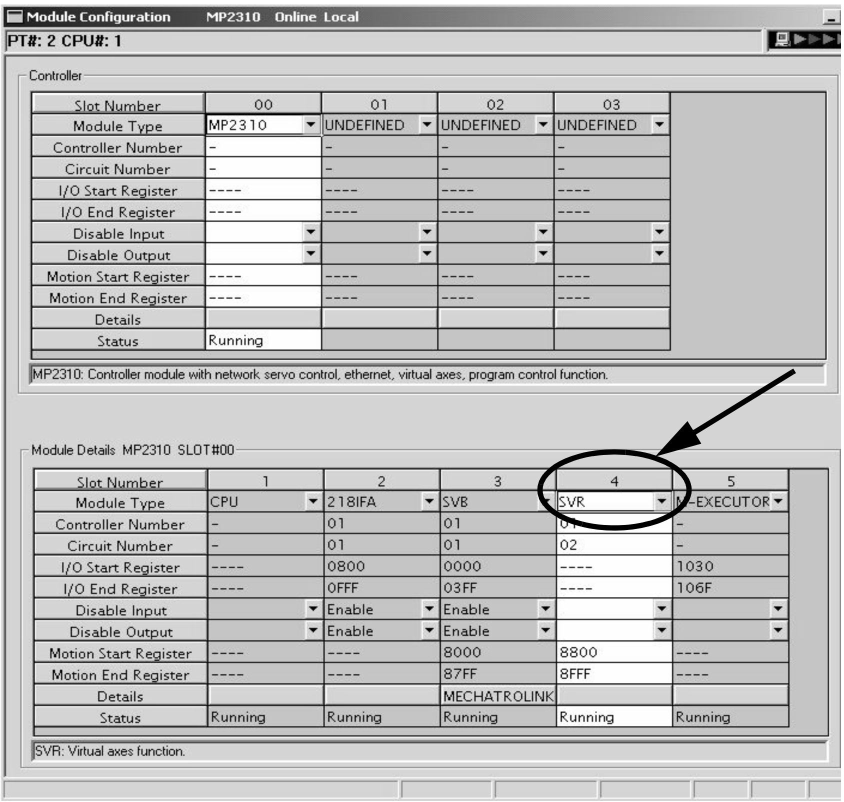
2.2.6 SVR Virtual Motion Module

(1) Outline

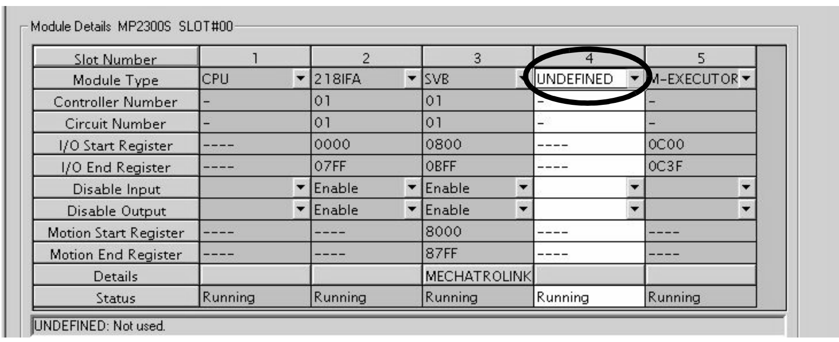
The Virtual Motion Module is a software module provided as a standard feature with the MP2310. It is not connected to a motor, but provides a virtual axis interface.
The SVR is configured in the same way as the MP2310 built-in SVB with fixed parameters, setting parameters, and monitoring parameters, 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 Built-in SVB/SVB-01 Motion Module User's Manual* (manual no.: SIEPC88070033).

In the MP2310 Basic Module, slot 4 in the default **Module Configuration** Window is for SVR.



- If the SVR is not used, MP2310 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.

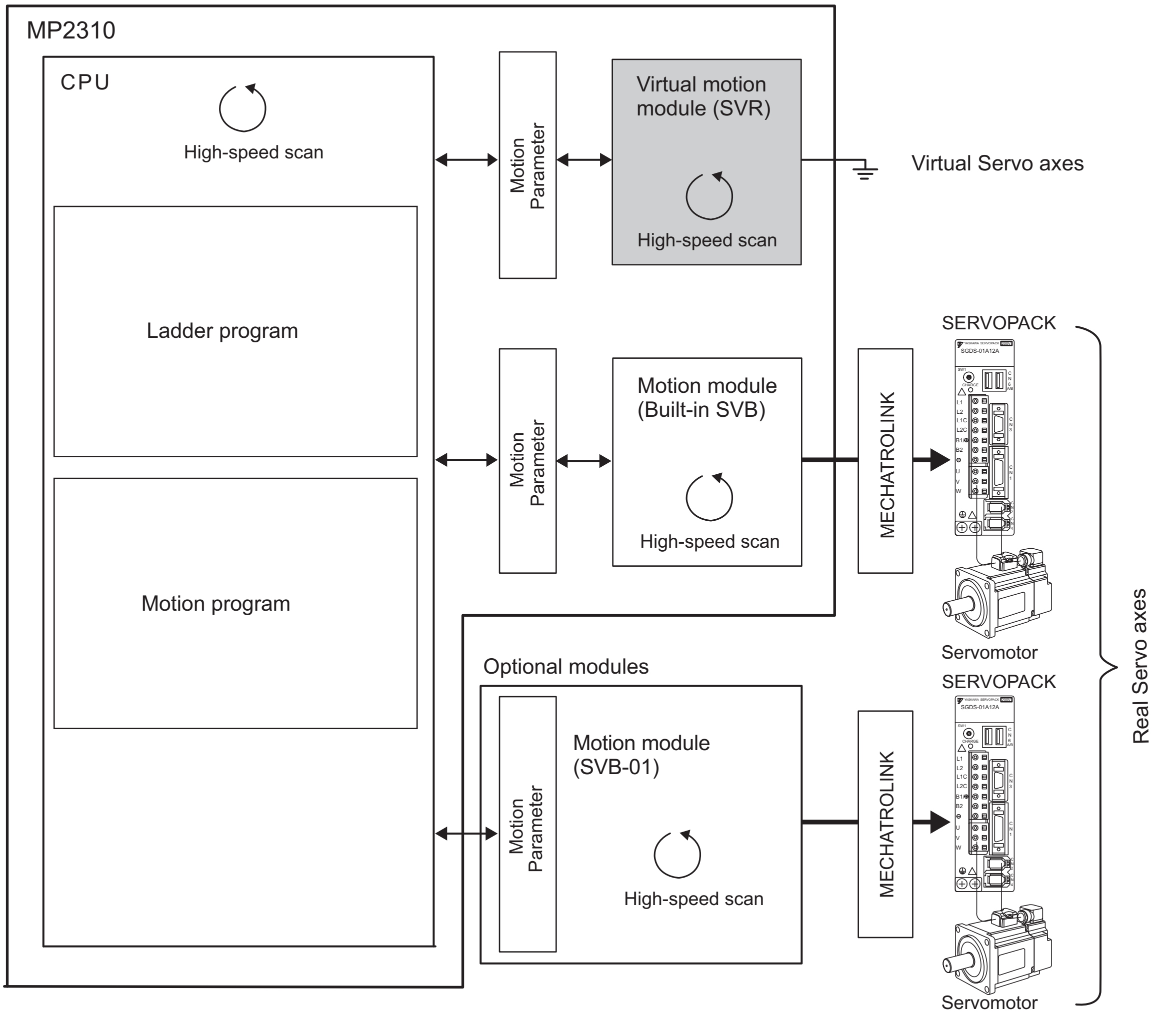
The following table lists application examples of the SVR.

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

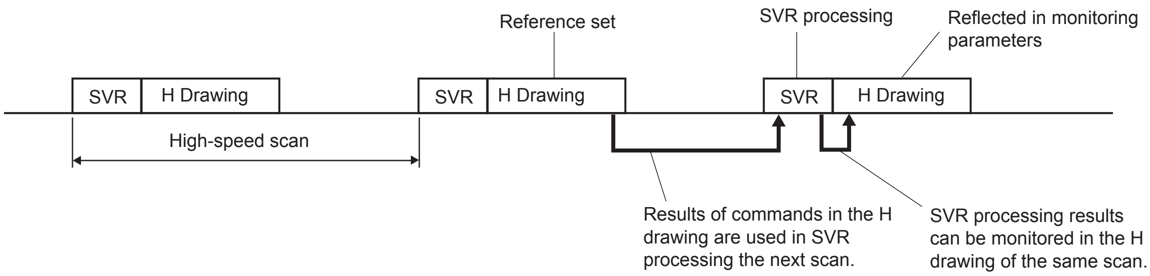
The following figure shows an example system configuration using SVR.



(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	MP2310
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 MP2310.
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

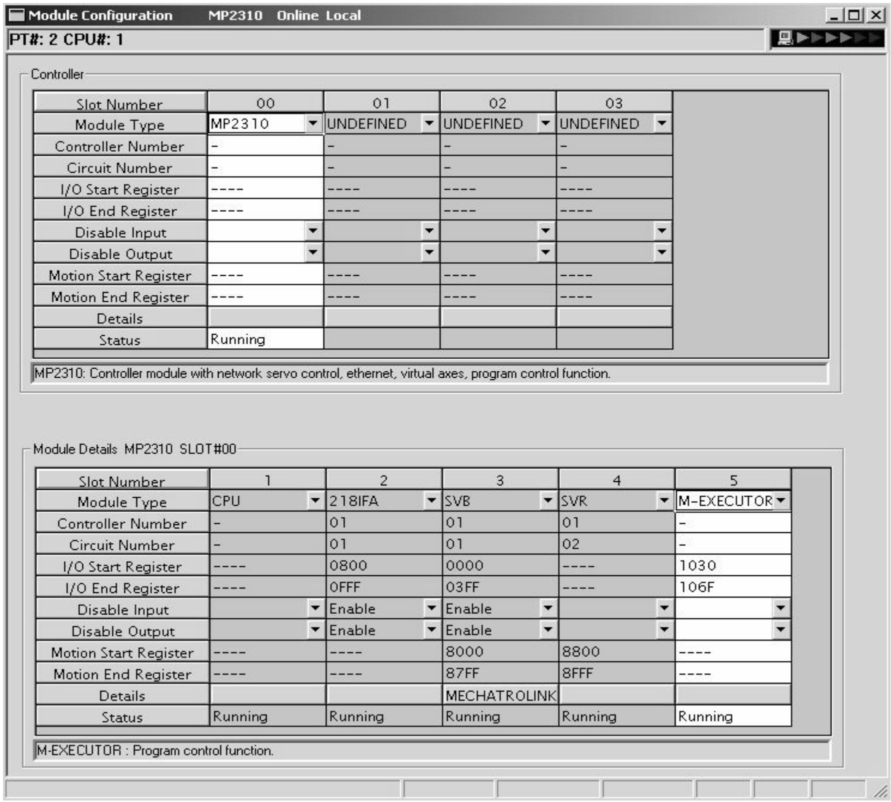
The following table shows the program control methods registered in M-EXECUTOR.

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

(3) Module Configuration Definition

(a) Details of Module Configuration Definition Window

Click **MP2310** 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.



Slot Number	00	01	02	03
Module Type	MP2310	UNDEFINED	UNDEFINED	UNDEFINED
Controller Number	-	-	-	-
Circuit Number	-	-	-	-
I/O Start Register	----	----	----	----
I/O End Register	----	----	----	----
Disable Input				
Disable Output				
Motion Start Register	----	----	----	----
Motion End Register	----	----	----	----
Details				
Status	Running			

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0800	0000	----	1030
I/O End Register	----	0FFF	03FF	----	106F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

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

Specifications and Functions

2

■ 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	
Iw□□□□ + 0	Definition No.1	Status
Iw□□□□ + 1		Spare
Iw□□□□ + 2		Spare
Iw□□□□ + 3		Spare
Iw□□□□ + 4	Definition No.2	Status
Iw□□□□ + 5		Spare
Iw□□□□ + 6		Spare
Iw□□□□ + 7		Spare
	.	
	.	
	.	
Iw□□□□ + 3C	Definition No.16	Status
Iw□□□□ + 3D		Spare
Iw□□□□ + 3E		Spare
Iw□□□□ + 3F		Spare

M-EXECUTOR Output Register

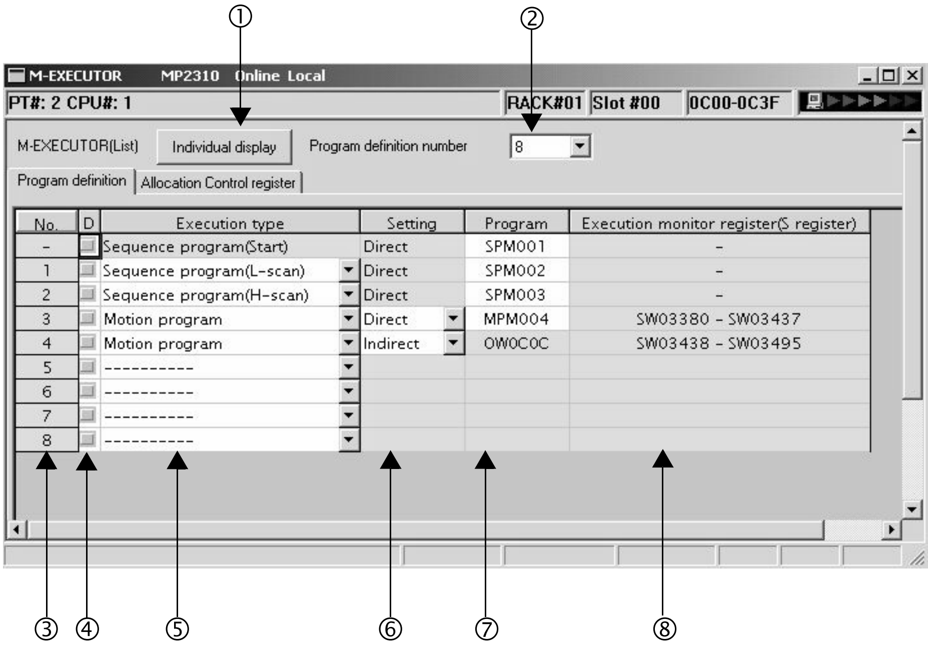
M-EXECUTOR Output Register	Item	
Ow□□□□ + 0	Definition No.1	Program number
Ow□□□□ + 1		Control signal
Ow□□□□ + 2		Override
Ow□□□□ + 3		Spare
Ow□□□□ + 4	Definition No.2	Program number
Ow□□□□ + 5		Control signal
Ow□□□□ + 6		Override
Ow□□□□ + 7		Spare
	.	
	.	
	.	
Ow□□□□ + 3C	Definition No.16	Program number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

Designa-tion 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.

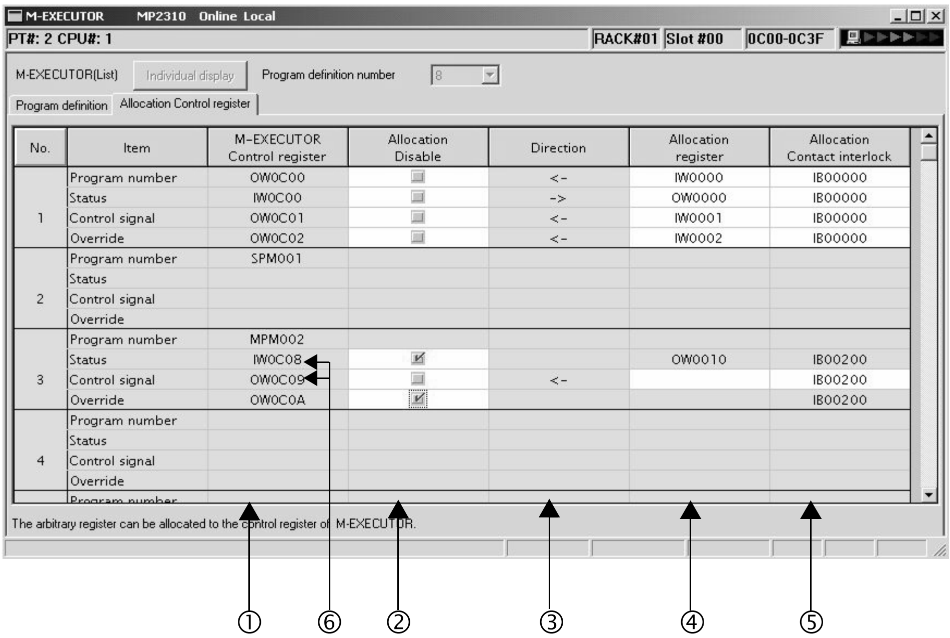
Execution Type	Remarks
Sequence Program (startup, L scan, H scan)	Enter “1” and press ENT to automatically input “SPM001.” You can save an unregistered program or exit this screen without setting (blank), but in these cases, the program will not be executed.
Motion Program	Direct designation: Enter “1” 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.

Specifications and Functions

2

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)

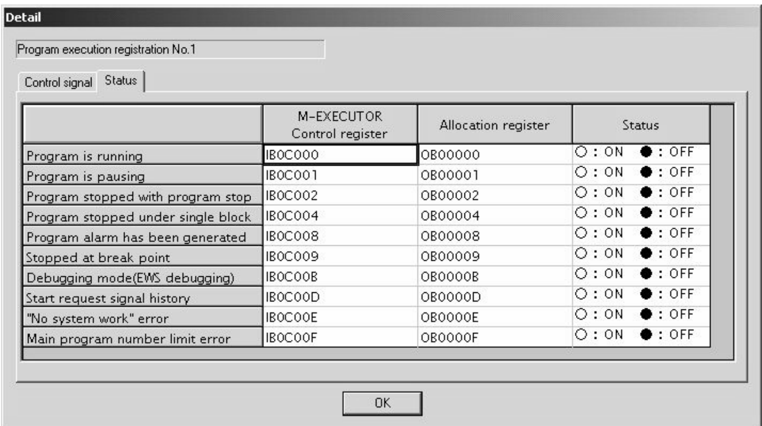
■ Caution

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.

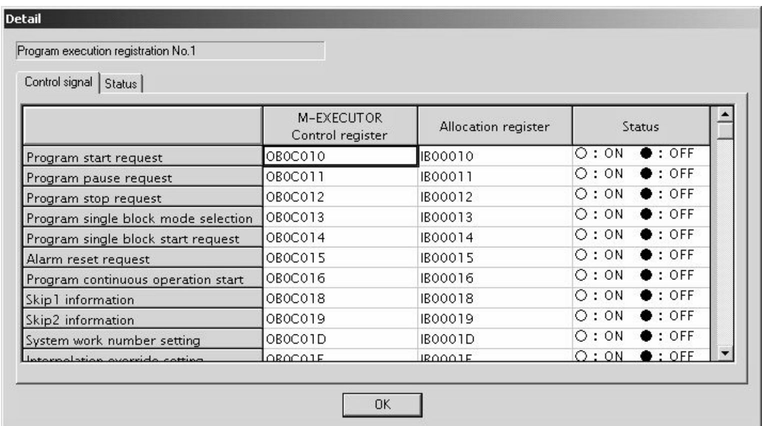
- Status


Detail
Program execution registration No.1
Control signal | Status

	M-EXECUTOR Control register	Allocation register	Status
Program is running	IB0C000	OB00000	○ : ON ● : OFF
Program is pausing	IB0C001	OB00001	○ : ON ● : OFF
Program stopped with program stop	IB0C002	OB00002	○ : ON ● : OFF
Program stopped under single block	IB0C004	OB00004	○ : ON ● : OFF
Program alarm has been generated	IB0C008	OB00008	○ : ON ● : OFF
Stopped at break point	IB0C009	OB00009	○ : ON ● : OFF
Debugging mode(EWS debugging)	IB0C00B	OB0000B	○ : ON ● : OFF
Start request signal history	IB0C00D	OB0000D	○ : ON ● : OFF
"No system work" error	IB0C00E	OB0000E	○ : ON ● : OFF
Main program number limit error	IB0C00F	OB0000F	○ : ON ● : OFF

OK

- Control Signal

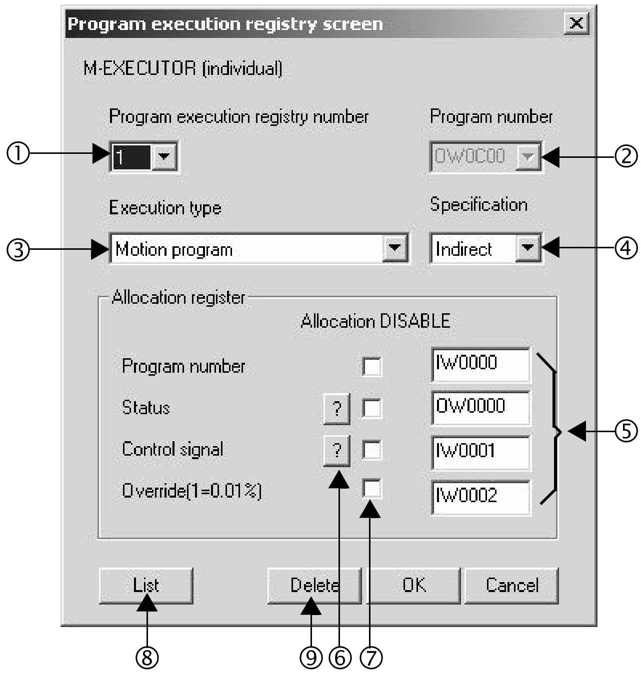

Detail
Program execution registration No.1
Control signal | Status

	M-EXECUTOR Control register	Allocation register	Status
Program start request	OB0C010	IB00010	○ : ON ● : OFF
Program pause request	OB0C011	IB00011	○ : ON ● : OFF
Program stop request	OB0C012	IB00012	○ : ON ● : OFF
Program single block mode selection	OB0C013	IB00013	○ : ON ● : OFF
Program single block start request	OB0C014	IB00014	○ : ON ● : OFF
Alarm reset request	OB0C015	IB00015	○ : ON ● : OFF
Program continuous operation start	OB0C016	IB00016	○ : ON ● : OFF
Skip1 information	OB0C018	IB00018	○ : ON ● : OFF
Skip2 information	OB0C019	IB00019	○ : ON ● : OFF
System work number setting	OB0C01D	IB0001D	○ : ON ● : OFF

OK

■ 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.

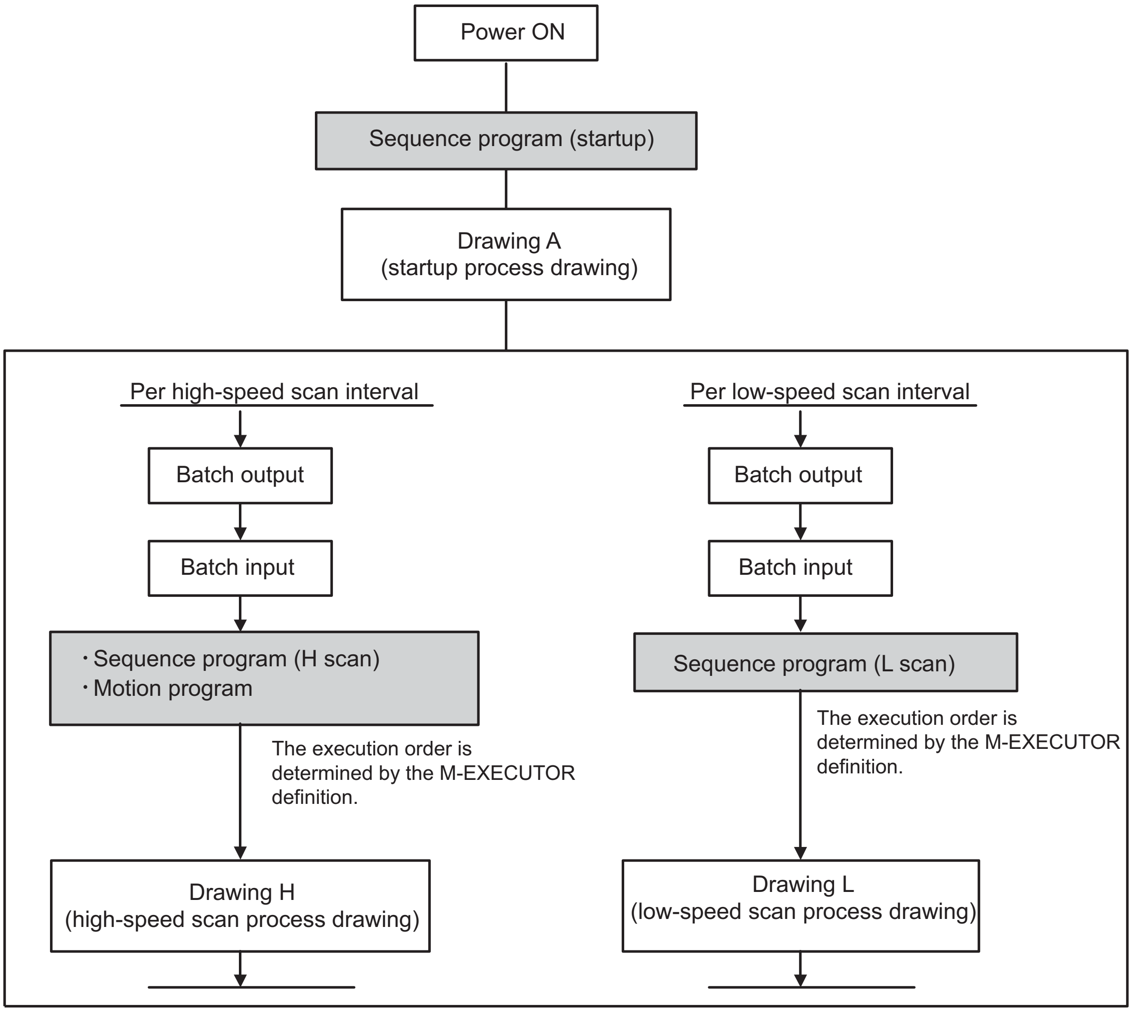
⑦ Allocation DISABLE
Enables/disables the allocation register. Uncheck to enable the definition.

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

⑨ Delete
Deletes a definition.

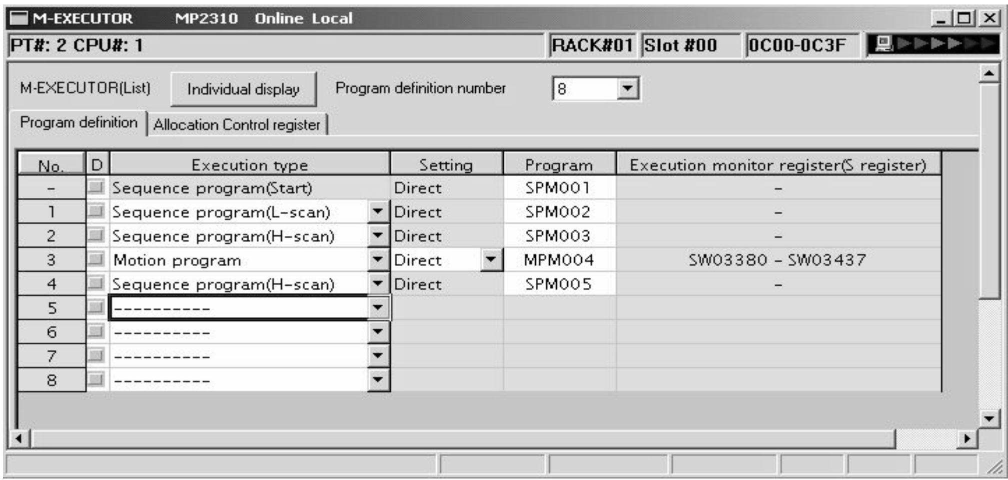
(5) Execution Scheduling

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



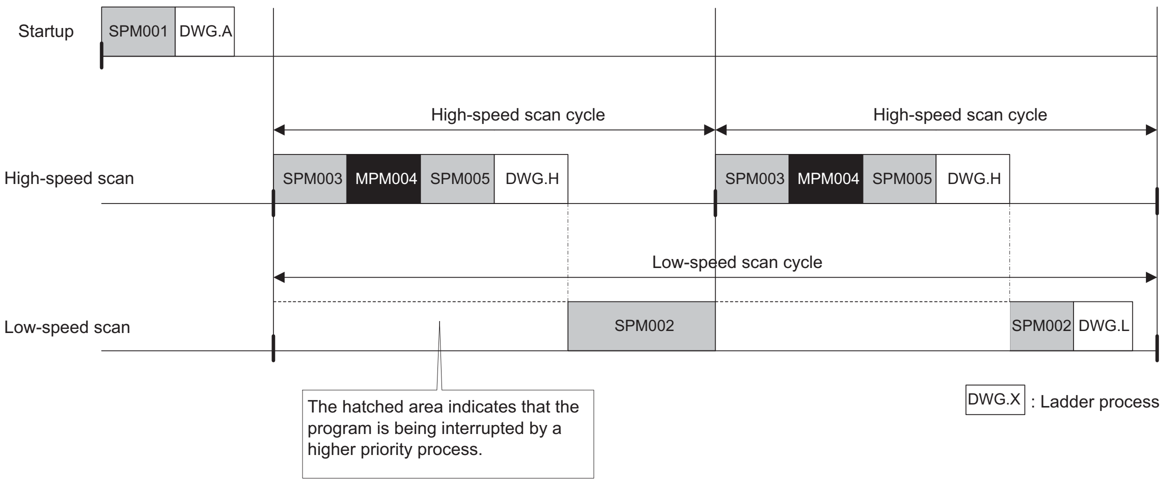
An execution example is as follows:

- M-EXECUTOR program definition


M-EXECUTOR MP2310 Online Local
PT#: 2 CPU#: 1 RACK#01 Slot #00 0C00-0C3F
M-EXECUTOR(List) Individual display Program definition number 8
Program definition | Allocation Control register

No.	D	Execution type	Setting	Program	Execution monitor register(S register)
–		Sequence program(Start)	Direct	SPM001	–
1		Sequence program(L-scan)	Direct	SPM002	–
2		Sequence program(H-scan)	Direct	SPM003	–
3		Motion program	Direct	MPM004	SW03380 – SW03437
4		Sequence program(H-scan)	Direct	SPM005	–
5		----------			
6		----------			
7		----------			
8		----------			

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



2.3 Option Module

This section provides an option module overview. For more information on its specifications, functions, connections, settings, etc., refer to the following documents separately.

2.3.1 Option Module Overview List

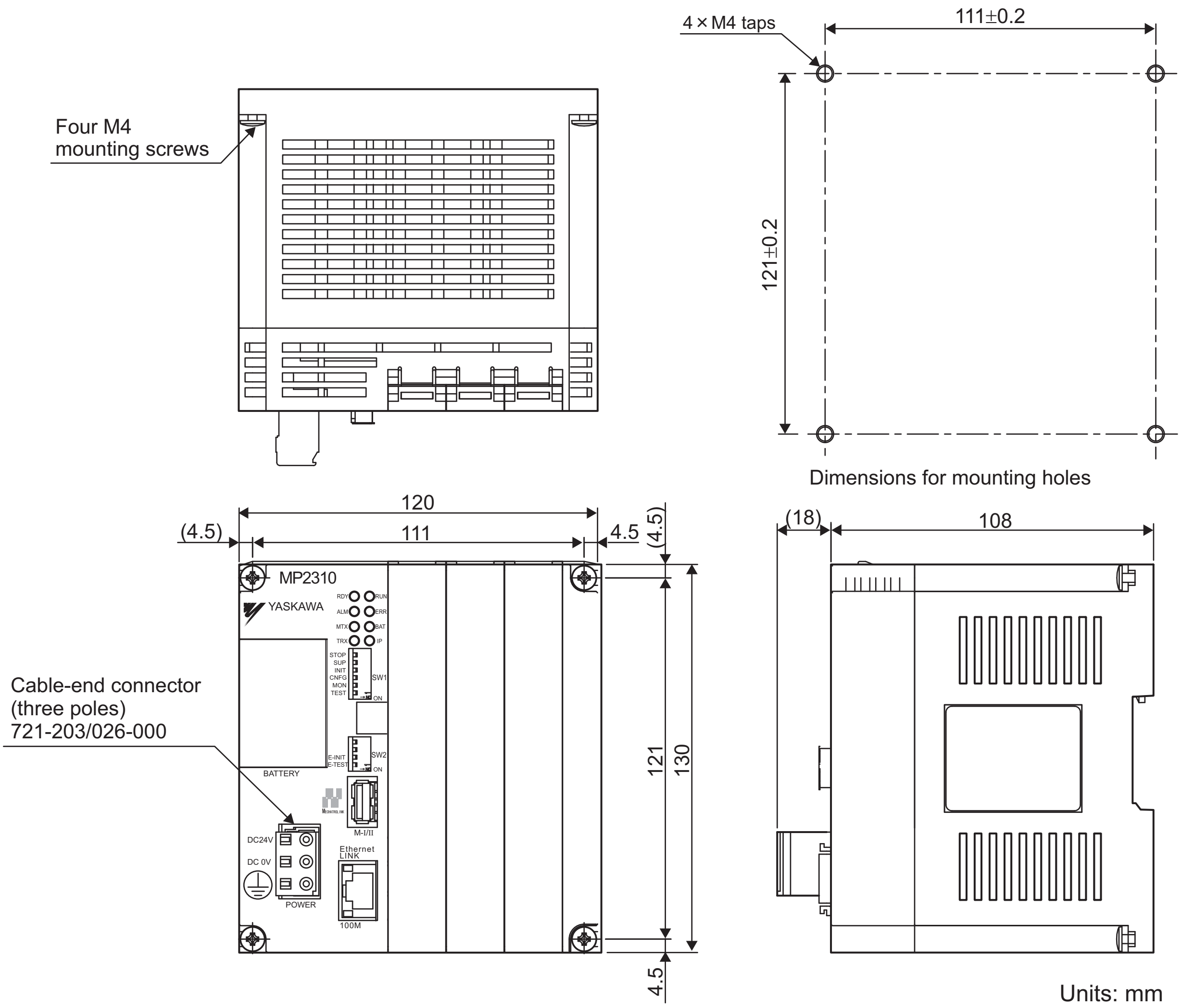
Classification	Option Module Name	Module Overview	Reference Manual
Motion Module	SVB-01 Module	The SVB-01 Module is a motion module equipped with a MECHATROLINK supporting interface. The adoption of MECHATROLINK enables reduced wiring and multi-axis control. In addition, the support for MECHATROLINK-II standard allows you to control position, speed, torque, and phase, realizing precise synchronous control. Also, complex mechanical operation can be achieved by changing the control mode during axis operation. ■ Features • Up to 21 slave stations per module are connectable (up to 16 servo axes are controllable) • Because synchronization between modules is enabled, adaptable to interpolation and synchronous control between modules • With the SVB-01 Module as a slave, connectable to an upper controller with the MECHATROLINK communication function • Self-configuration function allows you to automatically map slave devices connected to MECHATROLINK. • SERVOPACK parameters are manageable over the network	*Machine Controller MP2000 Series Built-in SVB/SVB-01 Motion Module User's Manual* (manual number: SIEPC88070033)
	SVA-01 Module	The SVA-01 Module is a motion control module with analog output. Capable of controlling a two-axes servo per module or an inverter. The module has two connectors (CN1, CN2) for connection to a SERVOPACK and an external I/O. Each connector is equipped with an analogue output to command speed and torque, an analogue input to monitor feedback speed and torque, a pulse input phase-A, B, and C (5V differential), and a general-purpose digital input/output. The control cycle is fixed at 500µs, so precise control is enabled regardless of high-speed scan cycles. ■ Features • Two axes servo module with analogue output • Each axis can independently perform position control, speed command output, torque command output, and phase control functions. • Self-configuration function allows you to automatically map modules.	*Machine Controller MP2000 Series Motion Module SVA-01 User's Manual* (manual number: SIEPC88070032)
	PO-01 Module	The PO-01 Module is a motion module with pulse output and a four-axes interface. Applicable to connection to a stepping motor or SERVOPACK.	*Machine Controller MP2000 Series Pulse Output Motion Module PO-01 User's Manual* (manual number: SIEPC88070028)

Classification	Option Module Name	Module Overview	Reference Manual
Input/Output Module	LIO-01/ LIO-02 Module	Digital I/O and pulse counter functions. As a digital I/O function, equipped with 16 digital inputs (DI), 16 digital outputs (DO) (LIO-01: sink output, LIO-02: source output). As a pulse counter function, one pulse input (PI). As for when to input/output for digital I/O and pulse counter functions, input/output for each MP2310 high-speed (High)/ low-speed (Low) scan is carried out at a constant cycle.	*Machine Controller MP2310 Basic Module User's Manual* (manual number: SIEPC88070003)
	LIO-04/ LIO-05 Module	As a digital I/O function, equipped with 32 digital inputs (DI), and 32 digital outputs (DO) (LIO-04: sink output, LIO-05: source output).	
	DO-01 Module	As a digital output function, equipped with 64 digital outputs (DO) (sink output).	
	AI-01 Module	8 channel analogue input module. For the input, capable of selecting from three options: -10V to +10V, 0V to +10V, or 0 to 20 mA.	*Machine Controller MP2000 Series Analogue Input/Output Module AI-01/AO-01 User's Manual* (manual number: SIEPC88070026)
	AO-01 Module	4 channel analogue output module. For the output, select one from two options: -10V to +10V, or 0V to +10V.	
	CNTR-01 Module	2 channel reversible counter module. 5V differential/ 12V input is optional, and phase-A or -B/ sign/ add-subtract method is optional.	*Machine Controller MP2000 Series Counter Module CNTR-01 User's Manual* (manual number: SIEPC88070027)
Communication Module	218IF-01 Module	Equipped with serial interface (RS-232C) and Ethernet interface. Allows you to connect to a personal computer, HMI equipment, or controller by other makers via PORT or 10Base-T connector.	*Machine Controller MP2300 Communication Module User's Manual* (manual number: SIEPC88070004)
	218IF-02 Module	Equipped with serial interface (RS-232C) and Ethernet interface. Allows you to connect to a personal computer, HMI equipment, or controller by other makers via PORT or 100Base-TX connector.	
	217IF-01 Module	Equipped with serial interfaces (RS-232C and RS422/485). Allows you to connect to a personal computer, HMI equipment, or controller by other makers via PORT or RS422/485 connector.	
	260IF-01 Module	Equipped with serial interface (RS-232C) and DeviceNet interface. Allows you to connect to a controller by other makers via DeviceNet connector. Also, allows you to connect to a personal computer or HMI equipment by other makers via the PORT connector.	
	261IF-01 Module	Equipped with serial interface (RS-232C) and PROFIBUS interface. Allows you to connect to a controller by other makers via the PROFIBUS connector. Also, allows you to connect to a personal computer or HMI equipment by other makers via the PORT connector.	
	215AIF-01 Module	MPLINK and CP-215 specifications. MPLINK specification is equipped with one line of our original real-time core network interface MPLINK transmission and a serial interface (RS-232C). CP-215 specification is equipped with one line of our original real-time core network interface CP-215 transmission and a serial interface (RS-232C).	

2.4 External Appearance

The external appearance of the basic module is as follows:

2.4.1 Basic Module



* 1. The following cable-side connectors are attached to the power connectors.

- Power connector: 721-203/026-000

Note: Attachment

- Handle for power connector (model: 231-131)
  * These handles are used when connecting a cable to the cable-side connector.

3

Mounting and Wiring

This chapter explains how to handle MP2310 and the connection methods for each module.

3.1 Mounting MP2310 - 3-2

3.1.1 Method - 3-2

3.1.2 MP2310 Mount Direction - 3-5

3.1.3 Replacing and Adding Optional Modules - 3-6

3.2 Basic Module Connections - 3-9

3.2.1 Connectors - 3-9

3.2.2 Power Supply Connector - 3-10

3.2.3 MECHATROLINK Connectors - 3-11

3.2.4 Ethernet Connector Details - 3-15

3.2.5 System Connection Example - 3-19

3.1 Mounting MP2310

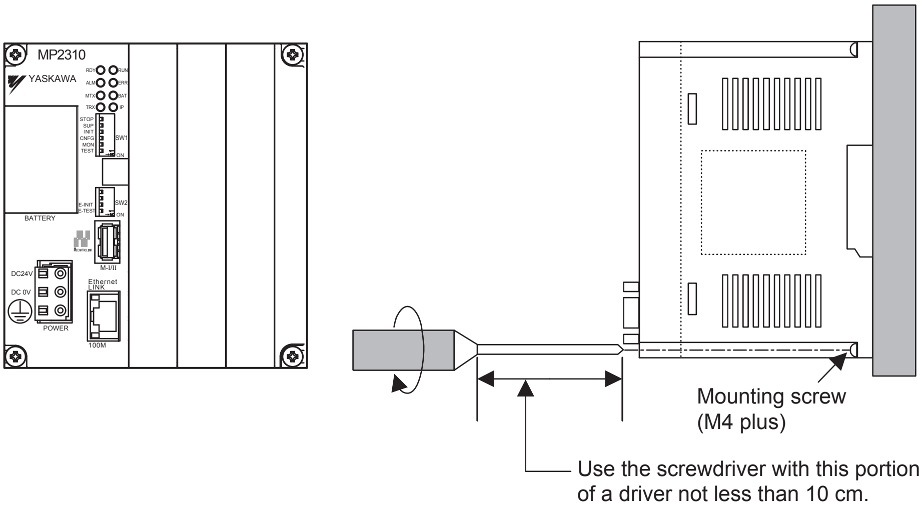
3.1.1 Method

There are two methods for mounting MP2310.

- Using screws
- Using DIN rail

(1) Screwed Method

Push the MP2310 mounted clamp onto the mounting plate as shown in the following figure, and use four mounting screws to firmly secure the clamp.

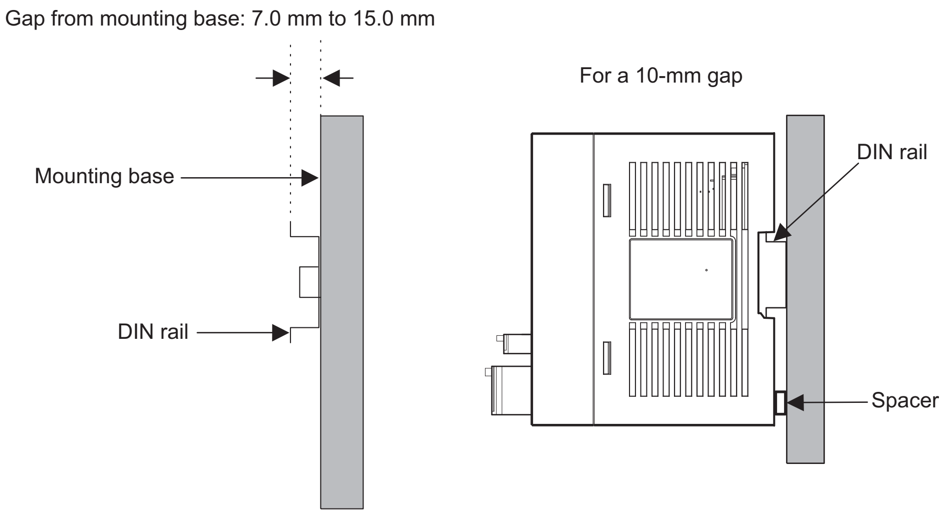


Note: Vertically mount it on the wall as shown in the figure above.

(2) 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 a MP2310 using DIN rail with 10 mm gap, install a spacer on the rear of the MP2310 near the bottom to protect the MP2310 from vibration and shock.

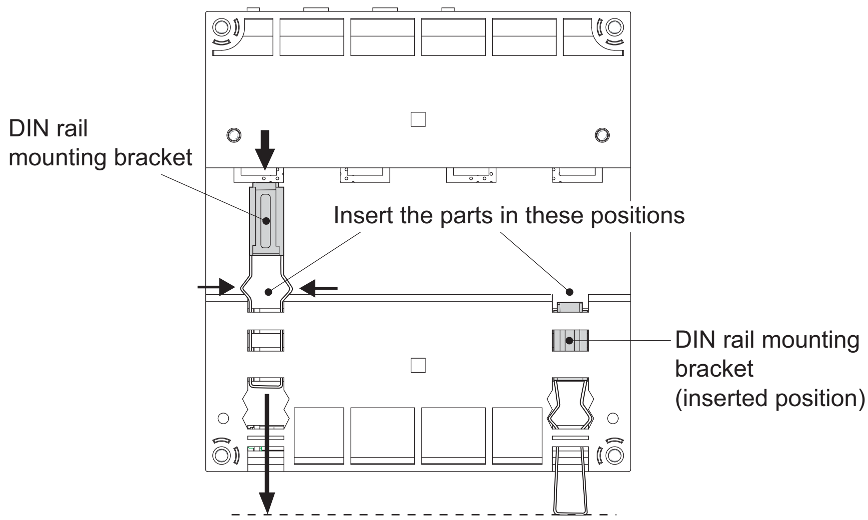


[b] Procedure for Mounting to DIN Rail

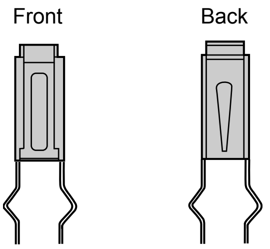
Use the following procedure to attach the DIN rail mounting parts to the MP2310 and then mount the MP2310 to the DIN rail.

1. Insert the DIN rails to the dotted line in the two slots on the rear of the MP2310 as shown in the following figure.

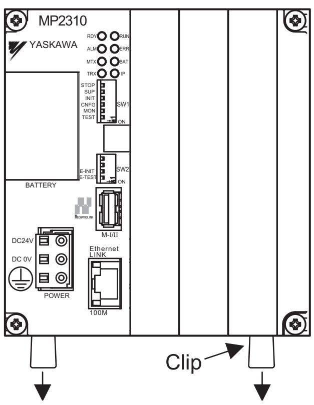
MP2310 Rear Side



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

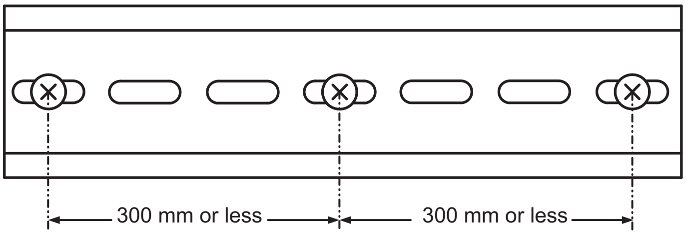


2. Pull the DIN rail mounting clips down to release them.

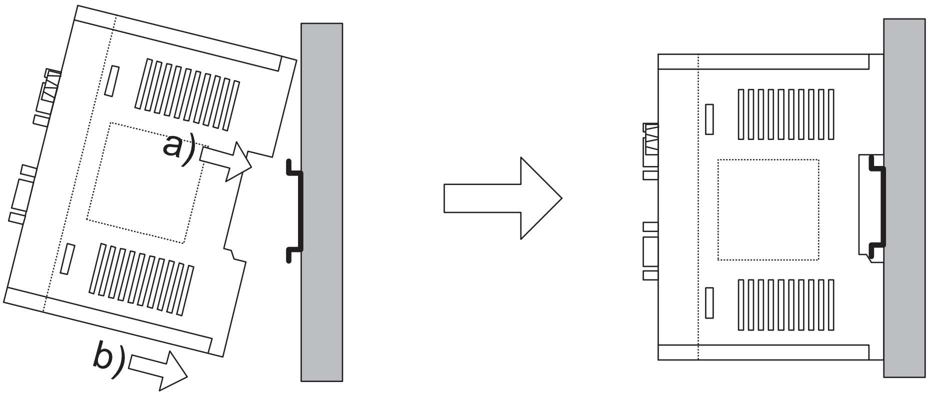


■ Fixing a DIN Rail

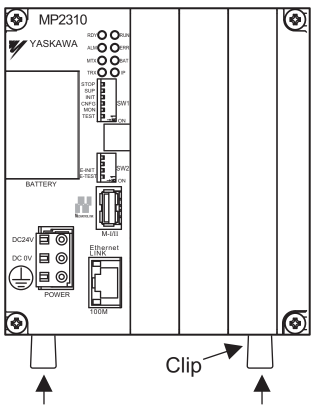
Make sure to fix a DIN rail at 300mm or less pitch as shown in the figure below.



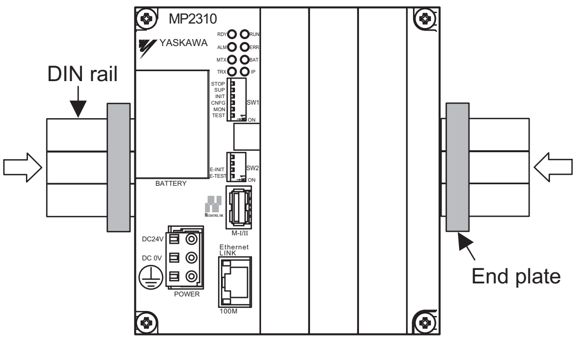
3. Hook the MP2310 to the top of the DIN rail (a), and then push the MP2310 towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MP2310 to secure it to the DIN rail.

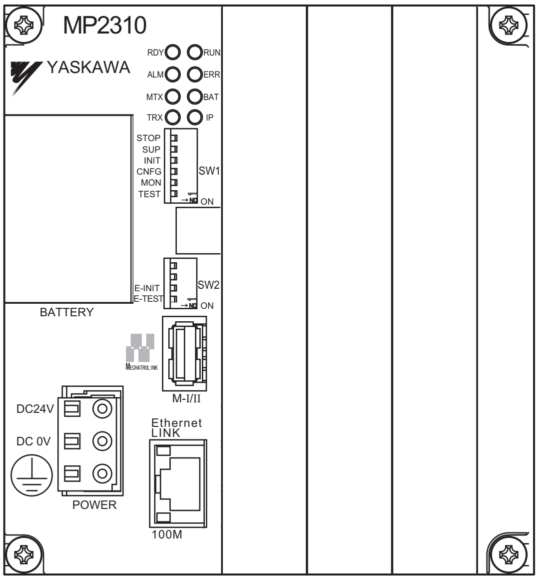


This completes the installation procedure.

3.1.2 MP2310 Mount Direction

Be sure to mount the MP2310 using screwed method or DIN rail.

View from front,
when attached



3.1.3 Replacing and Adding Optional Modules

Use the following procedures to replace and add Optional Modules.

(1) Preparations

1. Create a backup data file.

Use the MPE720 to save the MP2310 program on a computer (right-click the **PLC**, and select ***Transfer - All Files - From Controller to MPE720***.)

2. Remove the MP2310.

Turn OFF the power supply and disconnect all cables from the MP2310. Then remove the MP2310 from the panel or rack and place on a workbench or other area with sufficient space.

(2) Removing Optional Modules

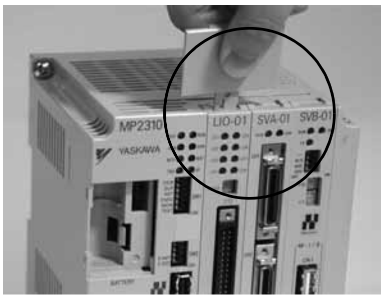
1. Remove the battery cover.

Pull the notch on the side of the MP2310 towards you to remove the battery cover.

2. Remove the panel of Optional Module.

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

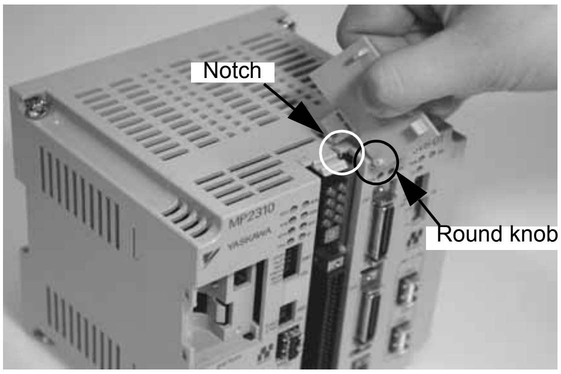
- Remove the front cover (optional) from the empty slot before mounting an Optional Module in an empty slot.



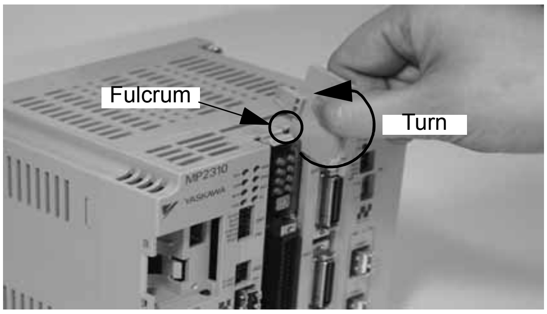
Unhook the bottom in the same way.

3. Remove the Optional Module from the mounting base.

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

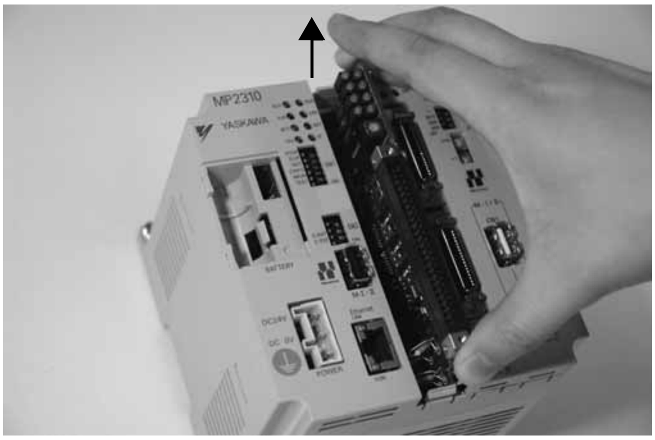


Hold the center of the battery cover as shown in the following diagram. Push the battery cover down and out, rotating from the round knob to disconnect the Module and mounting base connectors, and then pull the Optional Module forward.



4. Pull out the Optional Module.

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



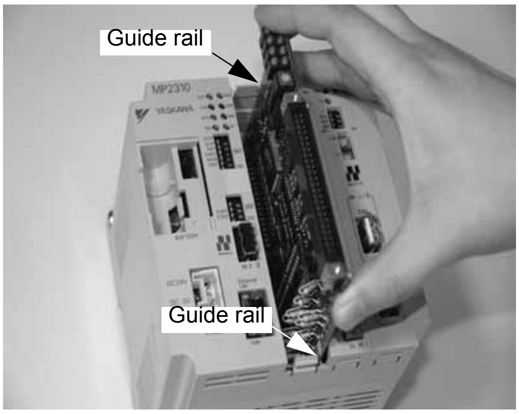
Put the removed Module into the bag that was supplied with and store the Module in this bag.

(3) Installing Optional Modules

1. Insert Optional Modules.

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

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

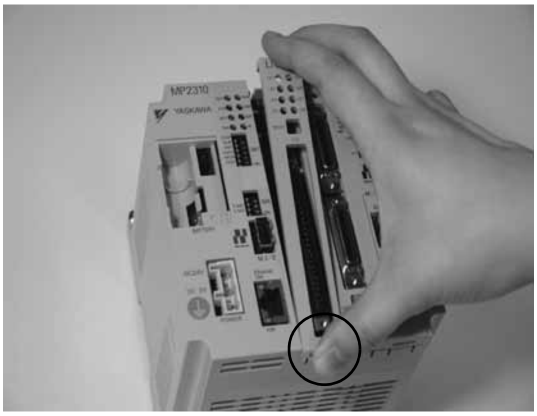


2. Mount on to the mounting base.

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

3. Install the panel of the Optional Module.

Place the hole on the bottom of the panel of the Optional Module onto the hook on the bottom of the MP2310. Next, hook the hole at the top of the panel of the Optional Module onto the hook at the top of the MP2310.

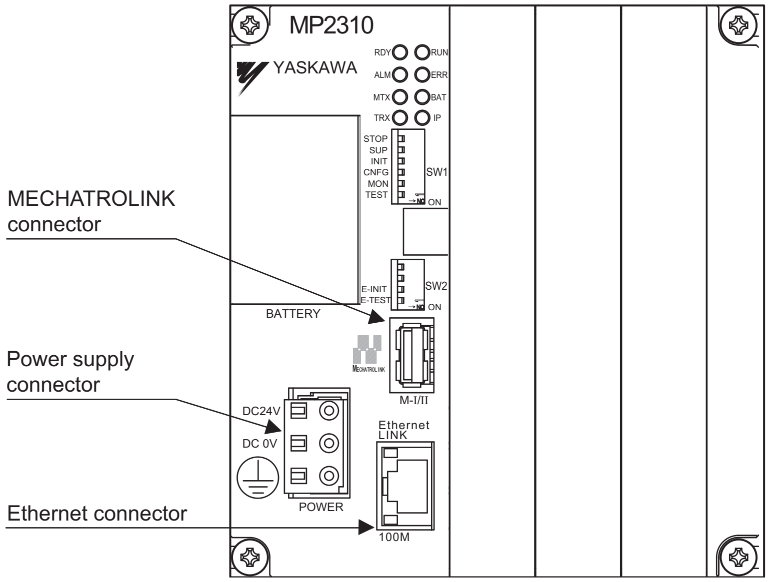


This completes the Optional Module mounting procedure.
Be sure to attach the optional cover (model: JEPMC-OP2300) on the empty slot.

3.2 Basic Module Connections

3.2.1 Connectors

The following diagram shows the connectors for the Basic Module.

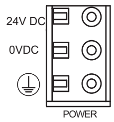


3.2.2 Power Supply Connector

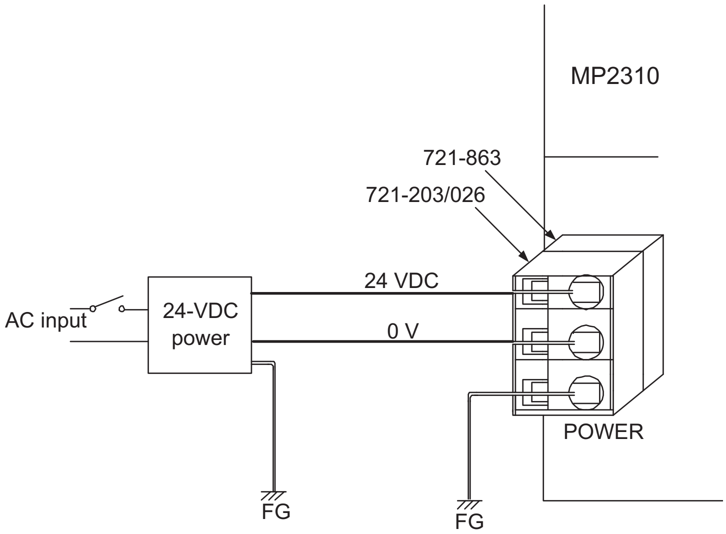
(1) Specifications, Pin Arrangement, and Connection Procedure

Supply a 24-VDC to the MP2310. 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.)

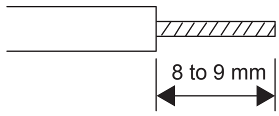


- Use an insulated 24-VDC power supply. Attach the power supply switch on the AC side. If the switch is attached on the 24-VDC side, there will be an inrush current of approximately 40 A when the power is turned ON.

(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. 6.5 mm the end of the wire.



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

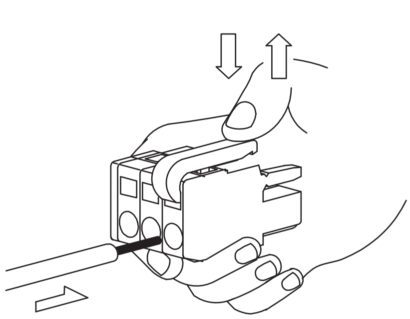


Fig. A (with lever)

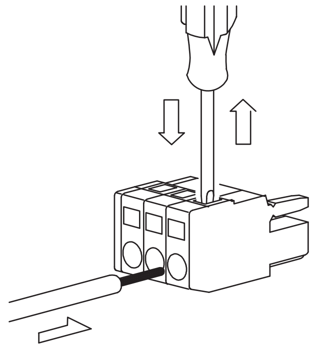


Fig. B (with screwdriver)

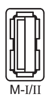
3. Insert the wire into the opening and then close the opening by releasing the lever or removing the screwdriver.

3.2.3 MECHATROLINK Connectors

MECHATROLINK connector is used to connect the MP2310 and the SERVOPACKs and distributed I/O via MECHATROLINK cables.

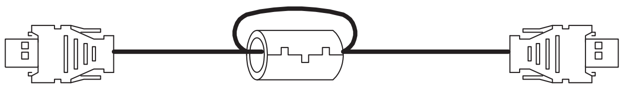
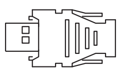
(1) Specifications and Pin Arrangement

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



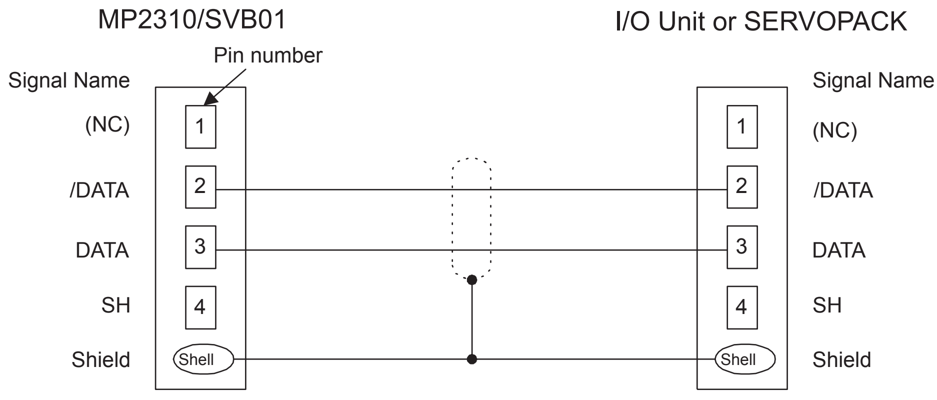
No.	Signal Name	Description
1	(NC)	Not used
2	/DATA	Signal –
3	DATA	Signal +
4	SH	Not used
Shell	Shield	Connect a shielded wire.

(2) Cables

<table>
<tr><th>Name and Specification</th><th>Model Number</th><th>Length</th></tr>
<tr><td rowspan="9">MECHATROLINK Cable
MECHATROLINK Connector – MECHATROLINK Connector
</td><td>JEPMC-W6002-A5</td><td>0.5 m</td></tr>
<tr><td>JEPMC-W6002-01</td><td>1 m</td></tr>
<tr><td>JEPMC-W6002-03</td><td>3 m</td></tr>
<tr><td>JEPMC-W6002-05</td><td>5 m</td></tr>
<tr><td>JEPMC-W6002-10</td><td>10 m</td></tr>
<tr><td>JEPMC-W6002-20</td><td>20 m</td></tr>
<tr><td>JEPMC-W6002-30</td><td>30 m</td></tr>
<tr><td>JEPMC-W6002-40</td><td>40 m</td></tr>
<tr><td>JEPMC-W6002-50</td><td>50 m</td></tr>
<tr><td rowspan="9">MECHATROLINK Cable
MECHATROLINK Connector – MECHATROLINK Connector
(with Ferrite Core)
</td><td>JEPMC-W6003-A5</td><td>0.5 m</td></tr>
<tr><td>JEPMC-W6003-01</td><td>1 m</td></tr>
<tr><td>JEPMC-W6003-03</td><td>3 m</td></tr>
<tr><td>JEPMC-W6003-05</td><td>5 m</td></tr>
<tr><td>JEPMC-W6003-10</td><td>10 m</td></tr>
<tr><td>JEPMC-W6003-20</td><td>20 m</td></tr>
<tr><td>JEPMC-W6003-30</td><td>30 m</td></tr>
<tr><td>JEPMC-W6003-40</td><td>40 m</td></tr>
<tr><td>JEPMC-W6003-50</td><td>50 m</td></tr>
<tr><td rowspan="9">MECHATROLINK Cable
MECHATROLINK Connector – Loose Wire
</td><td>JEPMC-W6011-A5</td><td>0.5m</td></tr>
<tr><td>JEPMC-W6011-01</td><td>1 m</td></tr>
<tr><td>JEPMC-W6011-03</td><td>3 m</td></tr>
<tr><td>JEPMC-W6011-05</td><td>5 m</td></tr>
<tr><td>JEPMC-W6011-10</td><td>10 m</td></tr>
<tr><td>JEPMC-W6011-20</td><td>20 m</td></tr>
<tr><td>JEPMC-W6011-30</td><td>30 m</td></tr>
<tr><td>JEPMC-W6011-40</td><td>40 m</td></tr>
<tr><td>JEPMC-W6011-50</td><td>50 m</td></tr>
<tr><td>Terminator
</td><td>JEPMC-W6022</td><td>–</td></tr>
</table>

(3) Cable Connections between the MP2310 and I/O Units and the MP2310 and SERVOPACKs

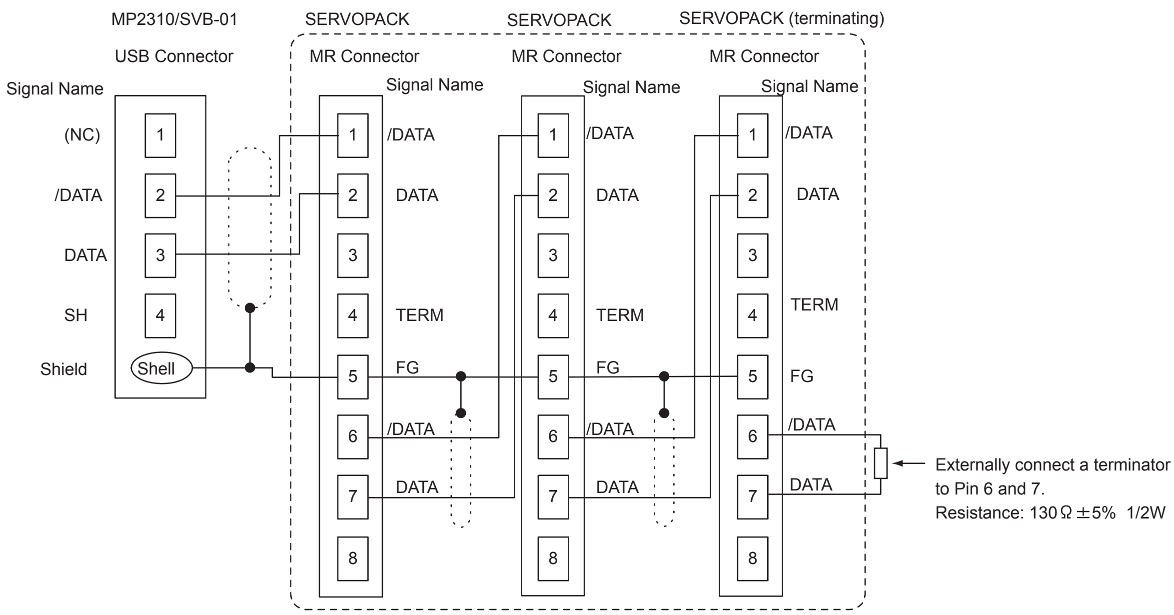
Use the MECHATROLINK cable JEPMC-W6002-☐☐ or JEPMC-W6003-☐☐ with a ferrite core for connection between the MP2310 and I/O units or SERVOPACKs.



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

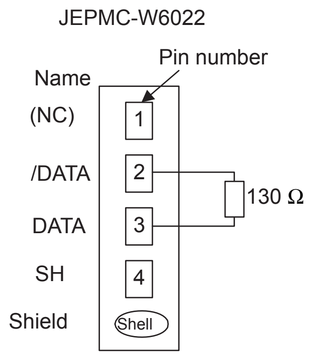
(4) Cable Connections between the MP2310 and SGD-☐☐☐N and SGDB-☐☐AN SERVOPACKs

Use the MECHATROLINK cable JEPMC-W611-☐☐ for the connections between the MP2310 and SGD-☐☐☐N or SGDB-☐☐AN SERVOPACK and between these SERVOPACKs.

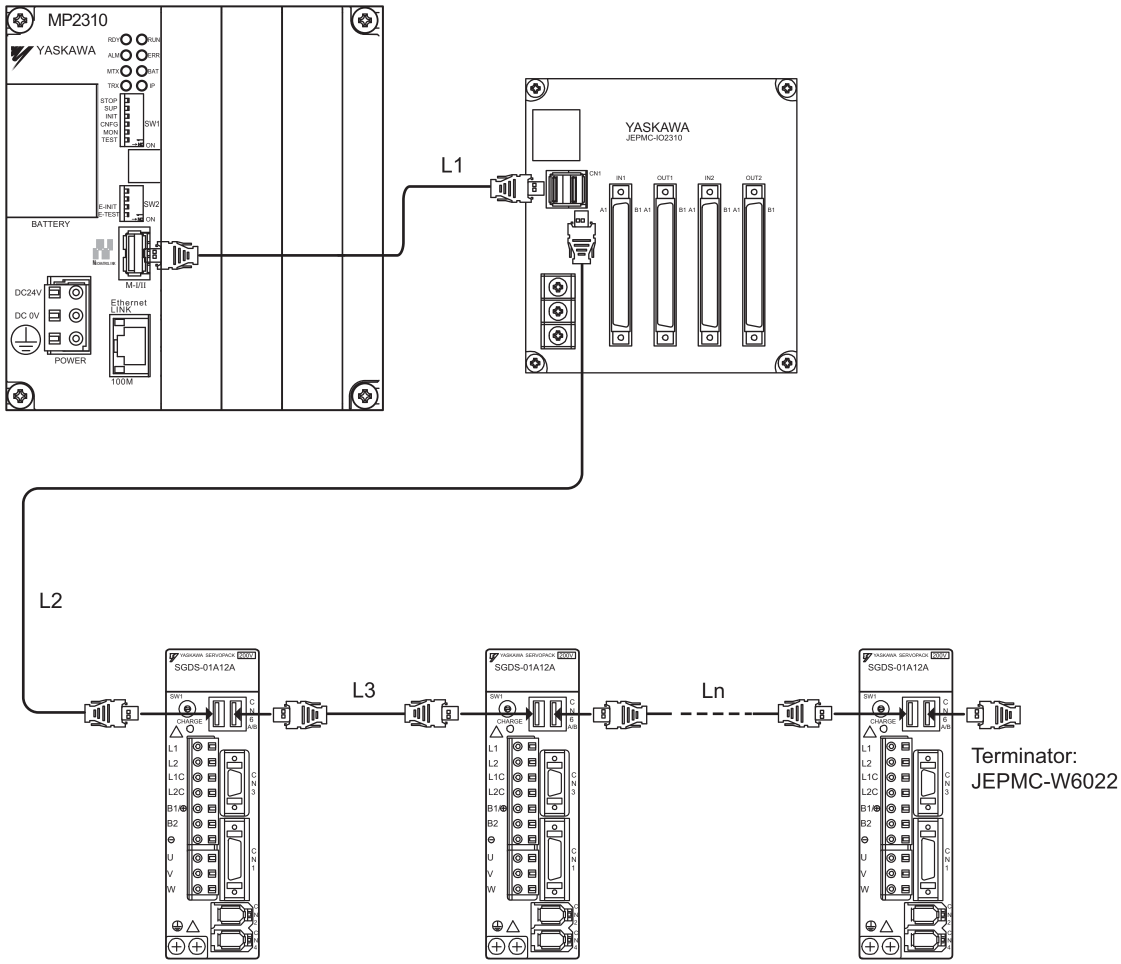


Note: 1. The JEPMC-6011-☐☐ has a USB connector on one end and loose wires on the other end. Use an MR connector and wiring material to create a 1:N cable. The terminator must be provided by the user.
2. The shield wire can be connected as instructed in the SERVOPACK's manual. However, the connections shown in the above diagram is recommended when using the MP2310 in combination with a SVB-01 Module.
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 MP2310, 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

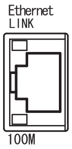
Connects to a personal computer or HMI device by Ethernet (100Base-TX /10Base-T).

(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.

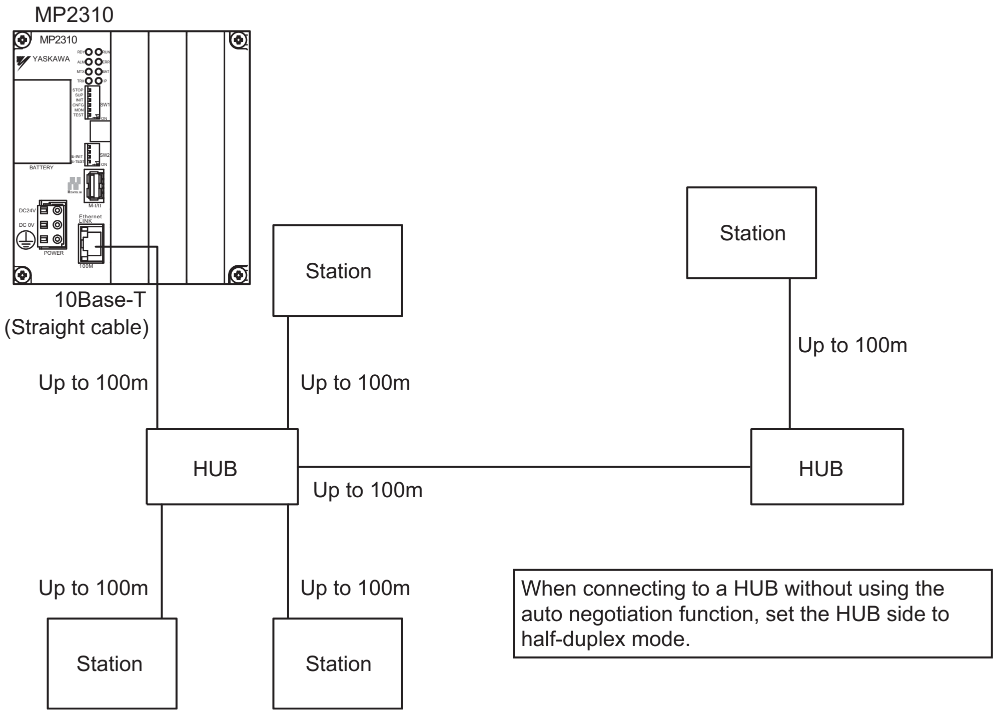
Ethernet Type	Category	Remarks
10Base-T	Category 3 or more	• When connecting to remote equipment through a hub: Straight cable • When connecting to remote equipment without using a hub: Cross cable
100Base-TX	Category 5 or more	

(3) Ethernet Connection Example

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

■ Connection Example 1

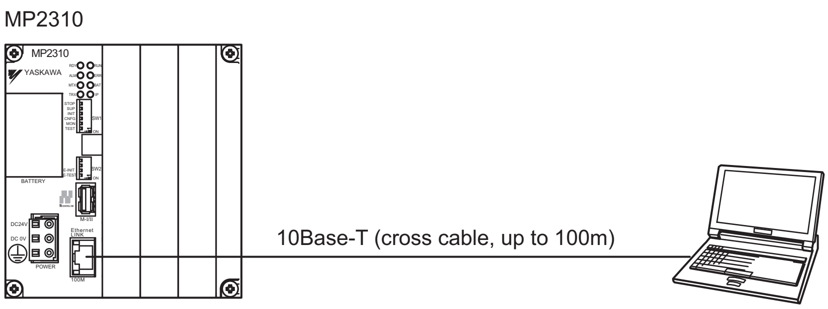
When using a repeater HUB:



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

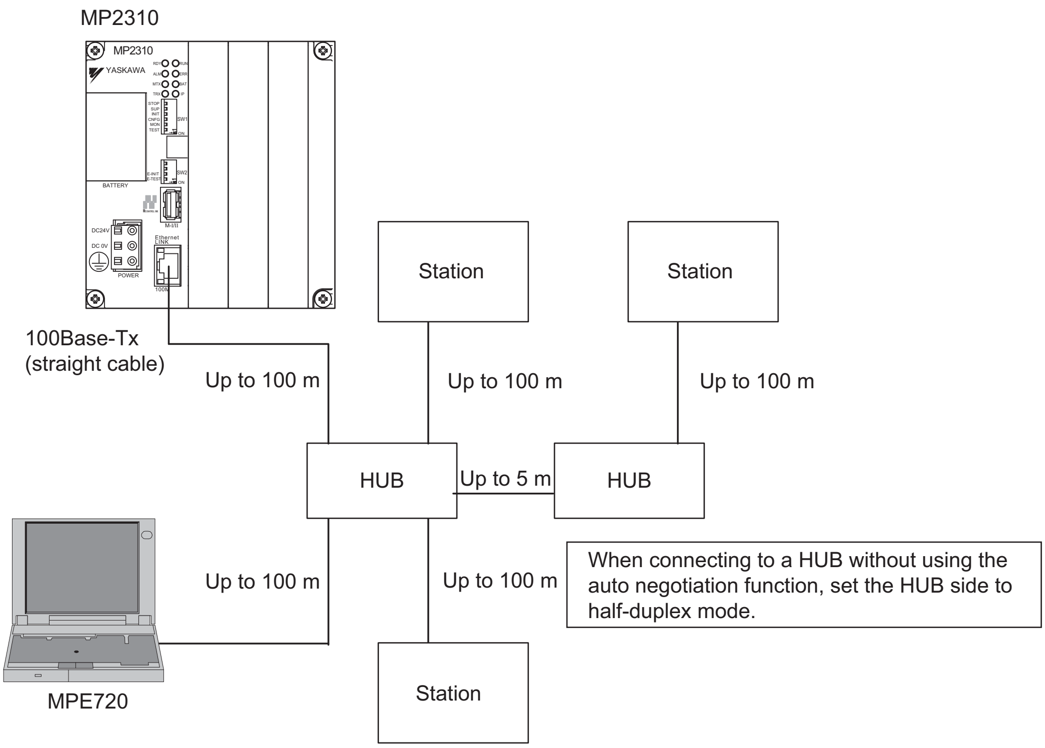
■ Connection Example 2



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

■ Connection Example 3

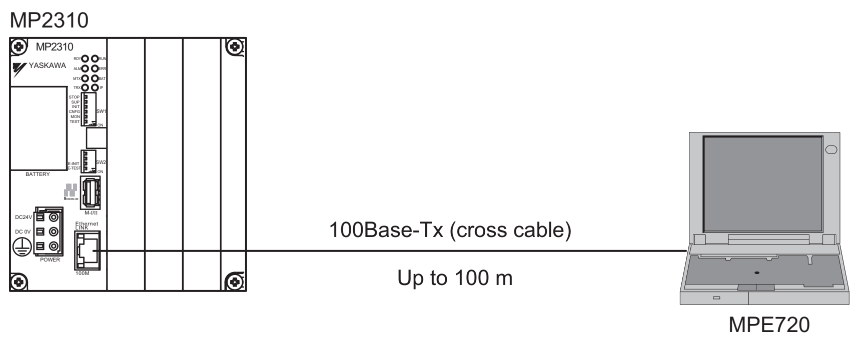
When using a repeater HUB:



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 4



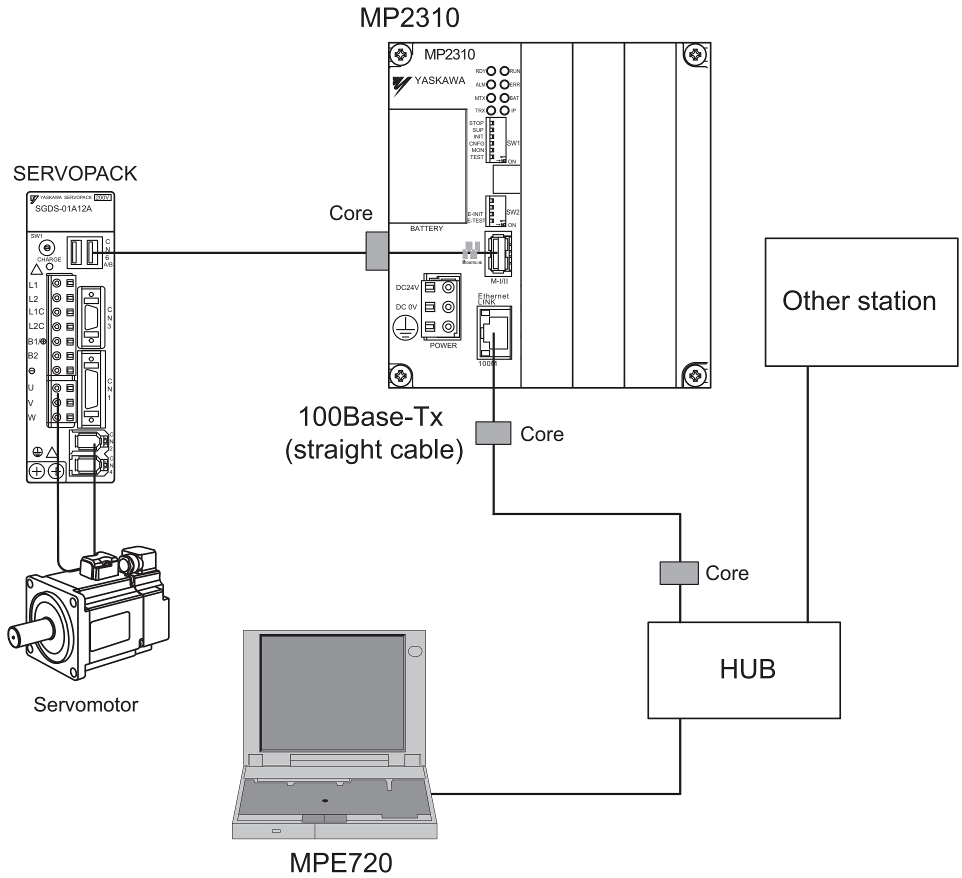
■ Caution

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 MP2310 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 MP2310 main unit.
MECHATROLINK : Attach it only to the communication port side of the MP2310 main unit.
(We will provide a standard cable with core. Model: JEPMC-W6003-□□)



Note: Recommended ferrite core

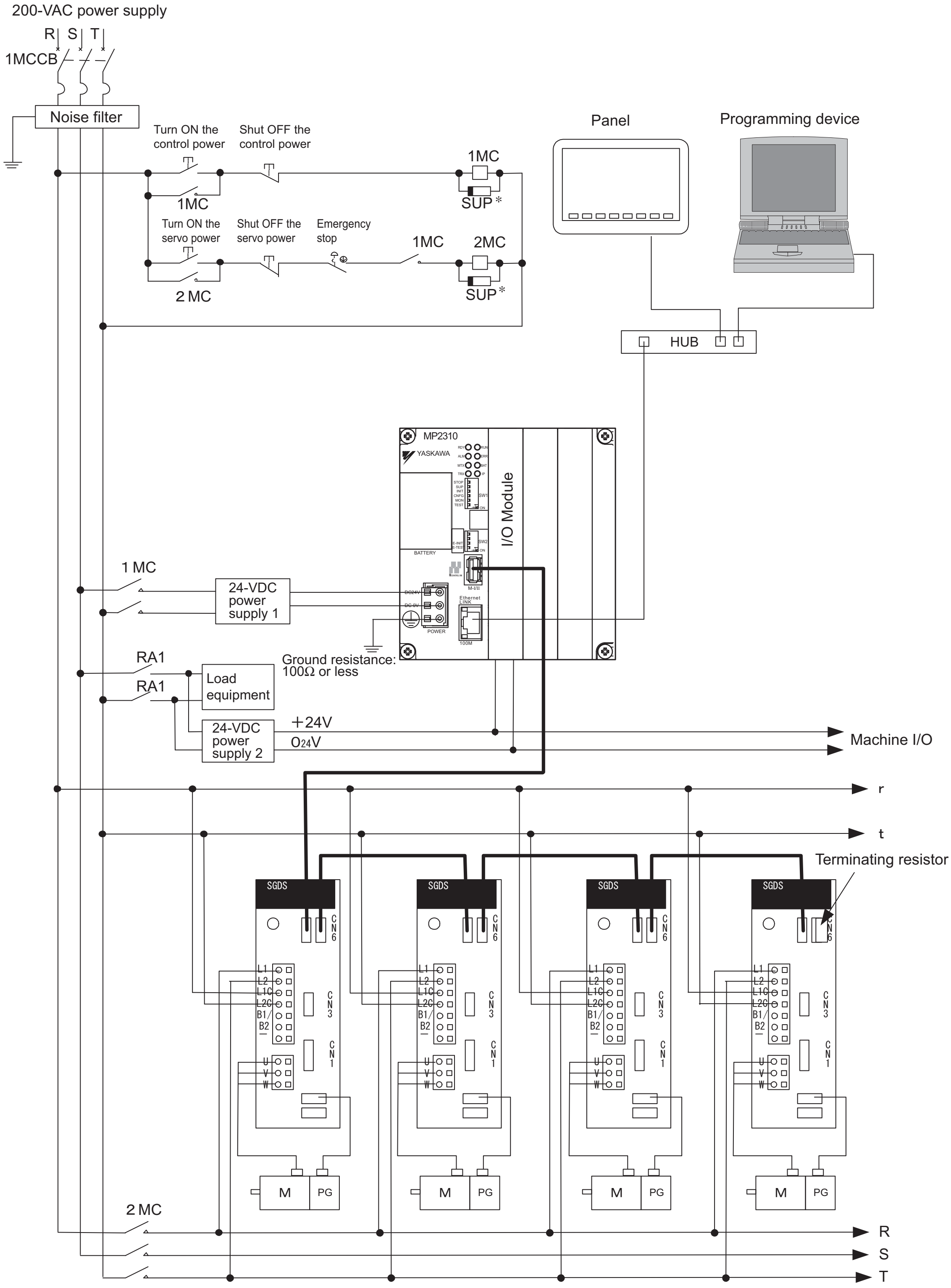
Model:	Manufacturer
E04SR301334	Seiwa Electric Mfg. Co., Ltd

3.2.5 System Connection Example

The following diagram shows a connection example of a system using the MP2310.

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

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



* SA: Surge absorber

MEMO

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 - 4-2

4.2 Preparation (step 1) - 4-3
- 4.2.1 Wiring - 4-3
- 4.2.2 Self Configuration - 4-5
- 4.2.3 Test Operation - 4-6

4.3 Programming (step 2) - 4-9
- 4.3.1 Initializing the M-EXECUTOR Module - 4-9
- 4.3.2 Programming Procedure - 4-12

4.4 Executing Motion (step 3) - 4-14
- 4.4.1 Registering Program Execution - 4-14
- 4.4.2 Starting a Motion Program Using the Operation Control Panel - 4-15

4.5 Starting Motion Program from an External Signal - 4-16
- 4.5.1 Overview - 4-16
- 4.5.2 Required Equipment - 4-16
- 4.5.3 Creation Procedure - 4-18

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;
```

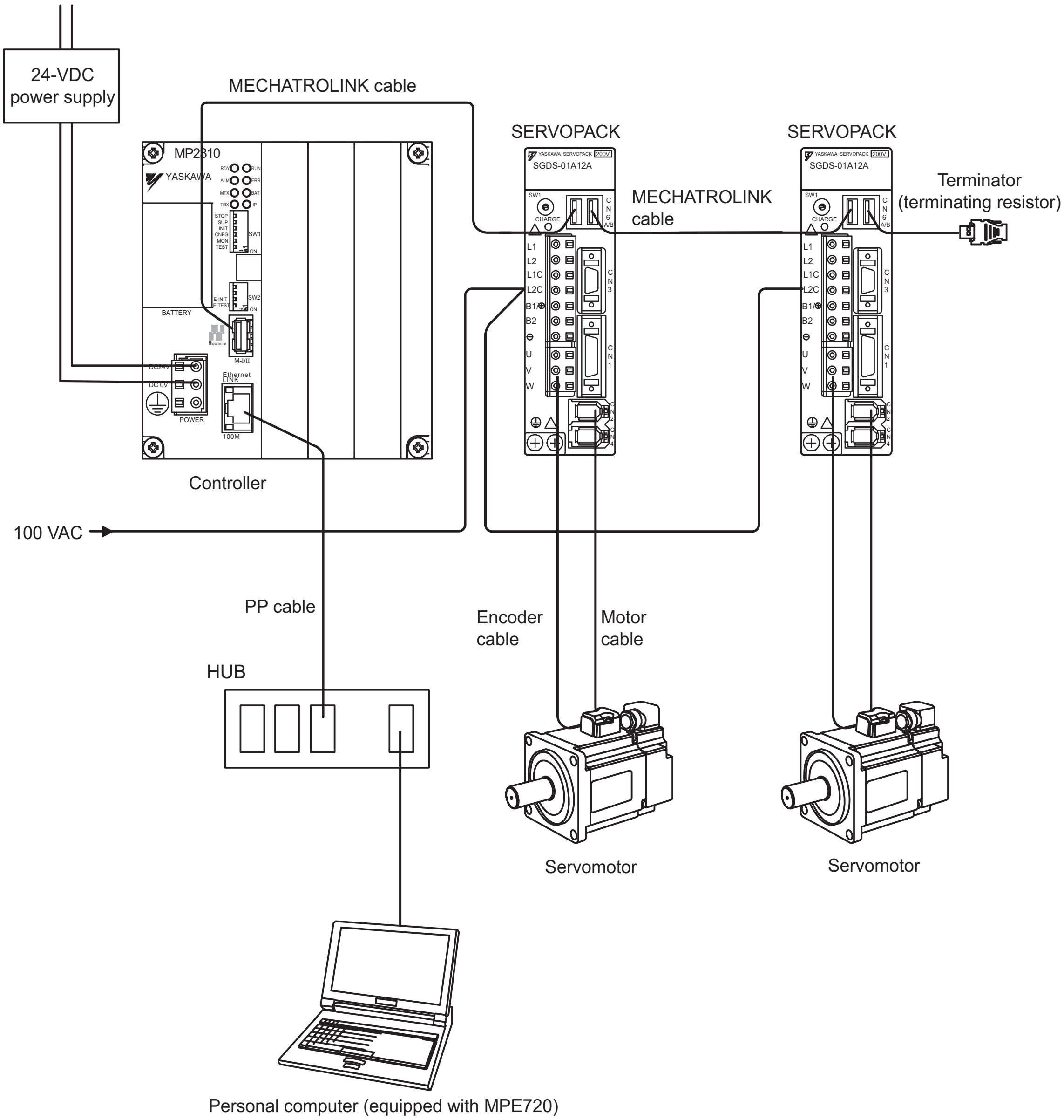
4.2 Preparation (step 1)

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
MP2310	JEPMC-MP2310-E	1
MECHATROLINK cable (0.5m)	JEPMC-W6002-A5	2
Terminator (terminating resistor)	JEPMC-W6022	2
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	CPMC-MPE770	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

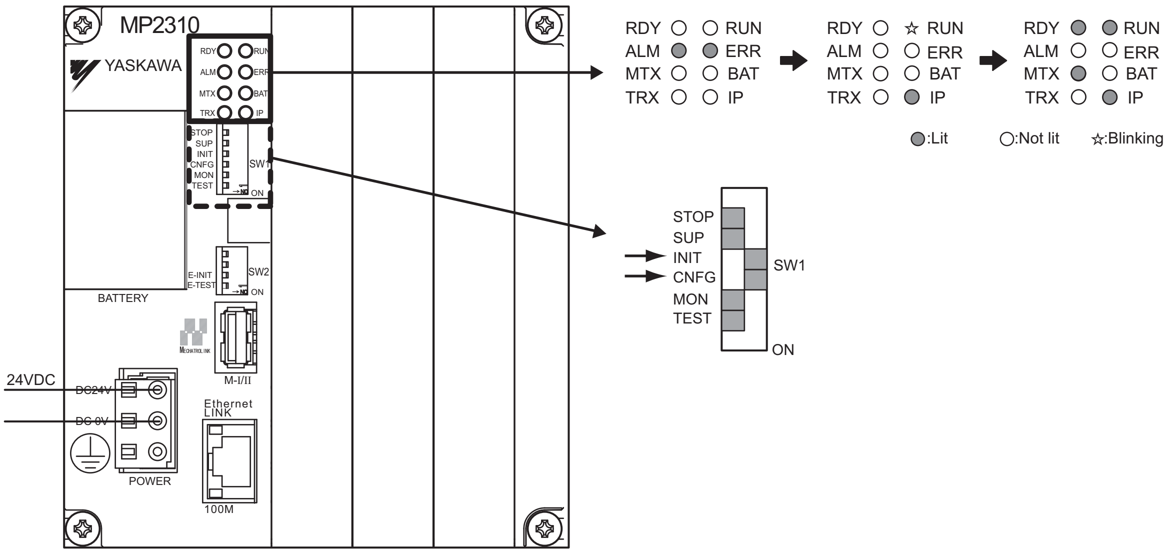
■ Caution

- 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-46.
- 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 MP2310 24-V power supply.
3. Turn ON “INIT” and “CONFIG” of DIP switch (SW1) on the MP2310 main unit.
4. Turn ON the 24-VDC power supply on the MP2310 main unit, and confirm the LED display changes as follows:



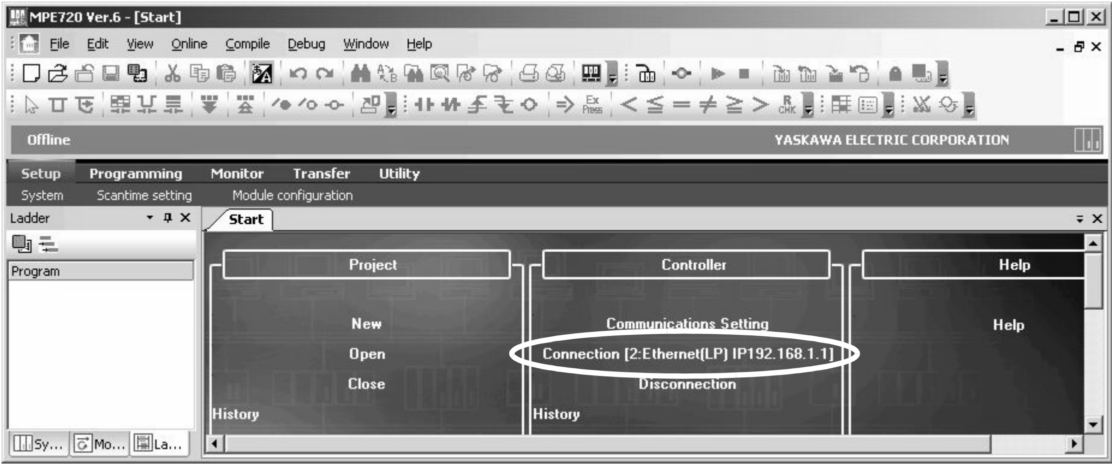
5. Self configuration is complete, and MECHATROLINK slave device information has been written to a definition information file.
6. Turn OFF “INIT” and “CONFIG” of DIP switch (SW1) on the MP2310 main unit.

4.2.3 Test Operation

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

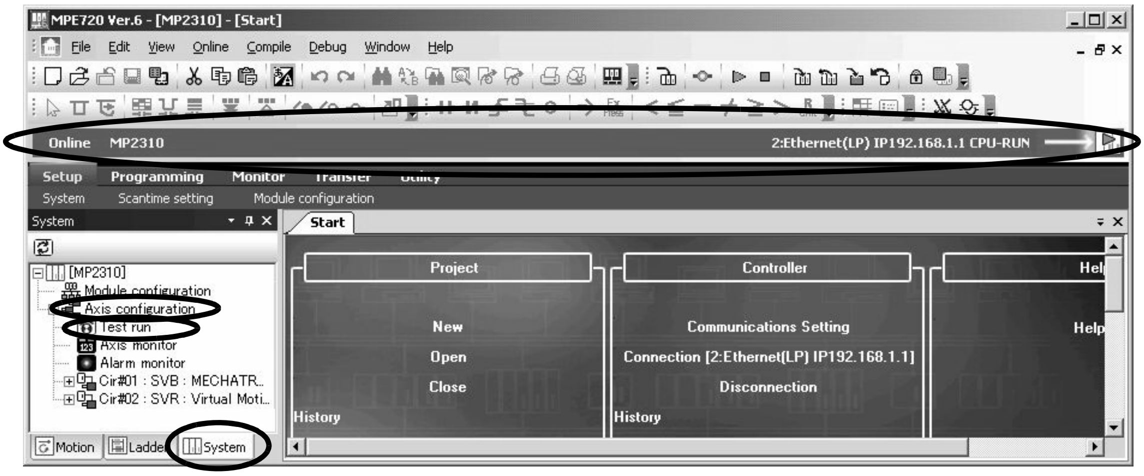
(1) Starting and Connecting MPE720 Ver.6

Launch MPE720Ver.6 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-46.

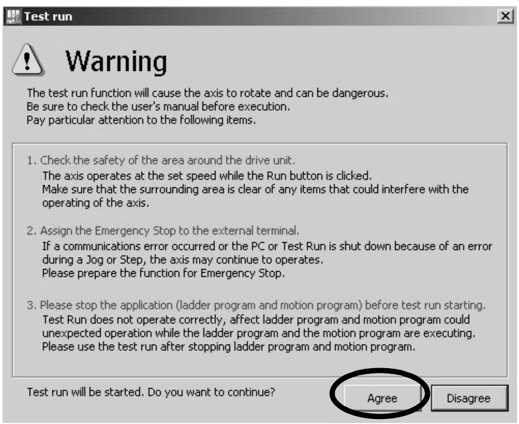


When the connection is complete, the display will change from offline to online.

(2) Operating Manually in the Test Operation Screen

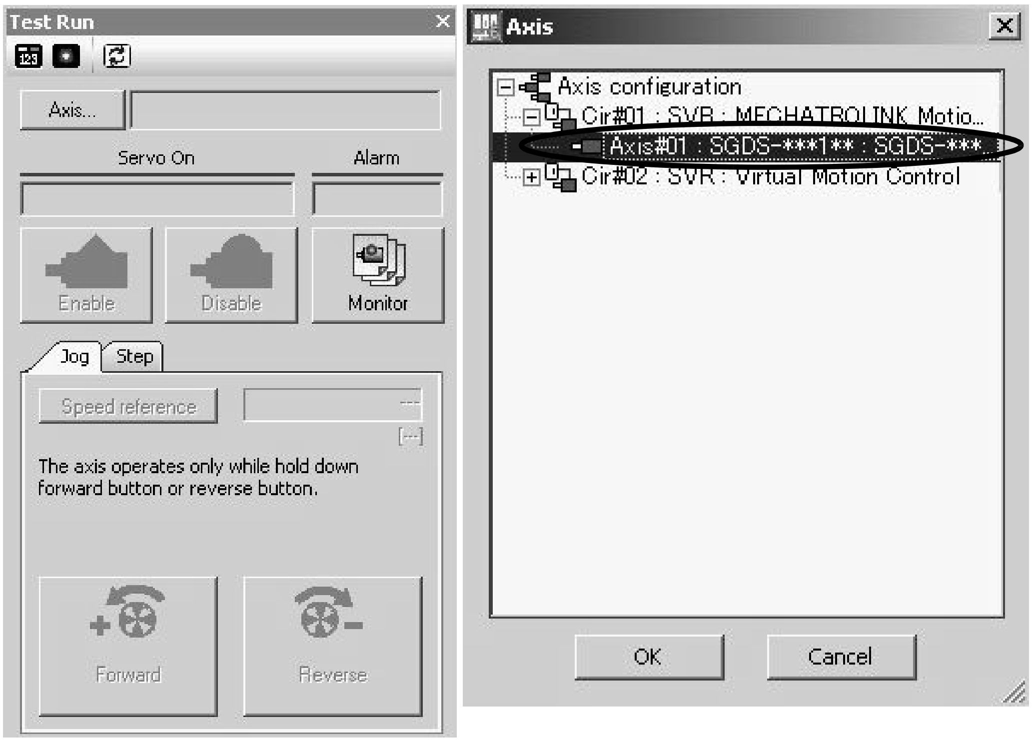


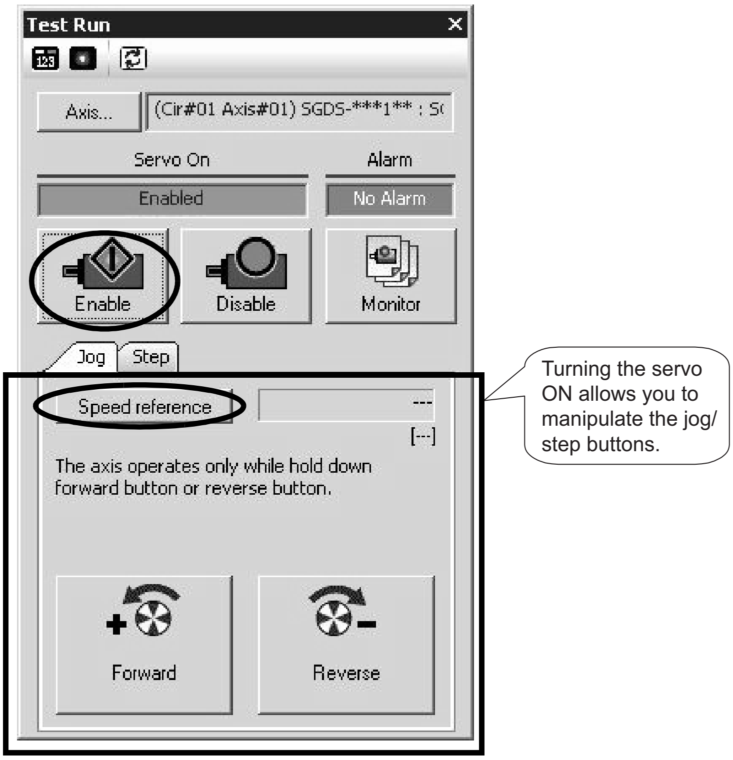
1. Click **System** in the subwindow and double-click ***Axis Configuration - Test Run*** to display a warning dialog a box for the test run. Click the **Agree** Button.



2. Axis Selection and Servo ON

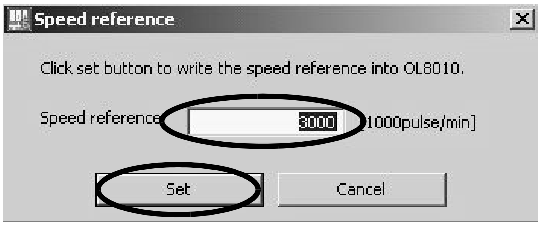
Set an axis number in the **Axis** Window and click the **Enable** (Servo ON) Button in the **Test Run** Window.

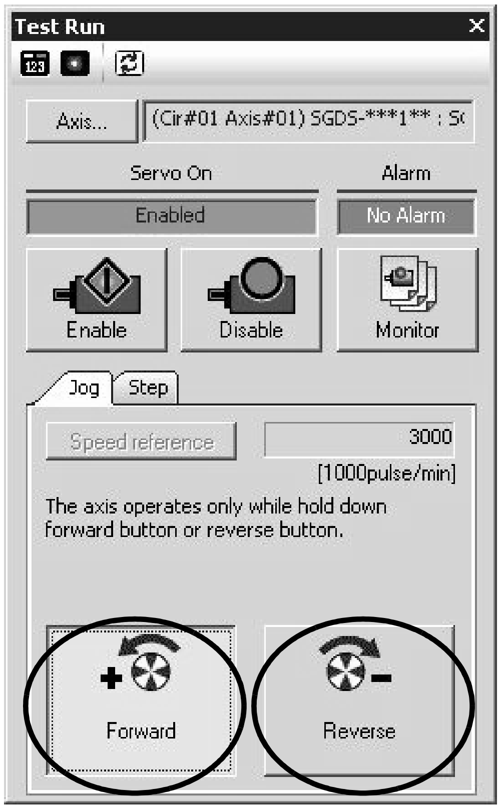




3. Jog Operation

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.

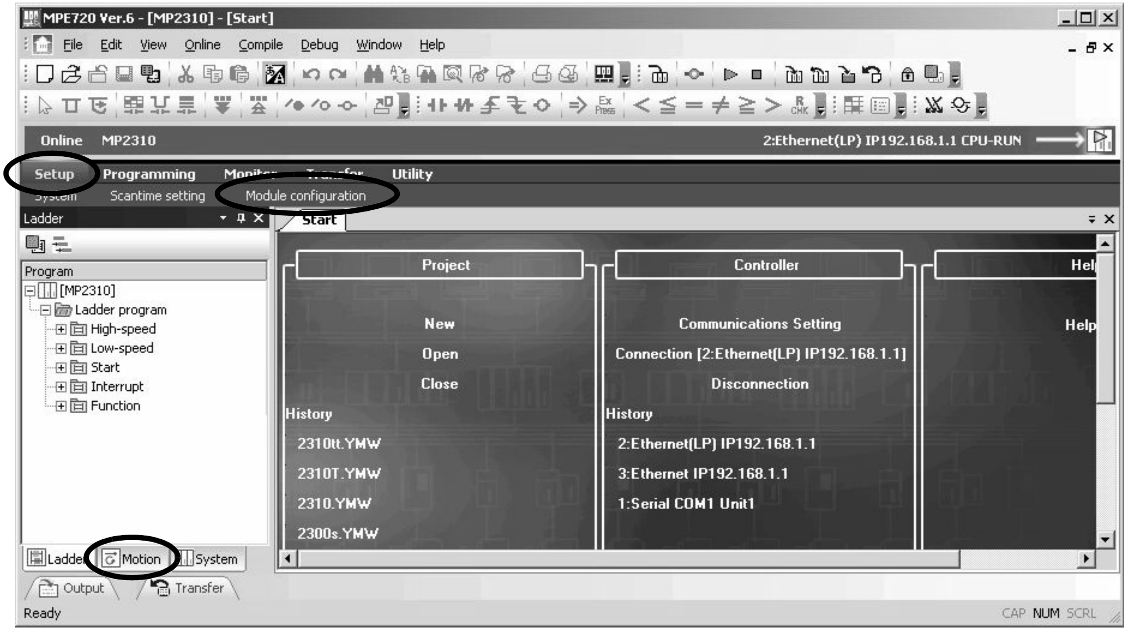
4.3 Programming (step 2)

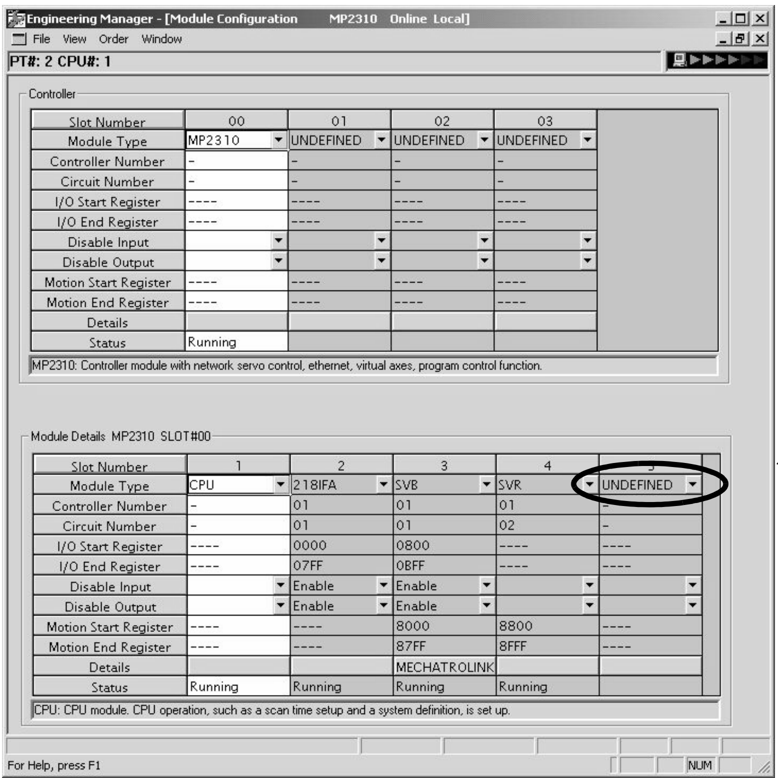
This section describes the procedure of initializing the M-EXECUTOR Module and the procedure from creating to saving a motion program.

4.3.1 Initializing the M-EXECUTOR Module

The M-EXECUTOR Module is disabled in default. Initialize the M-EXECUTOR Module to enable its function by the following procedure.

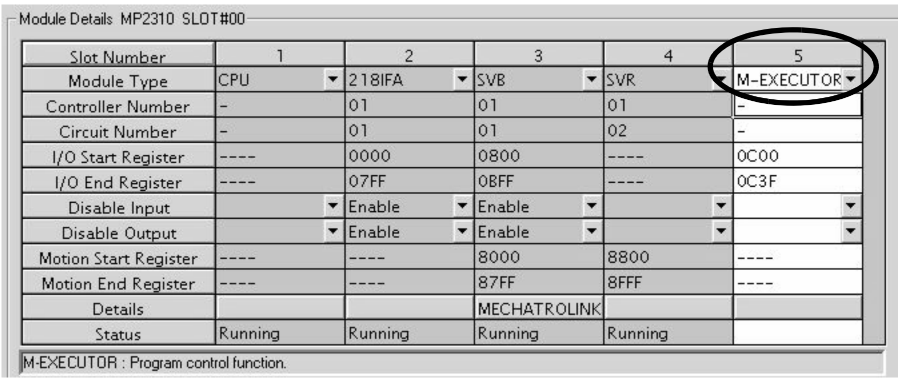
1. Double-click Module Configuration Definition Tab from Setup Menu. The Module Configuration Definition Window will appear.





The default of No.5 Module is "UNDEFINED."

2. Allocate the M-EXECUTOR to No.5 cell in the **Module Details** Area.

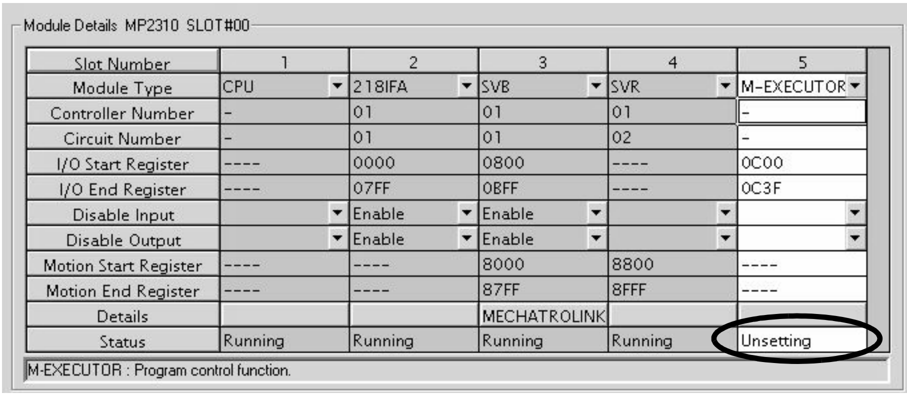


Module Details MP2310 SLOT#00

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	

M-EXECUTOR : Program control function.

3. Click **Save** Icon to save the module configuration definition. Check the status of No.5 cell becomes *Unsetting*.

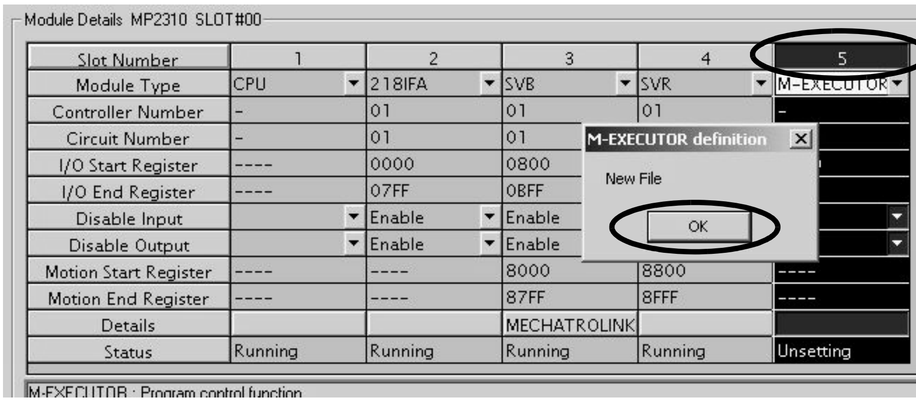


Module Details MP2310 SLOT#00

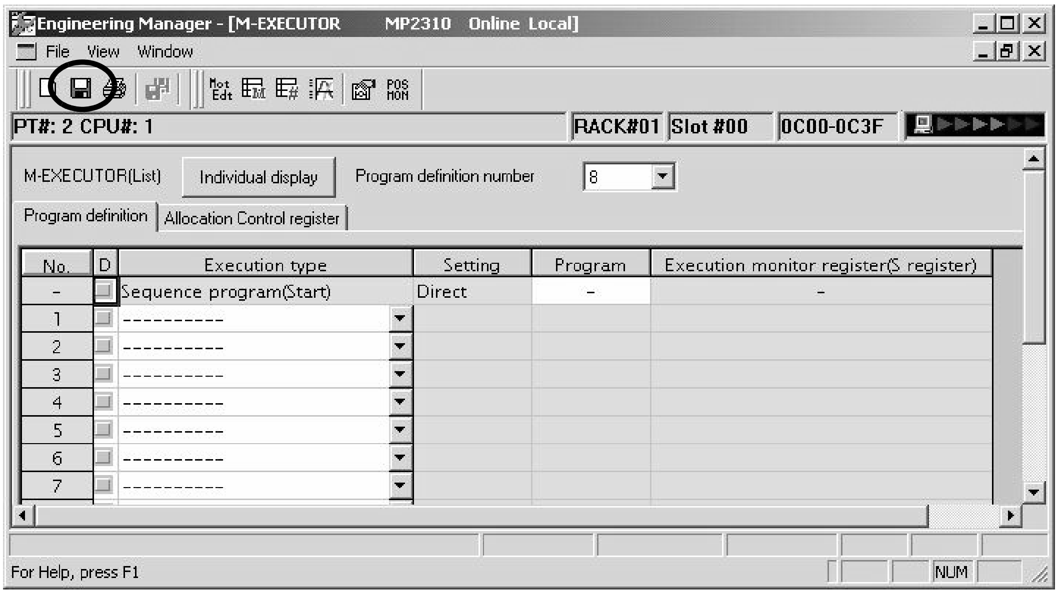
Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Unsetting

M-EXECUTOR : Program control function.

4. Double-click No.5 cell, then the **M-EXECUTOR Definition** Dialog Box will appear. Click OK.

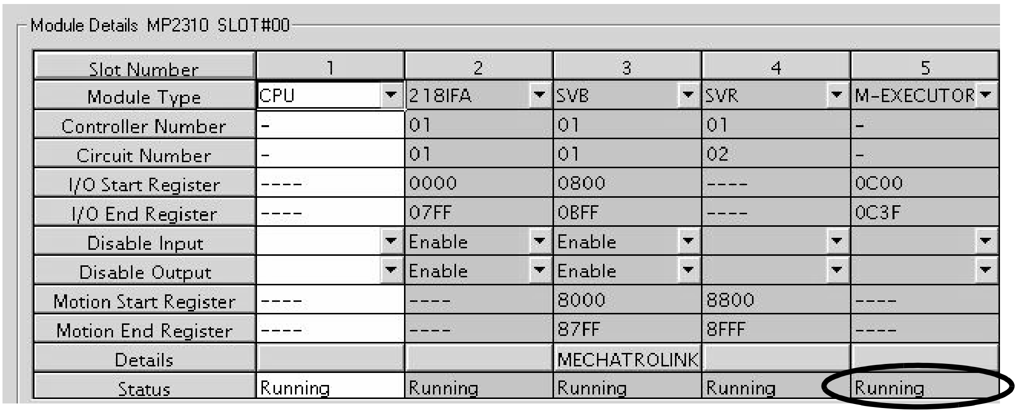


5. The following window will appear. Click **Save** Icon to save the M-EXECUTOR definitions.



This completes the initialization.

6. Return to Module Configuration Window. Check the status of No.5 cell changes from *Unsetting* to *Running*.

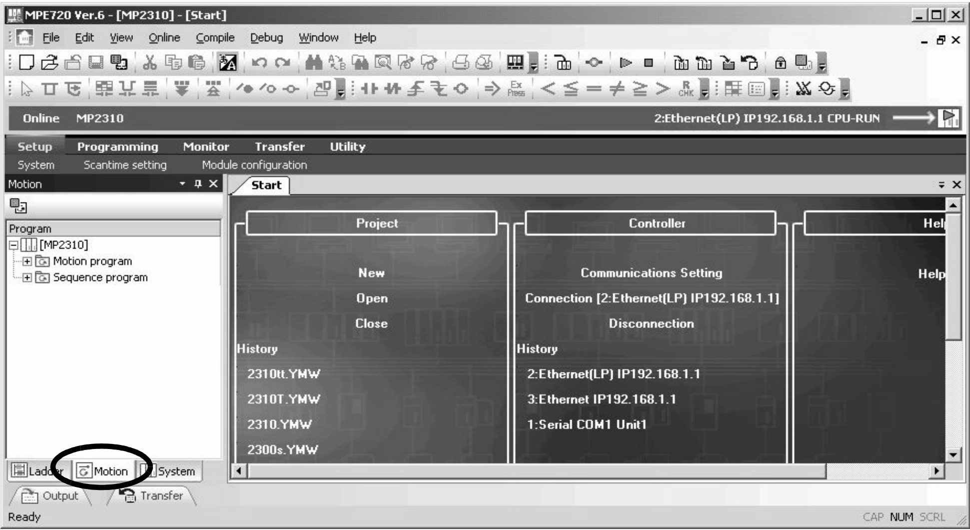

Module Details MP2310 SLOT#00

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

This enables the M-EXECUTOR function.

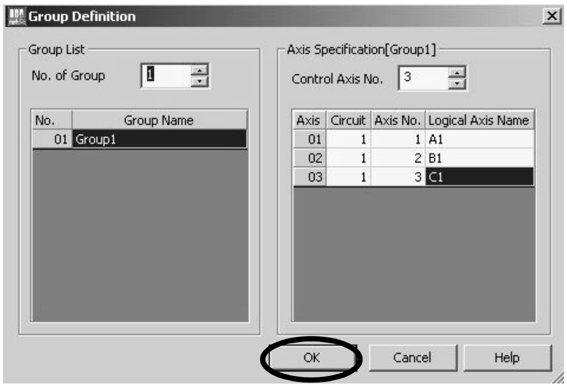
4.3.2 Programming Procedure

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

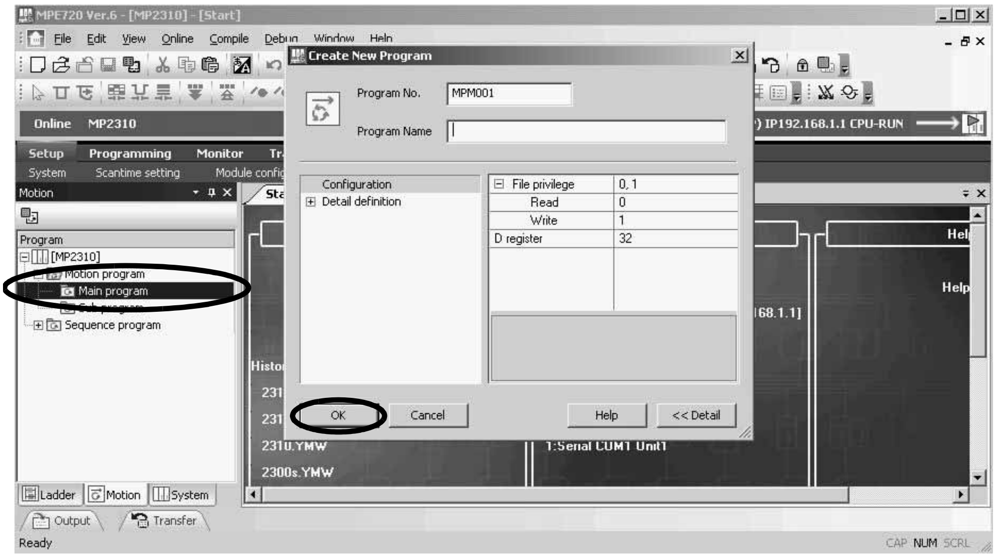


2. The motion program subwindow will appears.

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.



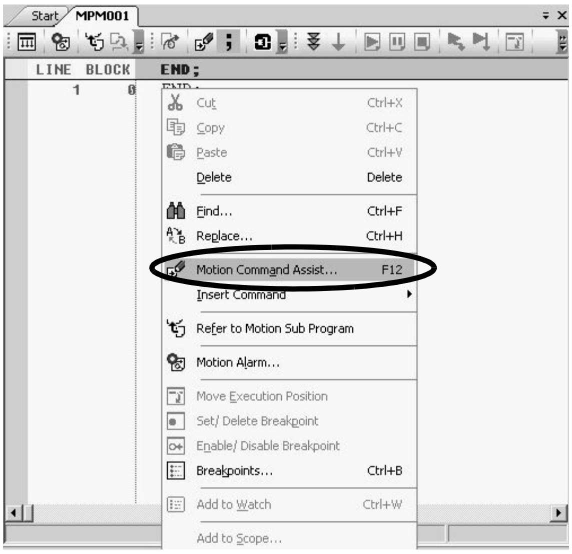
3. Right-click **Main Program** and select **Create New** to display the **Create New Program** Dialog Box. Then click the **OK** Button.



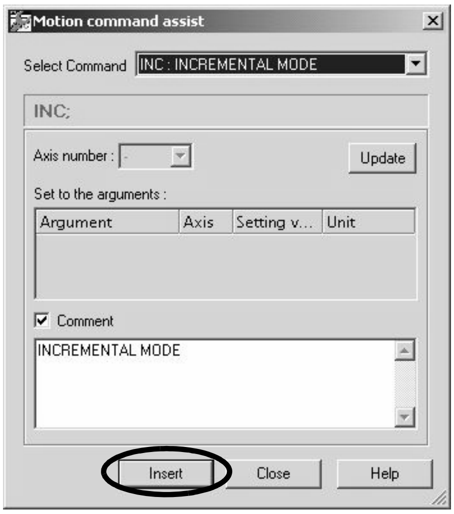
4. Editing Motion Program

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

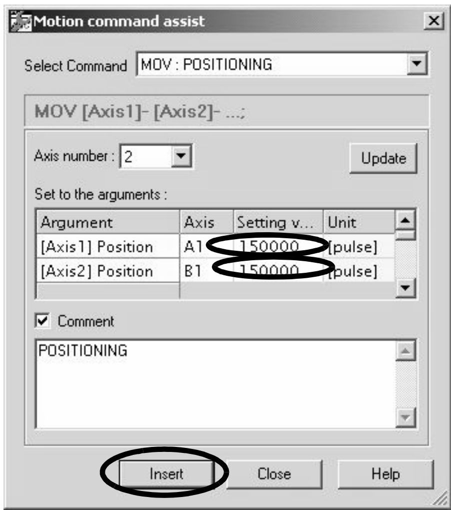
- Call the command input assist feature



- Insert an INC Command



- Insert a MOV Command

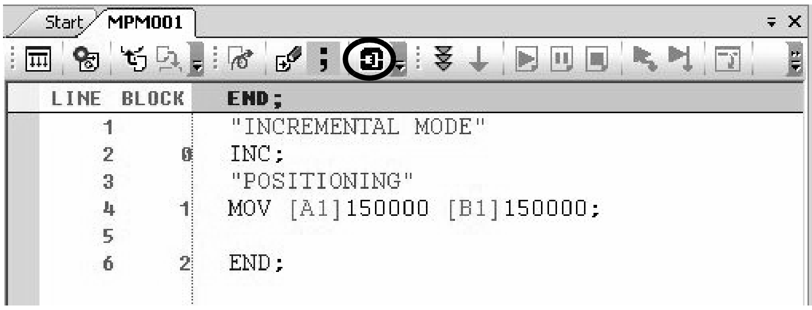


Click the save icon to save the motion program.

4.4 Executing Motion (step 3)

4.4.1 Registering Program Execution

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

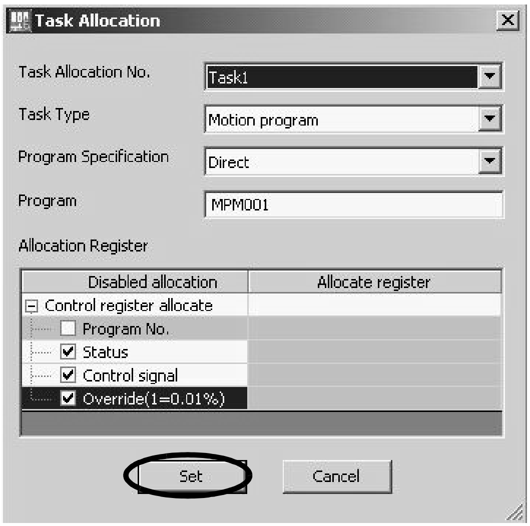


Note: 1. This motion program was made with the assumption that **Enable (Servo ON)** was selected in step 2 of *4.2.3 (2) Operating Manually in the Test Operation Screen*.

2. If the following warning appears after this operation, allocate the M-EXECUTOR. Refer to *4.3.1 Initializing the M-EXECUTOR Module*.

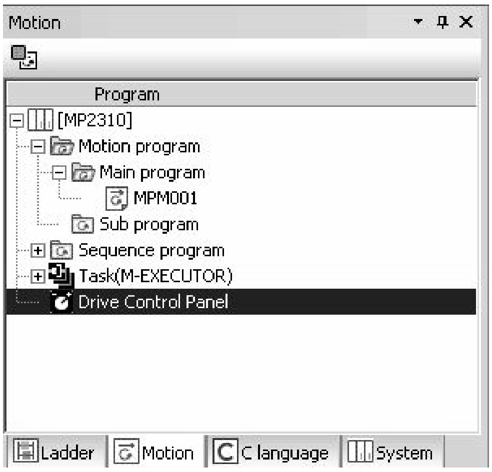
The **Program Execution Registry Screen** Dialog Box will appear.

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



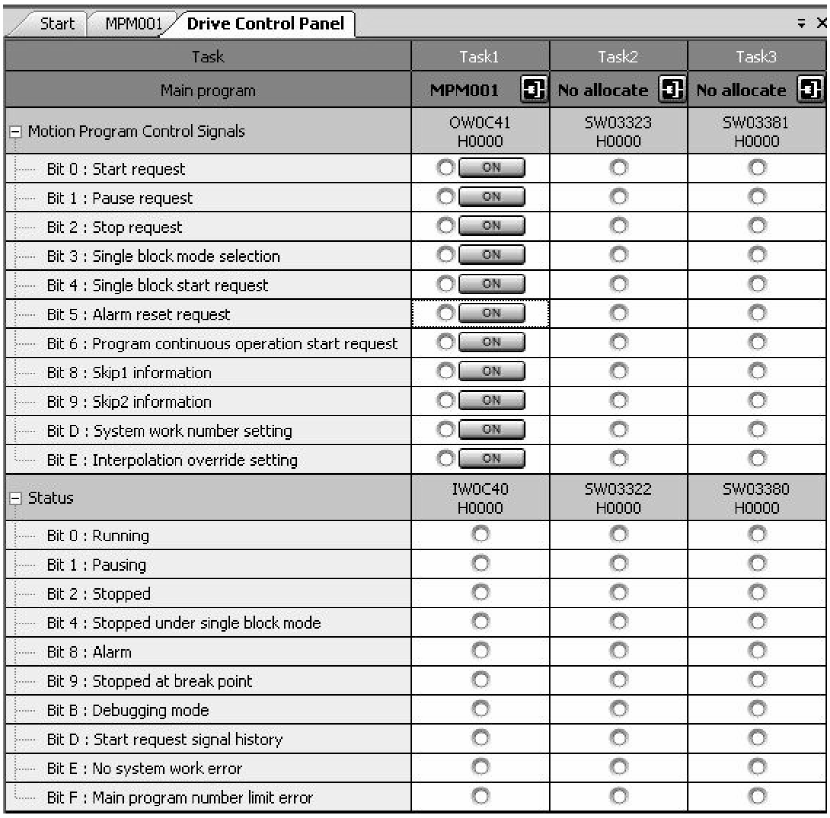
4.4.2 Starting a Motion Program Using the Operation Control Panel

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



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

2. Check Program to run, and click the **ON** 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 MP2310 automatically controls the motion program, so be aware that changing registers registered in ladder and sequence programs may cause problems.

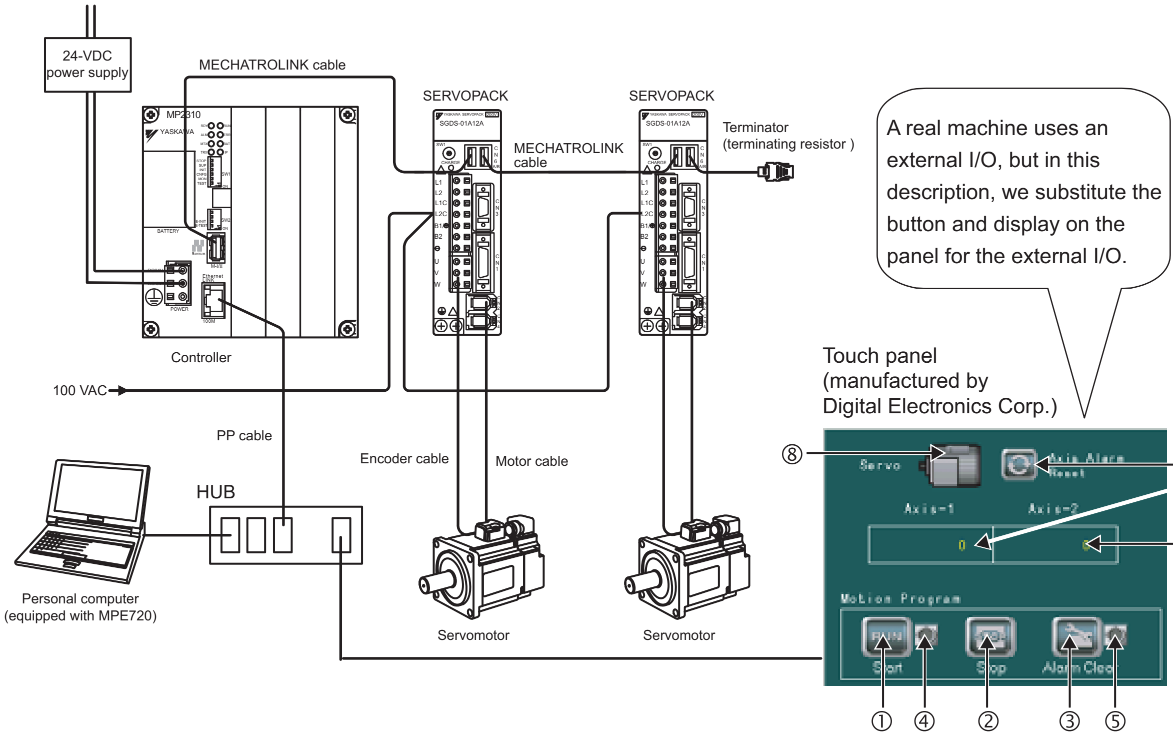
System Start Up and Easy Programming

4

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
MP2310	JEPMC-MP2310-E	1
MECHATROLINK cable (0.5 m)	JEPMC-W6002-A5	2
Terminator (terminating resistor)	JEPMC-W6022	2
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	CPMC-MPE770	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.

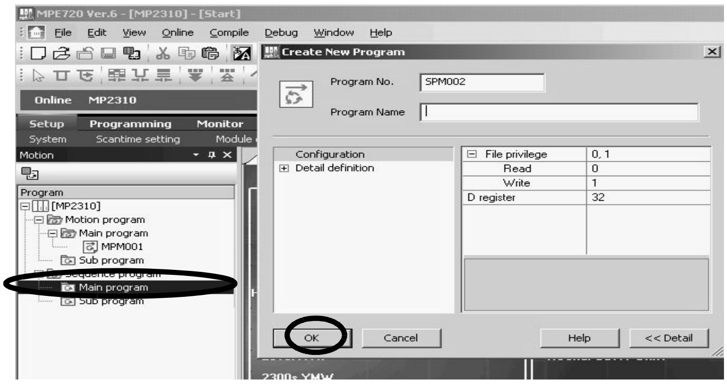
No.	Name	Mapping	Category	Description	MP2310 Operation
①	Start	MB5000	Control signal	Starts up a motion program	Sets in M-EXECUTOR
②	Stop	MB5002	Control signal	Displays the running of a motion program	
③	Clear Alarm	MB5005	Control signal	Stops a motion program	
④	Running Program	MB5010	Status	Clears 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	

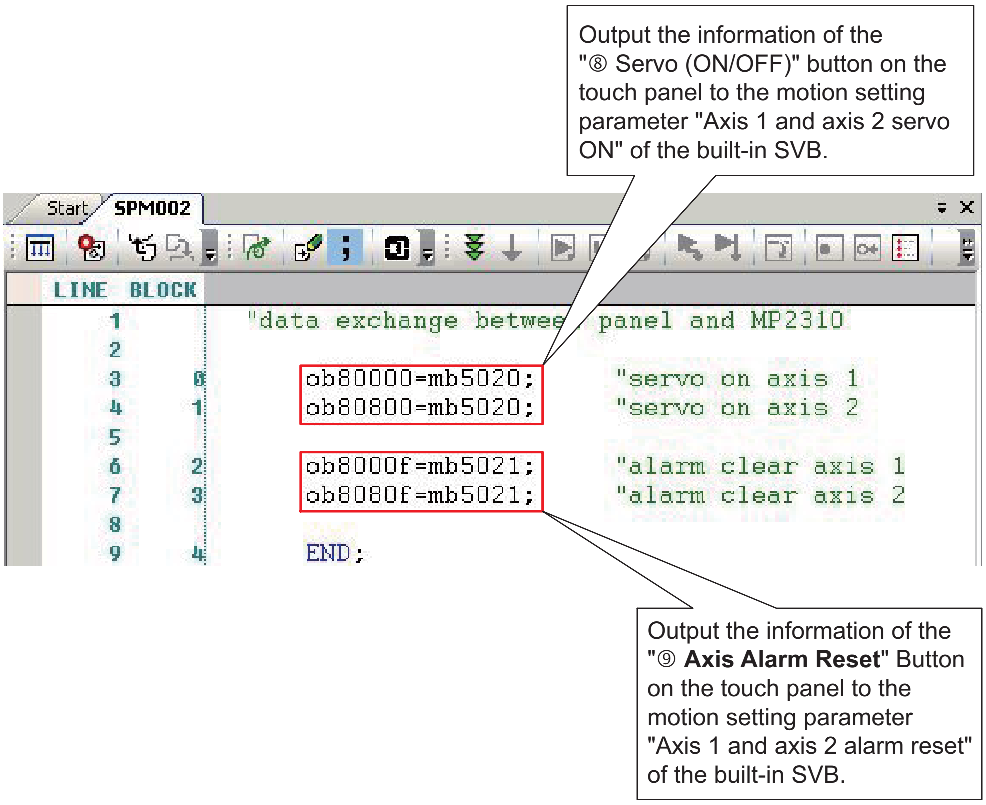
Note: 1. You do not need to create a program for signals and data in ① to ⑦.
2. You need to create a sequence program for outputting signals of ⑧ and ⑨ to the motion parameters.
3. For information on creating a program for the panel side, refer to *6.3.1 When MP2310 Acts as Slave*.

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.

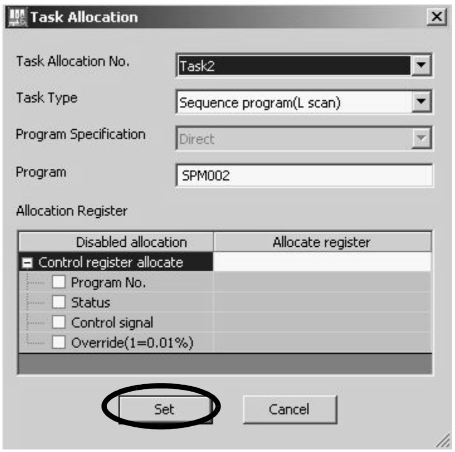


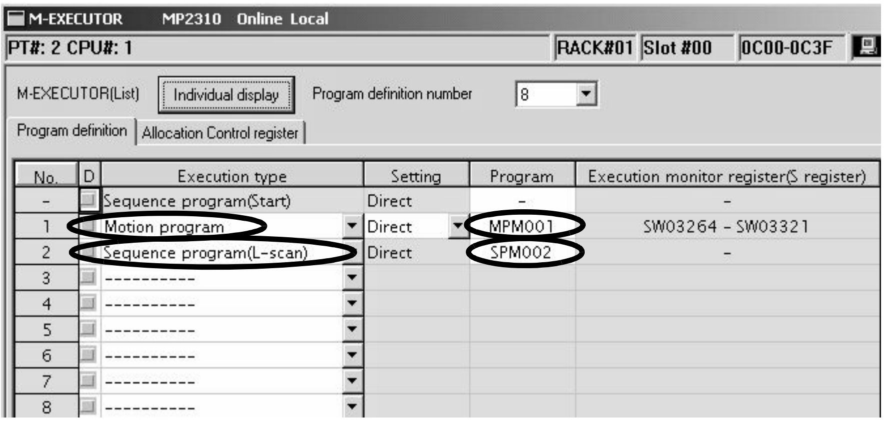


Click the **Execution Registration** Icon.

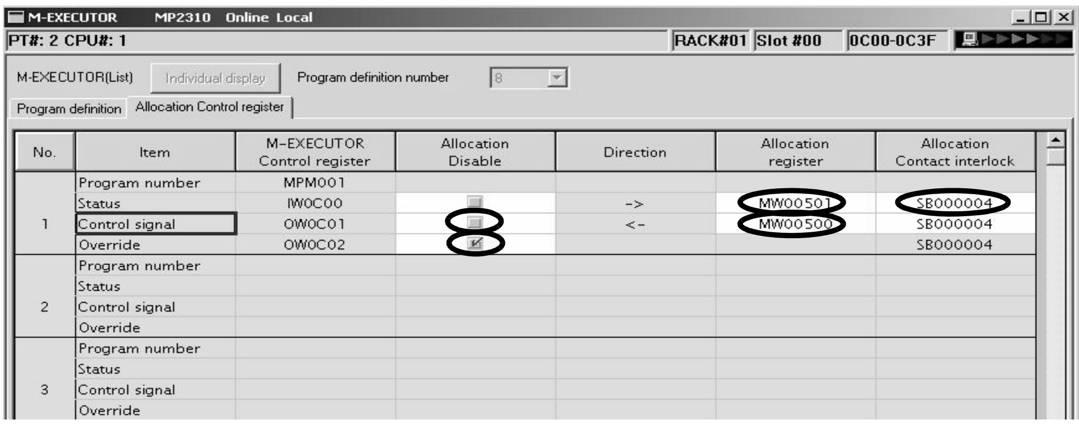
2. Registering Program Execution

- 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 2-47.

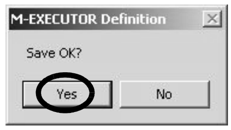




- In the **Allocation Control Register** Window, map the M registers allocated to control signals (① **Start** / ② **Stop** / ③ **Alarm Clear**) and status (④ **Running Program** / ⑤ **Alarm**) on the touch panel as an M-EXECUTOR allocation register for the motion program created in *4.3 Programming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

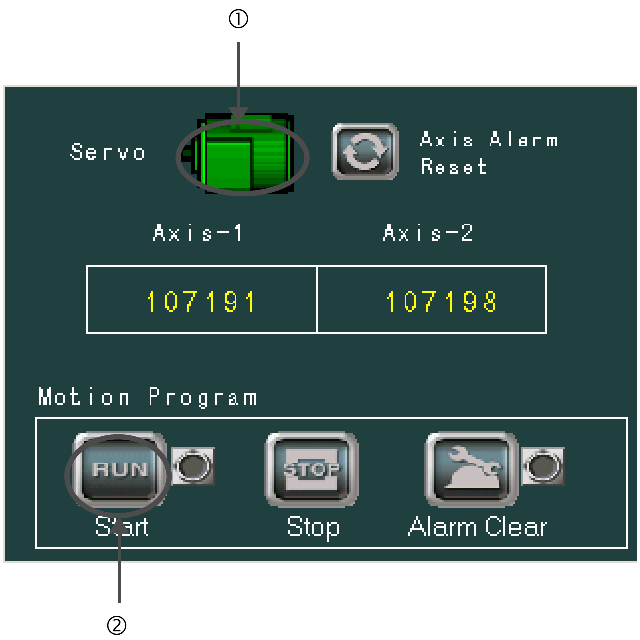
For information on communication setting with the touch panel, refer to *6.2.1 Automatic Receive Example Using Touch Panel*.

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 MP2310 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.



5

Outline of Motion Control Systems

This chapter describes the basic operation of MP2310 Motion Control Systems and provides an outline of user programs and registers.

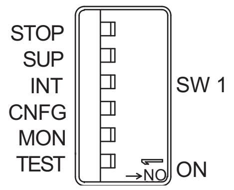
5.1 Startup Sequence and Basic Operation - - - - - 5-2
5.1.1 DIP Switch Settings - - - - - 5-2
5.1.2 Startup Sequence - - - - - 5-3
5.1.3 Startup Sequence Operation Details - - - - - 5-4
5.2 User Programs - - - - - 5-5
5.2.1 Types and Execution Timing of User Program - - - - - 5-5
5.2.2 Motion Programs - - - - - 5-6
5.2.3 Sequence Program - - - - - 5-26
5.2.4 Ladder Drawings (DWG) - - - - - 5-29
5.3 Registers - - - - - 5-34
5.3.1 Types of Registers - - - - - 5-34
5.3.2 Data Types - - - - - 5-37
5.3.3 How to Use Subscripts i, j - - - - - 5-38
5.3.4 Register Designation - - - - - 5-39
5.4 Self-configuration - - - - - 5-40
5.4.1 How to Execute Self-Configuration - - - - - 5-41
5.4.2 Definition Information Updated with Self-Configuration - - - - - 5-49
5.5 Precaution on Using MP2310 - - - - - 5-52
5.5.1 Precautions when User Definition File is Configured/Changed - - - - - 5-52
5.5.2 Setting or Changing Module Configuration Definition Files - - - - - 5-53
5.5.3 Setting and Changing the Scan Time - - - - - 5-54

5.1 Startup Sequence and Basic Operation

This section describes the MP2310 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

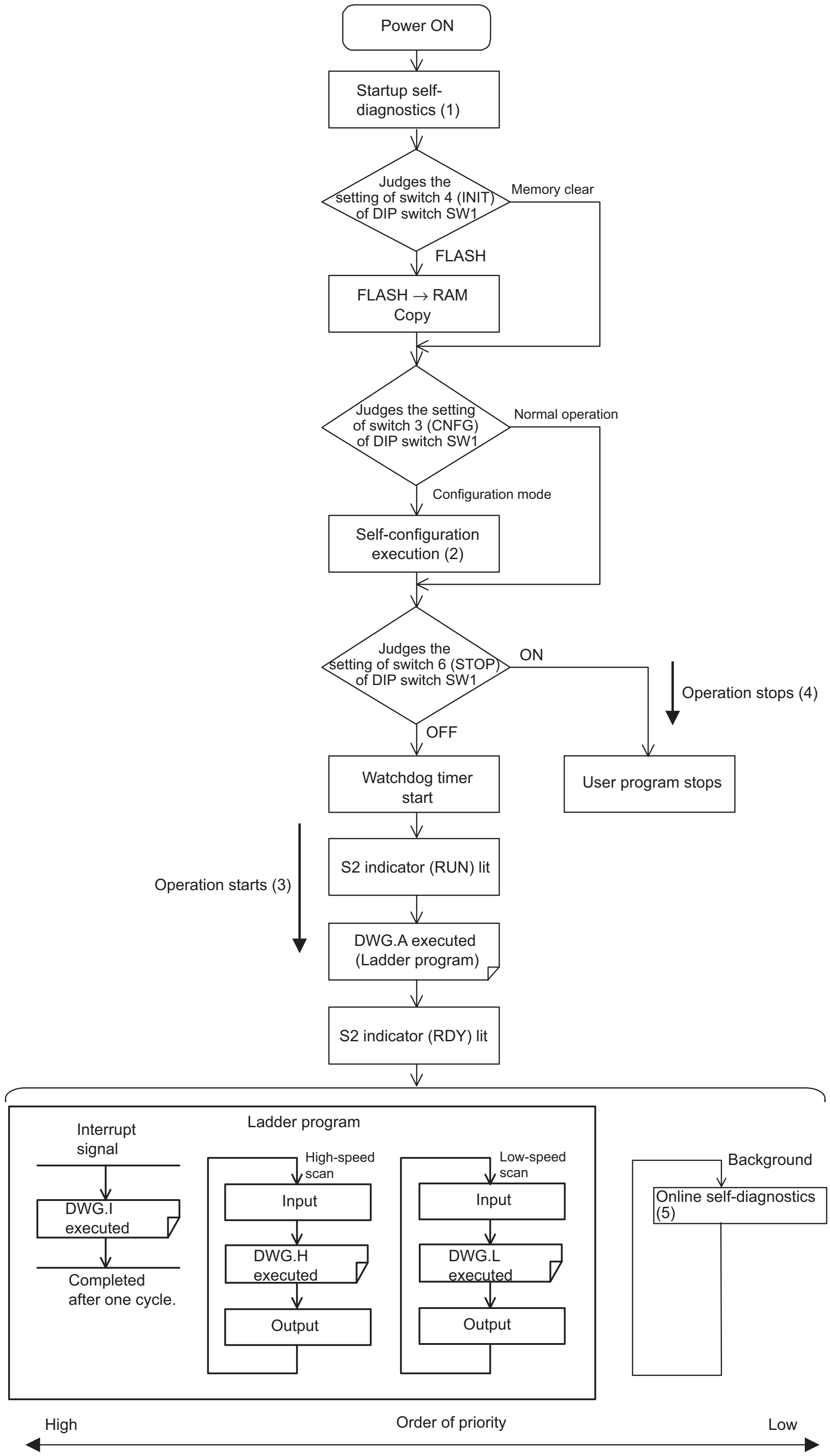
Set the DIP switch (SW1) on the Basic Module to control operations of the startup sequence. The six switches are provided on the DIP switch (SW1) on the Basic Module as shown in the following figure. The following table lists the functions of six switches.



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 firmware.
		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 MP2310 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).

Outline of Motion Control Systems
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 *8.2 LED Indicator Meanings* on page 8-3.

(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 5-40.
The RUN LED indicator will blink green during execution of self-configuration.

(3) Operation Start

When the STOP switch is set to OFF (RUN) or changes from ON (STOP) to OFF (RUN), the CPU starts the watchdog timer and then executes DWG.A in the ladder program. Refer to the startup processing drawing and *5.2.2 Motion Programs* on page 5-6.
First scan processing is executed once DWG.A has been completed and the high-speed or low-speed scan time has elapsed. System I/O are executed from the first scan.

(4) Operation Stop

MP2310 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 *8.2 LED Indicator Meanings* on page 8-3.

5.2 User Programs

User programs for executing machine control using the MP2310 include ladder programs and motion programs. This section describes the basic operation and other information about user programs.

- For programming details, refer to the following manuals.
  Machine Controller MP900/MP2000 Series User's Manual Ladder Programming (SIEZ-C887-1.2)
  Machine Controller MP900/MP2000 Series User's Manual Motion Programming (SIEZ-C887-1.3)
  Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual (SIEZ-C887-13.1)
  Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual (SIEZ-C887-13.2)

5.2.1 Types and Execution Timing of User Program

The following table shows the types and execution timing of MP2310 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)
Ladder Program	Startup Process	Power-up (during power-up, runs only once)
	Interrupt Process	Runs on external interrupt (runs on DI interrupt of option module and counter match interrupt)
	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

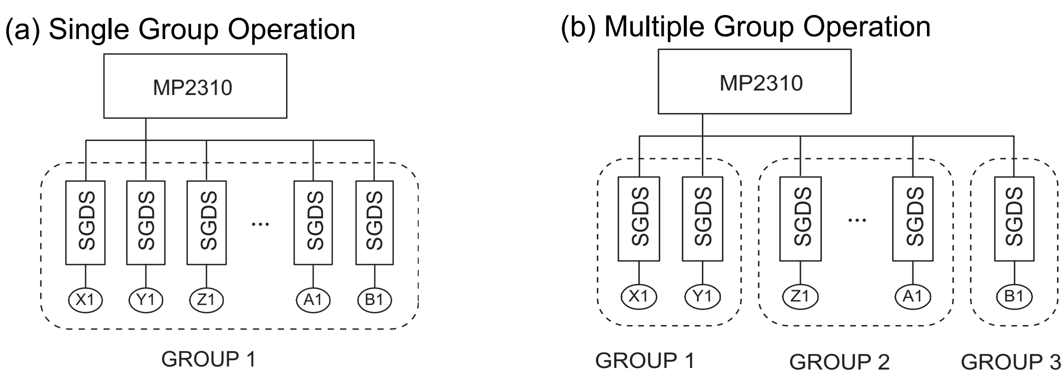
Motion programs are programs written in a text-based language called motion language.
The following table shows the two types of motion programs.

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

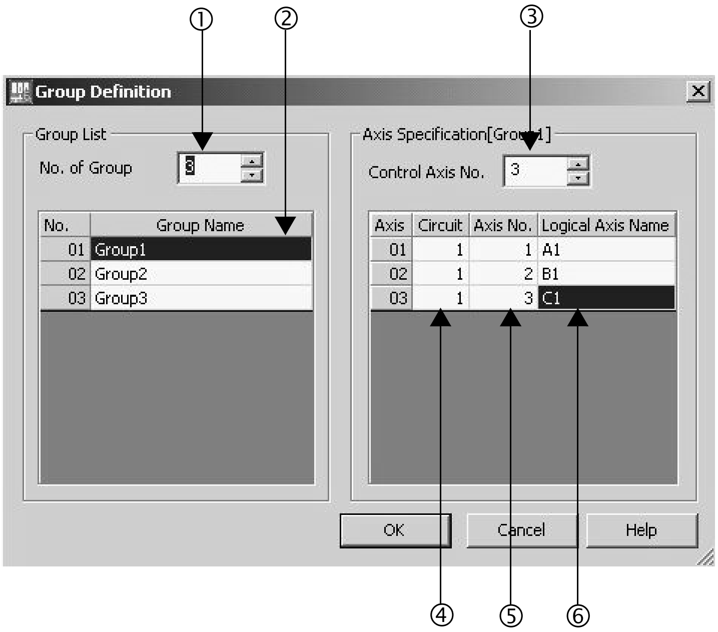
- The program numbers of motion programs are managed in the same manner as the sequence program numbers. Assign a unique number for each program number.
  - Program number of Motion program MPM □□□, MPS □□□
  - Program number of Sequence program SPM □□□, SPS □□□
- The MP2310 can execute up to 16 motion 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 MP2310 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*.



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

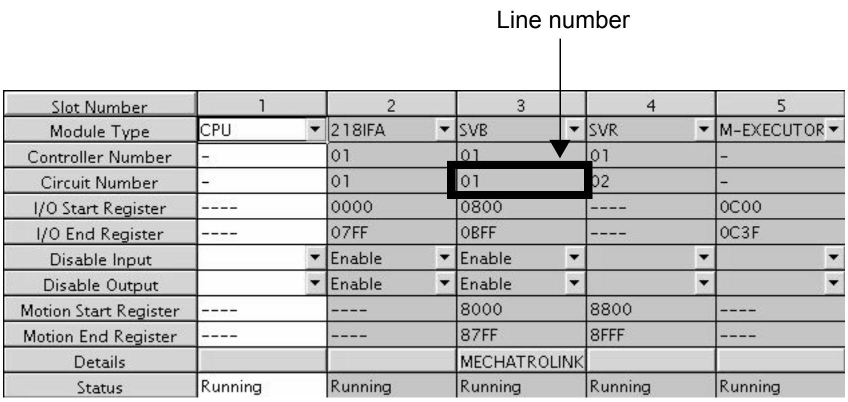
Define a group name.

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.

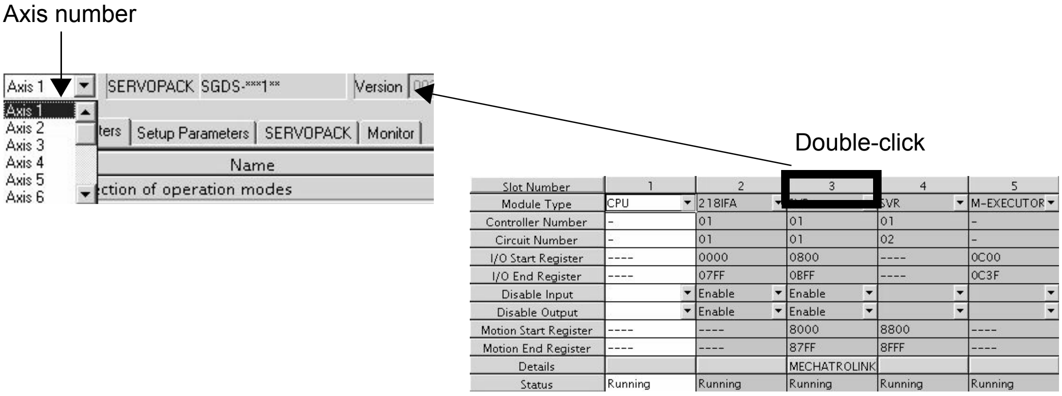


Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

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.

```
MVS  [A1]1000  [B1]2000  [C1]3000  F1000;
```

Logical axis name

(2) How to Run a Motion Program

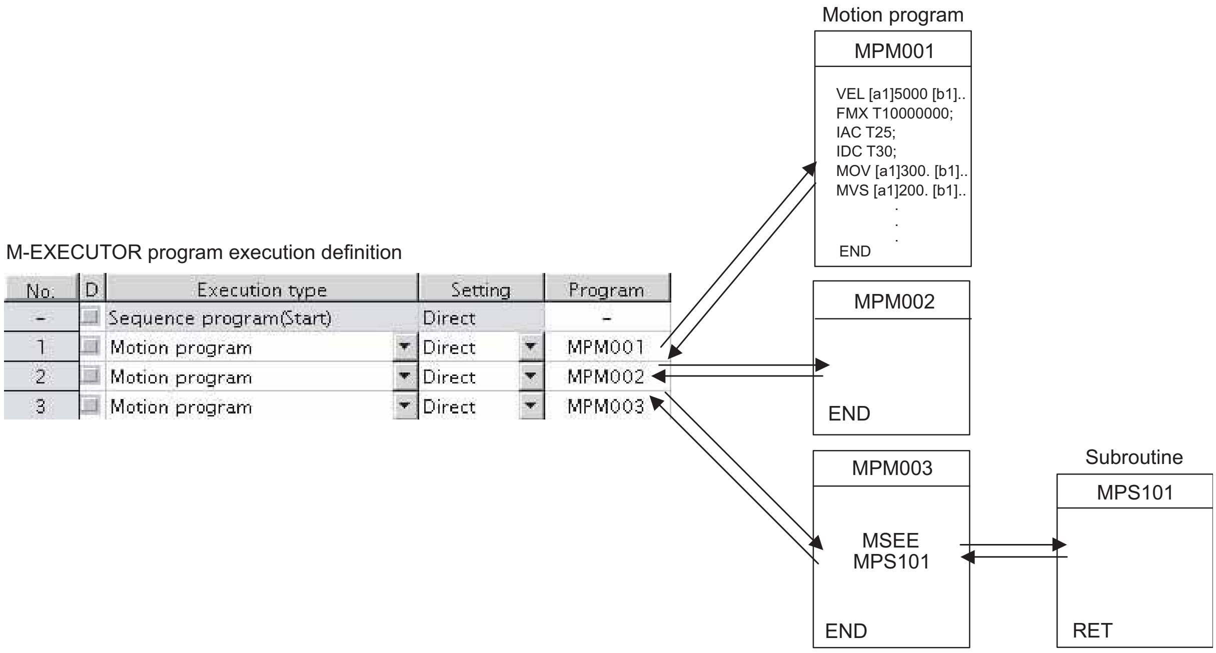
The following two methods are available for running a motion program.

- Registering it to the M-EXECUTOR program execution definition
- Executing it using a MSEE command from a ladder program of H drawing

Now, this section explains each way to run a motion program:

[a] Registering it to the M-EXECUTOR Program Execution Definition

After creating a motion program, register it in the M-EXECUTOR program execution definition screen.
The programs registered in the M-EXECUTOR program execution definition screen are executed in ascending numeric 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 ladder, 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.

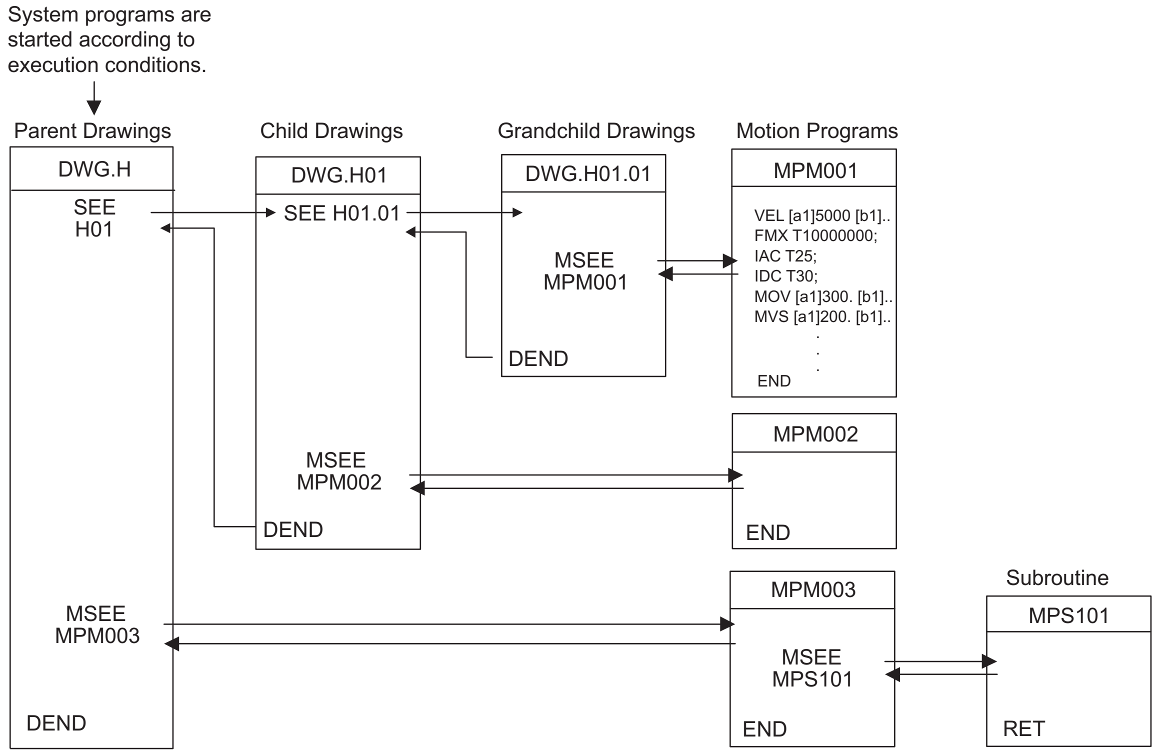
■ Caution

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.

[b] Executing H Drawings by MSEE Command

Motion programs are always called from H drawings using the MSEE command (motion program call command).
Motion programs can be called from any parent, child, or grandchild drawing in an H drawing.
The following figure shows an example of motion program execution.



H drawing ladder commands are executed in hierarchical order i.e., parent drawings, child drawings, then grandchild drawings each high-speed scan cycle.
The above method is a preparation for running a motion program. When a MSEE command is built in, the motion program does not start up. To start up the motion program, after the MSEE command is incorporated, use a control signal to turn on the request for the program operation startup.
Motion programs are also called each scan cycle, but unlike ladder programs, all motion programs cannot be executed in one scan. For this reason, motion programs are executed and controlled by special system's motion management function.

■ Caution

When running a motion program, pay attention to the followings:
- The motion program registered in M-EXECUTOR cannot be executed using a MSEE command.
- Multiple motion programs with the same number cannot be executed using a MSEE command.
- A subroutine (MPS □□□) cannot be executed from a MSEE command in a ladder.
  It can only be referenced from a motion program (MPM □□□, MPS □□□).
- A sequence program (SPM □□□, SPS □□□) cannot be executed from a MSEE command in a ladder.
- The same subroutine cannot be referenced at the same time.

(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 □□□).

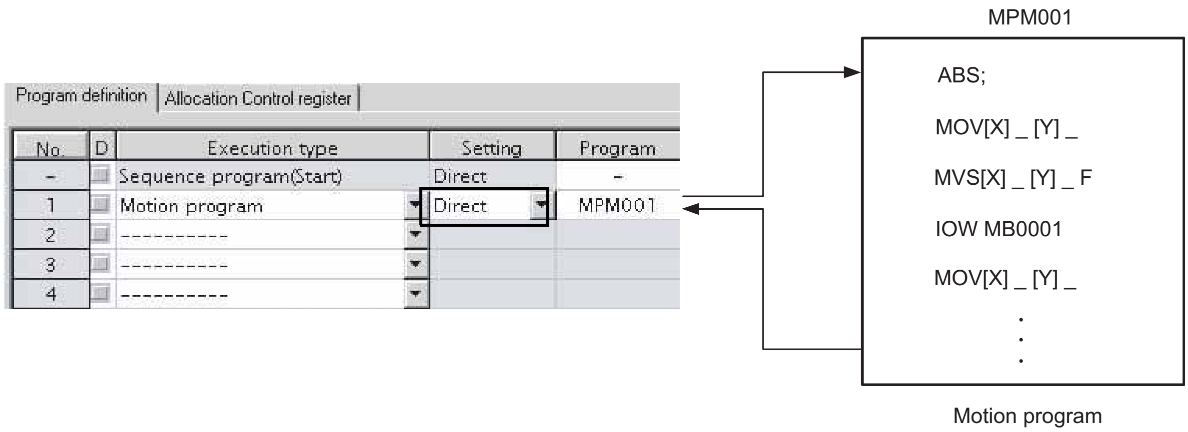


Fig. 5.1 Calling a Motion Program Using a Direct Designation - 1

■ A motion program referenced by a MSEE command from a ladder program

Set a program number to Program No. (□□□□□) in the MSEE command.

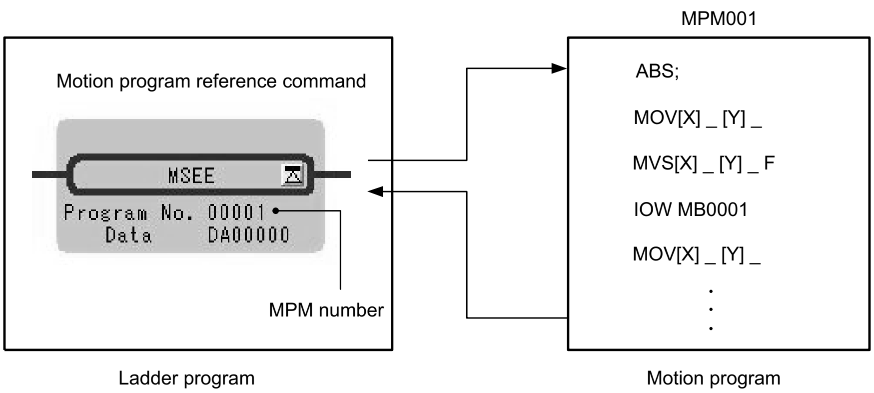


Fig. 5.2 Calling a Motion Program Using a Direct Designation -2

[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.

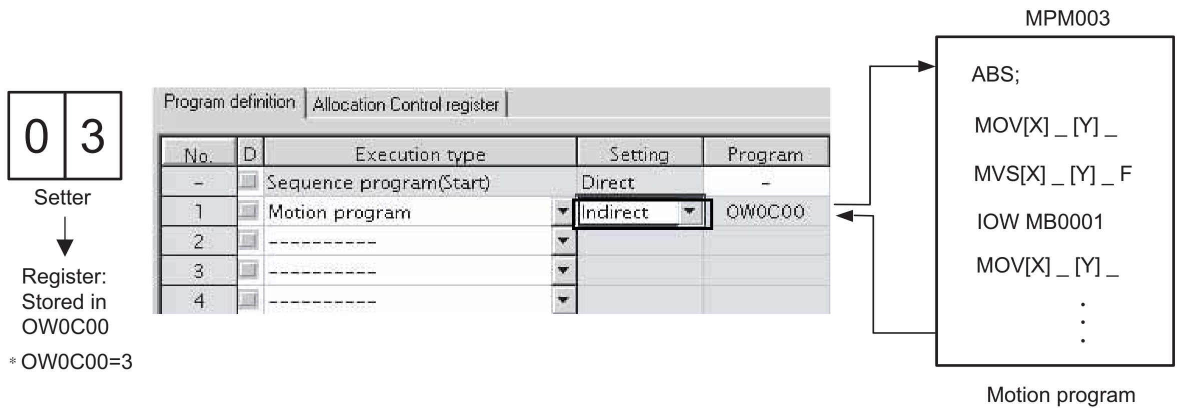


Fig. 5.3 Calling a Motion Program Using an Indirect Designation - 1

■ A motion program referenced by a MSEE command from a ladder program

Specify any register (M or D register) used for an indirect designation for Program No. in the MSEE command.

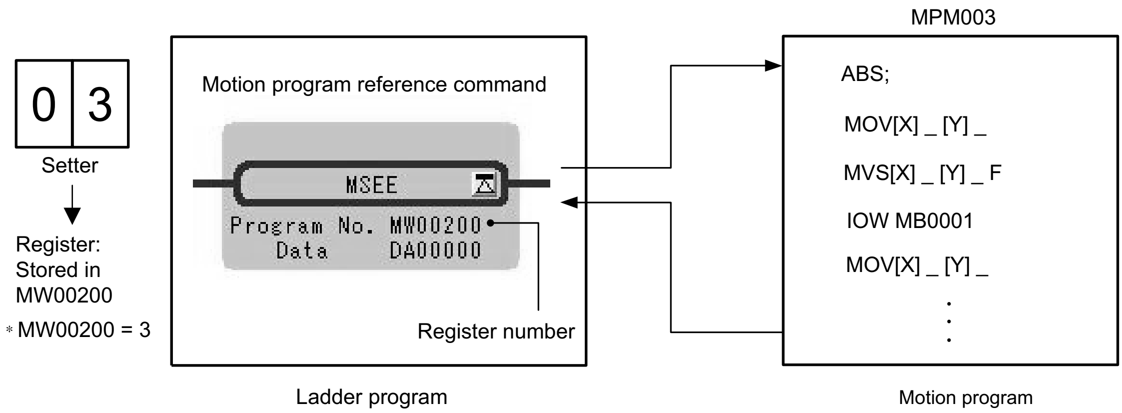


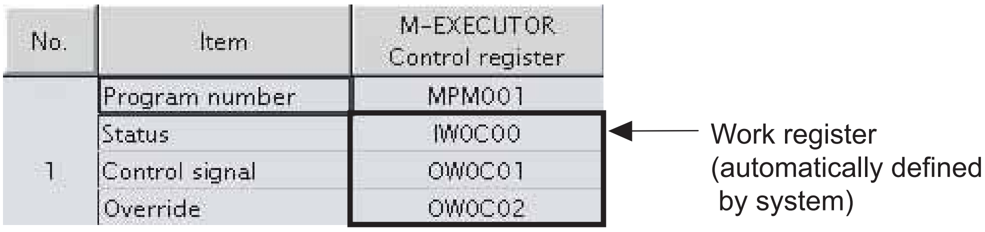
Fig. 5.4 Calling a Motion Program Using an Indirect Designation -2

(4) Work Register

Configure and monitor a motion program via a work register.
The work register constitution for motion programs registered in the M-EXECUTOR program execution definition differs from that for motion programs referenced by a MSEE command from a ladder program.
The work register constitution in each case is as follows:

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

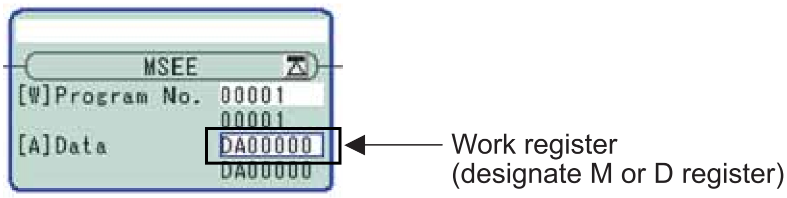
The work register is assigned to a M-EXECUTOR control register. (automatically defined by system)
The M-EXECUTOR control register constitution is as follows:



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

■ A motion program executed by a MSEE command from a ladder program

Use a MSEE command of a ladder program to designate the work register (M or D register).
The work register constitution is as follows:



Work Register	Description
First word	Status flag of a motion program
Second word	Control signal of a motion program
Third word	Override for interpolation
Fourth word	System work number

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	System work number setting*1	NO contact
E	Override setting for interpolation*2	NO contact
F	(reserved)	

* 1. System work number setting
- When a motion program is registered in M-EXECUTOR:
  Unable to designate it. The same system work number as No. defined in the system is used.
- When a motion program is invoked by a MSEE command from a ladder program:
  OFF: A system work automatically retrieved by system is used. The system work number may differ in each case.
  ON: A work with the designated system work number is used.
  However, when a work occupied by M-EXECUTOR is designated, “BitE: Error without a system work” is reported to the status.

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

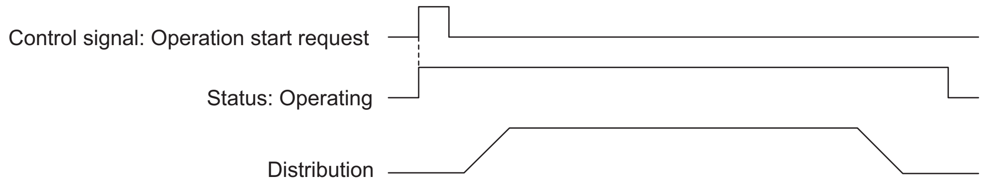
Use signals conforming to the above signal types when writing ladder programs.

Note: Motion programs are executed if the program operation start request signal is ON when the power is turned ON.

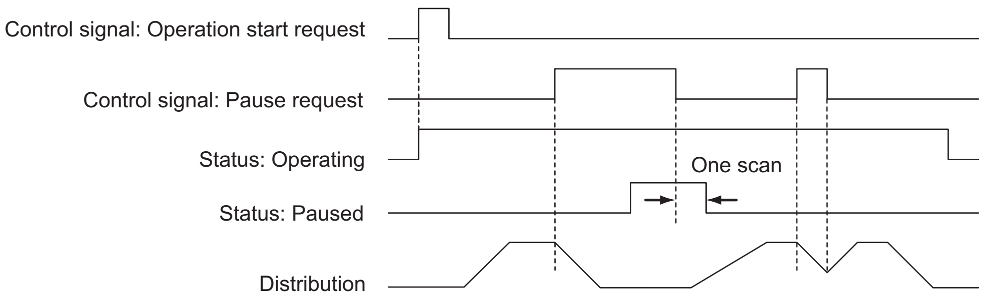
■ Timing Chart for Motion Program Control Signals

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

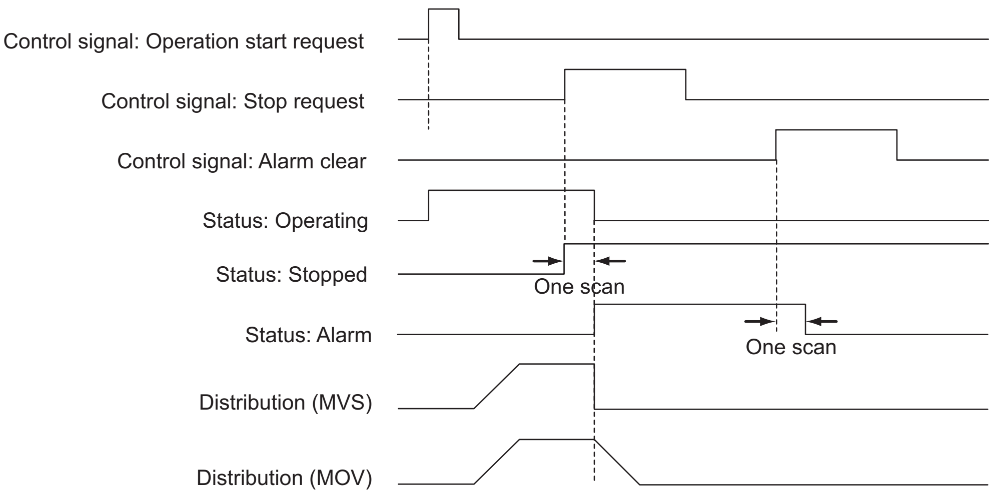
・Program Operation Start Request



・Pause Request



・Stop Request



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

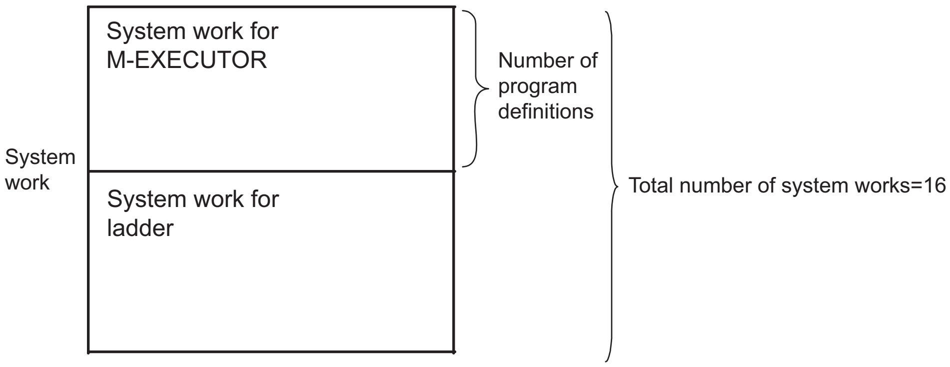
[c] Interpolation Override

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.

[d] System Work Number

The system work number n (setting range: 1 to 16) used when executing motion programs is set by the MSEE work registers.
This system work number is enabled only when the motion program control signal bit D (system work number setting) is ON. The status bit, bit E (No system work error), will turn ON if the work number setting is outside the setting range or the specified system work is in use.

- The total number of system works of a motion program is 16 for both M-EXECUTOR and ladder. The number configured in the number of program definitions of the M-EXECUTOR detailed screen is set for the system work for M-EXECUTOR.



1. A work not occupied by M-EXECUTOR can execute a motion program using a MSEE command from a ladder program.
2. When the number of a system work occupied by M-EXECUTOR is specified by a ladder program, an alarm (Error without a system work) occurs. Therefore, when the number of program definitions is set to 16 in the M-EXECUTOR detailed screen, a motion program cannot be executed by a ladder MSEE command.
   - Error without a system work: Status flag Bit E of the motion program

(5) How to Operate a Work Register

The way to operate a work register of a motion program registered in the M-EXECUTOR program execution definition differs from that of a motion program referenced by a MSEE command from a ladder program.
The way to operate it in each case is shown as follows:

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

When a motion program is registered in M-EXECUTOR program execution definition, select one from the following two execution processings.

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

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

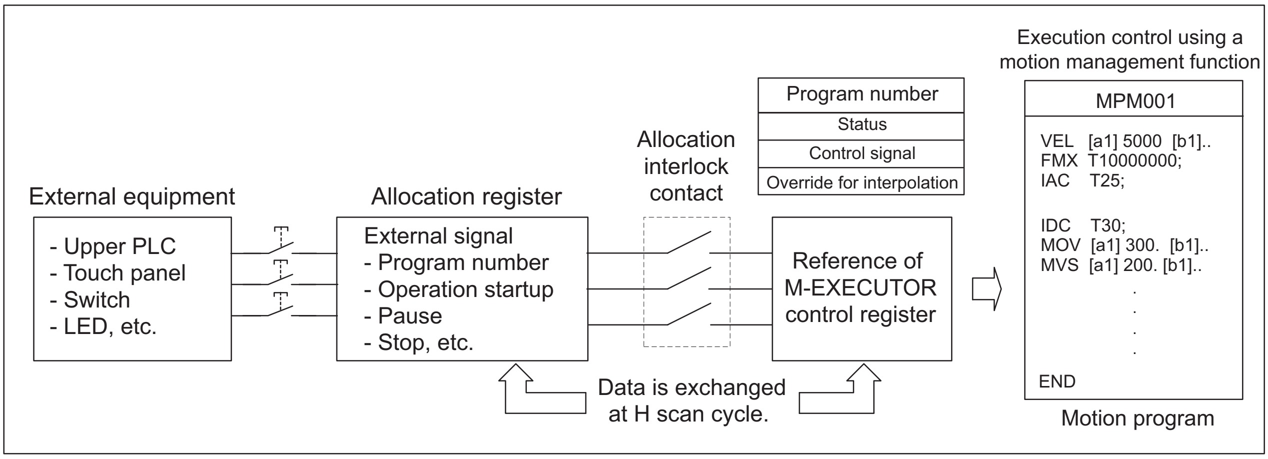
■ A Way to Immediately Control a Motion Program from External Equipment

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.”

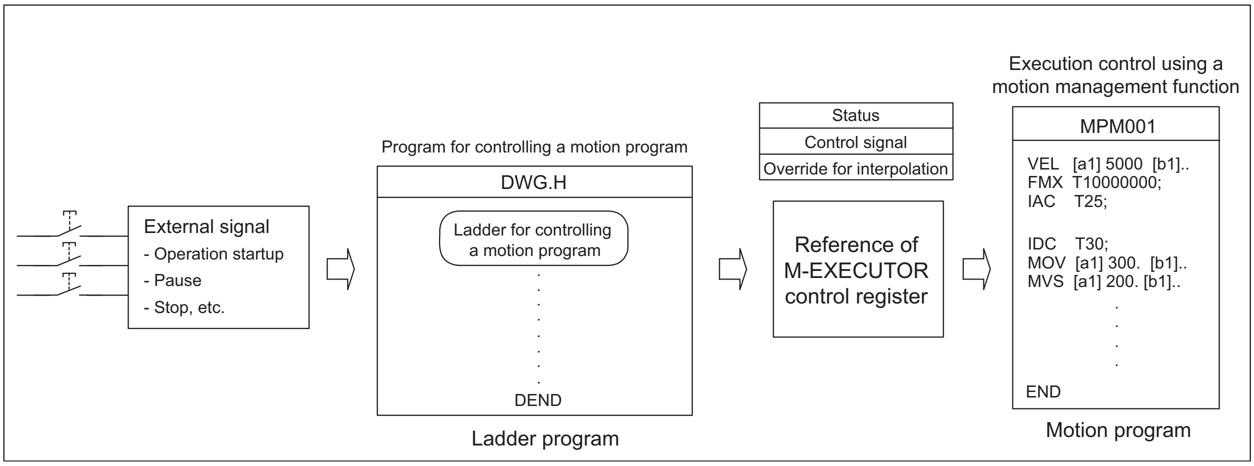
■ A Way to Control a Motion Program via a Sequence or Ladder Program

Without using the allocating function of the above mentioned M-EXECUTOR control register, controls a motion program via a sequence or ladder 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.

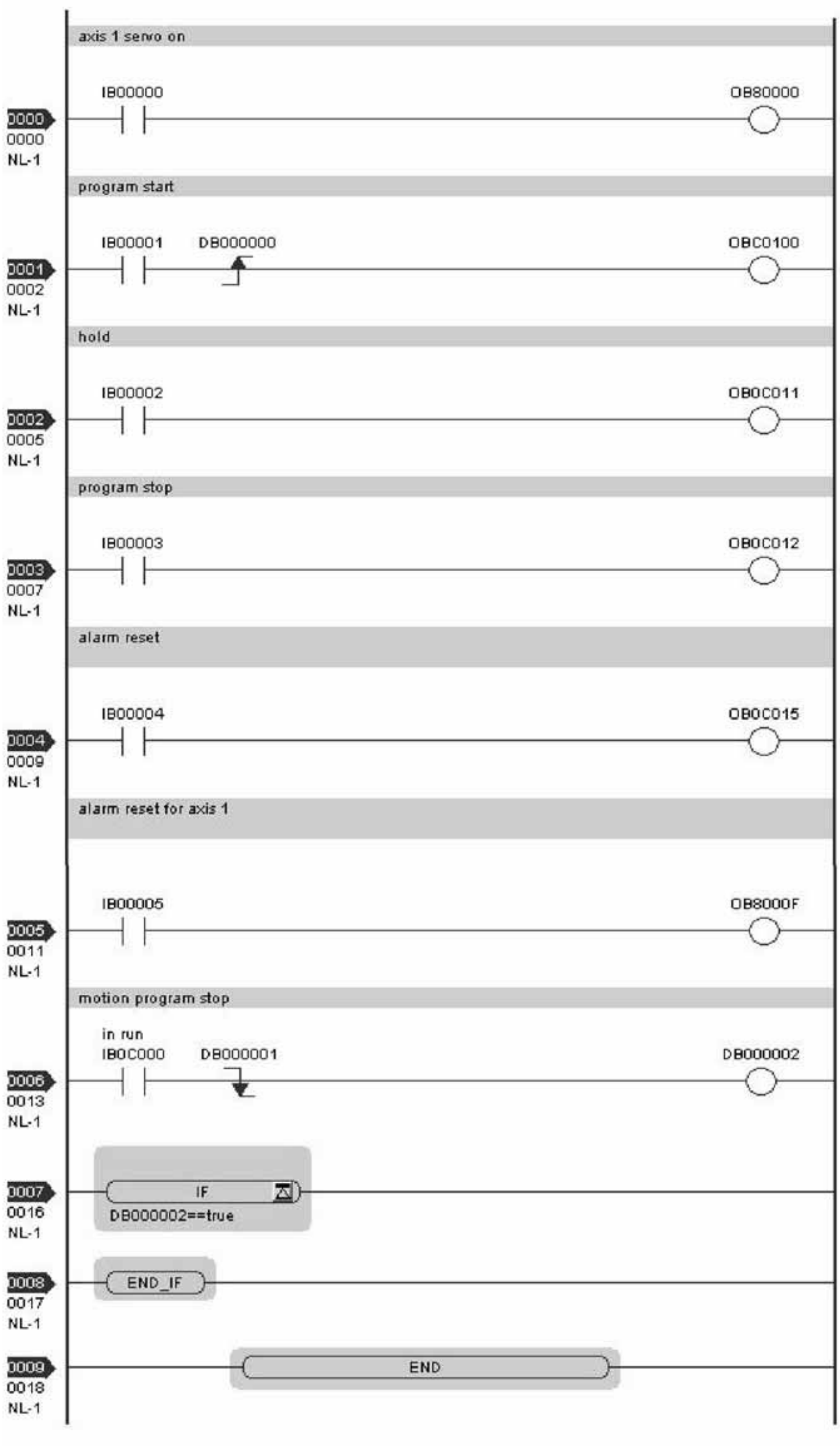


Each example which uses a sequence program and ladder program respectively as a program for controlling the motion program is shown as follows:

1. Example using a sequence program

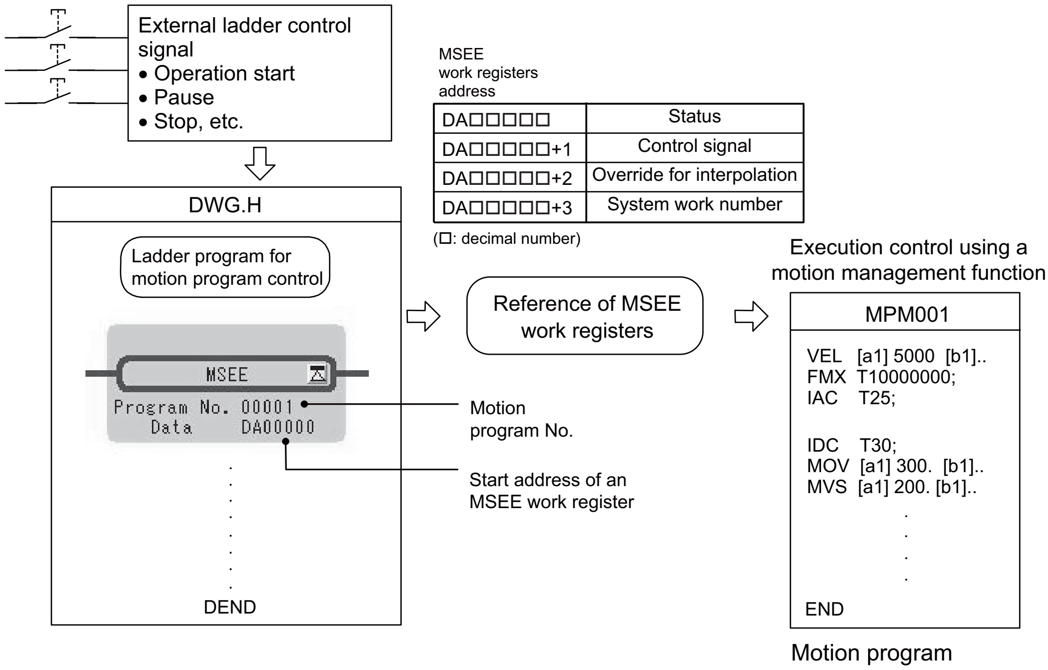
```
OB80000 = IB00000;                          "axis 1 servo on"
OB0C010 = PON( IB00001 DB000000 );          "program start"
OB0C011 = IB00002;                          "hold"
OB0C012 = IB00003;                          "program stop"
OB0C015 = IB00004;                          "alarm reset"
OB8000F = 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;
```

2. Example using a ladder program



[b] A motion program referenced by a MSEE command from a ladder program

When a motion program is referenced by a MSEE command from a ladder program, control the motion program via a sequence or ladder program.
To use this execution processing, incorporate a MSEE command in the ladder H drawing. In this case, MSEE work register configures and monitors the motion program.
The following figure shows a setting example in this method.



- For information about the meaning and estimation of the register number, refer to *5.3 Registers* on page 5-34.

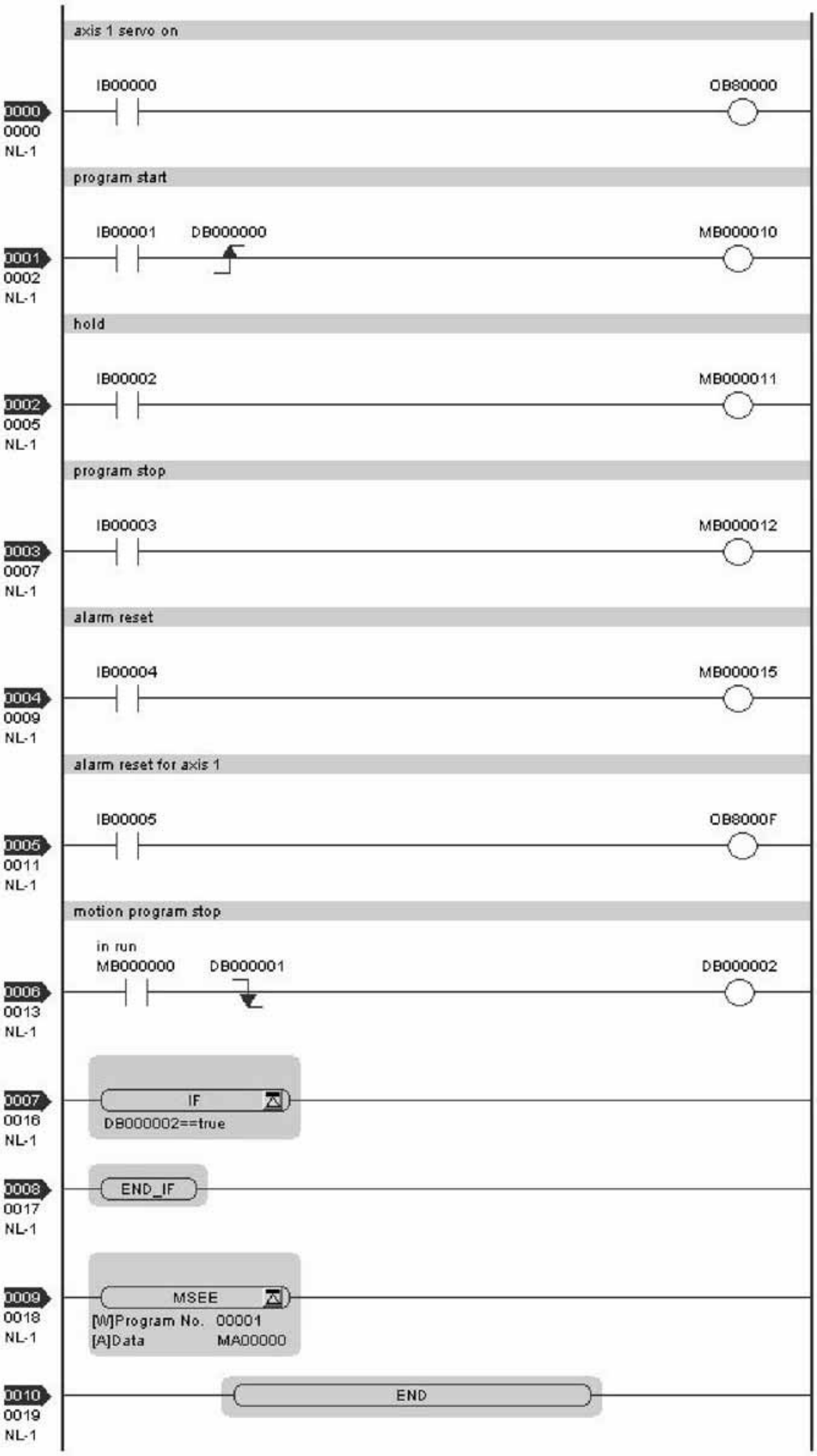
Each example which uses a sequence program and ladder program respectively as a program for controlling the motion program is shown as follows:

1. Example using a sequence program

```
OB80000 = IB00000;                          "axis 1 servo on"
MB00010 = PON( IB00001 DB000000 );          "program start"
MB00011 = IB00002;                          "hold"
MB00012 = IB00003;                          "program stop"
MB00015 = IB00004;                          "alarm reset"
OB8000F = IB00005;                          "alarm reset for axis 1"
IF NON( MB00000 DB000001 ) == 1;            "motion program stop"
;                                           "Process when program operation is stopped"
IEND;

END;
```

Note: An MSEE command cannot be incorporated into a sequence program.
Incorporate an MSEE command separately into a ladder H drawing.

2. Example using a ladder program



(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 the execution information for a motion program registered in the M-EXECUTOR program execution definition differs from that for a motion program referenced by an MSEE command from a ladder program.
The way to monitor it in each case 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).

[b] A motion program referenced by an MSEE command from a ladder program

When a motion program is referenced by an MSEE command from a ladder program, the way differs, depending on the “BitD” setting (system work number setting) of the motion program control signal, as follows:

■ The motion program control signal “BitD, System Work Number Setting” = ON

The execution information is reported to “Program Information Using Work n” register (SW03264-SW04191).
For example, when “System Work Number”=1, the motion program execution information can be monitored in SW03264-SW03321 “Program Information Using Work 1”.

■ The motion program control signal “BitD, System Work Number Setting” = OFF

The used system work is automatically decided by system. Thus, to check which work is used, refer to “Running Program Number” (=SW03200 to SW03215).
For example, when you want to monitor the motion program MPM001 and SW03202=001, as used the work number=3, the execution information for the motion program MPM001 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

Motion program execution information

SW03200	Executing program number (No. of main program currently executing)	16W
SW03216	Reserved by the system.	16W
SW03232	Executing Program Bit (Executing when corresponding bit is ON)	16W
SW03248	Reserved by the system.	16W
SW03264	Program information used by work 1	58W
SW03222	Program information used by work 2	58W
SW03380	Program information used by work 3	58W
SW03438	Program information used by work 4	58W
SW03496	Program information used by work 5	58W
SW03554	Program information used by work 6	58W
SW03612	Program information used by work 7	58W
SW03670	Program information used by work 8	58W
SW03728	Program information used by work 9	58W
SW03786	Program information used by work 10	58W
SW03844	Program information used by work 11	58W
SW03902	Program information used by work 12	58W
SW03960	Program information used by work 13	58W
SW04018	Program information used by work 14	58W
SW04076	Program information used by work 15	58W
SW04134	Program information used by work 16	58W
SW04192	Reserved by the system.	928W
SW05120	Reserved by the system.	64W

Executing program number

SW03200	Program number used by work 1
SW03201	Program number used by work 2
SW03202	Program number used by work 3
SW03203	Program number used by work 4
SW03204	Program number used by work 5
SW03205	Program number used by work 6
SW03206	Program number used by work 7
SW03207	Program number used by work 8
SW03208	Program number used by work 9
SW03209	Program number used by work 10
SW03210	Program number used by work 11
SW03211	Program number used by work 12
SW03212	Program number used by work 13
SW03213	Program number used by work 14
SW03214	Program number used by work 15
SW03215	Program number used by work 16

Executing program bit

SW03232	MP□016 (Bit15) to MP□001 (Bit0)
SW03233	MP□032 (Bit15) to MP□017 (Bit0)
SW03234	MP□048 (Bit15) to MP□033 (Bit0)
SW03235	MP□054 (Bit15) to MP□049 (Bit0)
SW03236	MP□080 (Bit15) to MP□055 (Bit0)
SW03237	MP□096 (Bit15) to MP□081 (Bit0)
SW03238	MP□112 (Bit15) to MP□097 (Bit0)
SW03239	MP□128 (Bit15) to MP□113 (Bit0)
SW03240	MP□144 (Bit15) to MP□129 (Bit0)
SW03241	MP□160 (Bit15) to MP□145 (Bit0)
SW03242	MP□176 (Bit15) to MP□161 (Bit0)
SW03243	MP□192 (Bit15) to MP□177 (Bit0)
SW03244	MP□208 (Bit15) to MP□193 (Bit0)
SW03245	MP□224 (Bit15) to MP□209 (Bit0)
SW03246	MP□240 (Bit15) to MP□225 (Bit0)
SW03247	MP□256 (Bit15) to MP□241 (Bit0)

Note: □ indicates M or S.

■ Details of Program Information Used by Work n

Program information used by work n

Offset	Content	Size
+0	Program status	
+1	Program control signal	
+2	Parallel 0 information	3W
+5	Parallel 1 information	3W
+8	Parallel 2 information	3W
+11	Parallel 3 information	3W
+14	Parallel 4 information	3W
+17	Parallel 5 information	3W
+20	Parallel 6 information	3W
+23	Parallel 7 information	3W
+26	Logical axis #1 program current position	2W
+28	Logical axis #2 program current position	2W
+30	Logical axis #3 program current position	2W
+32	Logical axis #4 program current position	2W
+34	Logical axis #5 program current position	2W
+36	Logical axis #6 program current position	2W
+38	Logical axis #7 program current position	2W
+40	Logical axis #8 program current position	2W
+42	Logical axis #9 program current position	2W
+44	Logical axis #10 program current position	2W
+46	Logical axis #11 program current position	2W
+48	Logical axis #12 program current position	2W
+50	Logical axis #13 program current position	2W
+52	Logical axis #14 program current position	2W
+54	Logical axis #15 program current position	2W
+56	Logical axis #16 program current position	2W

Executing program number
Executing block number
Error code

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.

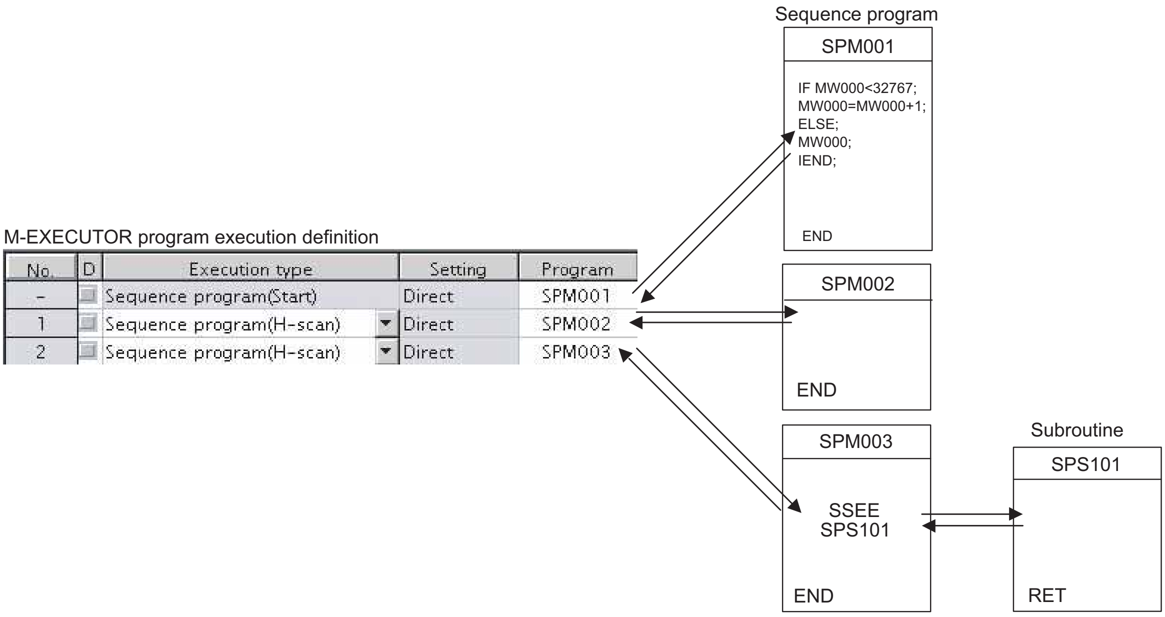
Category	Designation Method	Features	Number of Programs
Main program	SPM□□□ (□□□=1 to 256)	Calling from the M-EXECUTOR program execution definition	Up to 256 programs of the following types can be created: • Main motion program • Sub motion program • Main sequence program • Sub sequence program
Sub program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

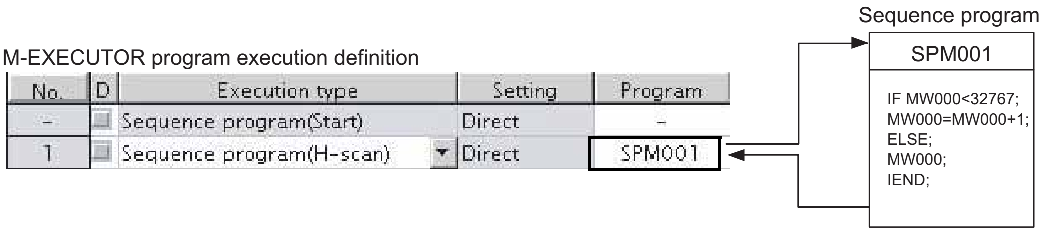


Fig. 5.5 Calling a Sequence Program

(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

5.2.4 Ladder Drawings (DWG)

(1) Types of Drawings

Ladder programs are managed in units of ladder drawings, which are identified by drawing numbers. These drawings form the basis of user programs.
Ladder drawings include parent drawings, child drawings, grandchild drawings, and operation error processing drawings. In addition to drawings, there are functions that can be freely accessed from each drawing.

- Parent Drawings
  Parent drawings are automatically executed by the system program when the execution conditions, outlined in the table below, are met.
- Child Drawings
  Child drawings are accessed using a SEE command from a parent drawing.
- Grandchild Drawings
  Grandchild drawings are accessed using a SEE command from a child drawing.
- Operation Error Processing Drawings
  Operation error processing drawings are automatically executed by the system program when an operation error occurs.
- Functions
  Functions are accessed and executed from parent, child, and grandchild drawings using the FUNC command.

[a] Drawing Types and Order of Priority

Drawings are classified by their first letter (A, I, H, or L) based on the processing purpose. The following table outlines the order of priority and execution conditions for these drawings.

Type of Parent Drawing	Function	Priority	Execution Conditions	Max. No. of Drawings
DWG.A (Drawing A)	Startup processing	1	Power ON (Executed once only, when power turned ON)	64
DWG.I (Drawing I)	Interrupt processing	2	External interrupt (executed by Option Module DI interrupt or counter match interrupt)	64
DWG.H (Drawing H)	High-speed scan processing	3	Scheduled cycle startup (Executed each high-speed scan)	200
DWG.L (Drawing L)	Low-speed scan	4	Scheduled cycle startup (Executed each low-speed scan)	500

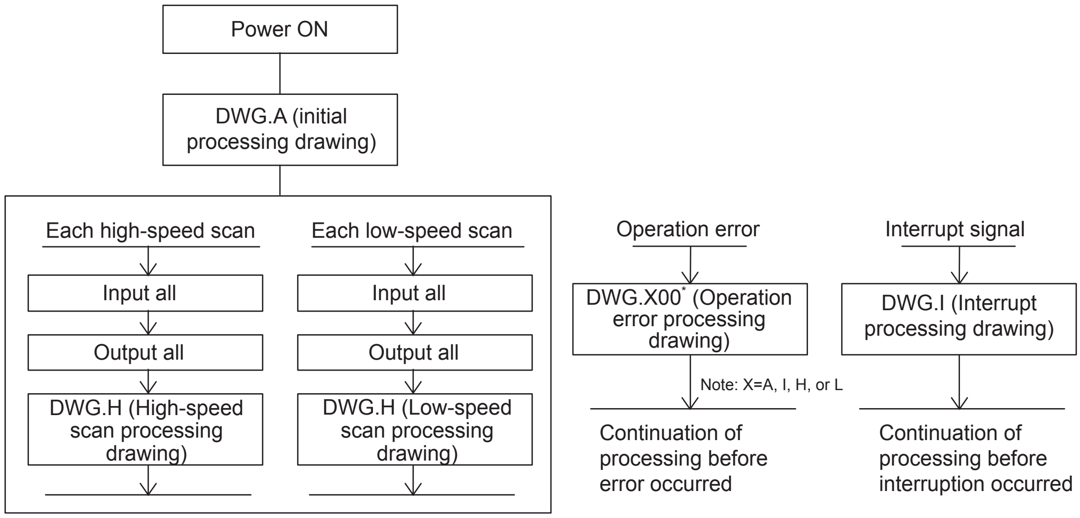
The following table provides details of the number of drawings for each drawing.

Drawing	Number of Drawings			
	DWG.A	DWG.I	DWG.H	DWG.L
Parent Drawings	1 (A)	1 (I)	1 (H)	1 (L)
Operation Error Processing Drawings	1 (A00)	1 (I00)	1 (H00)	1 (L00)
Child Drawings Grandchild Drawings	Total: 62 max.	Total: 62 max.	Total: 198 max.	Total: 498 max.

(2) Execution Control of Drawings

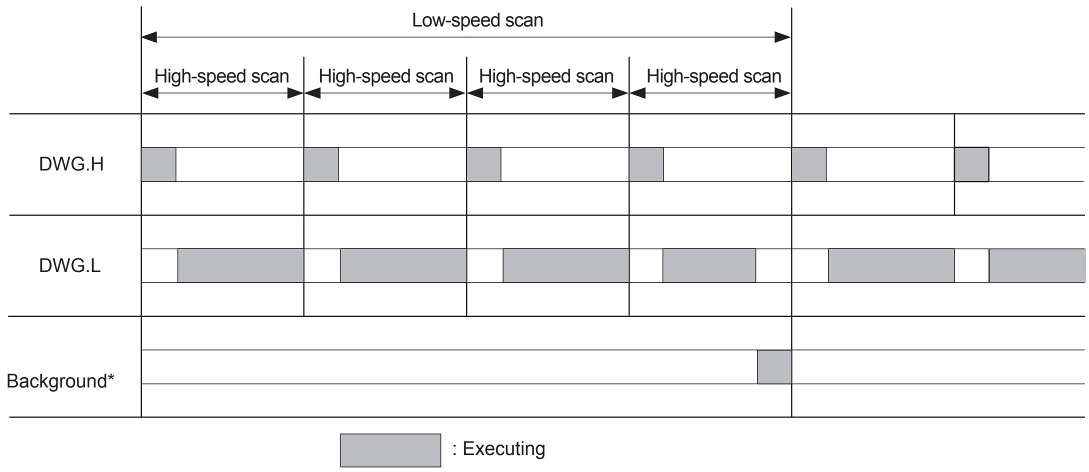
[a] Execution Control

The following table shows when each drawing is executed based on the order of priority.



[b] Execution Schedule for Scan Processing Drawings

The scan processing drawings are not executed simultaneously. As shown in the following figure, the execution of each drawing is scheduled based on the order of priority and time sharing.

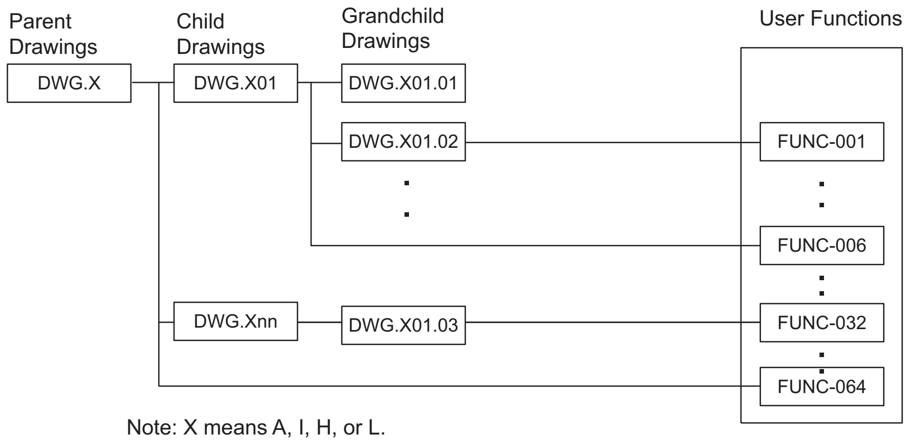


* Background processing is used to execute internal system processing, e.g., communication processing.

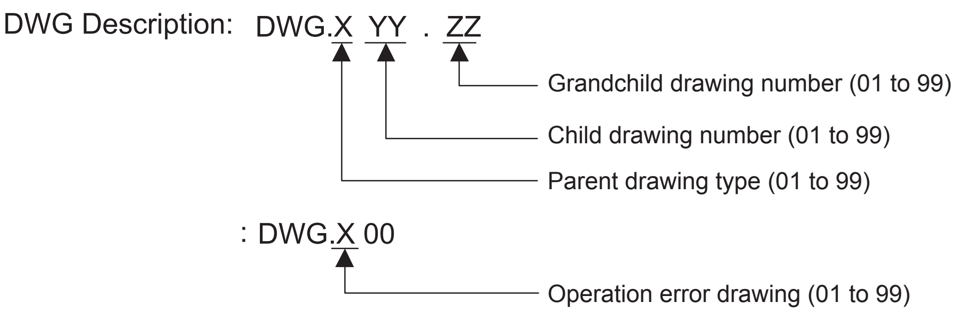
Low-speed scan processing is executed in spare processing time of the high-speed scan. Set the time of the high-speed scan to approximately double the total execution time for DWG.H.

[c] Hierarchical Structure of Drawings

Each processing program is made up of parent drawings, child drawings, and grandchild drawings. Parent drawings cannot call child drawings from a different type of drawing and child drawings cannot call grandchild drawings from a different type of drawing. Also, parent drawings cannot directly call grandchild drawings. Child drawings are always called from parent drawings and grandchild drawings are always called from child drawings. This is the hierarchical structure of drawings.
As shown in the following figure, each processing program is created from a hierarchy of parent, child, and grandchild drawings.

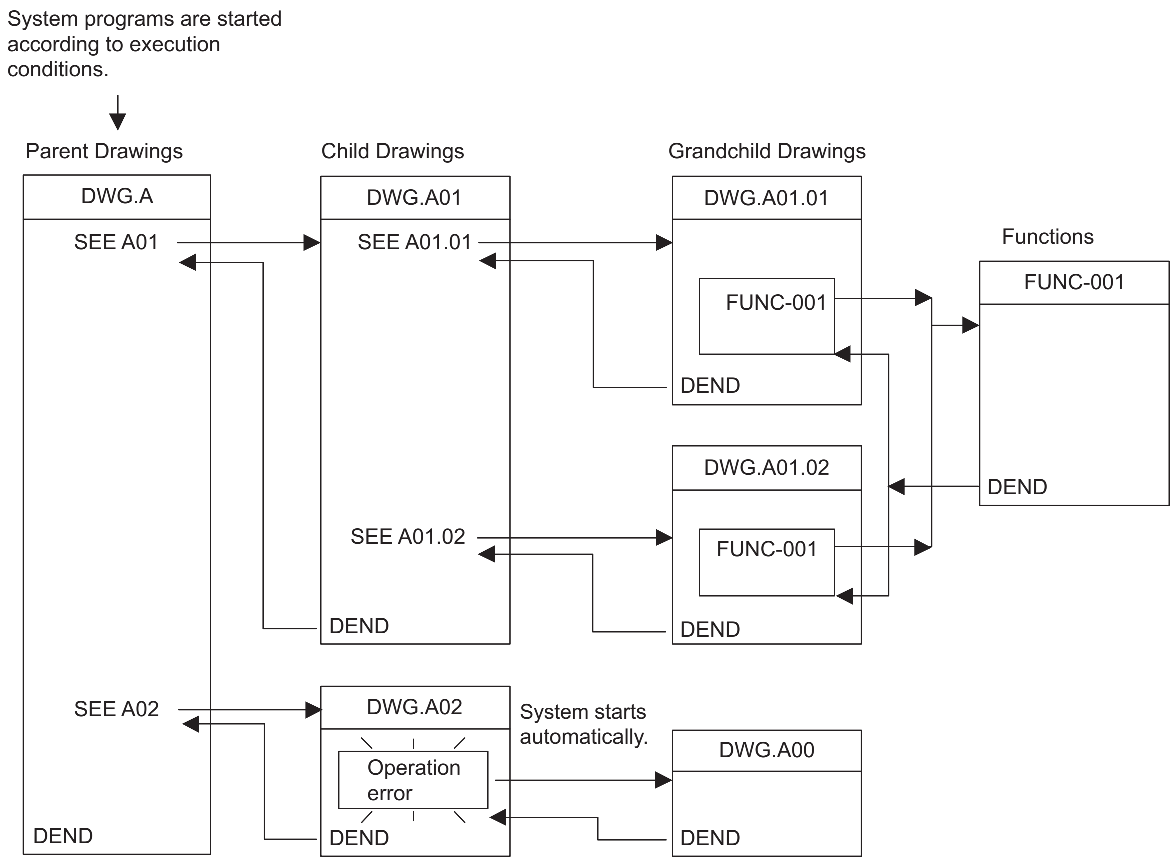


Note: X means A, I, H, or L.



[d] Drawing Execution Processing Method

The execution processing of hierarchical drawings are performed by calling lower-level drawings from higher-level drawings.
The following figure shows the execution processing for drawings, using DWG.A as an example.



Note: 1. Parent drawing is automatically called and executed by system. Therefore, you can execute the child and grandchild drawings by programming a DWG reference command (SEE command) in the parent and child drawings.
2. Functions can be referenced from any drawing. Functions can also be referenced from other functions.
3. When an operation error occurs, the operation error processing drawing for that drawing will be started.

(3) Functions

Functions are executed by calling them from parent, child, or grandchild drawings using the FUNC command.
Functions can be called from any drawing, and the same function can be called at the same time from different types of drawings and from different levels of drawings. Another completed functions can also be called from functions.
Using functions has the following advantages.

- Easier creation of user program components
- Easier writing and maintenance of user programs

Functions include standard system functions that are already in the system and user functions that are defined by the user.

[a] Standard System Functions

The transmission and other functions listed below are already created as standard system functions. Standard system functions cannot be changed by users.

Type	Name	Symbol	Contents
System functions	Counter	COUNTER	Incremental/decremental counter
	First in/first out	FINFOUT	First in/first out
	Trace function	TRACE	Data trace execution control
	Data trace read	DTRC-RD	Reads data from data trace memory to user memory
	Inverter trace read function	ITRC-RD	Reads trace data from inverter trace memory to user memory
	Message send	MSG-SND	Sends messages to external communication devices
	Message receive	MSG-RCV	Receives messages from external communication devices

[b] User Functions

The functions (programs) and the function definitions can be changed (programmed) freely by users.
The maximum number of user functions that can be defined is 500 drawings.

- Refer to the following manual for information on defining functions.
  - *Machine Controller MP900/MP2000 Series User's Manual Ladder Programming (manual number: SIEZ-C887-1.2)*
  - *Machine Controller MP900/MP2000 Series User's Manual Motion Programming (manual number: SIEZ-C887-1.3)*
  - *Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual (manual number: SIEZ-C887-13.1)*
  - *Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual (manual number: SIEZ-C887-13.2)*
  - *MP2000 Series Engineering Tool for Controller MPE720 Ver.6.0 User's Manual (manual number: SIEPC88070030)*

5.3 Registers

This section describes the types of registers used in MP2310 user programs (mainly ladder programs) and how to use them.

5.3.1 Types of Registers

(1) DWG Registers

Registers used by ladder programs (ladder drawings; DWG). Each drawing can use the registers outlined in the following table.

Type	Name	Specification Method	Range	Details	Characteristics
S	System registers	SB, SW, SL, SFnnnnn (SAnnnnn)	SW00000 to SW08191	Registers provided by the system. SW00000 to SW00049 are cleared to all zeros when the system starts.	Common to all drawings
M	Data registers	MB, MW, ML, MFnnnnn (MAnnnnn)	MW00000 to MW65534	Registers shared by all drawings. Used, e.g., as an interface between drawings.	
I	Input registers	IB, IW, IL, IFhhhh (IAhhhh)	IW0000 to IW13FFF	Registers used for input data.	
O	Output registers	OB, OW, OL, OFhhhh (OAhhhh)	OW0000 to OW13FFF	Registers used for output data.	
C	Constants registers	CB, CW, CL, CFnnnnn (CAnnnnn)	CW00000 to CW16383	Registers that can only be called from programs.	
#	# registers	#B, #W, #L, #Fnnnnn (#Annnnn)	#W00000 to #W16383	Call-only registers Can be called only by corresponding drawing. The usage range is set by the user using MPE720.	Unique to each drawing
D	D registers	DB, DW, DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each drawing. Can be used only by corresponding drawing. The usage range is set by the user using MPE720.	

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 5-37.)
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 Drawings Properties Window. Refer to the *Machine Controller MP900/ MP2000 Series User's Manual MPE720 Software for Programming Device (SIEPC88070005)* or, refer to *MP2000 Series Engineering Tool for 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 MP2310 power is turned OFF and ON. Other register data is saved to flash memory, so when the MP2310 power is turned OFF to ON, data saved to flash memory is read and data not saved to flash memory is lost. It is recommended, therefore, that data to be held regardless of whether or not the power is turned OFF to ON should be written to M registers if possible.

(2) Function Registers

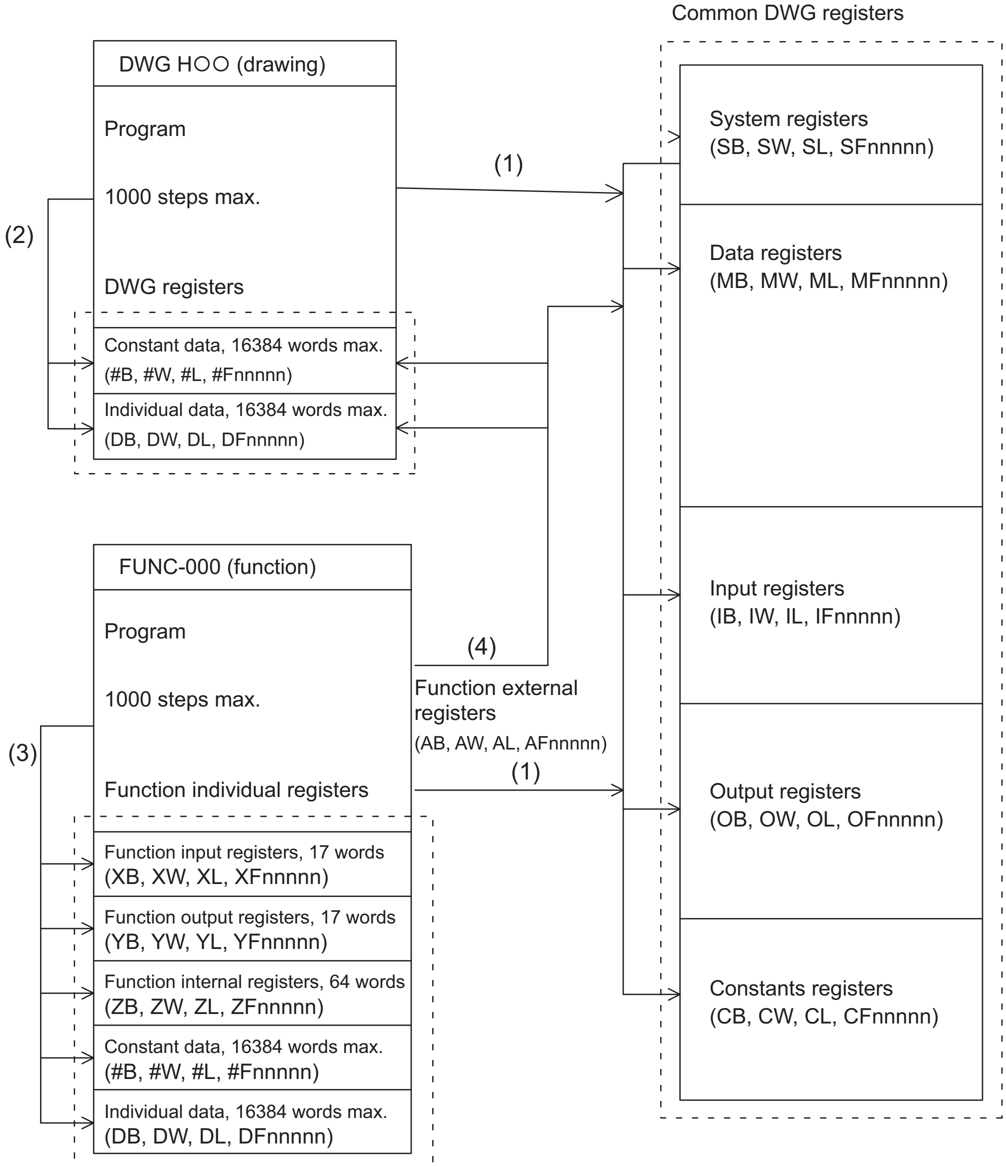
The following table shows the registers that can be used with each function.

Type	Name	Specification Method	Range	Details	Characteristics
X	Function input registers	XB, XW, XL, XFnnnnn	XW00000 to XW00016	Input to functions Bit input: XB000000 to XB00000F Integer input: XW00001 to XW00016 Double-length integer input: XL00001 to XL00015	Unique to each function
Y	Function output registers	YB, YW, YL, YFnnnnn	YW00000 to YW00016	Output from functions Bit output: YB000000 to YB00000F Integer output: YW00001 to YW00016 Double-length integer output: YL00001 to YL00015	
Z	Internal function registers	ZB, ZW, ZL, ZFnnnnn	ZW0000 to ZW00063	Internal registers unique to each function Can be used for function internal processing.	
A	External function registers	AB, AW, AL, AFhhhh	AW0000 to AW32767	External registers with the address input value as the base address. For linking with S, M, I, O, #, and DAnnnnn.	
#	# registers	#B, #W, #L, #Fnnnnn (#Annnnn)	#W00000 to #W16383	Call-only registers Can be called only from the relevant function. The usage range is set by the user using MPE720.	
D	D registers	DB, DW, DL, DFnnnnn (DAnnnnn)	DW00000 to DW16383	Internal registers unique to each function. Can be called only the relevant function. The usage range is set by the user using MPE720.	
S	System registers	SB, SW, SL, SFnnnnn (SAnnnnn)	Same as DWG registers These registers are shared by drawings and functions. Pay attention to how these registers are to be used when calling the same function from a drawing of a different priority level.		
M	Data registers	MB, MW, ML, MFnnnnn (MAnnnnn)			
I	Input registers	IB, IW, IL, IFhhhh (IAhhhh)			
O	Output registers	OB, OW, OL, OFhhhh (OAhhhh)			
C	Constants registers	CB, CW, CL, CFhhhh (CAnnnn)			

- n: Decimal number; h: Hexadecimal number
- B, W, L, F, and A: Data type (B: Bit, W: Integer, L: Double-length integer, F: Real number, A: Address. Refer to *5.3.2 Data Types* on page 5-37.)
- SA, MA, IA, OA, DA, #A, and CA registers can be used within functions.

(3) Register Ranges in Programs

The following figure shows DWG programs, function programs, and register call ranges.

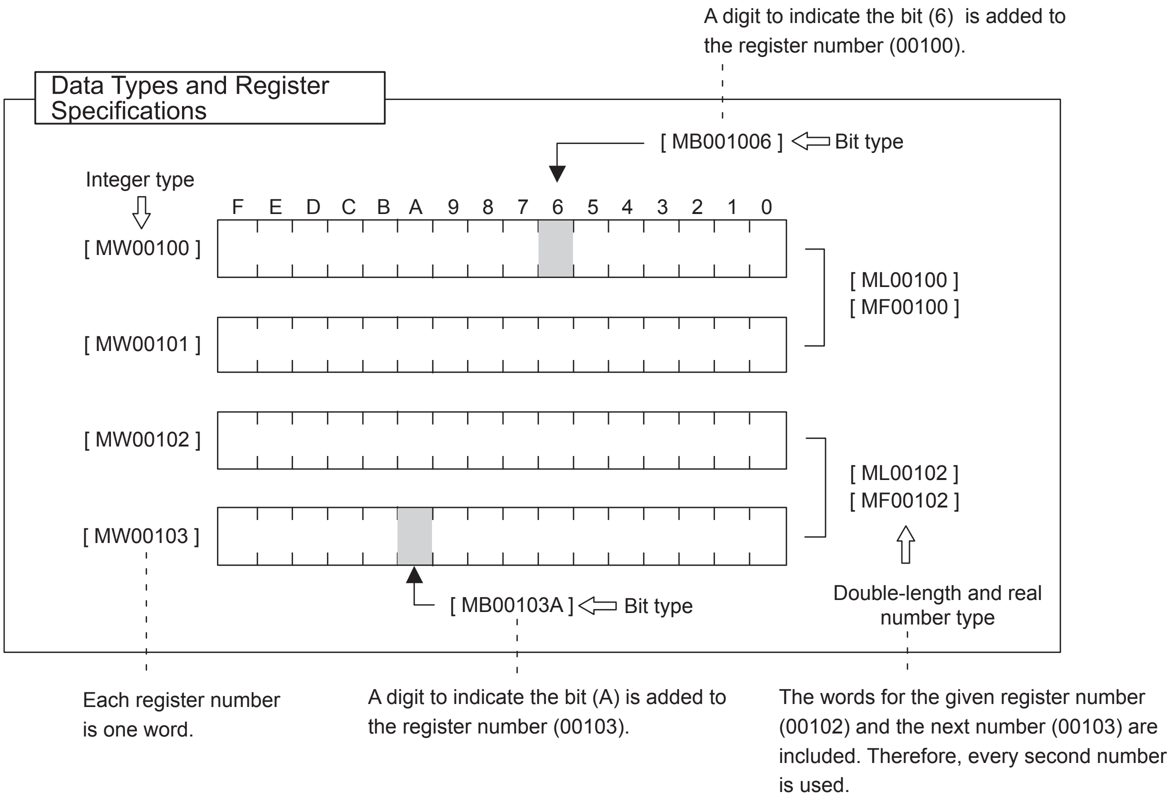


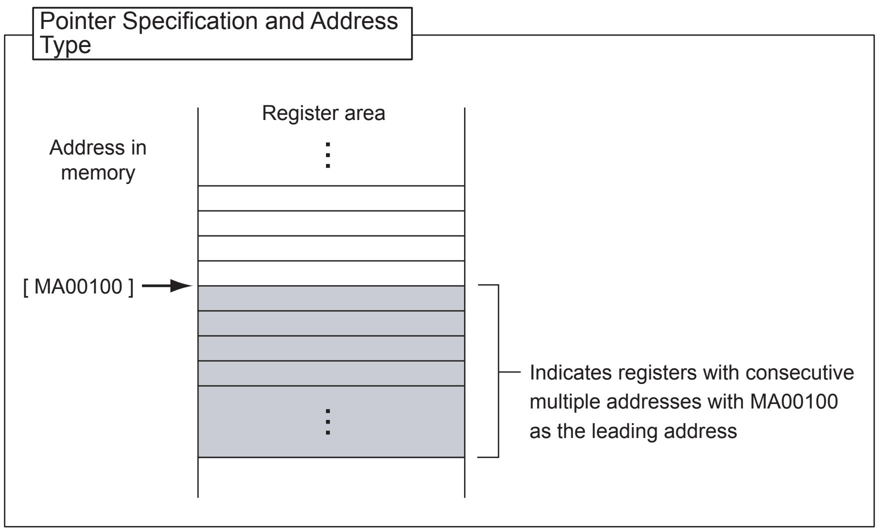
(1): Registers that are common to all drawings can be called from any drawing or function.
(2): Registers that are unique to each drawing can be called only from within the drawing.
(3): Registers that are unique to each function can be called only from within the function.
(4): Registers that are common to all drawings and registers that are unique to each drawing can be called from functions using the external function registers.

5.3.2 Data Types

There are five kinds of data: Bit, integer, double-length integer, real number, and address data. Each is used differently depending on the application. Address data, however, is used only inside functions when specifying pointers.
The following table shows the types of data.

Type	Data types	Numeric Value Range	Remarks
B	Bit	0, 1	Used by relay circuits.
W	Integer	–32768 to +32767 (8000H) (7FFFH)	Used for numeric value operations. The values in parentheses ( ) indicate use with logical operations.
L	Double-length integer	–2147483648 to +2147483647 (80000000H) (7FFFFFFFH)	Used for numeric value operations. The values in parentheses ( ) are for use with logical operations.
F	Real number	± (1.175E-38 to 3.402E+38), 0	Used for numeric value operations.
A	Address	0 to 32767	Used only when specifying pointers.

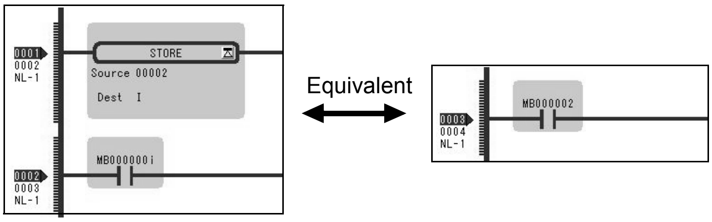




5.3.3 How to Use Subscripts i, j

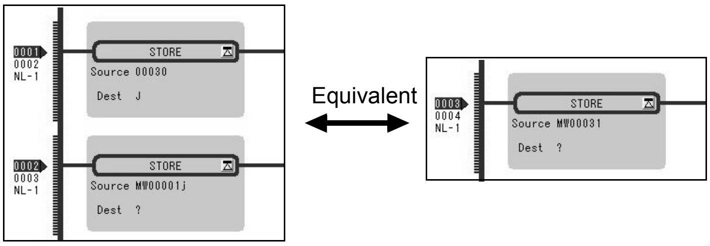
Two type of registers (i, j) are available as dedicated registers to modify the relay and register numbers. Both i and j have the same function. They are used when you want to handle a register number as a variable.
An example for each register data type is given as explanation.

(1) Bit Type Attached with a Subscript



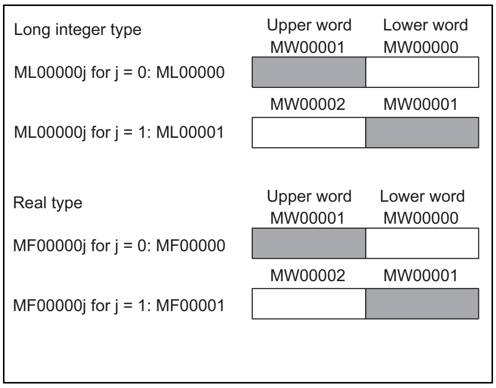
The result is a relay number added with i or j value.
For example, MB000000i for i=2 is the same as MB000002.
Also, MB000000j for j=27 is the same as MB00001B.

(2) Integer Type Attached with a Subscript



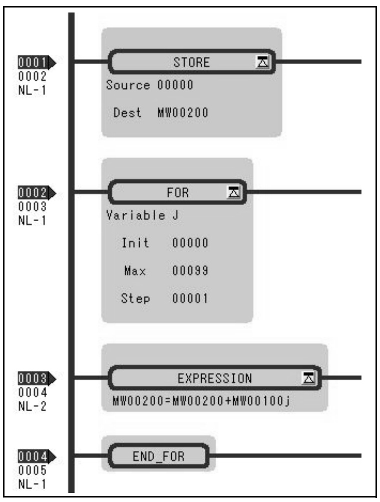
The result is a register number added with i or j value.
For example, MW00010i for i=3 is the same as MW00013.
Also, MW00001j for j=30 is the same as MW00031.

(3) Long Integer or Real Type Attached with a Subscript



The result is a register number with an added i or j value.
For example, “ML00000j for j=1” is the same as ML00001. Also, “MF00000j for j=1” is the same as MF00001.
However, as a word indicated by a register number is the lower word for a long integer/real type, for the same ML00001 and MF00001, be aware that an upper/lower word of ML00001 and MF00001 for j=0 may differ from those of

Program example using subscript

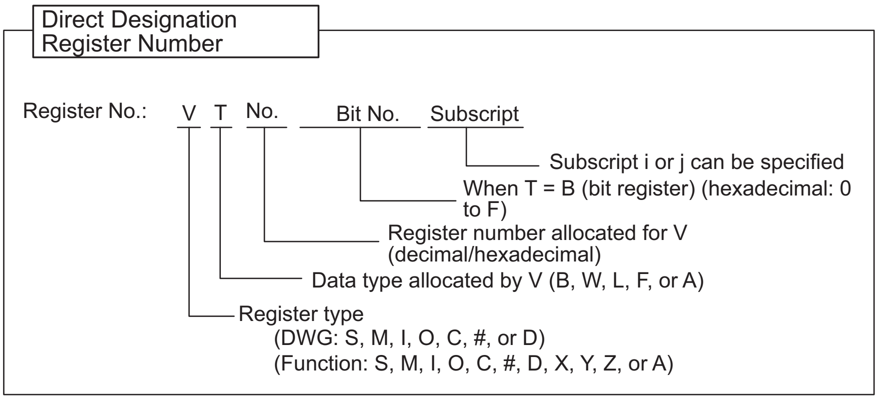


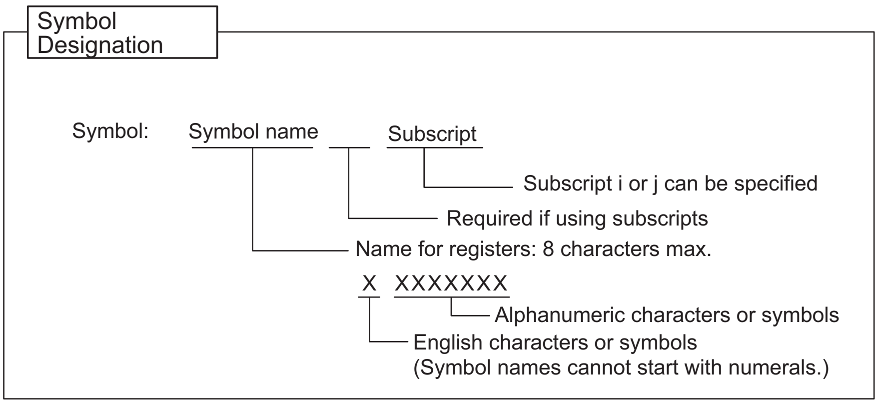
The left program uses a subscript j and calculates the total amount of a hundred registers from MW00100 to MW00199, and stores the total amount in MW00200.

5.3.4 Register Designation

Registers can be specified directly by register number or by symbol (register name). A combination of both of these register designation methods can be used in ladder programs.
When using the symbol specification method, the relationship between symbols and register numbers must be defined.
The following table shows the register specification methods.

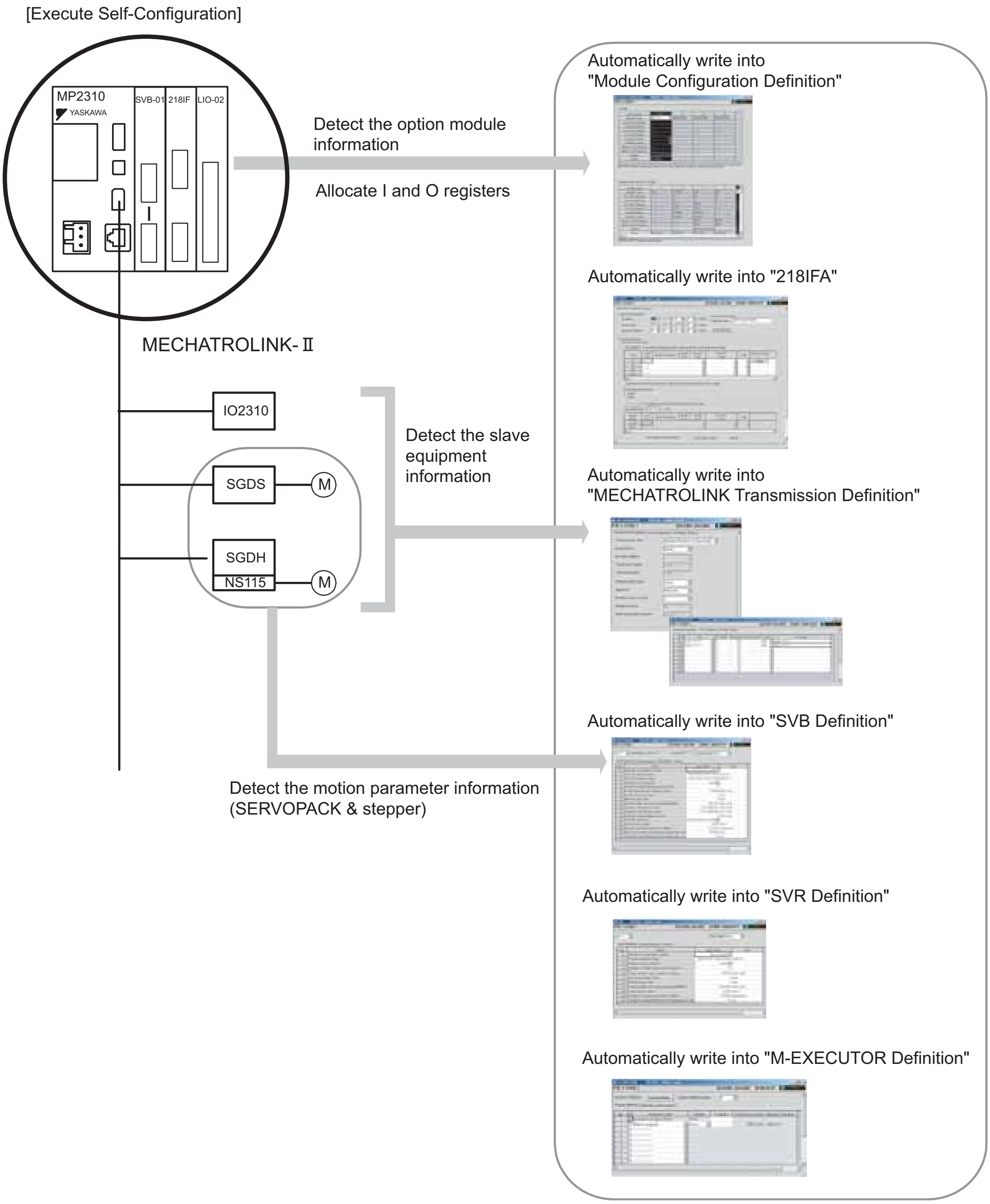
Designation Method	Designation Example for Each Data Type
Register Number Direct Designation	Bit register: MB00100AX Integer register: MW00100X Double-length integer register: ML00100X Real number register: MF00100X Address register: MA00100X X: When specifying subscripts, subscript i or j is added after the register number.
Symbol Designation	Bit register: RESET1-A.X Integer register: STIME-H.X Double-length integer registers: POS-REF.X Real number registers: IN-DEF.X Address registers: PID-DATA.X ↓ 8 alphanumeric characters max. X: When specifying subscripts, a period (.) is added after the symbol (8 alphanumeric characters max.) and then a subscript i or j is added.





5.4 Self-configuration

The self-configuration function automatically recognizes the Optional Modules mounted to the MP2310 Basic Module and all slave data for slaves connected to the MECHATROLINK network, 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.

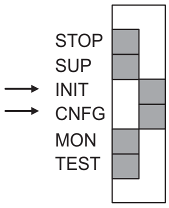
■ Caution

Note that this operation can clear the following data in MP2310.

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

---

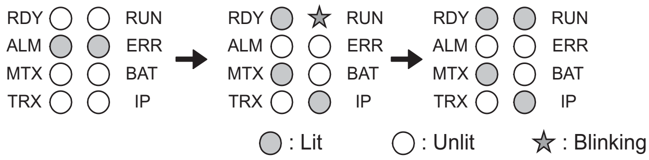
1. Turn OFF the power supply.
   Turn OFF the 24-VDC power supply to the MP2310.

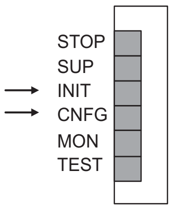


2. Set the DIP switch.
   Set the switches INIT and CNFG of the DIP switch SW1 on the MP2310 Basic Module to ON.

3. Turn ON the power supply.
   Turn ON the 24-VDC power supply to the MP2310.

4. Check the LED indicators.
   Check that the LED indicators on the MP2310 Basic Module change as follows.



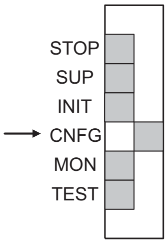


5. Reset the DIP siwtch.
   Set the switches INIT and CNFG of the DIP switch SW1 on the MP2310 Basic Module to OFF.

[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.

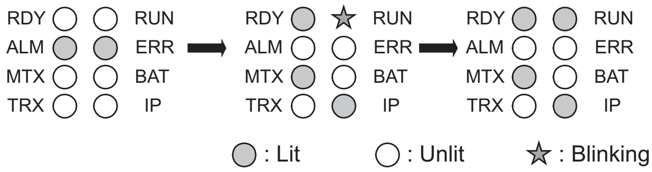
1. Turn OFF the power supply
   Turn OFF the MP2310's 24-VDC power supply.

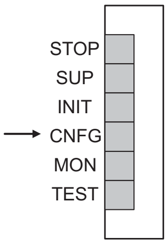


2. DIP switch setting
   Turn ON CNFG of MP2310's DIP switch (SW1).

3. Turn ON the power supply
   Turn ON the MP2310's 24-VDC power supply.

4. Check the display
   Check that LED display of the MP2310 main unit is changed as follows:





5. DIP switch resetting
   Turn OFF CNFG of MP2310's DIP switch (SW1).

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 MP2310 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 MP2310 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 MP2310 after executing self-configuration until the definitions data has been saved to flash memory in the MP2310. If the power is somehow turned OFF before the data is saved to flash memory, re-execute the self-configuration.

(2) Procedure Using MPE720

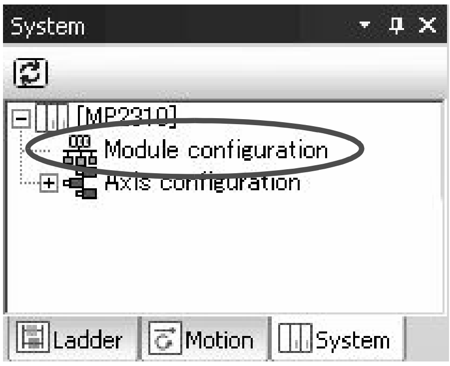
Executing self-configuration from MPE720 allows self-configuration for individual Modules as well as for all modules.
When self-configuration is carried out from MPE720, a definition for any axis newly detected in the MECHATROLINK transmission is created. The definitions for already mapped axes are not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

This section explains each way to execute the self-configuration:

[a] Self-configuration for All the Modules

By performing the following operation, the self-configuration for MP2310 basic and option modules is executed. Before performing the operation, turn ON the power supply of equipment such as SERVOPACK.

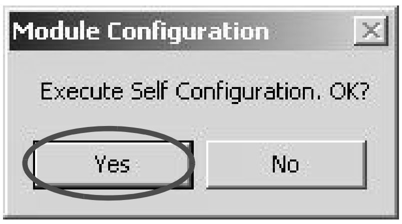
1. Double-click ***System - Module Configuration***.



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.



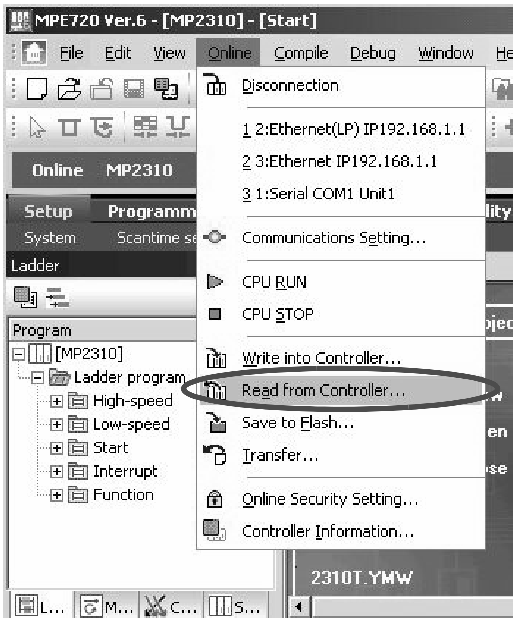
4. While running the self-configuration, the following message is shown.

Outline of Motion Control Systems

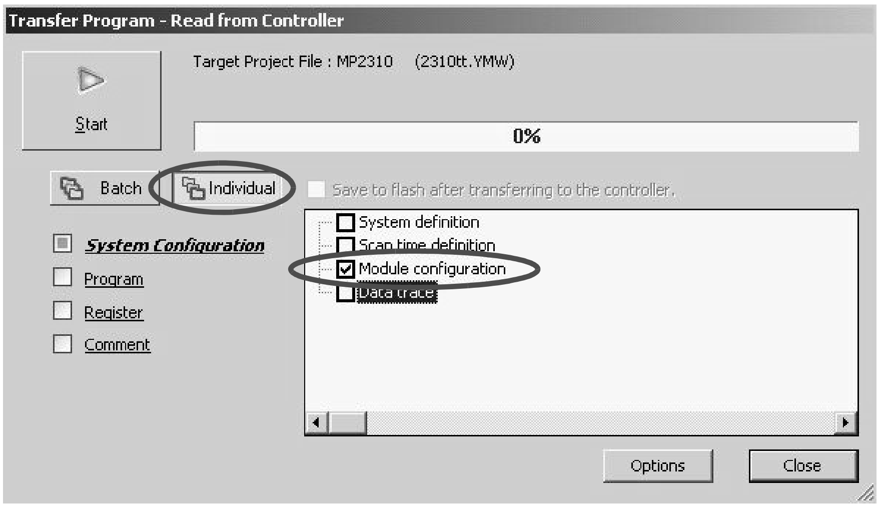
5

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.

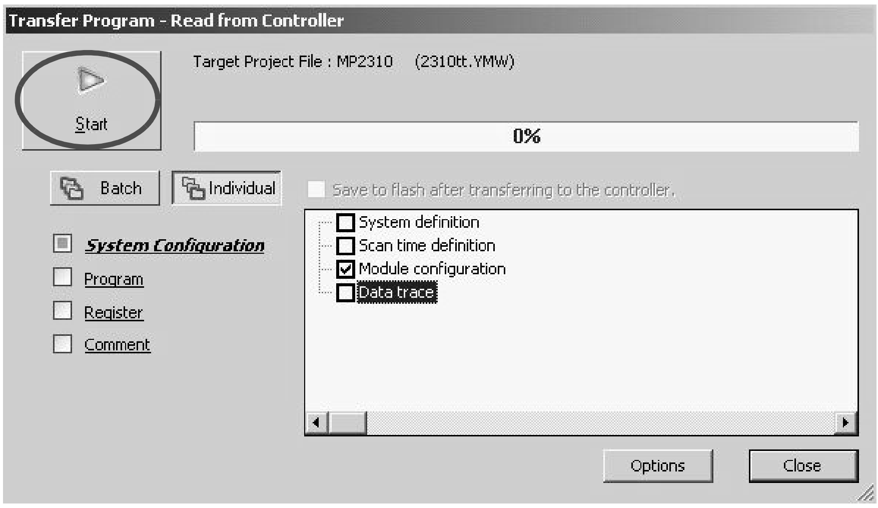
6. Select ***Online(O) - Read from Controller(A)***.



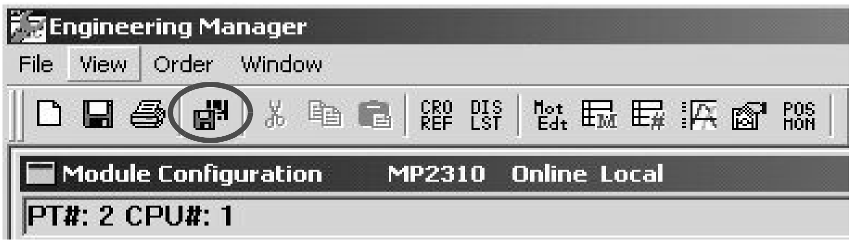
7. Click **Individual**, and only check **Module Configuration**.



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.

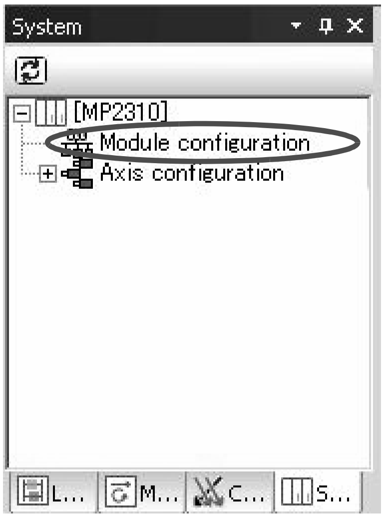
Outline of Motion Control Systems

5

[b] Self Configuration of Each Module

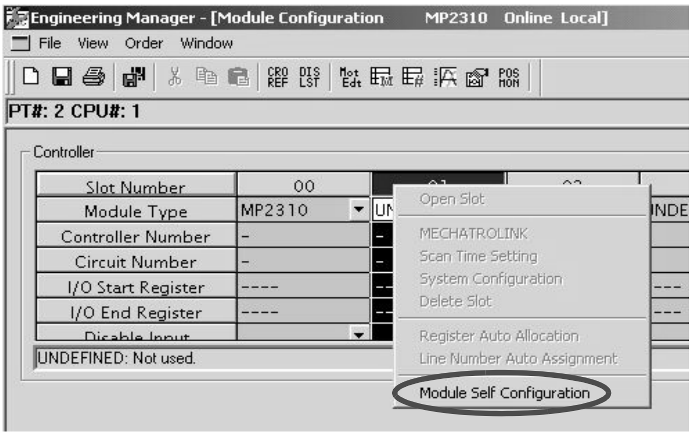
If modules or devices are added, self-configuration can be executed separately for the Module (port) that has been changed.
By performing the following operation, self-configuration will be executed for the selected slot.
Before performing the operation, turn ON the power supply of devices such as SERVOPACK.

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



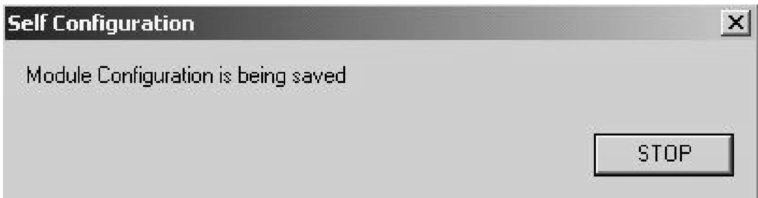
The **Engineering Manager** Window will start and the **Module Configuration** Window will appear.

2. Right-click the Module for which devices have been added and select **Module Self Configuration** from the pop menu to execute self-configuration.



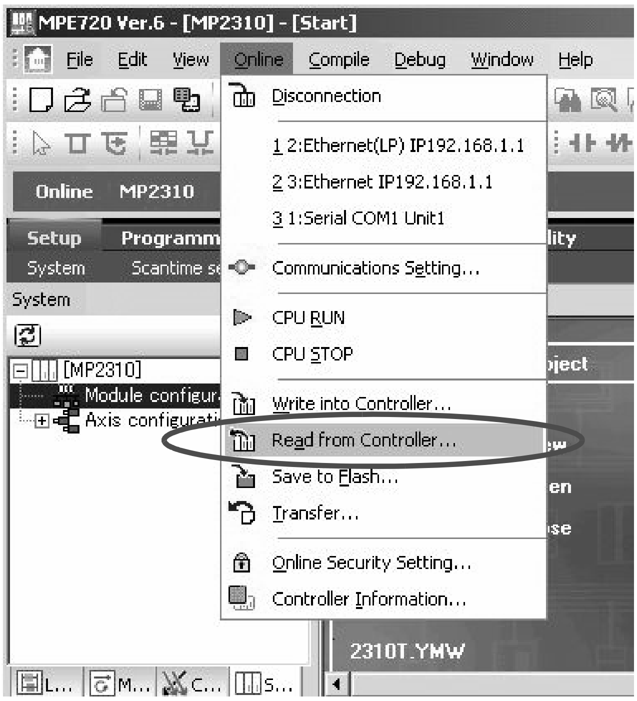
3. Click **Yes** for the following message.

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

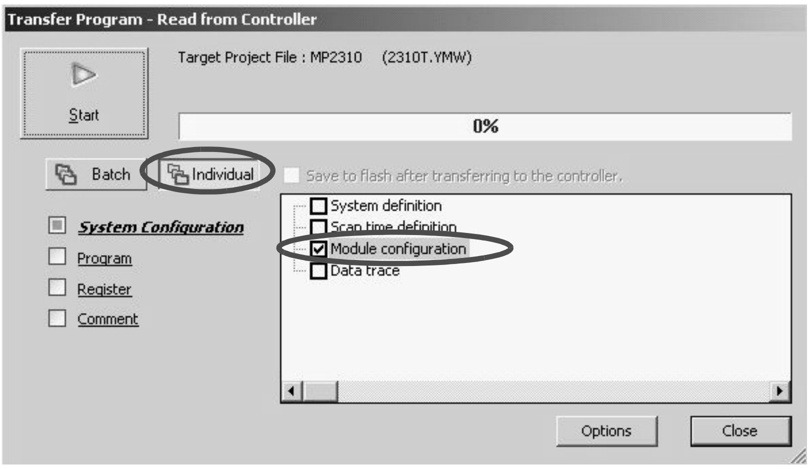


5. If the following warning message is shown after performing step 4, the module configuration definitions for CPU and MPE720 may differ from each other. Continue to perform step 6. When the message is not shown, go to step 9.

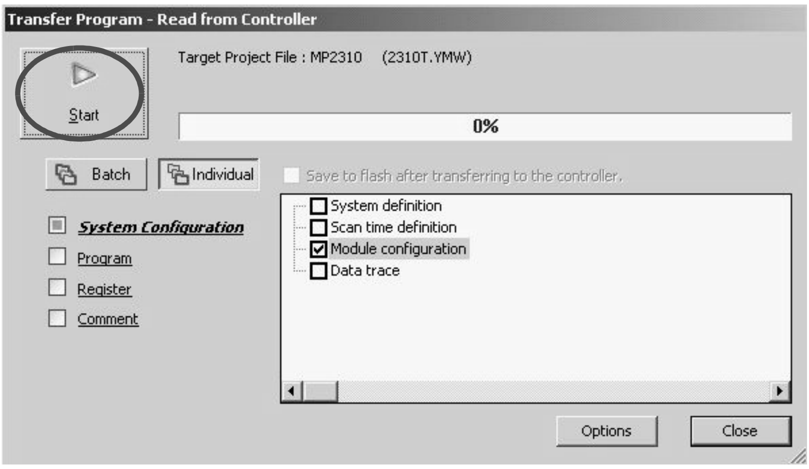
6. Select ***Online(O) - Read from Controller(A)***.



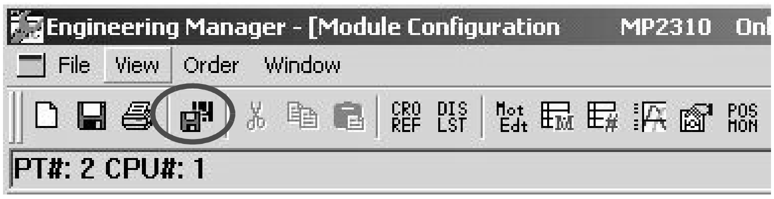
7. Click **Individual**, and only check **Module Configuration**.



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. In the **Module Configuration Definition** Window, check that the definition has been created.

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 MP2310 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, or MSG-SND/MSG-RCV functions are required.

[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 Built-in SVB/SVB-01 Motion Module User's Manual* (manual number: SIEPC88070033).

■ Master

<table>
<tr><th colspan="2">Item</th><th colspan="4">MECHATROLINK-II
(32-byte mode)</th><th colspan="2">MECHATROLINK-II
(17-byte mode)</th><th rowspan="2">MECHATROLINK-I</th></tr>
<tr><th></th><th>Maximum Slave Station Number</th><th>1 to 8</th><th>9</th><th>10 to 16</th><th>17 to 21</th><th>1 to 14</th><th>15</th></tr>
<tr><td colspan="2">Number of Transmit Bytes</td><td colspan="4">31 bytes</td><td colspan="2">16 bytes</td><td>–</td></tr>
<tr><td colspan="2">Communication Cycle</td><td>1ms</td><td>1ms</td><td>2ms</td><td>2ms</td><td>1ms</td><td>1ms</td><td>2ms</td></tr>
<tr><td colspan="2">Number of Retry Stations</td><td>1</td><td>0</td><td>5</td><td>21: Maximum station number</td><td>1</td><td>0</td><td>14</td></tr>
<tr><td colspan="2">Number of Slave Stations</td><td>8</td><td>9</td><td>16</td><td>Maximum station number</td><td>14</td><td>15</td><td>14</td></tr>
</table>

■ 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 MP2310/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

Note: M-EXECUTOR is not defined for use with the MP2310. For details on how to define the M-EXECUTOR, refer to *4.3.1 Initializing the M-EXECUTOR Module* on page 4-9.

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

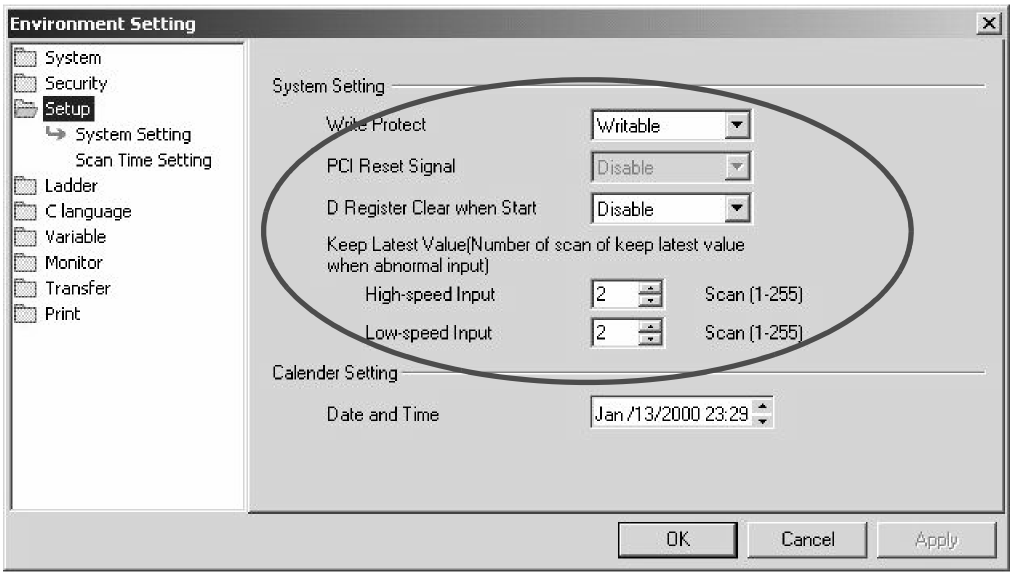
5.5 Precaution on Using MP2310

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

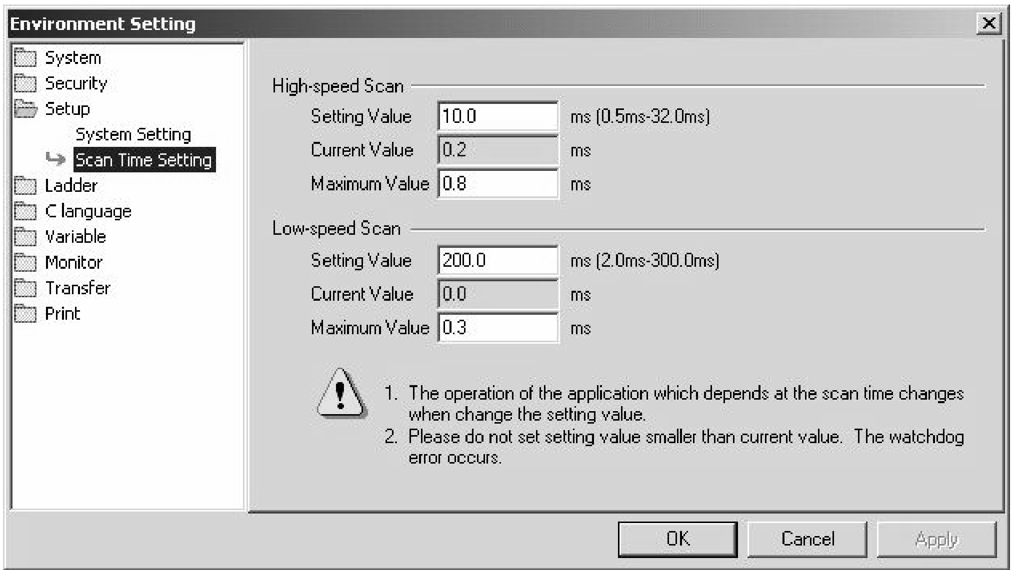
5.5.1 Precautions when User Definition File is Configured/Changed

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 MP2310 power supply is turn ON again without flash saving, the configured/changed data may be lost.

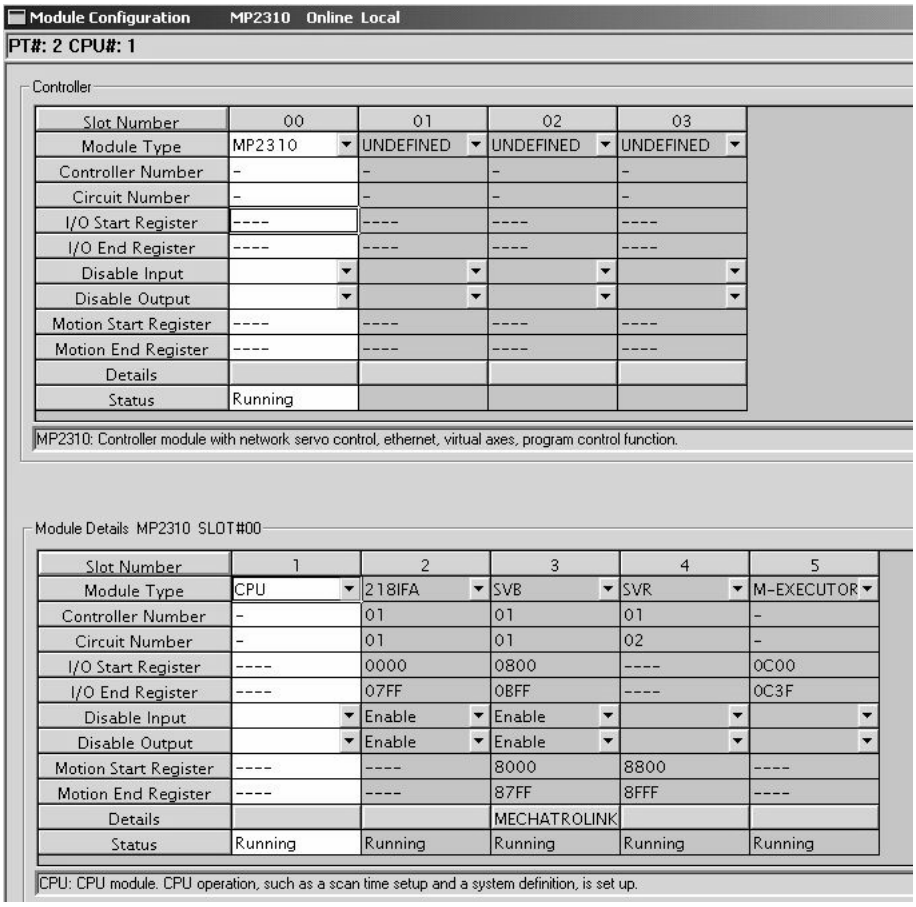
- System Setting



- Scan Time Setting



• Module Configuration Definition


Module Configuration MP2310 Online Local

PT#: 2 CPU#: 1

Controller

Slot Number	00	01	02	03
Module Type	MP2310	UNDEFINED	UNDEFINED	UNDEFINED
Controller Number	-	-	-	-
Circuit Number	-	-	-	-
I/O Start Register	----	----	----	----
I/O End Register	----	----	----	----
Disable Input				
Disable Output				
Motion Start Register	----	----	----	----
Motion End Register	----	----	----	----
Details				
Status	Running			

MP2310: Controller module with network servo control, ethernet, virtual axes, program control function.

Module Details MP2310 SLOT#00

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

CPU: CPU module. CPU operation, such as a scan time setup and a system definition, is set up.

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 MP2310 OFF and ON.

5.5.3 Setting and Changing the Scan Time

(1) Precautions When Setting or Changing the Scan Time

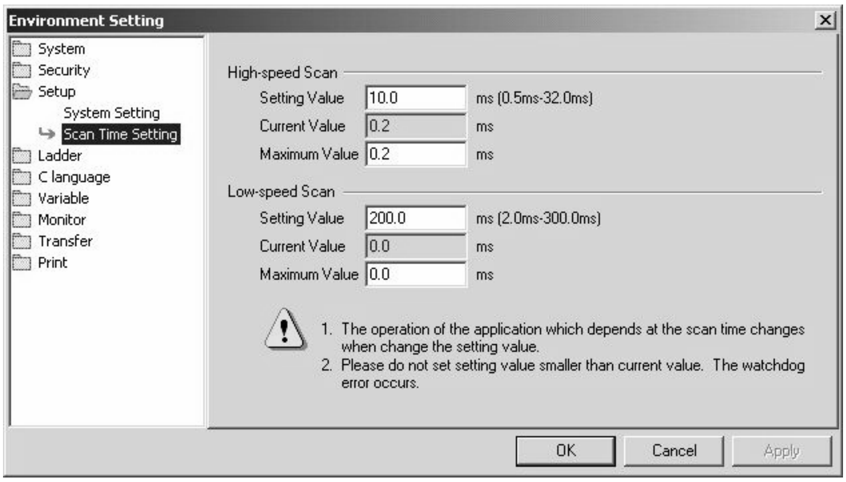
The scan time can be set and changed in the **Scan Time Setting** Window in the **Environmental Setting** Dialog Box on the MPE720.

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 MP2310 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 MP2310. 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 MP2310 by Ethernet.

6.1 Communication Methods - 6-2

6.2 Communication with Other MP Series - 6-3

6.2.1 When the MP2310 Acts as Slave (automatic receive function is used) - - - - - - - - - - - - - - - - - 6-3

6.2.2 When the MP2310 Acts as a Slave (ladder program which uses a MSG-RCV function) - - - - 6-16

6.2.3 When MP2310 Acts as Master (I/O message communication function is used) - - - - - - - - - - 6-34

6.2.4 When the MP2310 Acts as Master (ladder program which uses MSG-SND function) - - - - - - 6-47

6.3 Communication with Touch Panel - 6-63

6.3.1 When MP2310 Acts as Slave - 6-63

6.4 Communication with PLC Manufactured by Mitsubishi Electric Corporation (MELSEC protocol) - - - - - - - - - - - - - - - - - - - 6-73

6.4.1 When the MP2310 Acts as Slave (automatic receive function is used) - - - - - - - - - - - - - - - - 6-73

6.4.2 When the MP2310 Acts as Master (I/O message communication function is used) - - - - - - - 6-80

6.1 Communication Methods

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

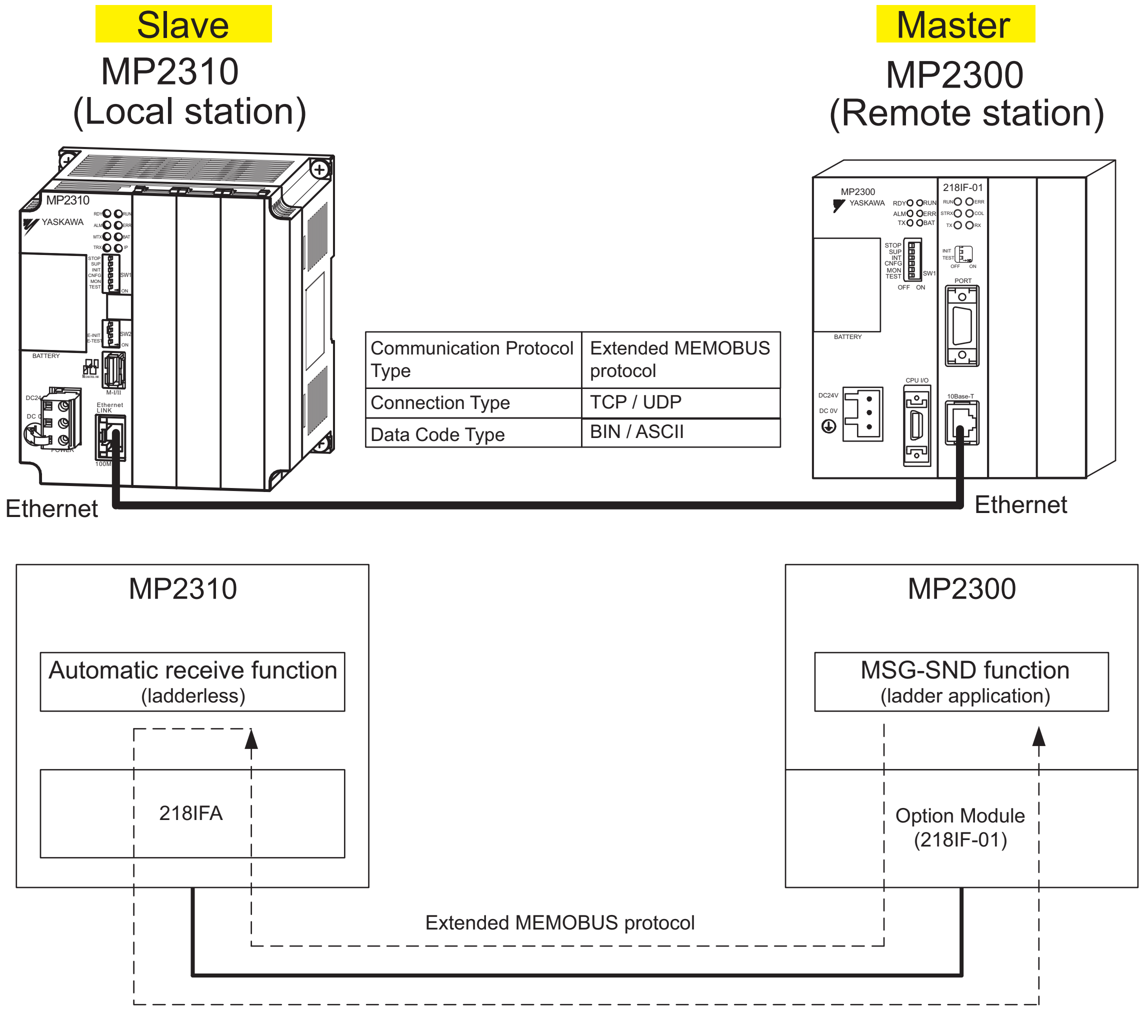
Remote Equipment	Purpose	Communication Method	Remarks
Other MP Series	When other MP series equipment reads/writes the coil state or register content of MP2310	Uses the Extended MEMOBUS communication protocol. The remote equipment (master) side creates a ladder program using a MSG-SND function. The MP2310 (slave) side uses an automatic receive function. (You do not need to create a ladder program.) ⇒ Refer to *6.2.1 When the MP2310 Acts as Slave (automatic receive function is used)*	MP2310 can communicate with only one master using the automatic receive function.
		Uses the Extended MEMOBUS communication protocol. The remote equipment (master) side creates a ladder program using a MSG-SND function. The MP2310 (slave) side creates a ladder program using a MSG-RCV function. ⇒ Refer to *6.2.2 When the MP2310 Acts as a Slave (ladder program which uses a MSG-RCV function)*	Communication with multiple masters is possible.
	When MP2310 reads/writes the coil state or register content of other MP series equipment	Uses the Extended MEMOBUS communication protocol. The MP2310 (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 *6.2.3 When MP2310 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.
		Uses the Extended MEMOBUS communication protocol. The MP2310 (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 *6.2.4 When the MP2310 Acts as Master (ladder program which uses MSG-SND function)*	Registers other than the holding register are capable of reading/writing. Communication with multiple slaves is enabled.
Touch Panel	When a touch panel reads/writes the coil state or register content of MP2310	Uses the Extended MEMOBUS communication protocol. Set the protocol for the touch panel side to the Extended MEMOBUS protocol. The MP2310 (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 MP2310 register content.	Uses the MELSEC communication protocol. The remote equipment (master) side creates a ladder program using a BUFSND function. The MP2310 (slave) side uses an automatic receive function. (You do not need to create a ladder program.) ⇒ Refer to *6.4.1 When the MP2310 Acts as Slave (automatic receive function is used)*	The MP2310 can communicate with only one master when using the automatic receive function.
	When an MP2310 reads/writes the relay state or register content of PLC Manufactured by Mitsubishi Electric Corporation.	Uses the MELSEC communication protocol. The MP2310 (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 MP2310 Acts as Master (I/O message communication function is used)*	The MP2310 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 MP2310 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 MP2310 acts as a slave and a master respectively.
When the MP2310 acts as a slave, this chapter explains communications using an automatic receive function and a ladder program with the MSG-RCV function.
When the MP2310 acts as a master, this chapter explains communications using an I/O message communication function and a ladder program with the MSG-SND function.

6.2.1 When the MP2310 Acts as Slave (automatic receive function is used)

This section explains how to communicate with the MP2300 message transmit function (MSG-SND) using the MP2310 automatic receive function.

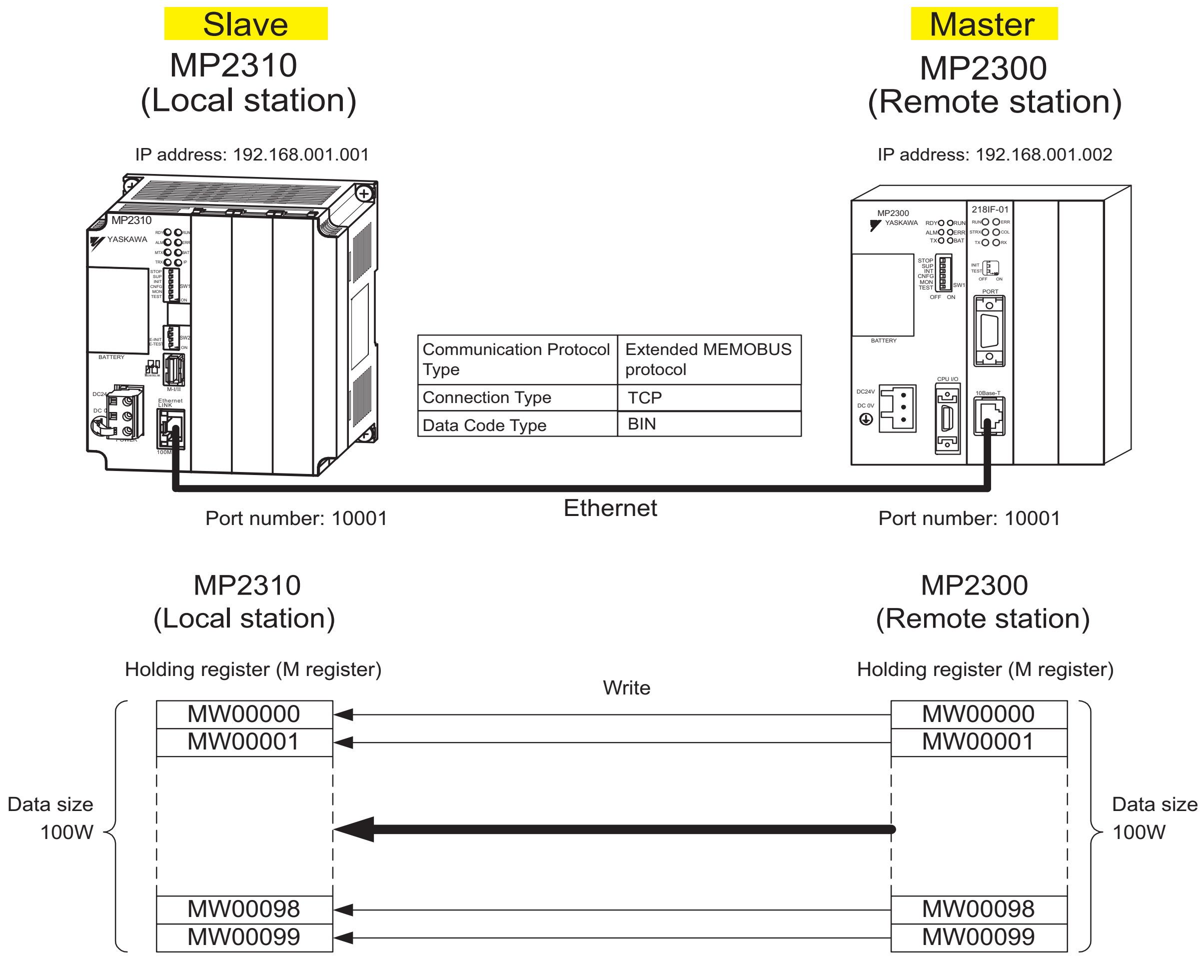


Communication Protocol Type	Extended MEMOBUS protocol
Connection Type	TCP / UDP
Data Code Type	BIN / ASCII

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

■ Setting Example

The following figure illustrates how the content of the MP2310 (master) holding register (MW00000 to MW00099) is written into the MP2310 (slave) holding register (MW00000 to MW00099).

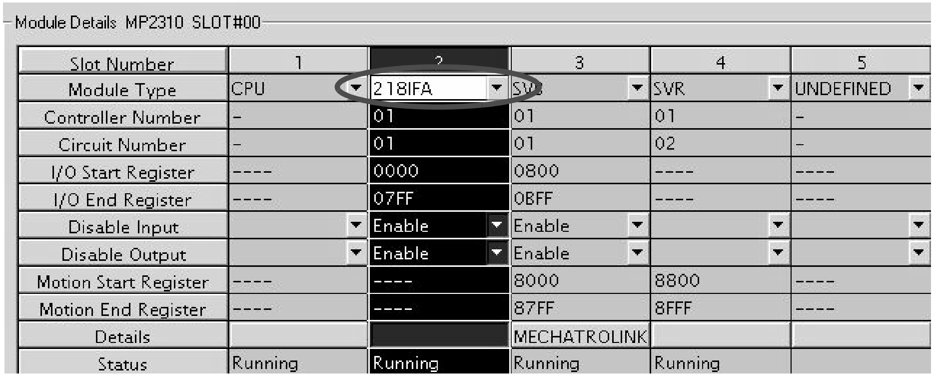


The setup procedure is explained in the following pages.

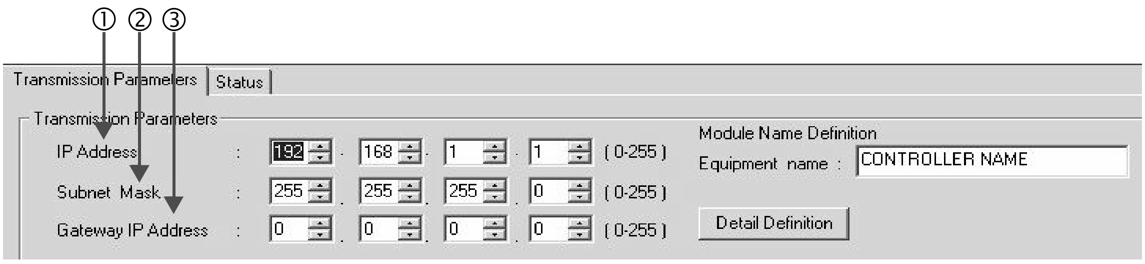
(1) How to Set up the MP2310 Side

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

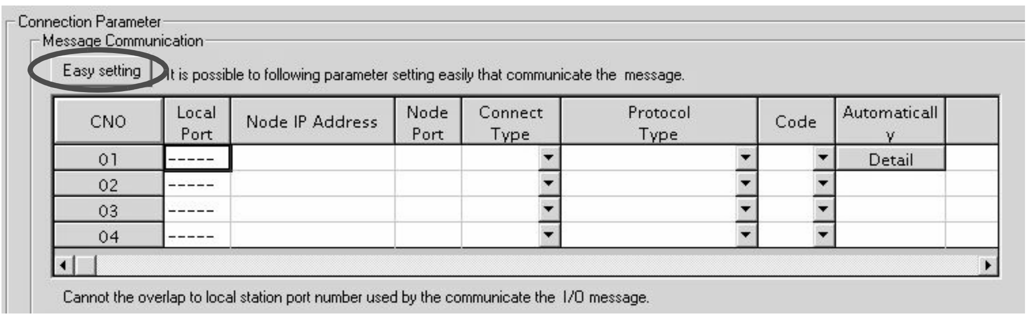
① Set **IP Address** (to “192.168.001.001,” for example).
② Set **Subnet Mask** (to “255.255.255.000,” for example).
③ Set **Gateway IP Address** (to “000.000.000.000,” for example).

■ Caution

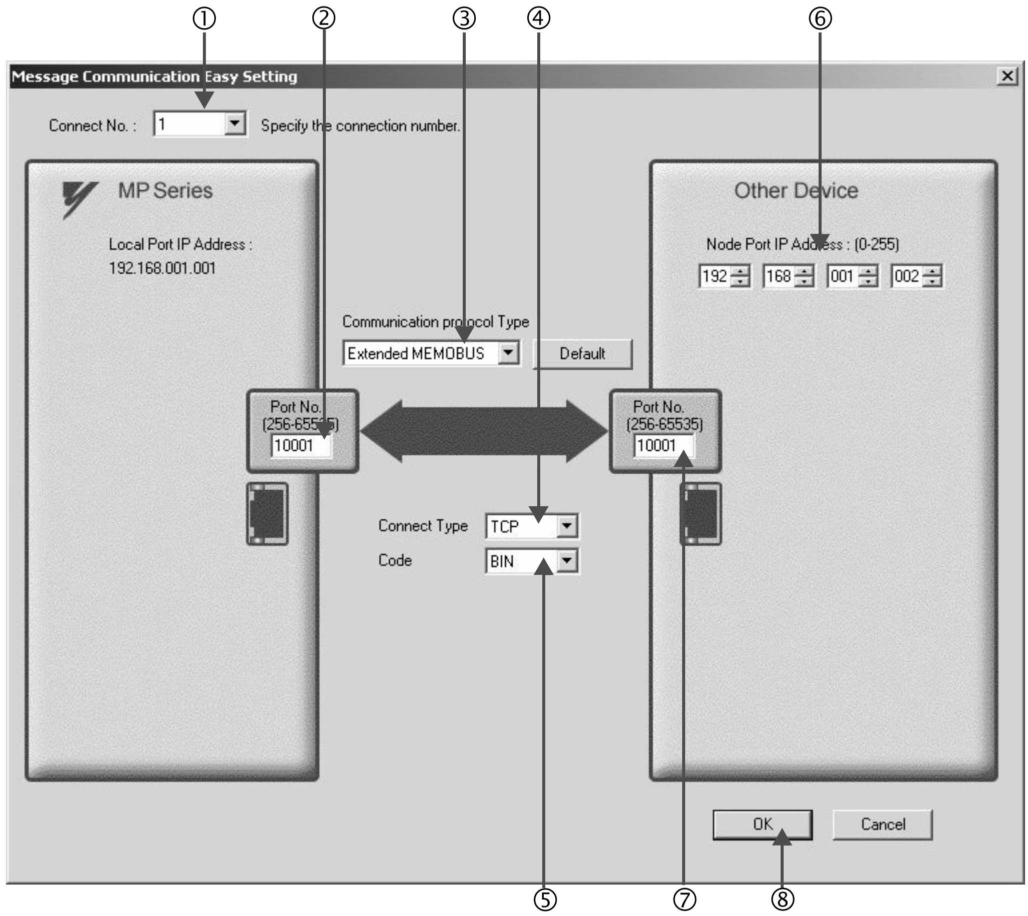
Set up a unique IP address in the network.
For the IP address, check with your network administrator.

---

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 MP2310 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.

■ Caution

When message functions (MSG-SND, MSG-RCV) are used with the connection number 01, disable the automatic receive function. If message functions are used while the automatic receive function is enabled, communications will not function properly.

Note: The automatic receive function with a connection number 01 is set to “Enable” by default.

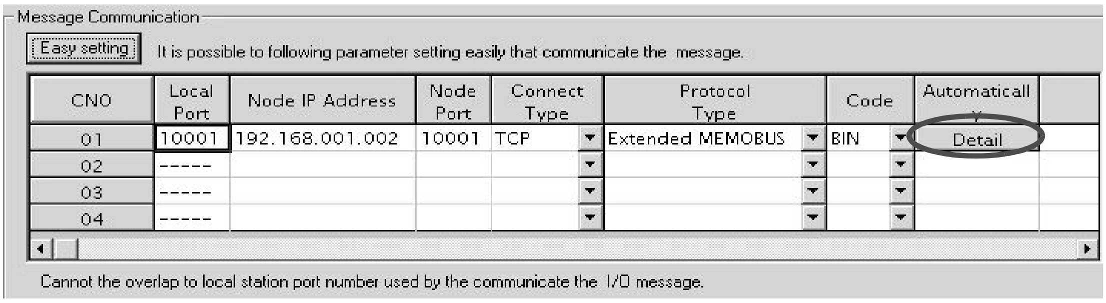
---

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

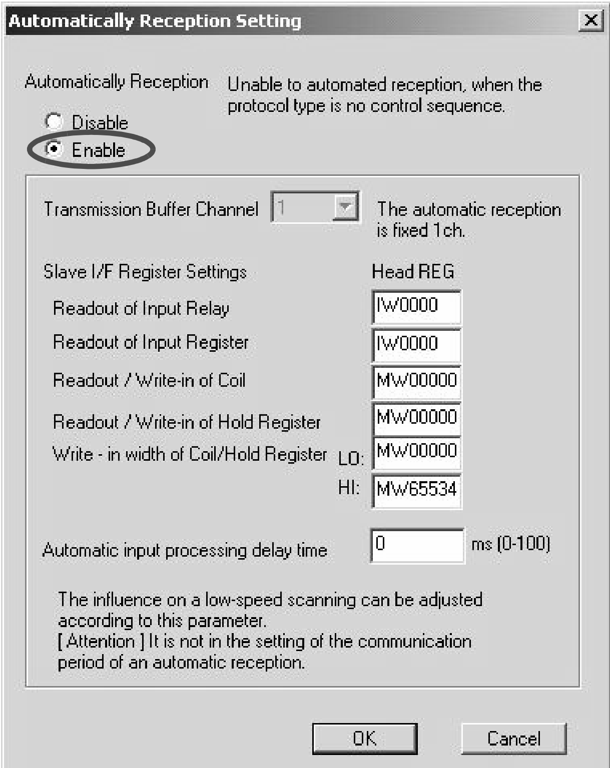
■ Caution

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 2-21.

Now, the automatic receive function is set up when the MP2310 acts as a slave.

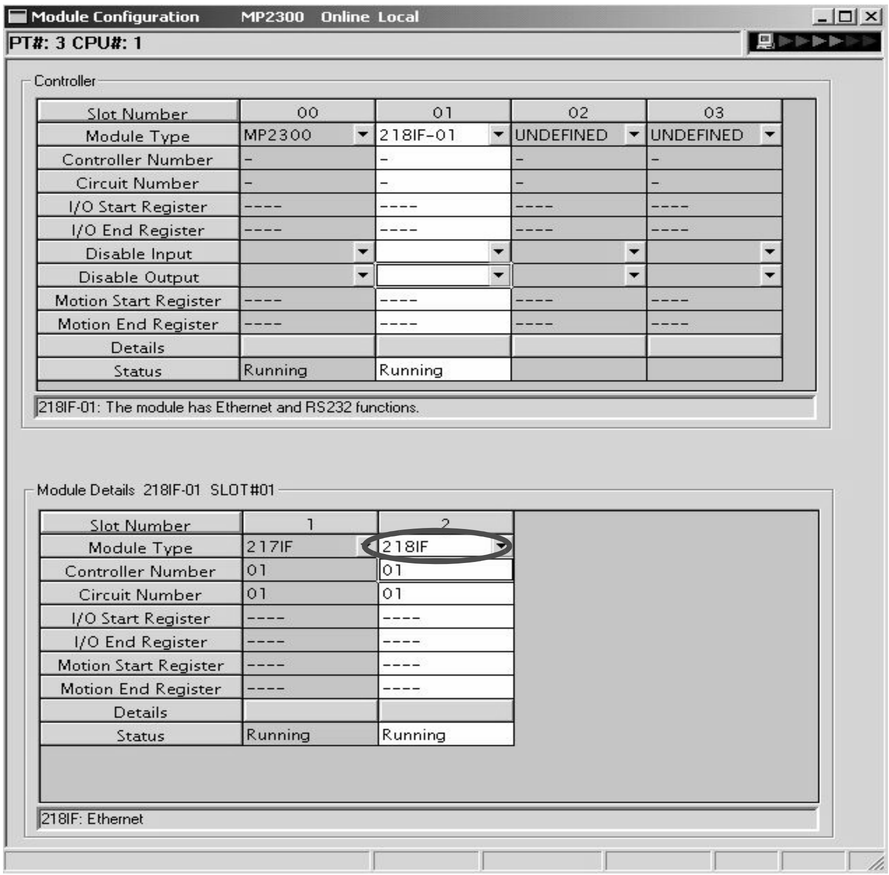
■ Caution

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.

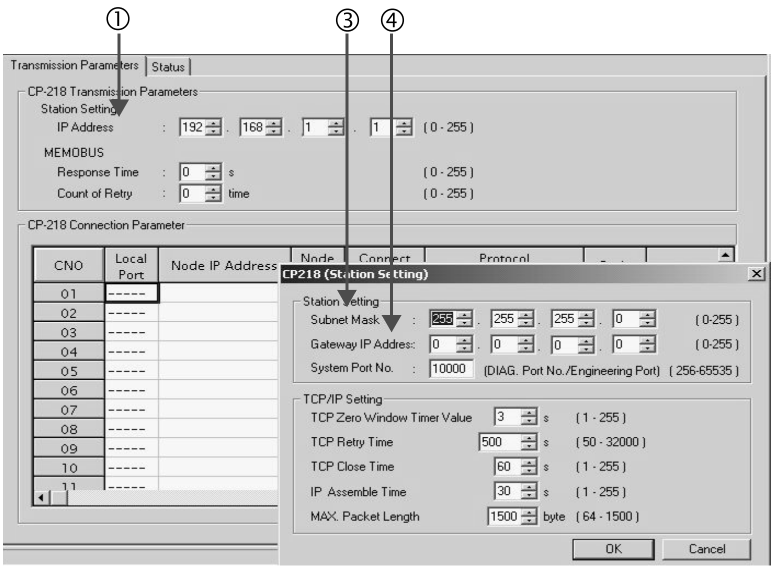
(2) How to Set up the Remote Device (MP2300) to Be Connected

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.



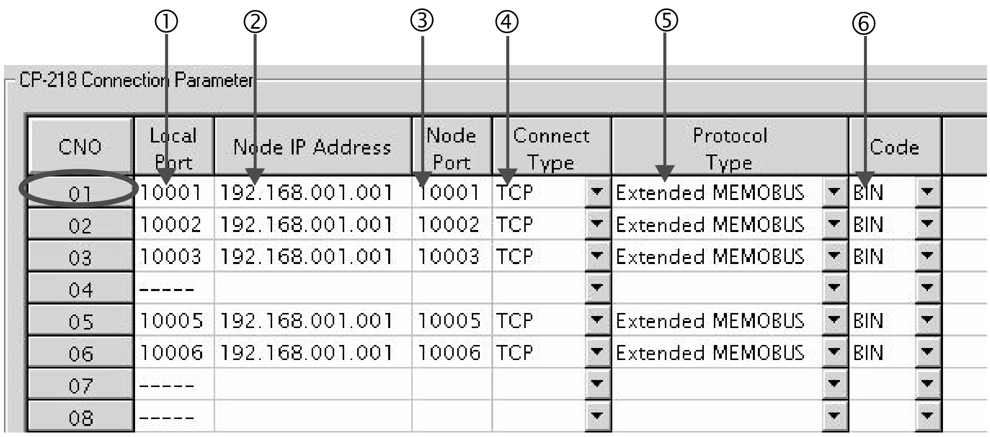
■ How to set up transmission parameters

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.



CNO	Local Port	Node IP Address	Node Port	Connect Type	Protocol Type	Code
01	10001	192.168.001.001	10001	TCP	Extended MEMOBUS	BIN
02	10002	192.168.001.001	10002	TCP	Extended MEMOBUS	BIN
03	10003	192.168.001.001	10003	TCP	Extended MEMOBUS	BIN
04	-----					
05	10005	192.168.001.001	10005	TCP	Extended MEMOBUS	BIN
06	10006	192.168.001.001	10006	TCP	Extended MEMOBUS	BIN
07	-----					
08	-----					

■ 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 MP2310 side.
③ Set **Node Port** to the port number configured in the MP2310 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

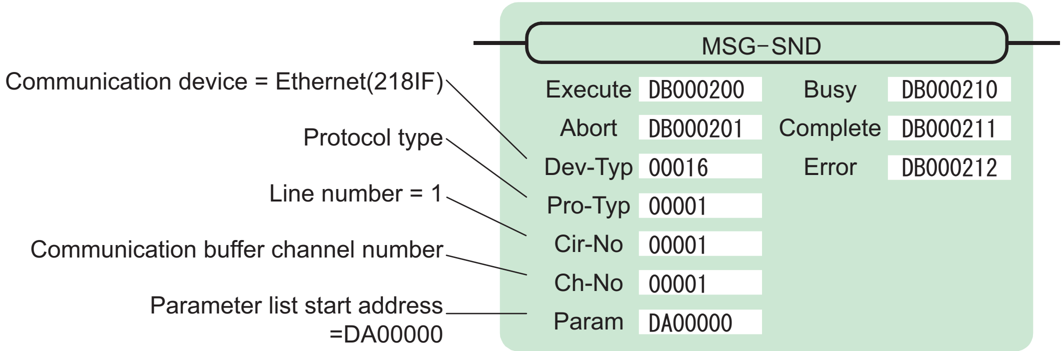
When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power turned ON again.

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.



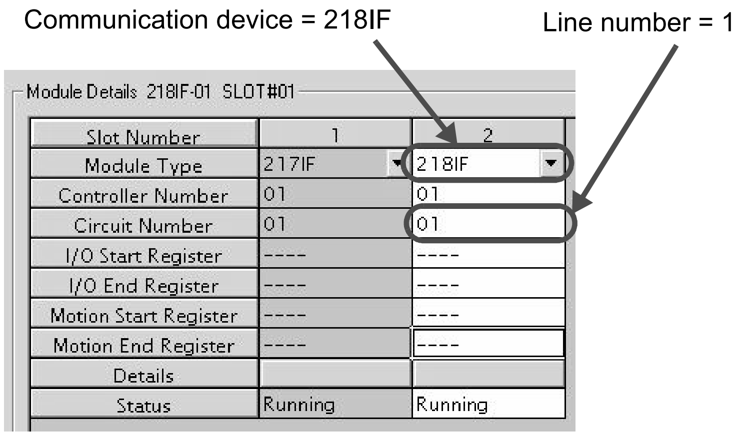


Fig. 6.2 MPE720 Module Configuration Definition Window

■ 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:

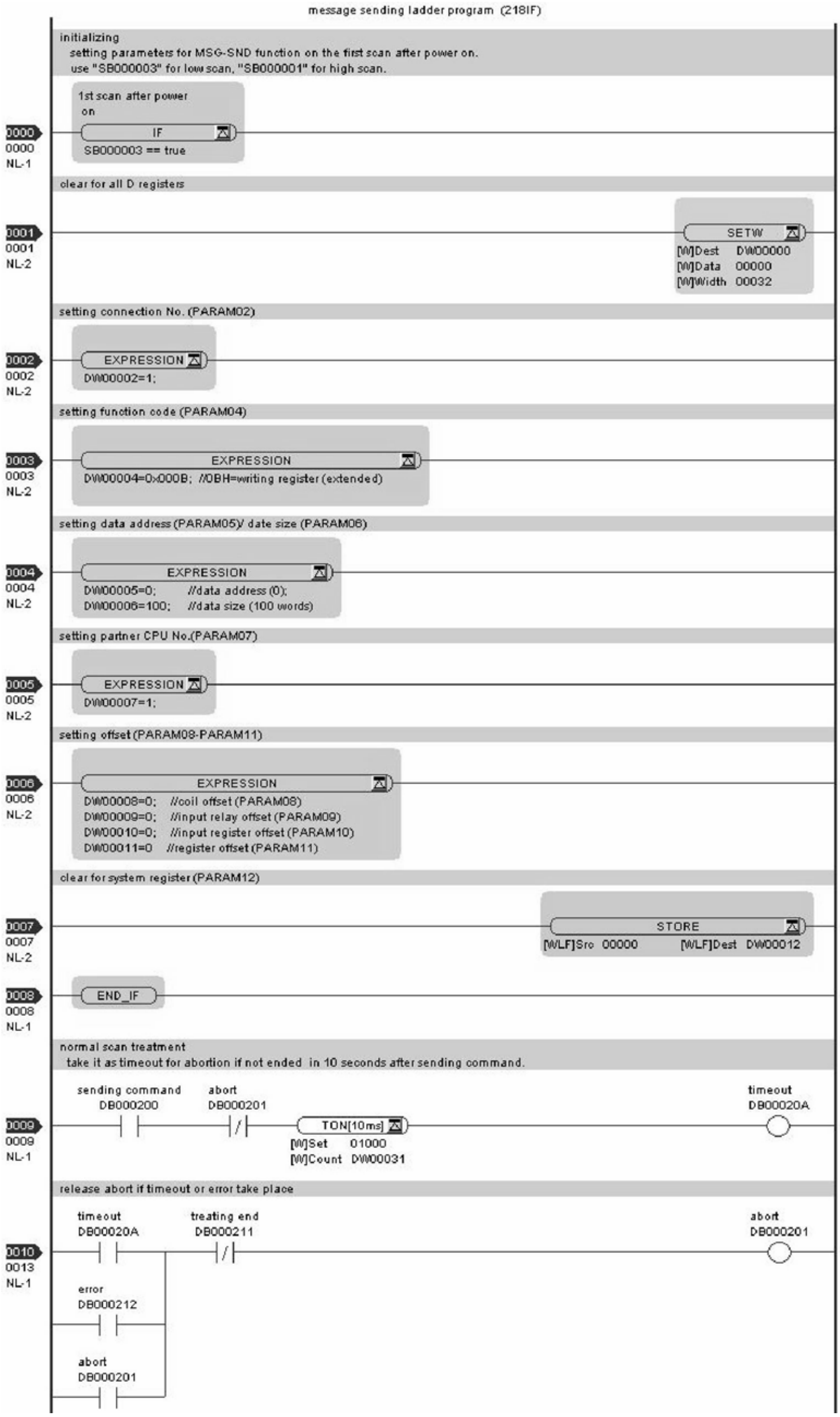
Table 6.2 Sample Parameter List Setting (parameter list start address Param=DA00000)

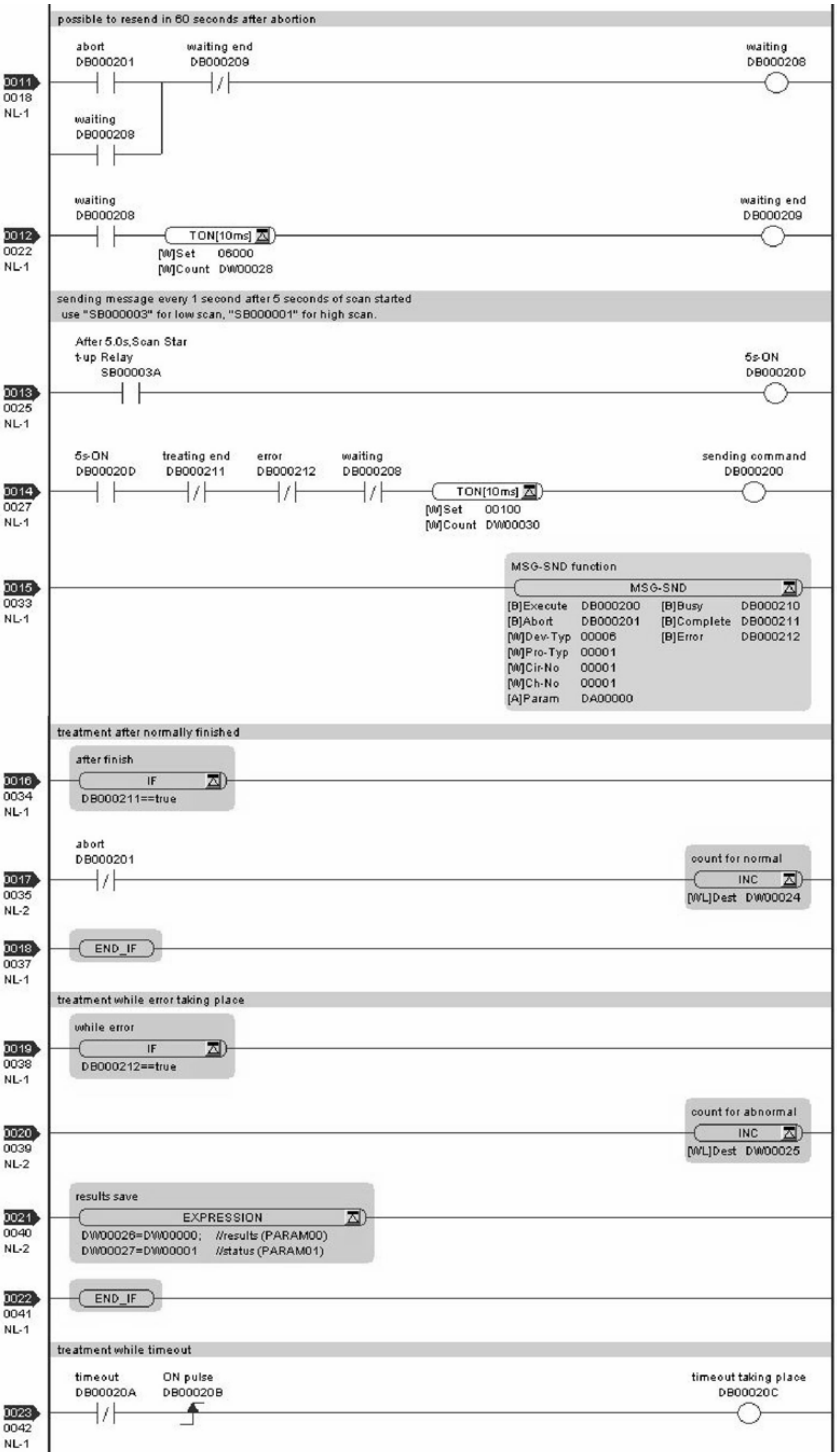
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00001	PARAM02	IN	Connection number = 1
DW00003	–	PARAM03	IN	Option (Setting unnecessary)
DW00004	000BH	PARAM04	IN	Function code = 0BH (Writes to holding register)
DW00005	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.

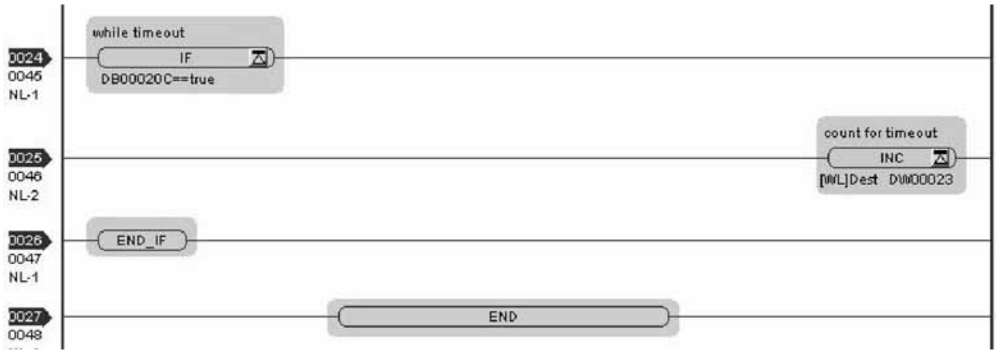
Note: N: Input, OUT: Output, SYS: For system use

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

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




possible to resend in 60 seconds after abortion
0011
0018
NL-1
abort
DB000201
waiting end
DB000209
waiting
DB000208
waiting
DB000208
0012
0022
NL-1
waiting
DB000208
TON[10ms]
[W]Set 06000
[W]Count DW00028
waiting end
DB000209
sending message every 1 second after 5 seconds of scan started
use "SB000003" for low scan, "SB000001" for high scan.
0013
0025
NL-1
After 5.0s,Scan Star
t-up Relay
SB00003A
5s-ON
DB00020D
0014
0027
NL-1
5s-ON
DB00020D
treating end
DB000211
error
DB000212
waiting
DB000208
TON[10ms]
[W]Set 00100
[W]Count DW00030
sending command
DB000200
0015
0033
NL-1
MSG-SND function
MSG-SND
[B]Execute DB000200
[B]Abort DB000201
[W]Dev-Typ 00006
[W]Pro-Typ 00001
[W]Cir-No 00001
[W]Ch-No 00001
[A]Param DA00000
[B]Busy DB000210
[B]Complete DB000211
[B]Error DB000212
treatment after normally finished
0016
0034
NL-1
after finish
IF
DB000211==true
0017
0035
NL-2
abort
DB000201
count for normal
INC
[WL]Dest DW00024
0018
0037
NL-1
END_IF
treatment while error taking place
0019
0038
NL-1
while error
IF
DB000212==true
0020
0039
NL-2
count for abnormal
INC
[WL]Dest DW00025
0021
0040
NL-2
results save
EXPRESSION
DW00026=DW00000; //results (PARAM00)
DW00027=DW00001 //status (PARAM01)
0022
0041
NL-1
END_IF
treatment while timeout
0023
0042
NL-1
timeout
DB00020A
ON pulse
DB00020B
timeout taking place
DB00020C



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

(3) How to Start Communications

1. The MP2310 side starts to receive the messages.

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

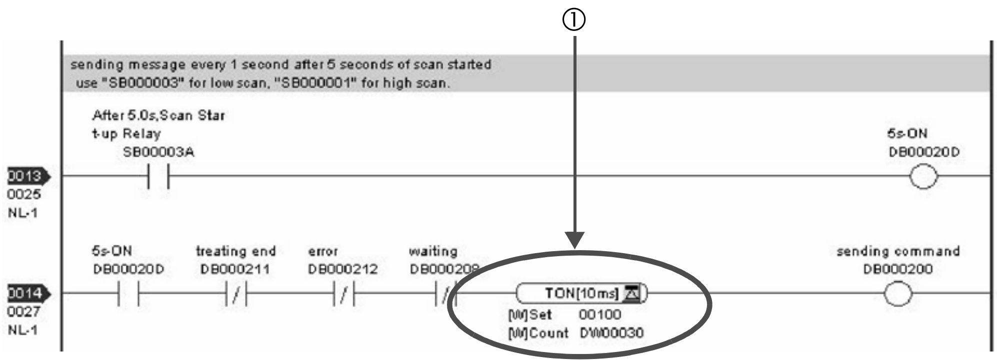
2. Turn Execute ON for the message transmit function in the MP2300 side to transmit messages.

Messages are transmitted by turning ON the register (DB000200, for example), configured in Execute of the message transmit function, starting communication with the MP2310.

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.

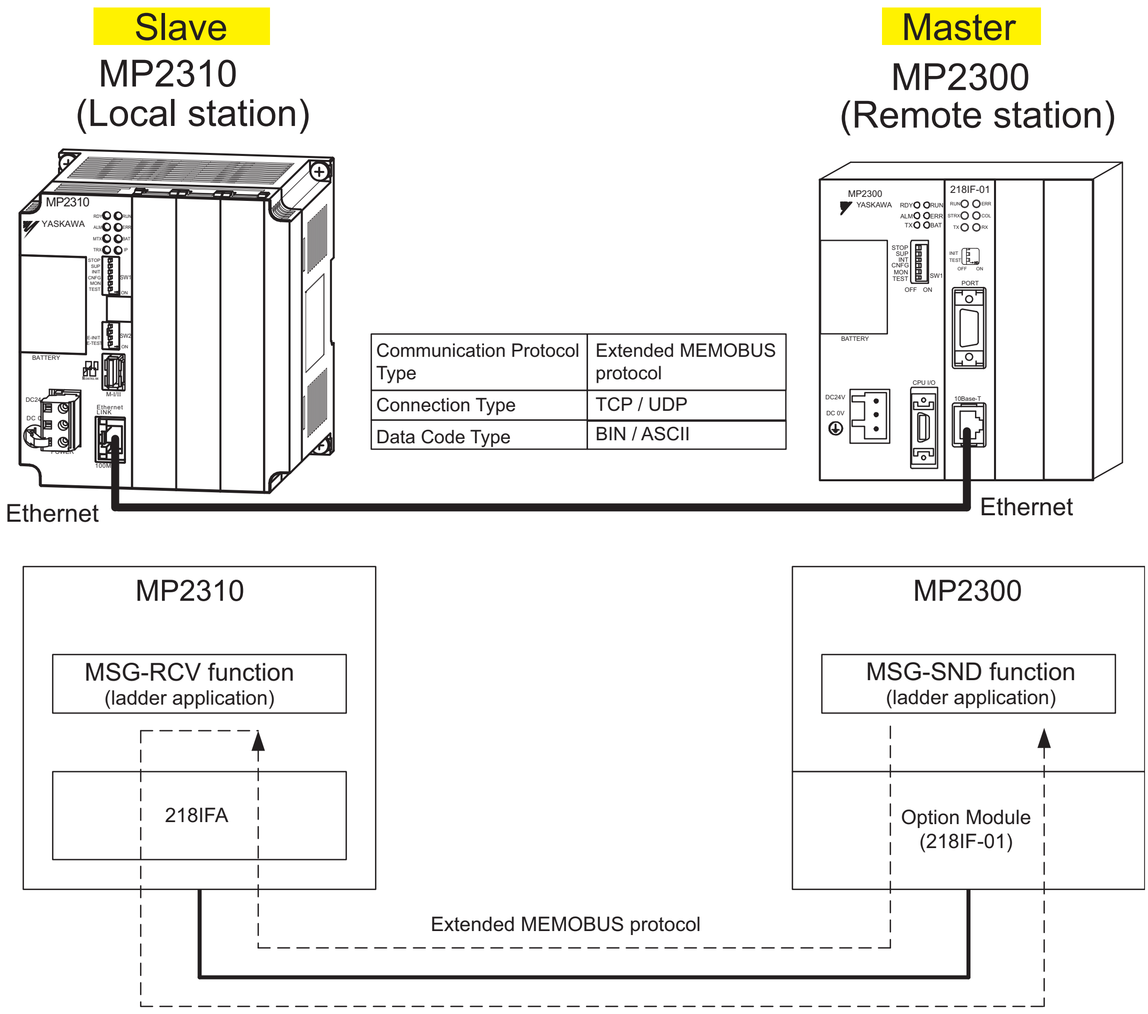
The sample ladder program is created to transmit a message every one second when five seconds have elapsed after the low-speed scan (or high-speed scan) startup.
To change the message transmission interval, change the timer value ①.



6.2.2 When the MP2310 Acts as a Slave (ladder program which uses a MSG-RCV function)

The MP2310 can communicate with only one master when using the automatic receive function.
To communicate with more than one master, use a ladder program with a message receive function (MSG-RCV) at the MP2310 end. You can use the message receive function (MSG-RCV) as well as the automatic receive function by keeping connections separate from each other.

This section explains how to communicate with an MP2300 message transmit function (MSG-SND) using the MP2310 message receive function (MSG-RCV).

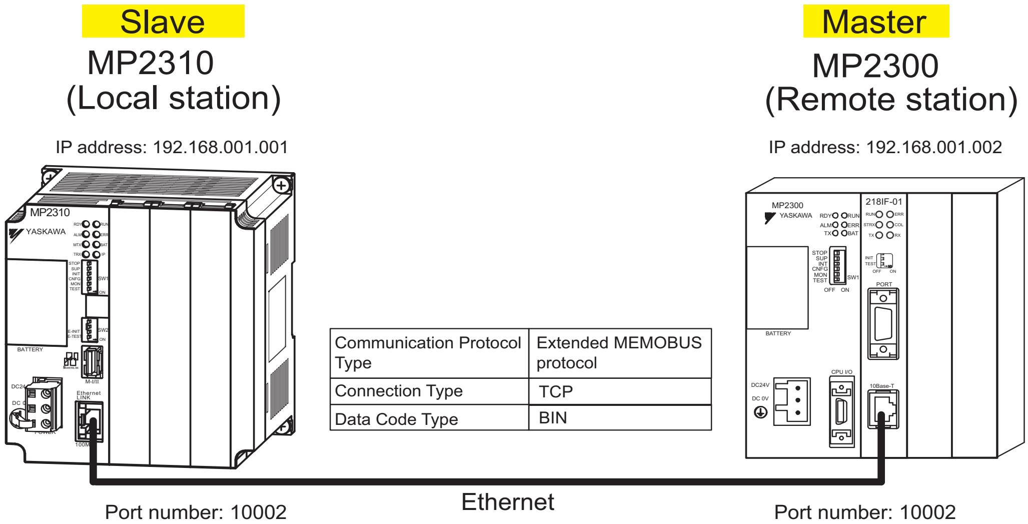


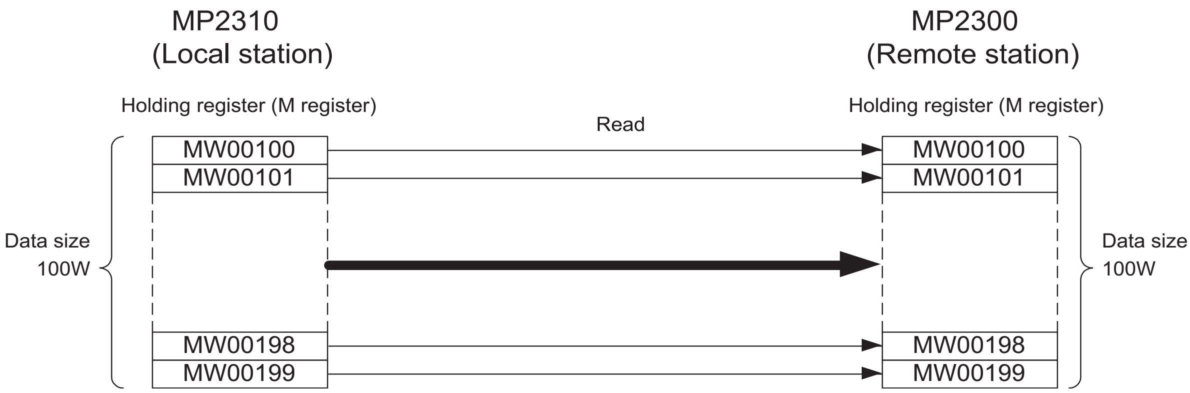
Communication Protocol Type	Extended MEMOBUS protocol
Connection Type	TCP / UDP
Data Code Type	BIN / ASCII

Fig. 6.3 Message Flow with MP2300 when Message Receive Function (MSG-RCV) Is Used

■ Setting Example

The following figure illustrates one example of writing the contents of the MP2300 (master) holding register (MW00100 to MW00199) into the MP2310 (slave) holding register (MW00100 to MW00199).



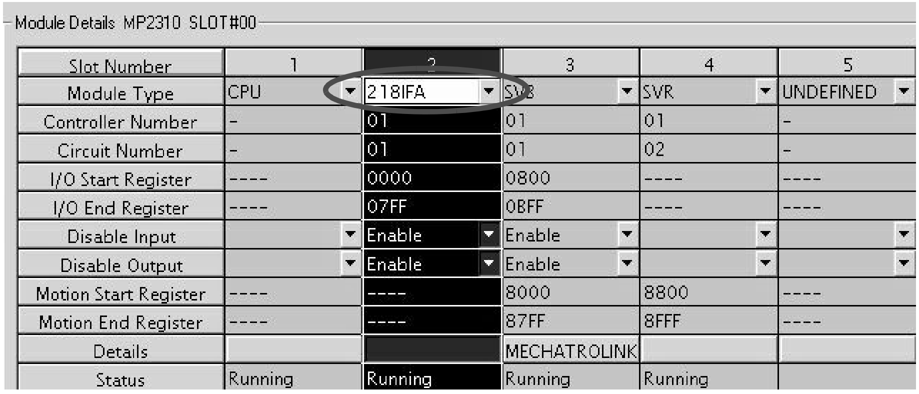


The particular setup procedure is explained in the subsequent pages.

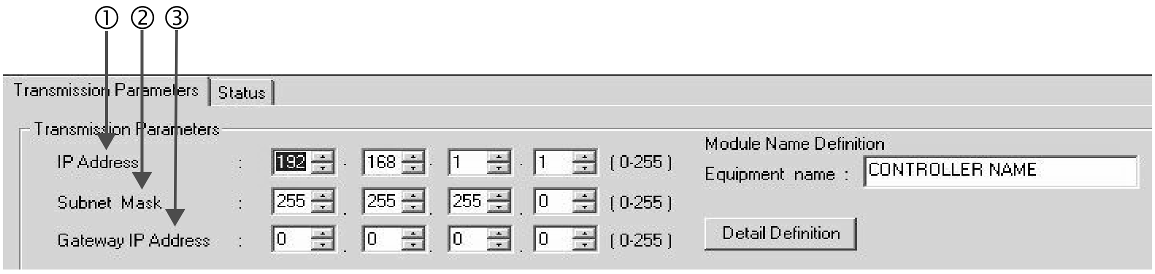
(1) How to Set up the MP2310 Side

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.

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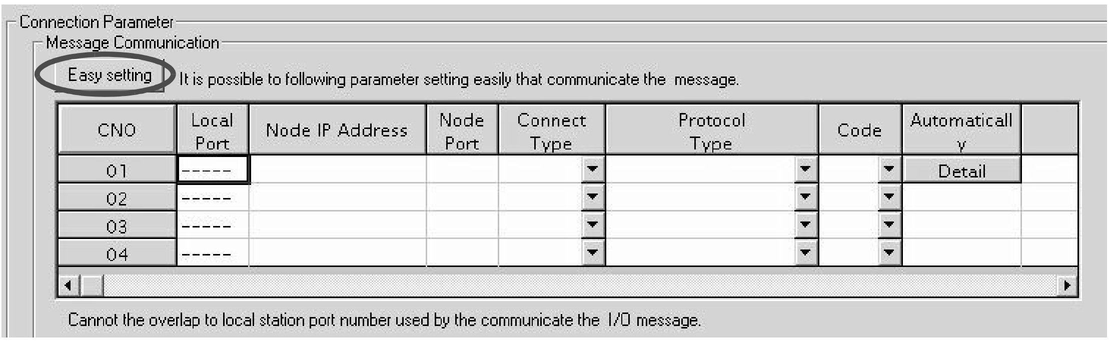
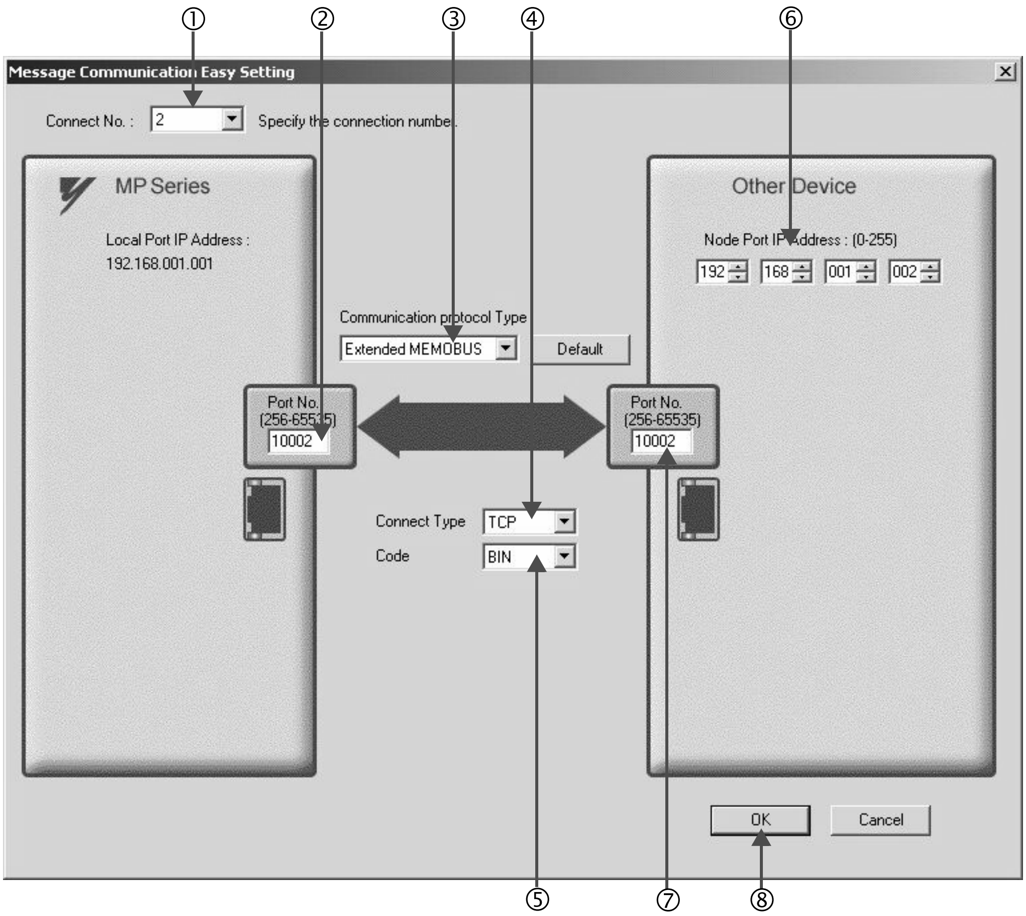
3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



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 “2” for the **Connect No.**
② Set **Port No.** of the MP2310 side (“10002,” 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 (to “192.168.001.002,” for example).
⑦ Set **Port No.** of the other device (MP2300) to be connected (to “10002,” for example).
⑧ Click **OK**.

■ Caution

When message functions (MSG-SND, MSG-RCV) are used with the connection number 01, disable the automatic receive function. If message functions are used while the automatic receive function is enabled, communications will not function properly.

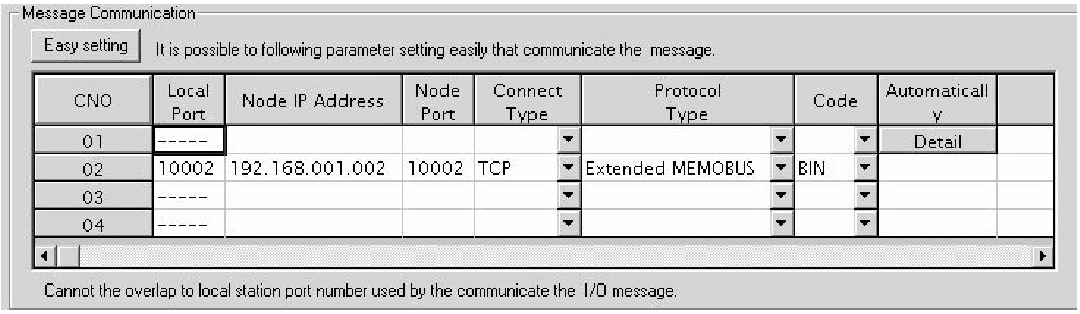
Note: By default, the automatic receive function with a connection number 01 is set to “Enable.”

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

■ 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.



■ Caution

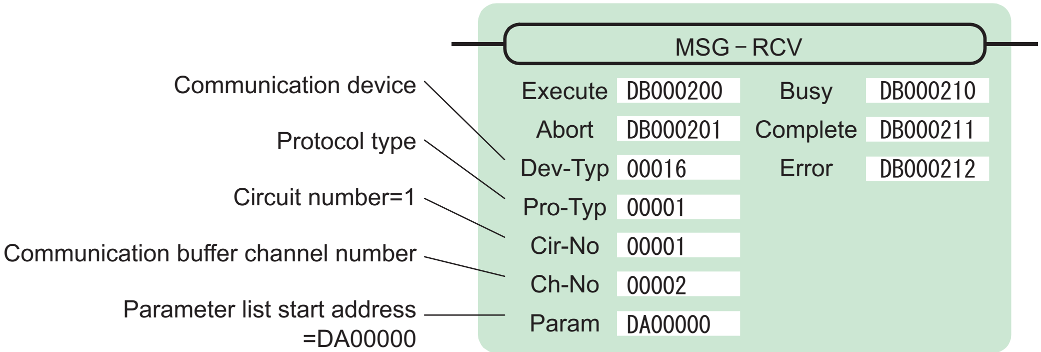
When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

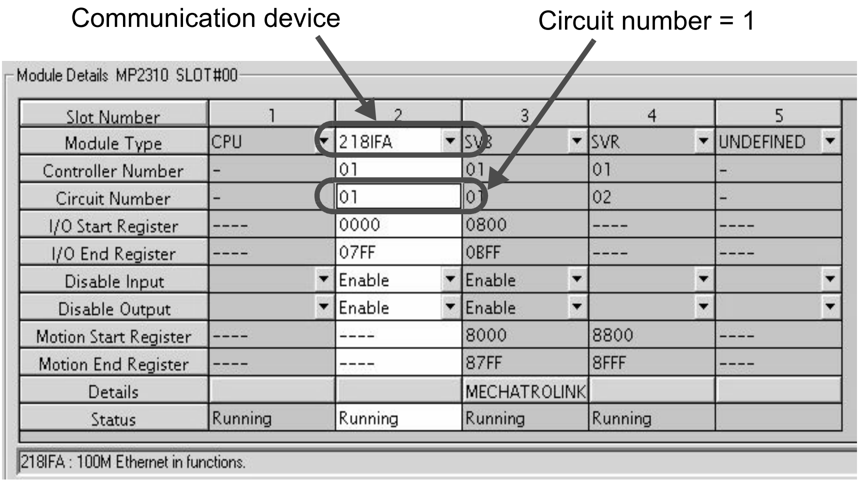
7. Create a ladder program with a message receive function (MSG-RCV) in it.

An example of a ladder program for receiving messages in the MP2310 side is as follows:

■ Message receive function (MSG-RCV)

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





Module Details MP2310 SLOT#00

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	UNDEFINED
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	----
I/O End Register	----	07FF	0BFF	----	----
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	

218IFA : 100M Ethernet in functions.

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	Contents
Input Item	1	Execute	DB000200	Executes a reception When Execute is ON, message reception will be carried out.
	2	Abort	DB000201	Aborts a reception When Abort is ON, message reception is forcibly stopped.
	3	Dev-Typ	00016	Communication device type Specify the type of the communication device used in reception. When Ethernet (218IF) is used, specify "16."
	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 Window.
	6	Ch-No	00002	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 "4." * 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 a connection number = 2 follows:

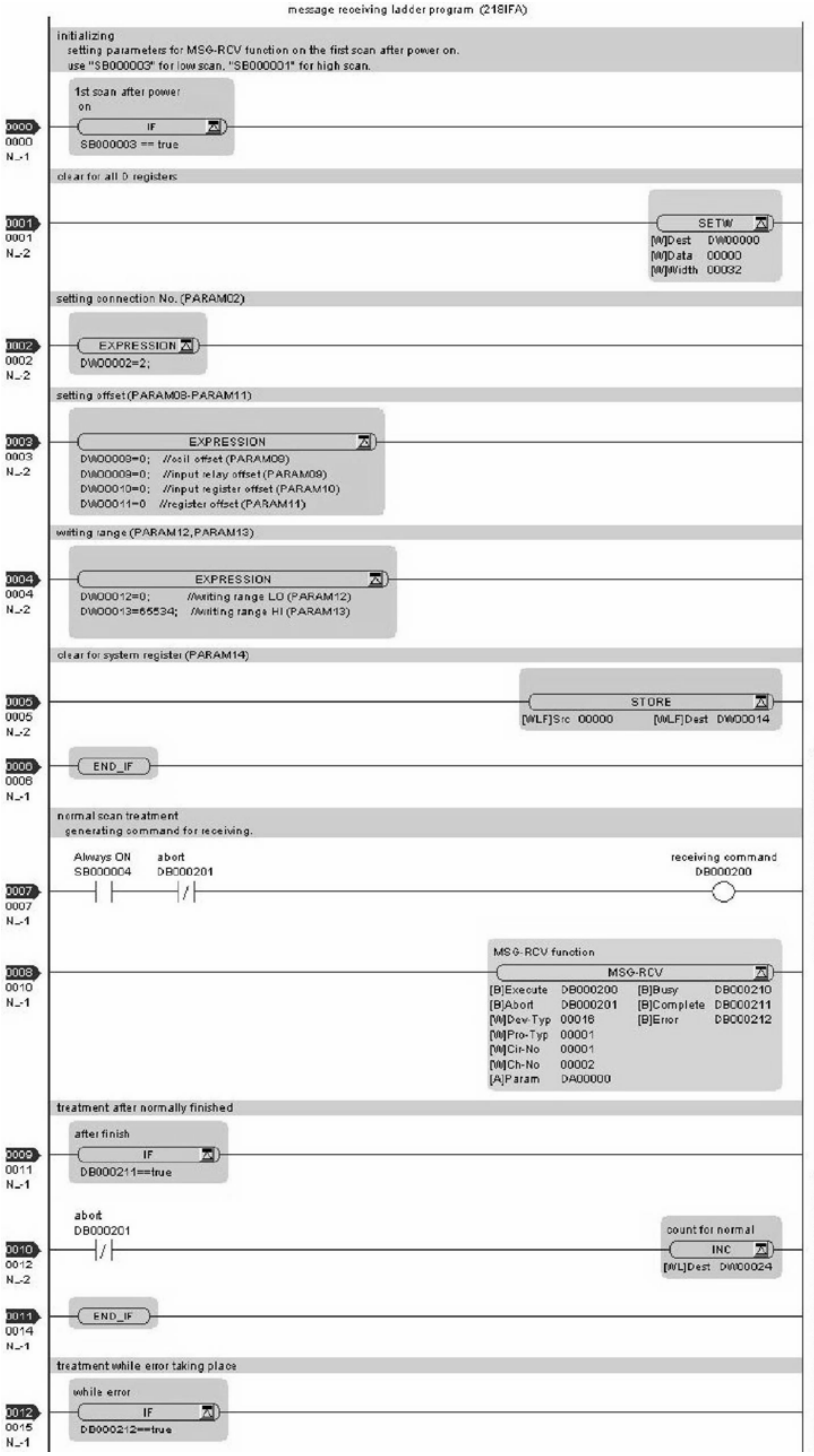
Table 6.5 Parameter List Setting Example (parameter list start address Param=DA00000)

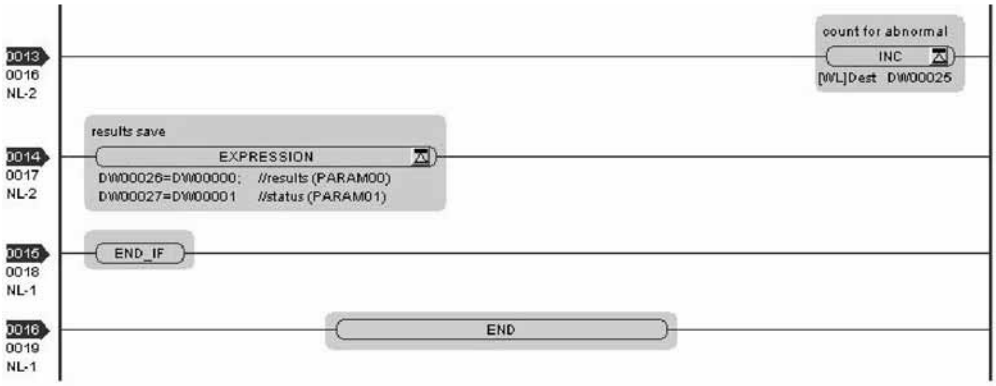
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	-	PARAM00	OUT	Process result
DW00001	-	PARAM01	OUT	Status
DW00002	00002	PARAM02	IN	Connection number = 2
DW00003	-	PARAM03	OUT	Option
DW00004	-	PARAM04	OUT	Function code
DW00005	-	PARAM05	OUT	Data address
DW00006	-	PARAM06	OUT	Data 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: IN: Input, OUT: Output, SYS: For system use

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

Here is an example of the message receive function through Ethernet (218IFA).



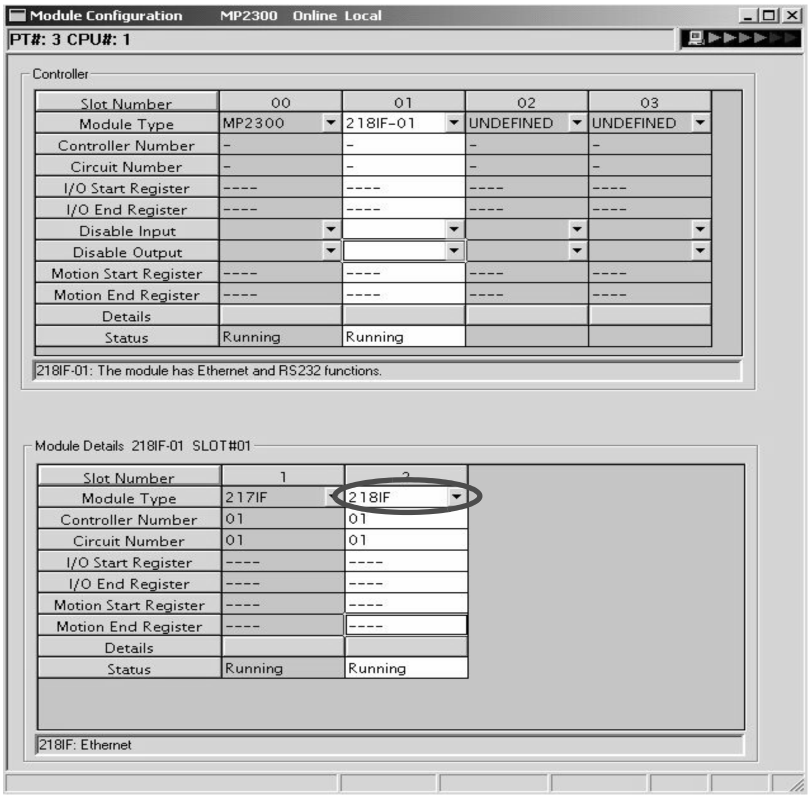


The communication setting and the ladder program creation are now finished, when the MP2310 acts as a slave.

(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.



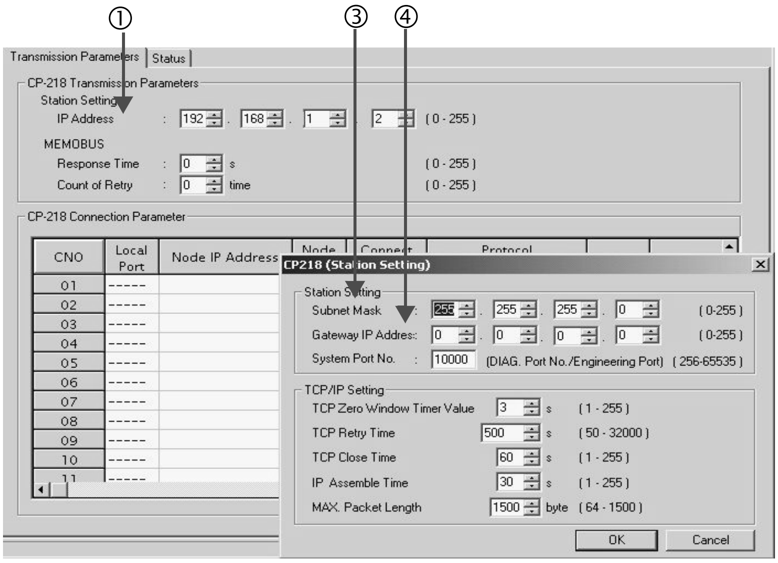
Slot Number	00	01	02	03
Module Type	MP2300	218IF-01	UNDEFINED	UNDEFINED
Controller Number	–	–	–	–
Circuit Number	–	–	–	–
I/O Start Register	----	----	----	----
I/O End Register	----	----	----	----
Disable Input				
Disable Output				
Motion Start Register	----	----	----	----
Motion End Register	----	----	----	----
Details				
Status	Running	Running		

Slot Number	1	2
Module Type	217IF	218IF
Controller Number	01	01
Circuit Number	01	01
I/O Start Register	----	----
I/O End Register	----	----
Motion Start Register	----	----
Motion End Register	----	----
Details		
Status	Running	Running

Ethernet Communications

6

2. Set transmission parameters.



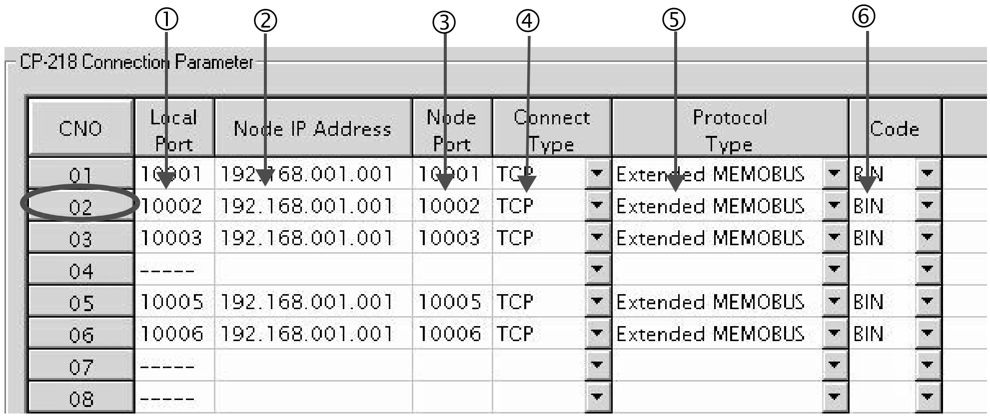
■ How to set up transmission parameters

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.



CNO	Local Port	Node IP Address	Node Port	Connect Type	Protocol Type	Code
01	10001	192.168.001.001	10001	TCP	Extended MEMOBUS	BIN
02	10002	192.168.001.001	10002	TCP	Extended MEMOBUS	BIN
03	10003	192.168.001.001	10003	TCP	Extended MEMOBUS	BIN
04	-----					
05	10005	192.168.001.001	10005	TCP	Extended MEMOBUS	BIN
06	10006	192.168.001.001	10006	TCP	Extended MEMOBUS	BIN
07	-----					
08	-----					

■ How to set up with a connection number 02 in the **CP-218 Connection Parameter** Window

① Set **Local Port** (to the port number “10002” used in the MP2300 side, for example).
② Set the **Node IP Address** (to the IP address “192.168.001.001” configured in the MP2310 side, for example).
③ Set the **Node Port** (to the port number “10002” configured in the MP2310 side, for example).
④ Select **Connect Type** (TCP, for example).
⑤ Select **Extended MEMOBUS** for **Protocol Type**.
⑥ Select **Code** (BIN, for example).

■ Caution

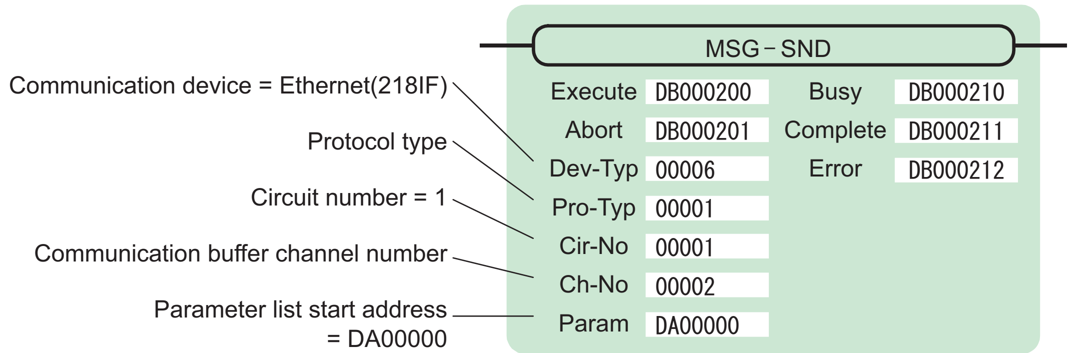
When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

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

An example of a ladder program for transmitting messages in the remote device (MP2310) side 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.



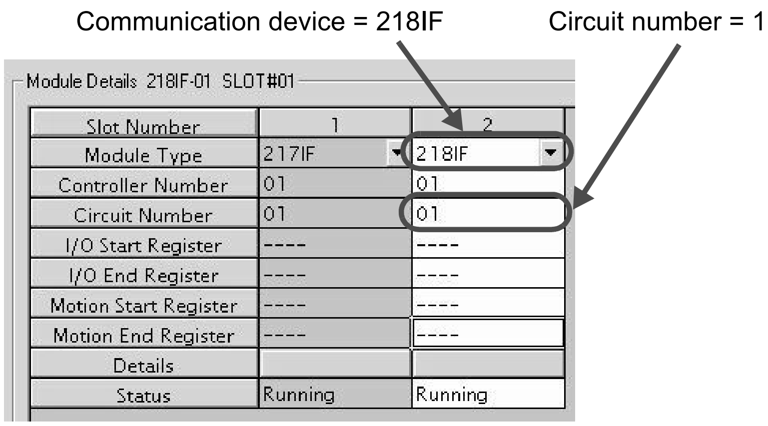


Fig. 6.5 MPE720 Module Configuration Definition Screen

■ Input/output definitions contents for message transmit functions

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

Table 6.6 Input/Output Definitions for Message Transmit Functions

I/O Definition	No.	Name	Setting Example	Contents
Input Item	1	Execute	DB000200	Executes a transmission When Execute is ON, the message transmission will be carried out.
	2	Abort	DB000201	Forcibly aborts a transmission When Abort 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 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	00002	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 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 transmission or forced abort process.
	2	Complete	DB000211	Process completed When a message transmission 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 transmitted on a per-word basis.
Non-procedure 2: In non-procedural communication, data is transmitted on a per-byte basis.

■ Parameter list setting for the message transmit function

An example of a parameter list setting when reading 100 words of data from MW00100 from the destination using the connection with a connection number = 2 follows:

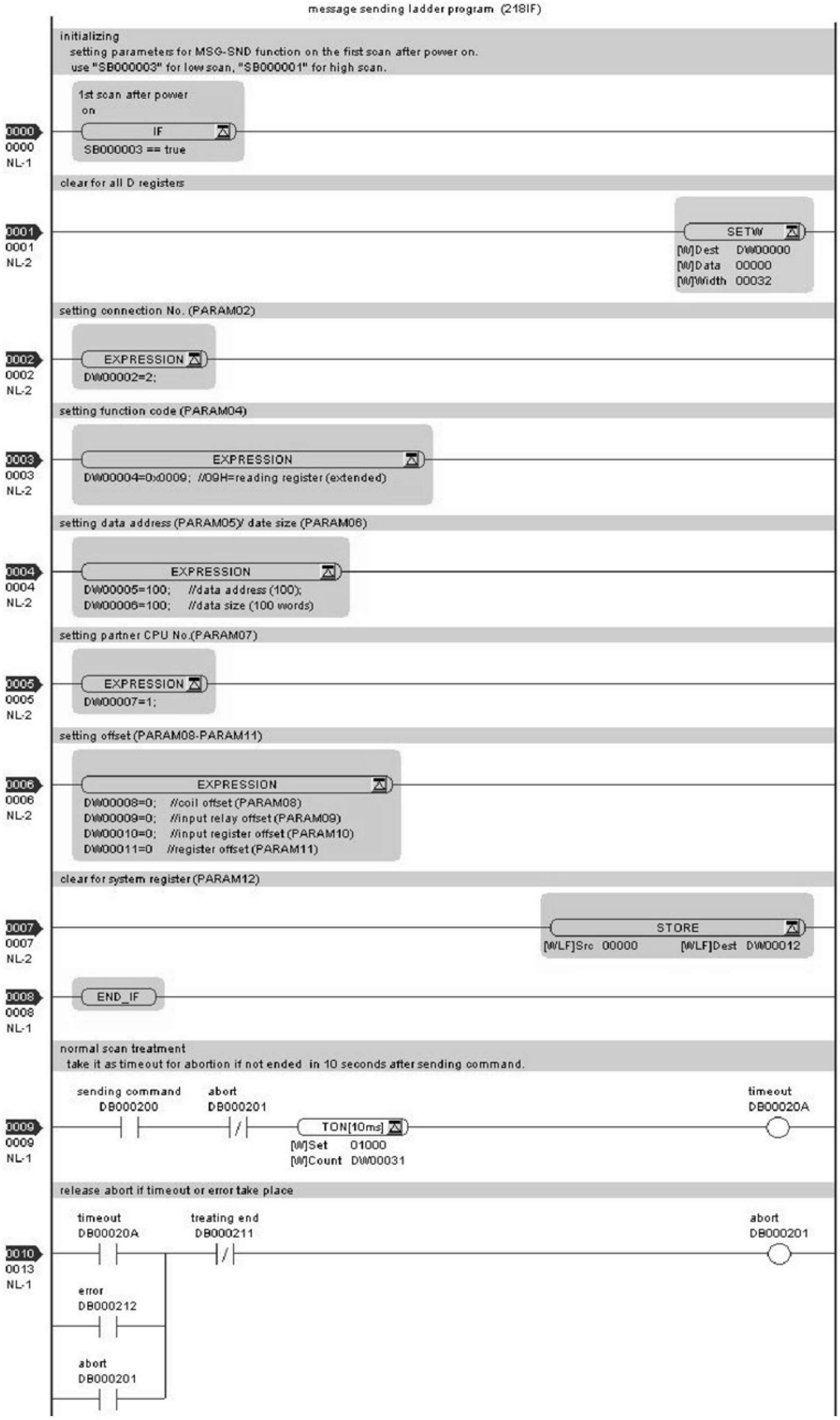
Table 6.7 Parameter List Setting Example (parameter list start address Param=DA00000)

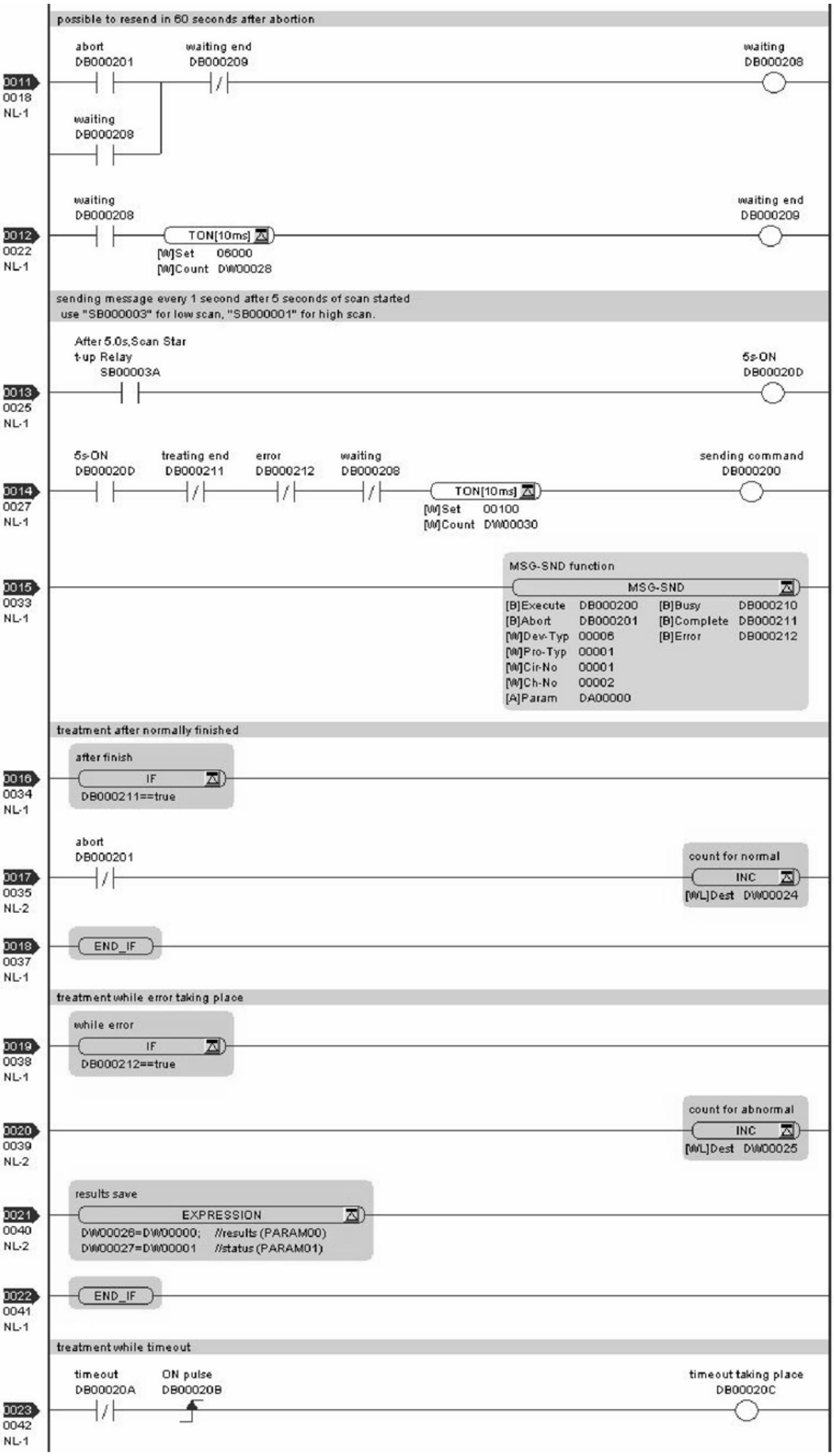
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00002	PARAM02	IN	Connection number = 2
DW00003	–	PARAM03	IN	Option (Setting unnecessary)
DW00004	0009H	PARAM04	IN	Function code = 09H (Reads a holding register)
DW00005	00100	PARAM05	IN	Data address = 100 (Starting from MW00100)
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.

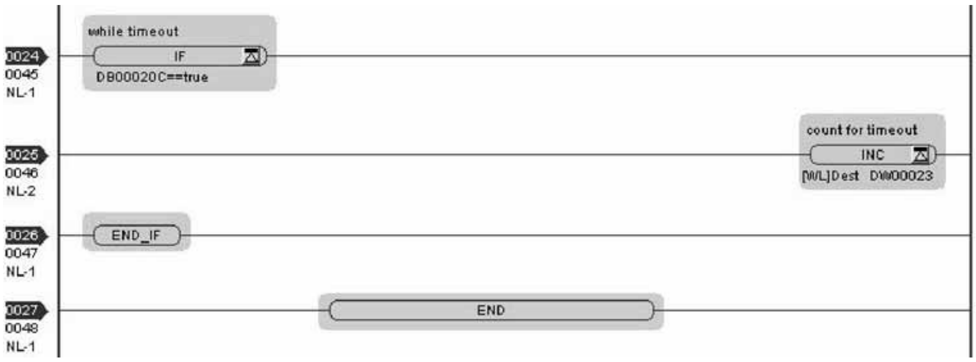
Note: IN: Input, OUT: Output, SYS: For system use

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

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




possible to resend in 60 seconds after abortion
abort DB000201
waiting end DB000209
waiting DB000208
0011 0018 NL-1
waiting DB000208
waiting DB000208
TON[10ms]
[W]Set 06000
[W]Count DW00028
waiting end DB000209
0012 0022 NL-1
sending message every 1 second after 5 seconds of scan started
use "SB000003" for low scan, "SB000001" for high scan.
After 5.0s,Scan Start-up Relay SB00003A
5s-ON DB00020D
0013 0025 NL-1
5s-ON DB00020D
treating end DB000211
error DB000212
waiting DB000208
TON[10ms]
[W]Set 00100
[W]Count DW00030
sending command DB000200
0014 0027 NL-1
MSG-SND function
MSG-SND
[B]Execute DB000200
[B]Abort DB000201
[W]Dev-Typ 00006
[W]Pro-Typ 00001
[W]Cir-No 00001
[W]Ch-No 00002
[A]Param DA00000
[B]Busy DB000210
[B]Complete DB000211
[B]Error DB000212
0015 0033 NL-1
treatment after normally finished
after finish
IF
DB000211==true
0016 0034 NL-1
abort DB000201
count for normal
INC
[WL]Dest DW00024
0017 0035 NL-2
END_IF
0018 0037 NL-1
treatment while error taking place
while error
IF
DB000212==true
0019 0038 NL-1
count for abnormal
INC
[WL]Dest DW00025
0020 0039 NL-2
results save
EXPRESSION
DW00026=DW00000; //results (PARAM00)
DW00027=DW00001 //status (PARAM01)
0021 0040 NL-2
END_IF
0022 0041 NL-1
treatment while timeout
timeout DB00020A
ON pulse DB00020B
timeout taking place DB00020C
0023 0042 NL-1



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

(3) How to Start Communications

1. The MP2310 side starts to receive the messages.

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

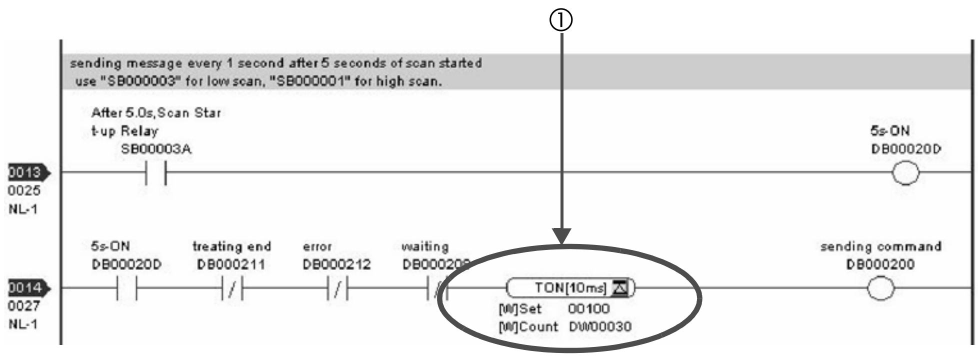
2. Turn Execute ON for the message transmit function in the MP2300 side to transmit messages.

Messages are transmitted by turning on the register DB000200 configured in Execute of the message transmit function, for example, starting communication with MP2310.

Table 6.8 Input/Output Definition for Message Transmit Function

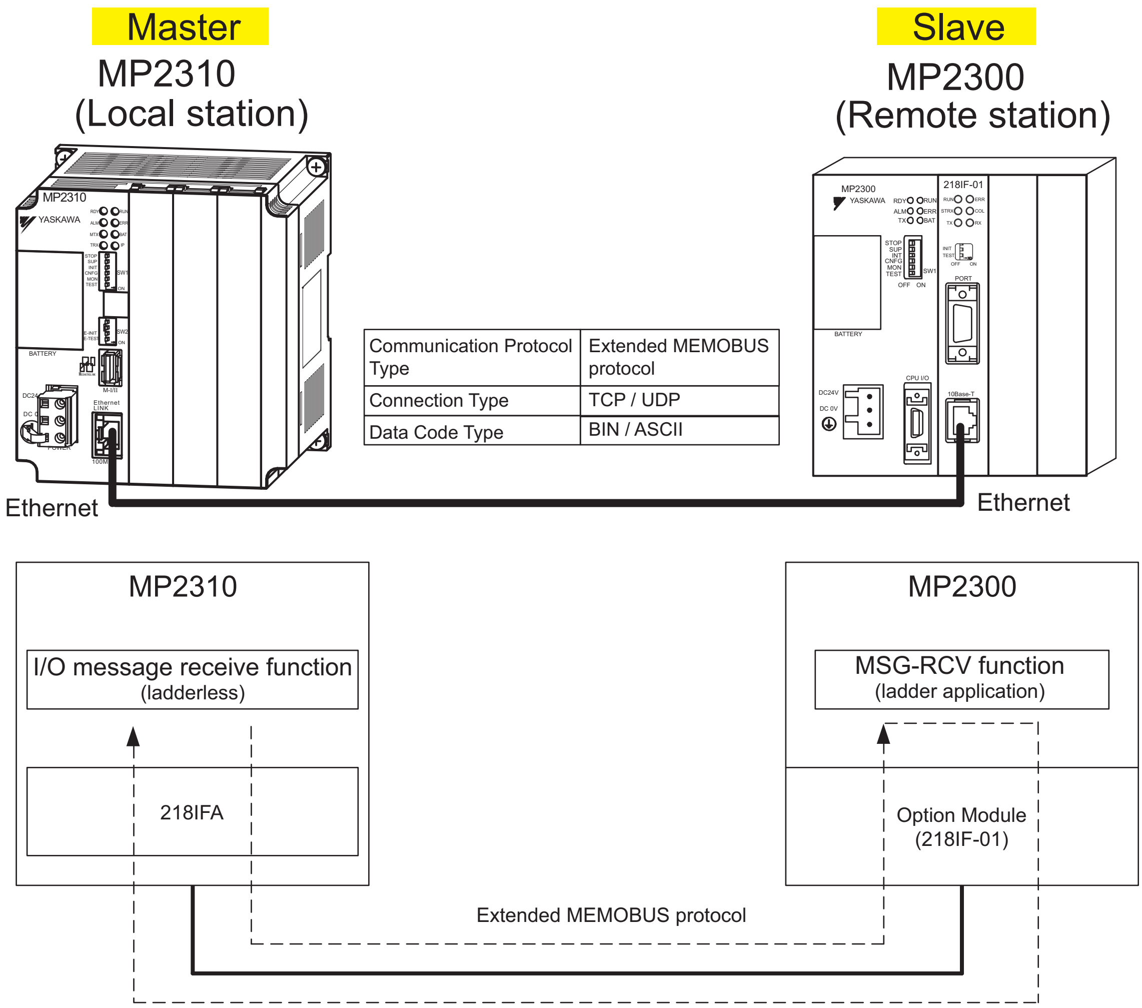
I/O Definition	No.	Name	Setting Example	Contents
Input Item	1	Execute	DB000200	Executes a transmission When Execute is ON, the message transmission is carried out.

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.



6.2.3 When MP2310 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 MP2310 I/O message communication function.



Communication Protocol Type	Extended MEMOBUS protocol
Connection Type	TCP / UDP
Data Code Type	BIN / ASCII

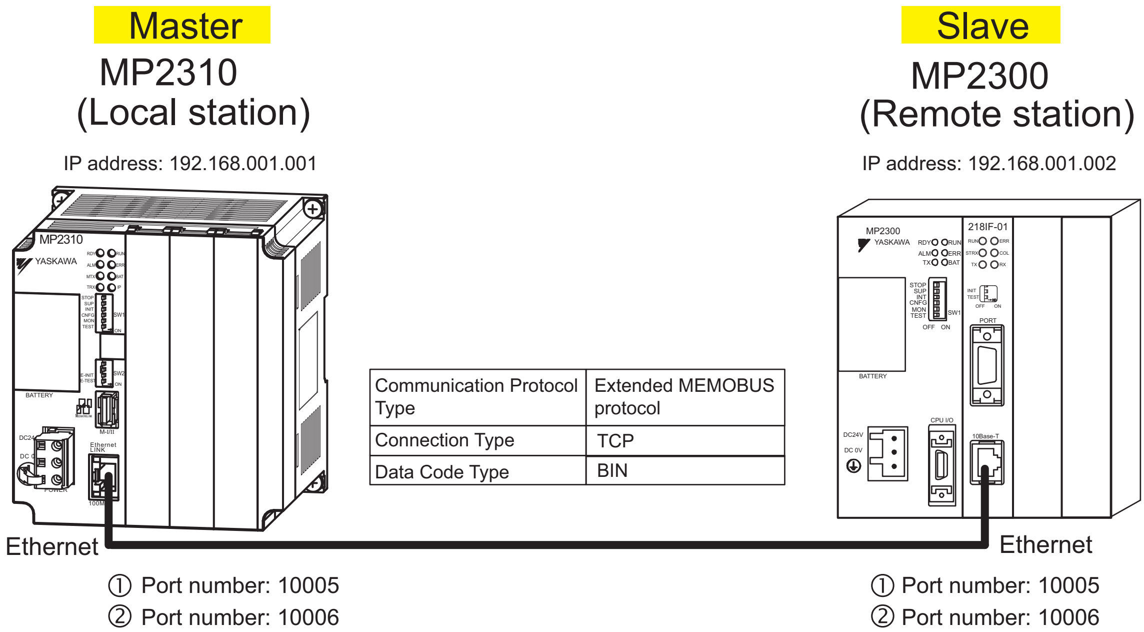
Fig. 6.6 Message Flow with MP2300 when I/O Message Communication Function Is Used

■ I/O Message Communication

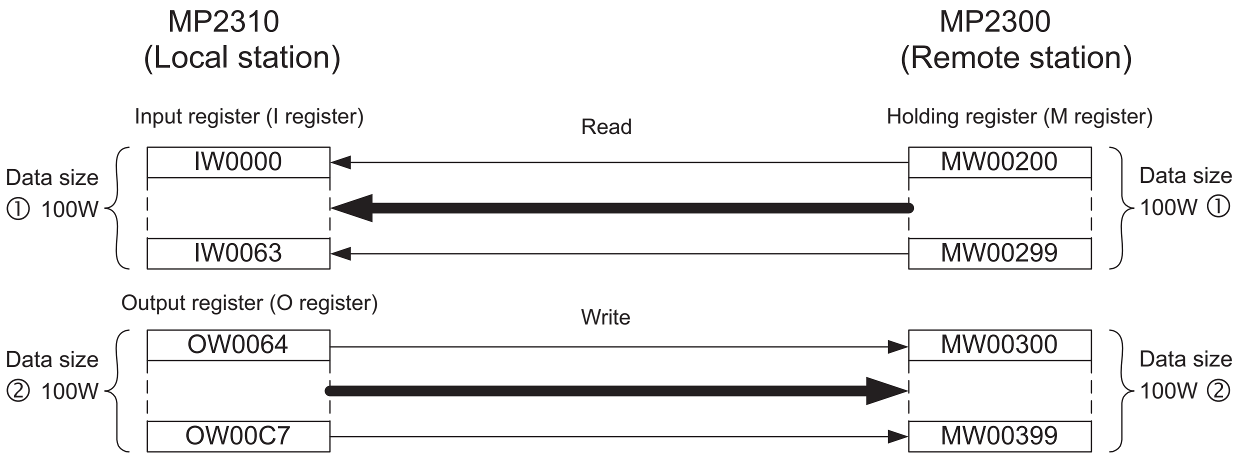
I/O message communication implements out 1:1 communication.
In addition, you can read and write only the holding register in the case of “Communication Protocol Type: Extended MEMO-BUS” used in the communication with MP series.
When you communicate with multiple remote devices, or when you need to read a coil state or input relay, or change a coil state as well as read/write a holding register, use the message transmit function (MSG-SND).

■ 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 MP2310 (master) and writing the contents of an output register (OW0064 to OW00C7) of MP2310 (master) into a holding register (MW00300 to MW00399) of MP2300 (slave).



Communication Protocol Type	Extended MEMOBUS protocol
Connection Type	TCP
Data Code Type	BIN

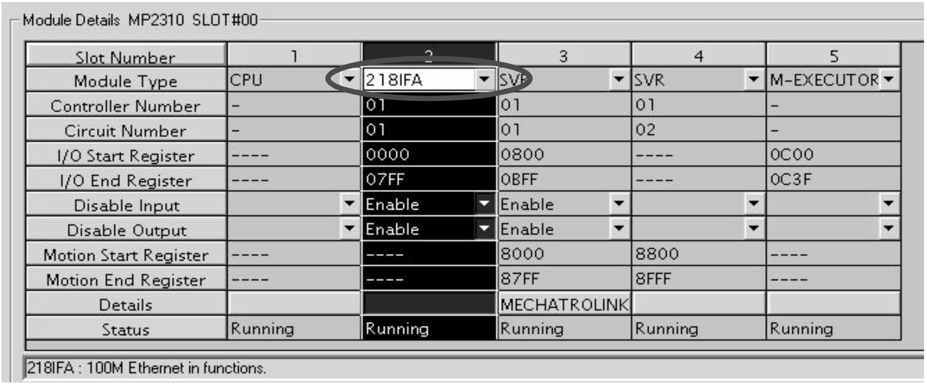


The particular setup procedure is explained in the subsequent pages.

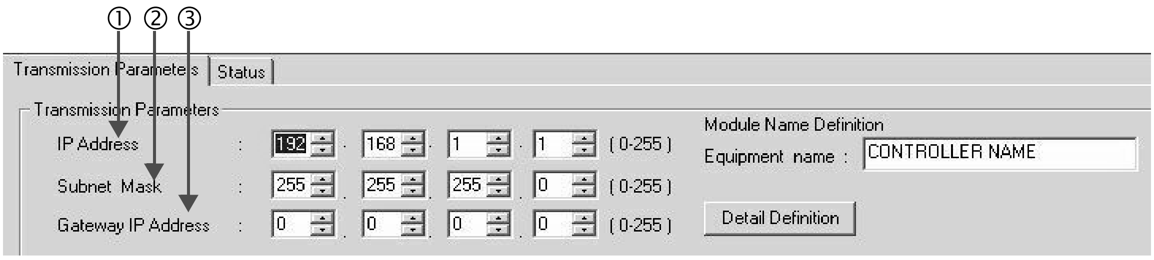
(1) How to Set up the MP2310 Side

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

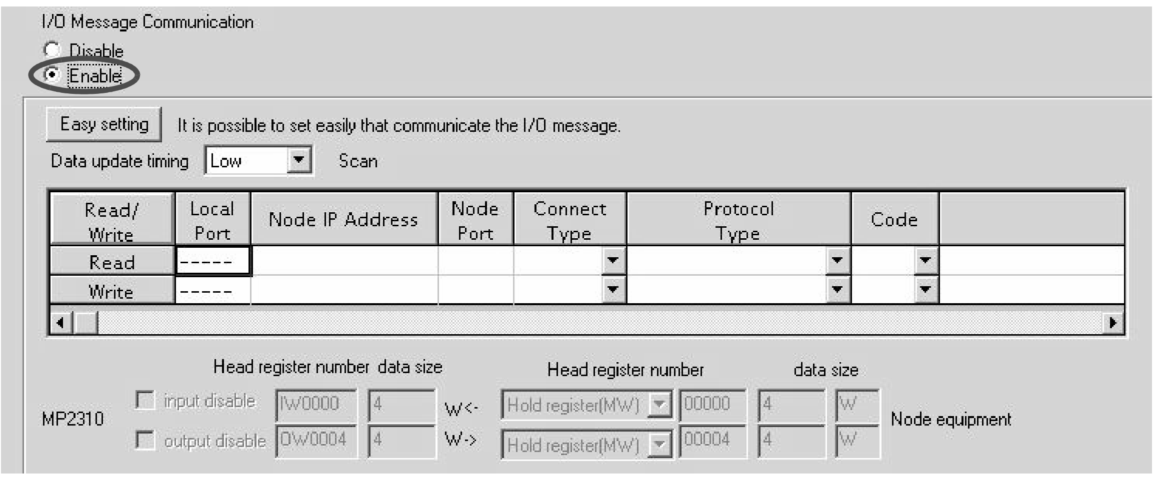
① Set **IP Address** (“192.168.001.001,” for example).
② Set **Subnet Mask** (“255.255.255.000,” for example).
③ Set **Gateway IP Address** (“000.000.000.000,” for example).

■ Caution

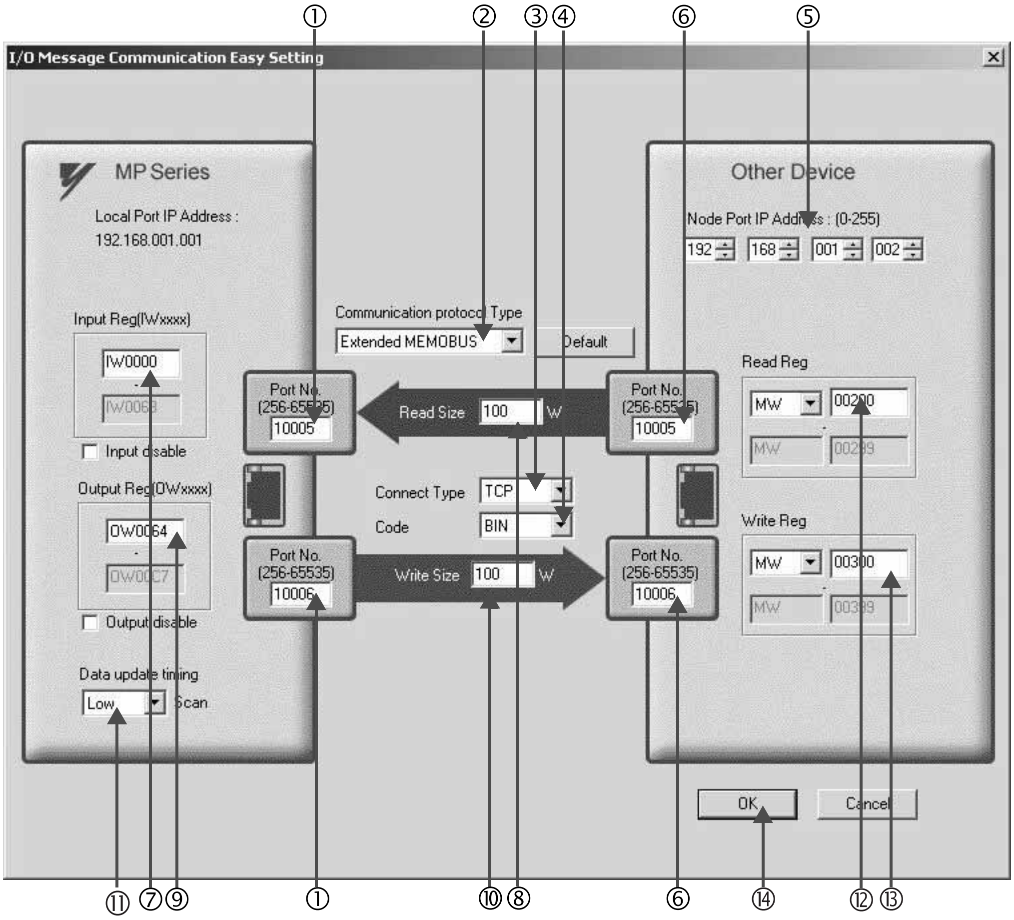
Set up a unique IP address in the network.
For the IP address, check with your network administrator.

---

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 MP2310 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 MP2310 (IW0000, for example).
⑧ Set the **Read Size** of data to be the read by the MP2310 (“100” W, for example).
⑨ Set a storage area (**Output Reg**) of data written by the MP2310 (OW0064, for example).
⑩ Set the **Write Size** of data written by the MP2310 (“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.

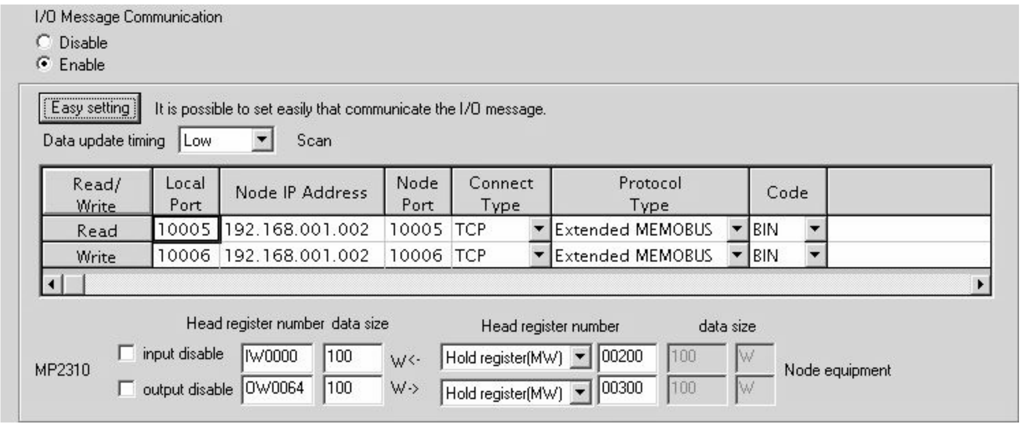
⑫ Set the register type and start address (**Read Reg**) of the remote device (MP2300) read by the MP2310 (“MW00200,” for example).
⑬ Set the register type and start address (**Write Reg**) of the remote device (MP2300) written by the MP2310 (“MW00300,” for example).
⑭ Click **OK**.

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 MP2310 acts as a master.

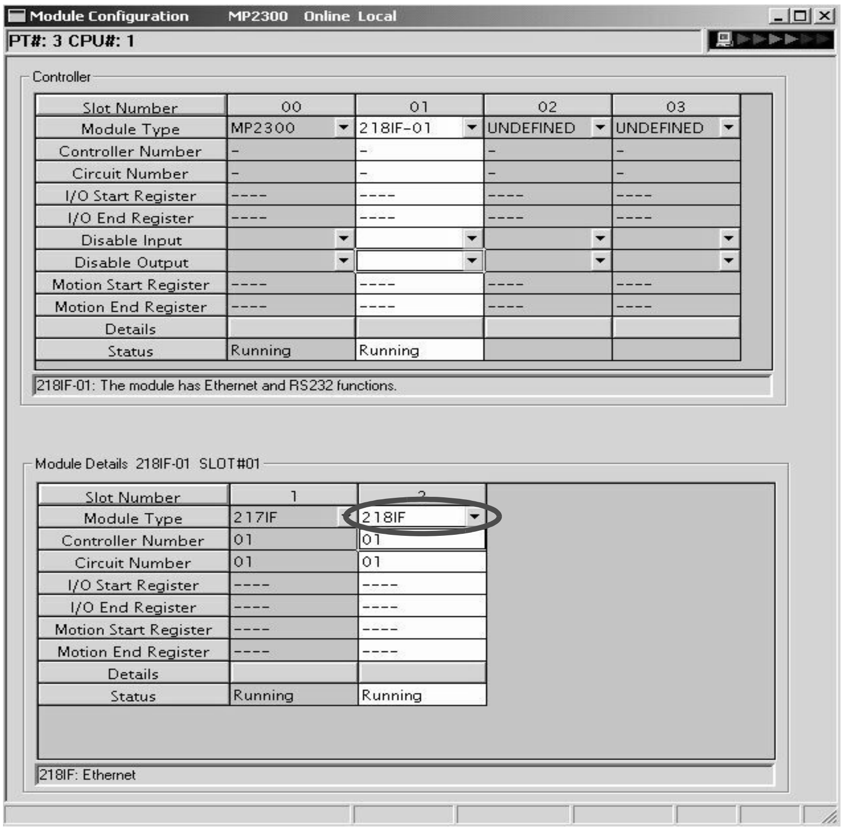
■ Caution

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.

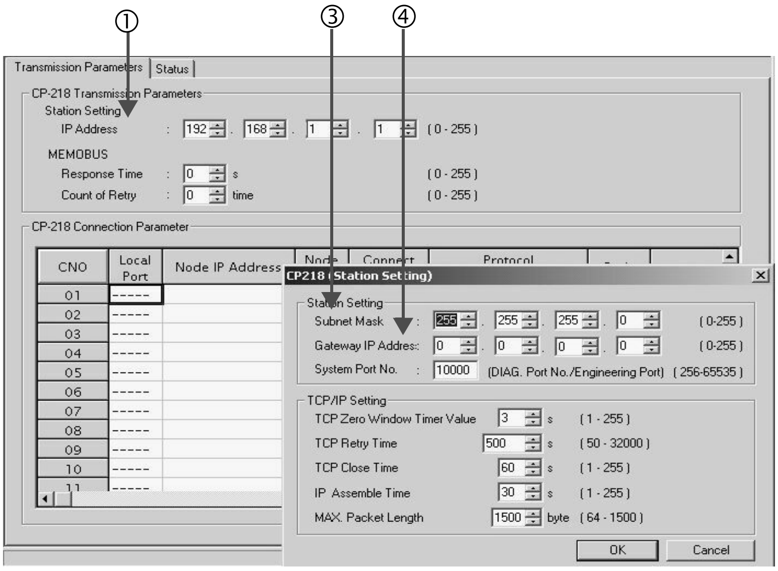
(2) How to Set up the Remote Device (MP2300) to Be Connected

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.



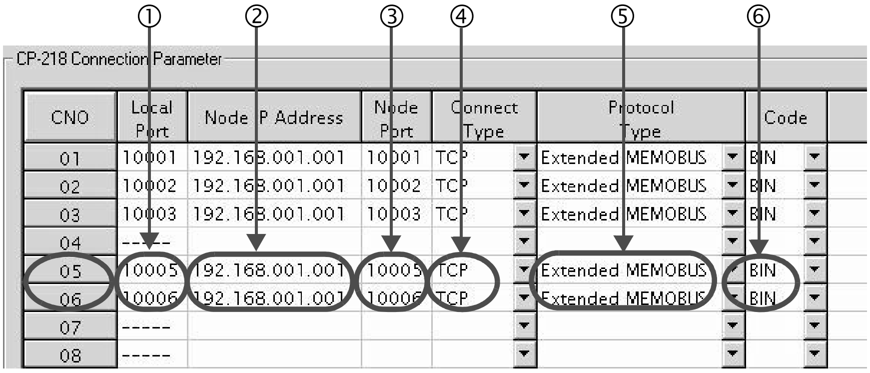
■ How to set up transmission parameters

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.



CNO	Local Port	Node IP Address	Node Port	Connect Type	Protocol Type	Code
01	10001	192.168.001.001	10001	TCP	Extended MEMOBUS	BIN
02	10002	192.168.001.001	10002	TCP	Extended MEMOBUS	BIN
03	10003	192.168.001.001	10003	TCP	Extended MEMOBUS	BIN
04	-----					
05	10005	192.168.001.001	10005	TCP	Extended MEMOBUS	BIN
06	10006	192.168.001.001	10006	TCP	Extended MEMOBUS	BIN
07	-----					
08	-----					

■ 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 MP2310 side, for example).
③ Set **Node Port** (the port number “10005, 10006” configured in the MP2310 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.

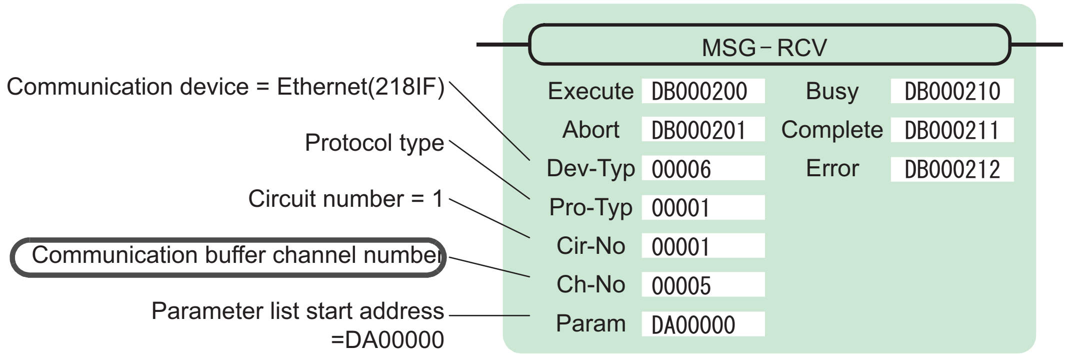
4. Create a ladder program with a message receive function (MSG-RCV) in it.

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 MP2310, 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 MP2310 side settings.



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

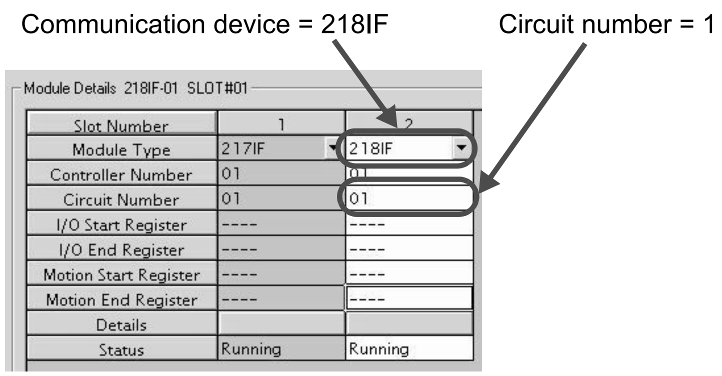


Fig. 6.7 MPE720 Module Configuration Definition Window

Ethernet Communications

6

■ Input/output definition contents for message receive functions

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

Table 6.9 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 6.10 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

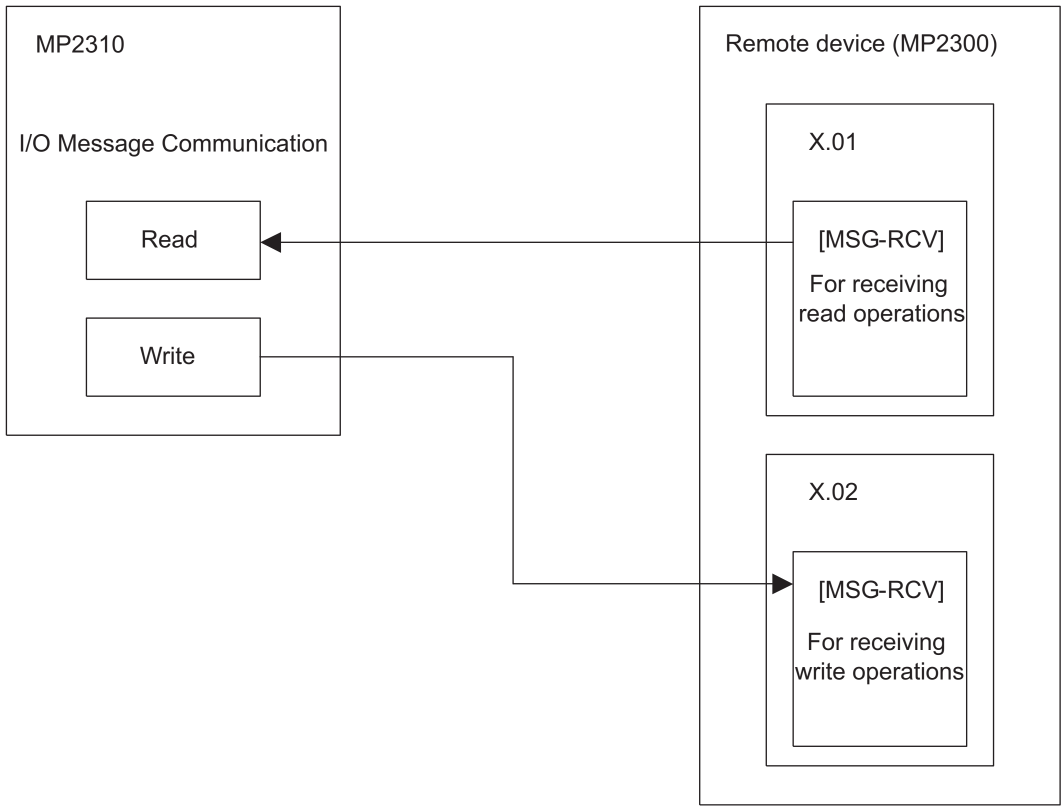
Table 6.11 Parameter List Setting Example 2 (parameter list start address Param = DA00000)

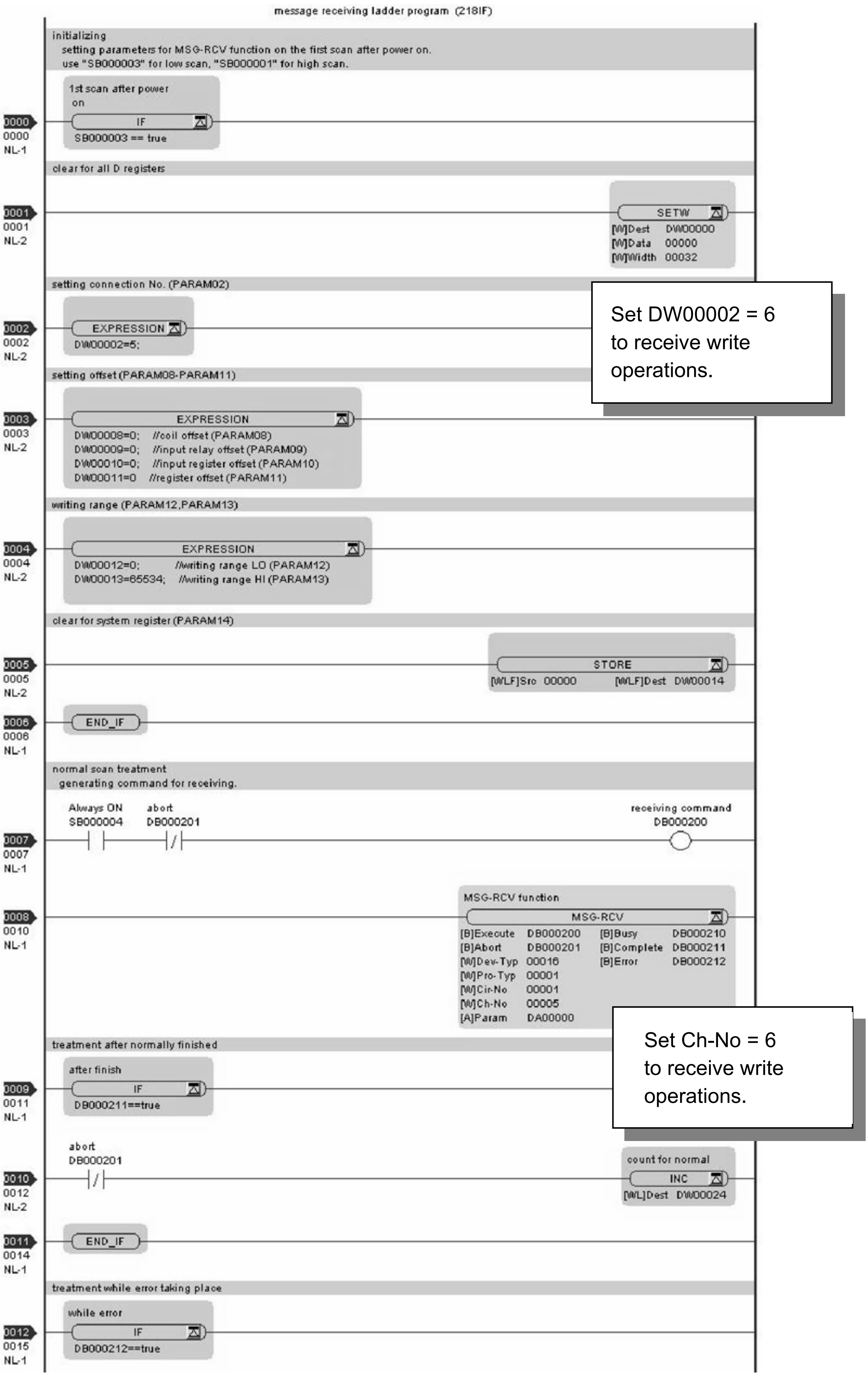
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00006	PARAM02	IN	Connection number = 6 (For receiving write operation)
DW00003	–	PARAM03	OUT	Option
DW00004	–	PARAM04	OUT	Function code
DW00005	–	PARAM05	OUT	Data address
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.

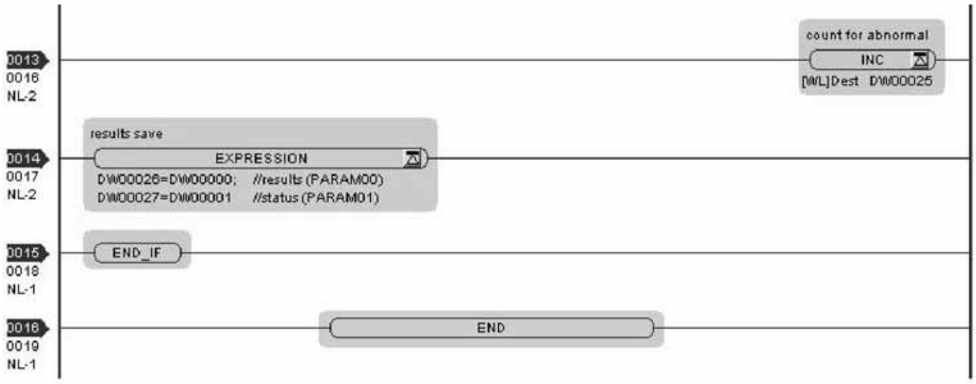
Note: N: Input, OUT: Output, SYS: For system use

■ 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
0000
0000
NL-1
clear for all D registers
SETW
[W]Dest DW00000
[W]Data 00000
[W]Width 00032
0001
0001
NL-2
setting connection No. (PARAM02)
EXPRESSION
DW00002=5;
0002
0002
NL-2
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)
0003
0003
NL-2
writing range (PARAM12,PARAM13)
EXPRESSION
DW00012=0; //writing range LO (PARAM12)
DW00013=65534; //writing range HI (PARAM13)
0004
0004
NL-2
clear for system register (PARAM14)
STORE
[WLF]Src 00000
[WLF]Dest DW00014
0005
0005
NL-2
END_IF
0006
0006
NL-1
normal scan treatment
generating command for receiving.
Always ON
SB000004
abort
DB000201
receiving command
DB000200
0007
0007
NL-1
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
0008
0010
NL-1
Set Ch-No = 6
to receive write
operations.
treatment after normally finished
after finish
IF
DB000211==true
0009
0011
NL-1
abort
DB000201
count for normal
INC
[WL]Dest DW00024
0010
0012
NL-2
END_IF
0011
0014
NL-1
treatment while error taking place
while error
IF
DB000212==true
0012
0015
NL-1



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 MP2310 side transmits messages.

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

6.2.4 When the MP2310 Acts as Master (ladder program which uses MSG-SND function)

The I/O message communication function cannot operate any registers other than the holding register (M register). Note that it can communicate with only one slave.
To communicate with more than one slave, use a ladder program with a message transmit function (MSG-SND) on the MP2310 side. You can use the message transmit (MSG-SND) function as well as the I/O message communication function by keeping connections separate from each other.

This section explains how to communicate with the MP2300 message receive function (MSG-RCV) using the MP2310 message transmit function (MSG-SND).

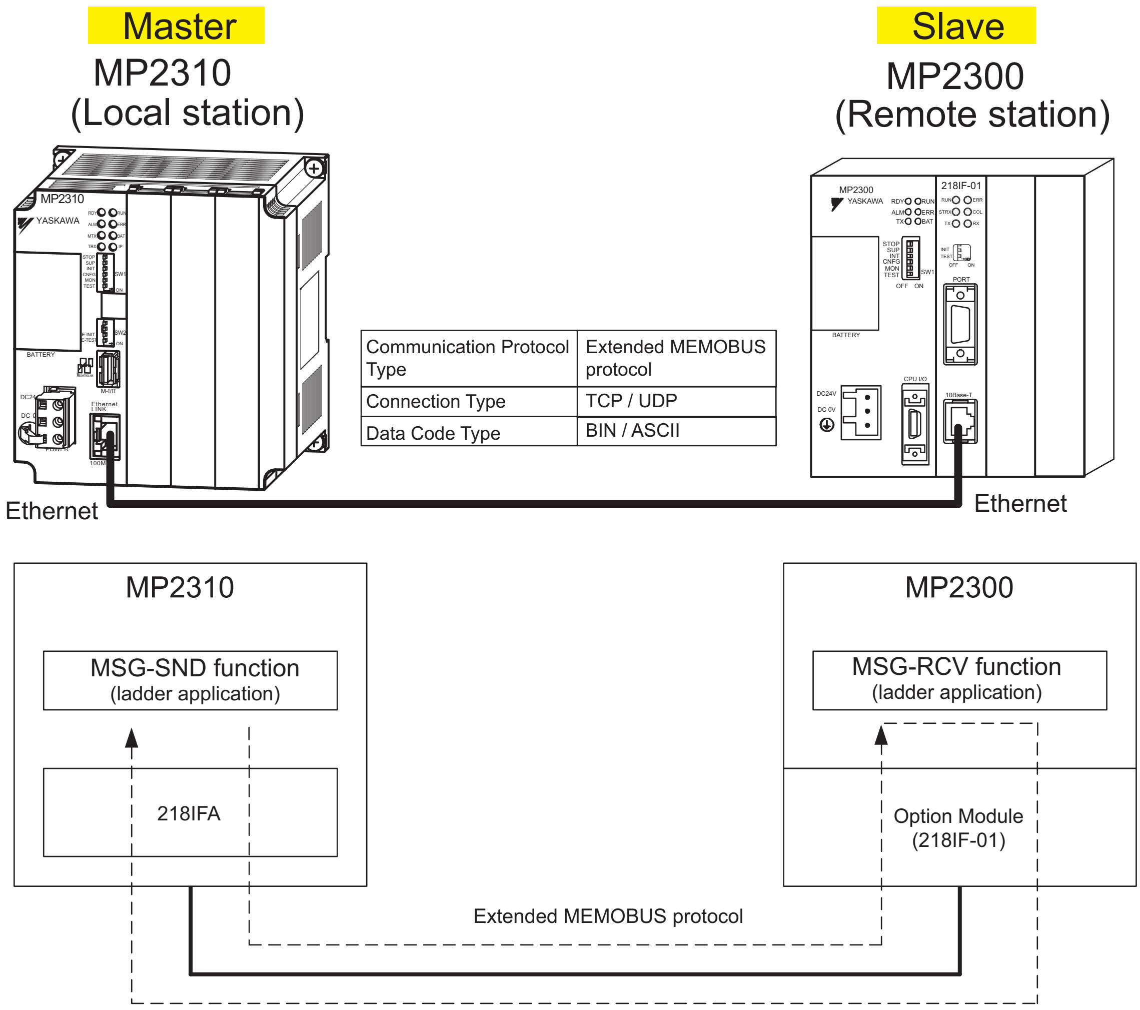
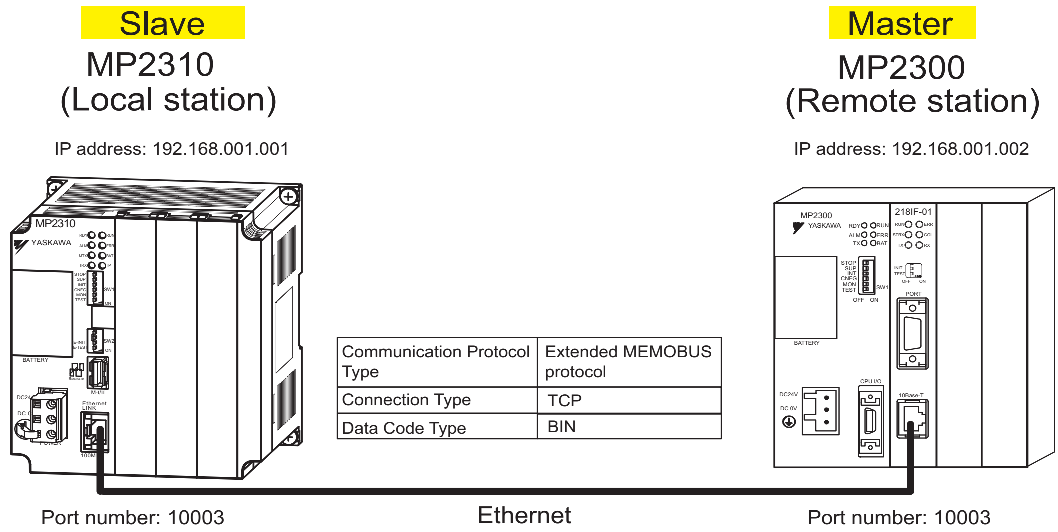
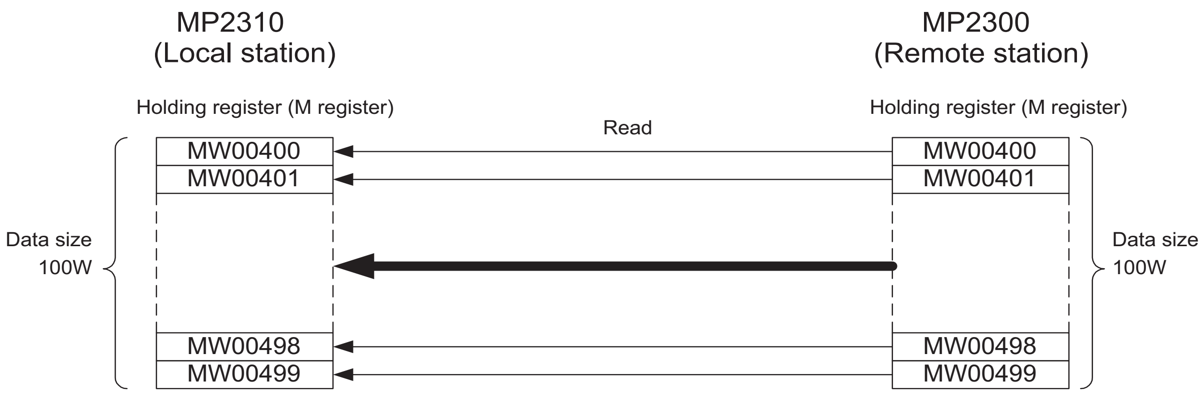


Fig. 6.8 Message Flow with MP2300 when Message Transmit Function (MSG-SND) Is Used

■ Setting Example

The following figure illustrates one example of reading the content of the MP2300 (slave) holding register (MW00400 to MW00499) into the MP2310 (master) holding register (MW00400 to MW00499).



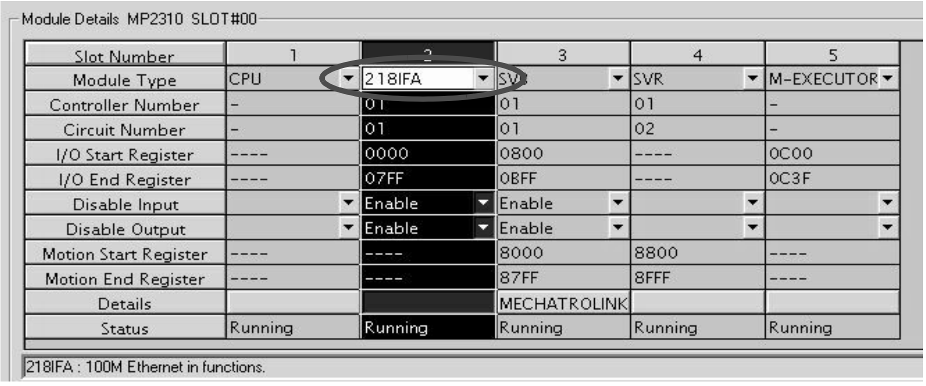


The particular setup procedure is explained in the subsequent pages.

(1) How to Set up the MP2310 Side

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

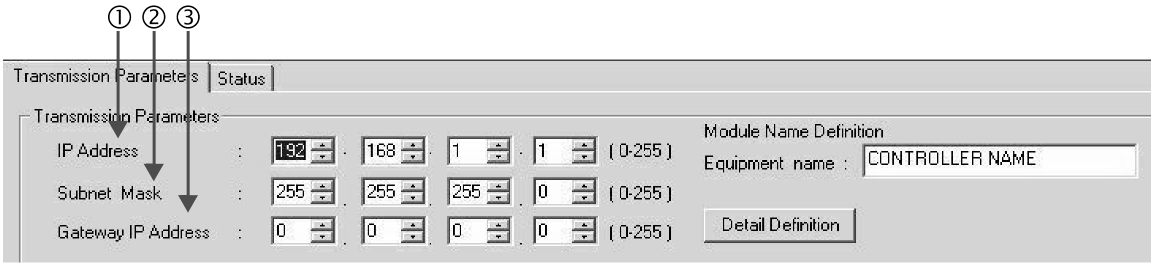
1. Double-click the **218IFA** Tab in the **Module Details** of the module configuration definition.


Module Details MP2310 SLOT#00

Slot Number	1	2	3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	01	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

218IFA : 100M Ethernet in functions.

2. Set transmission parameters.



■ How to set up transmission parameters

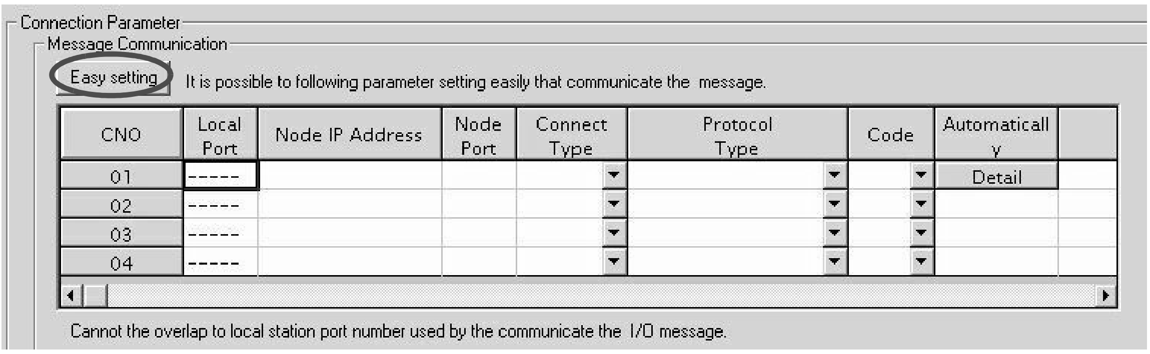
① Set **IP Address** (“192.168.001.001,” for example).
② Set **Subnet Mask** (“255.255.255.000,” for example).
③ Set **Gateway IP Address** (“000.000.000.000,” for example).

■ Caution

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

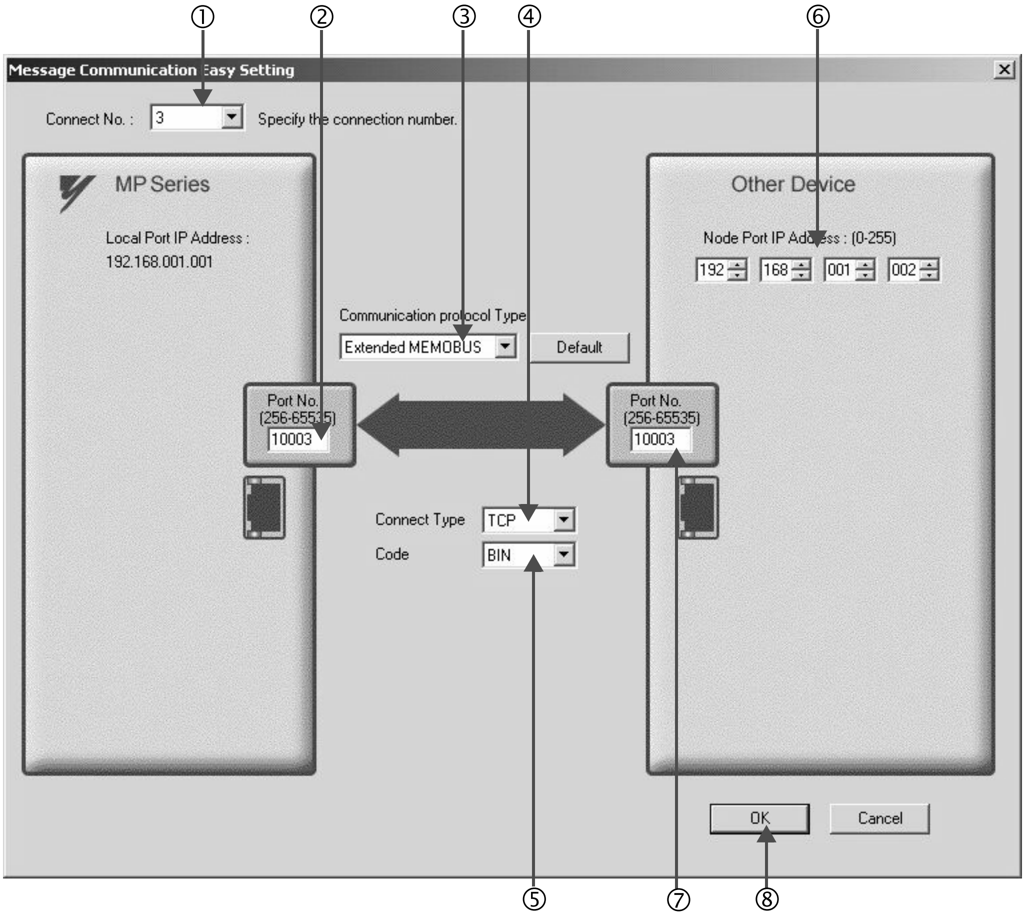
---

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



Ethernet Communications
6

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 "3" for the **Connect No.**
② Set **Port No.** of the MP2310 side ("10003," 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 (MP2310) to be connected ("10003," for example).
⑧ Click **OK**.

■ Caution

When message functions (MSG-SND, MSG-RCV) are used with the connection number 01, disable the automatic receive function. If message functions are used while the automatic receive function is enabled, the communication will not function properly.

Note: By default, the automatic receive function with a connection number 01 is set to "Enable."

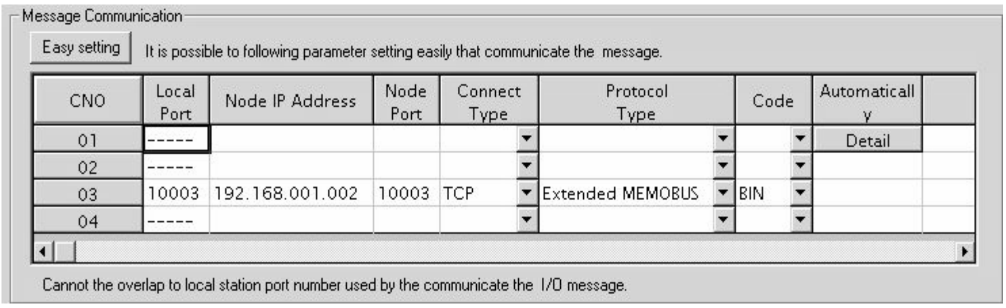
---

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.



■ Caution

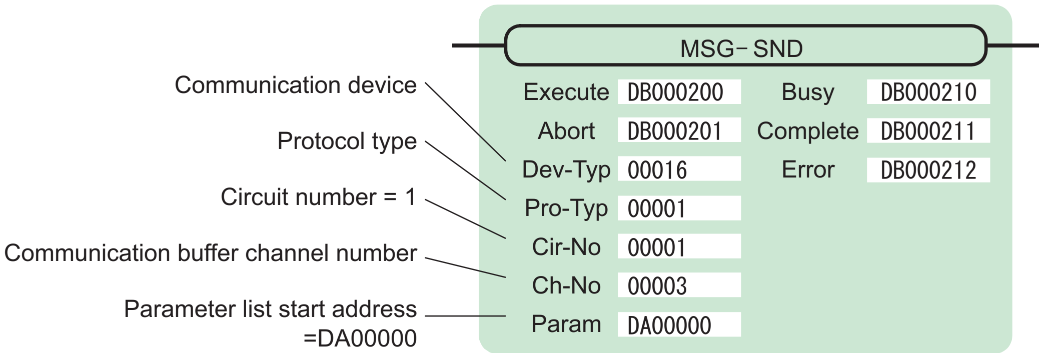
When any transmission or connection parameter is changed, the change will be reflected after FLASH has been saved and the power supply is turned ON again.

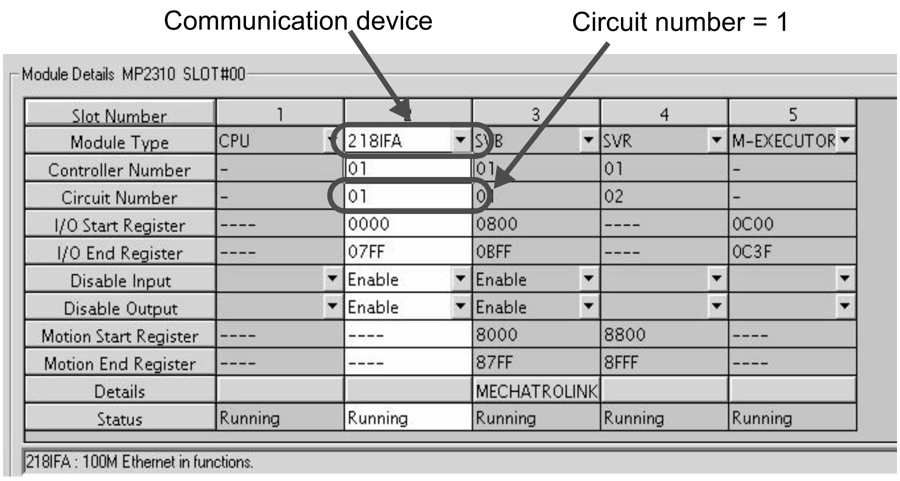
7. Create a ladder program containing a message transmit function (MSG-SND).

An example of a ladder program example for transmitting messages from the MP2310 side follows:

■ Message transmit function (MSG-SND)

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





Slot Number	1		3	4	5
Module Type	CPU	218IFA	SVB	SVR	M-EXECUTOR
Controller Number	-	01	01	01	-
Circuit Number	-	01	0	02	-
I/O Start Register	----	0000	0800	----	0C00
I/O End Register	----	07FF	0BFF	----	0C3F
Disable Input		Enable	Enable		
Disable Output		Enable	Enable		
Motion Start Register	----	----	8000	8800	----
Motion End Register	----	----	87FF	8FFF	----
Details			MECHATROLINK		
Status	Running	Running	Running	Running	Running

Fig. 6.9 MPE720 Module Configuration Definition Window

■ Input/output definition contents for message transmit functions

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

Table 6.12 Input/Output Definitions for Message Transmit Functions

I/O Definition	No.	Name	Setting Example	Contents
Input Item	1	Execute	DB000200	Executes a transmission When Execute turns ON, the message transmission is carried out.
	2	Abort	DB000201	Aborts a transmission When the Abort bit turns ON, message transmission is forcibly stopped.
	3	Dev-Typ	00016	Communication device type Specify the type of the communication device used in transmission. When Ethernet (218IF) is used, specify “16.”
	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	00003	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 “4.” * 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 is 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, Complete will turn ON only for one scan.
	3	Error	DB000212	Error occurred 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 transmitted on a per-word basis.
Non-procedure 2: In non-procedural communication, 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 MW00400 to the destination using the connection with a connection number = 3 follows:

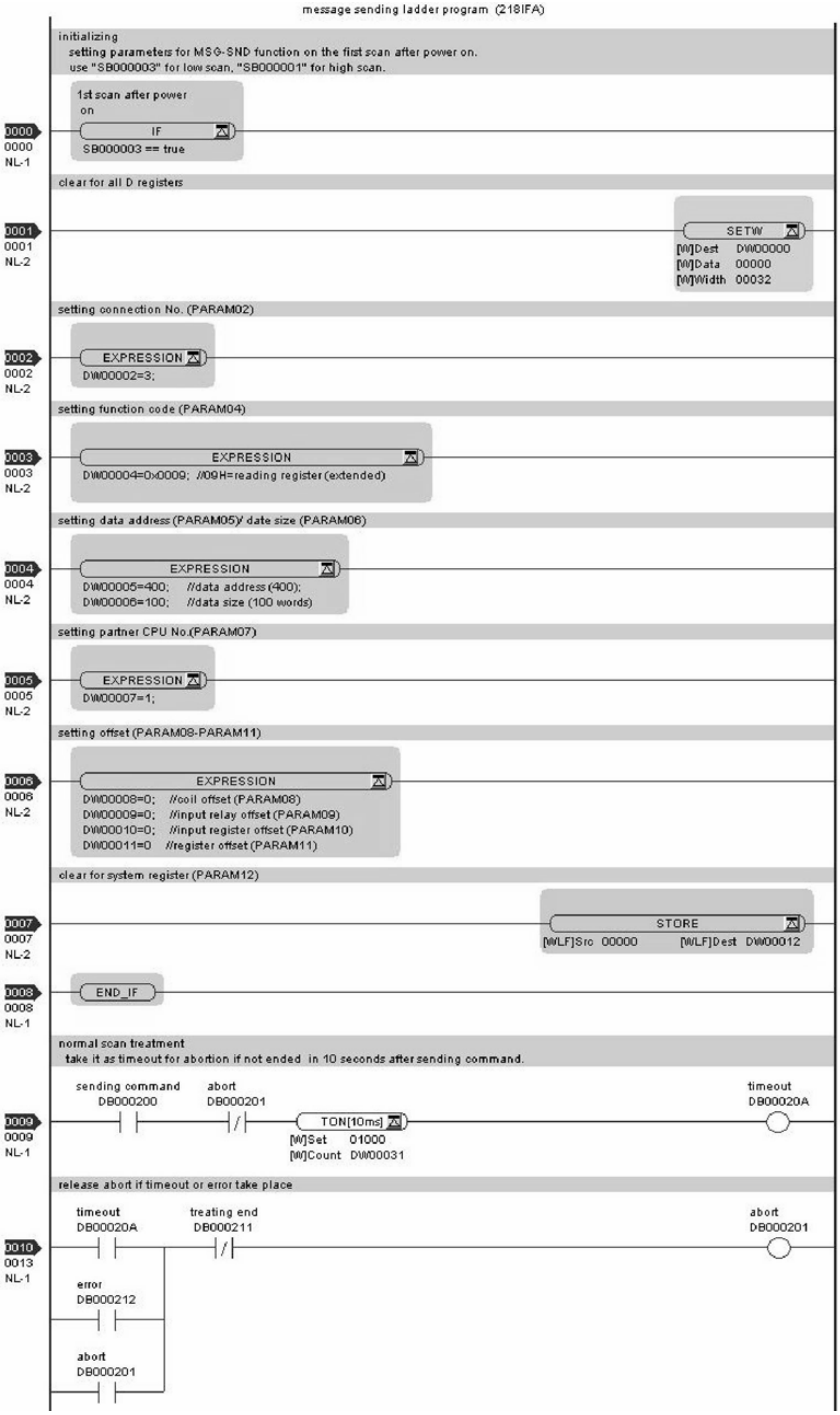
Table 6.13 Parameter List Setting Example (parameter list start address Param = DA00000)

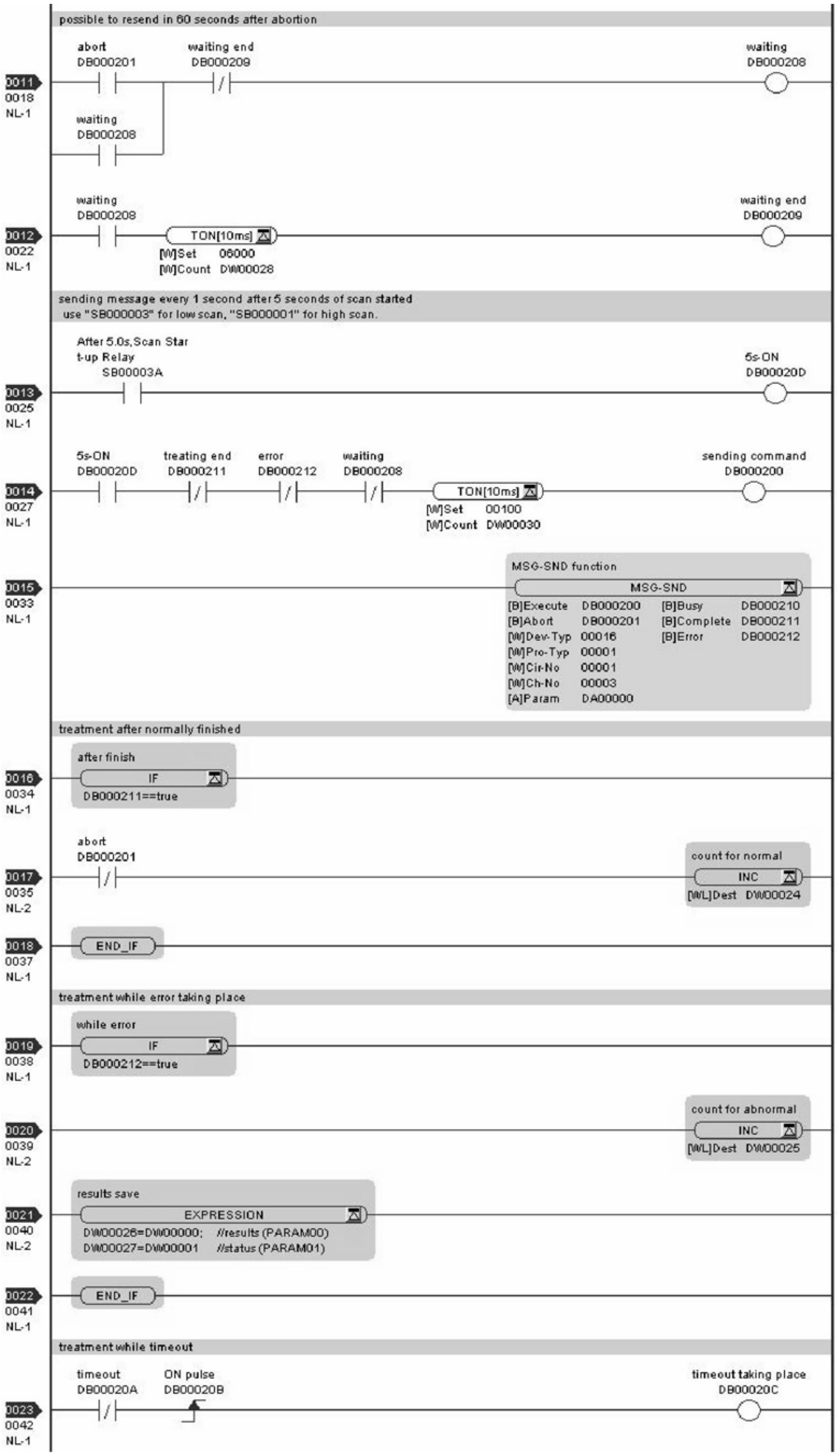
Register Number	Setting Value	Parameter Number	IN/OUT	Remarks
DW00000	–	PARAM00	OUT	Process result
DW00001	–	PARAM01	OUT	Status
DW00002	00003	PARAM02	IN	Connection number = 3
DW00003	–	PARAM03	IN	Option (Setting unnecessary)
DW00004	0009H	PARAM04	IN	Function code = 09H (Reads a holding register)
DW00005	00400	PARAM05	IN	Data address = 400 (Starting from MW00400)
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.

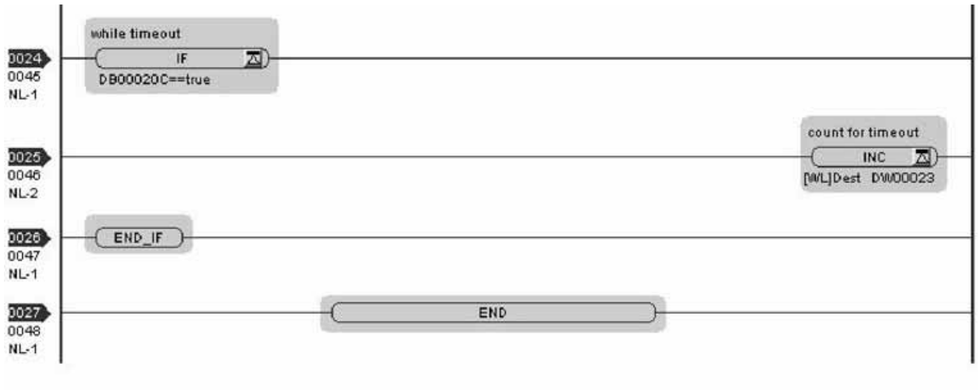
Note: N: Input, OUT: Output, SYS: For system use

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

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




possible to resend in 60 seconds after abortion
abort DB000201
waiting end DB000209
waiting DB000208
0011 0018 NL-1
waiting DB000208
waiting DB000208
waiting end DB000209
0012 0022 NL-1
TON[10ms]
[W]Set 06000
[W]Count DW00028
sending message every 1 second after 5 seconds of scan started
use "SB000003" for low scan, "SB000001" for high scan.
After 5.0s,Scan Start-up Relay SB00003A
5s-ON DB00020D
0013 0025 NL-1
5s-ON DB00020D
treating end DB000211
error DB000212
waiting DB000208
sending command DB000200
0014 0027 NL-1
TON[10ms]
[W]Set 00100
[W]Count DW00030
0015 0033 NL-1
MSG-SND function
MSG-SND
[B]Execute DB000200
[B]Abort DB000201
[W]Dev-Typ 00016
[W]Pro-Typ 00001
[W]Cir-No 00001
[W]Ch-No 00003
[A]Param DA00000
[B]Busy DB000210
[B]Complete DB000211
[B]Error DB000212
treatment after normally finished
0016 0034 NL-1
after finish
IF
DB000211==true
0017 0035 NL-2
abort DB000201
count for normal
INC
[WL]Dest DW00024
0018 0037 NL-1
END_IF
treatment while error taking place
0019 0038 NL-1
while error
IF
DB000212==true
0020 0039 NL-2
count for abnormal
INC
[WL]Dest DW00025
0021 0040 NL-2
results save
EXPRESSION
DW00026=DW00000; //results (PARAM00)
DW00027=DW00001 //status (PARAM01)
0022 0041 NL-1
END_IF
treatment while timeout
0023 0042 NL-1
timeout DB00020A
ON pulse DB00020B
timeout taking place DB00020C

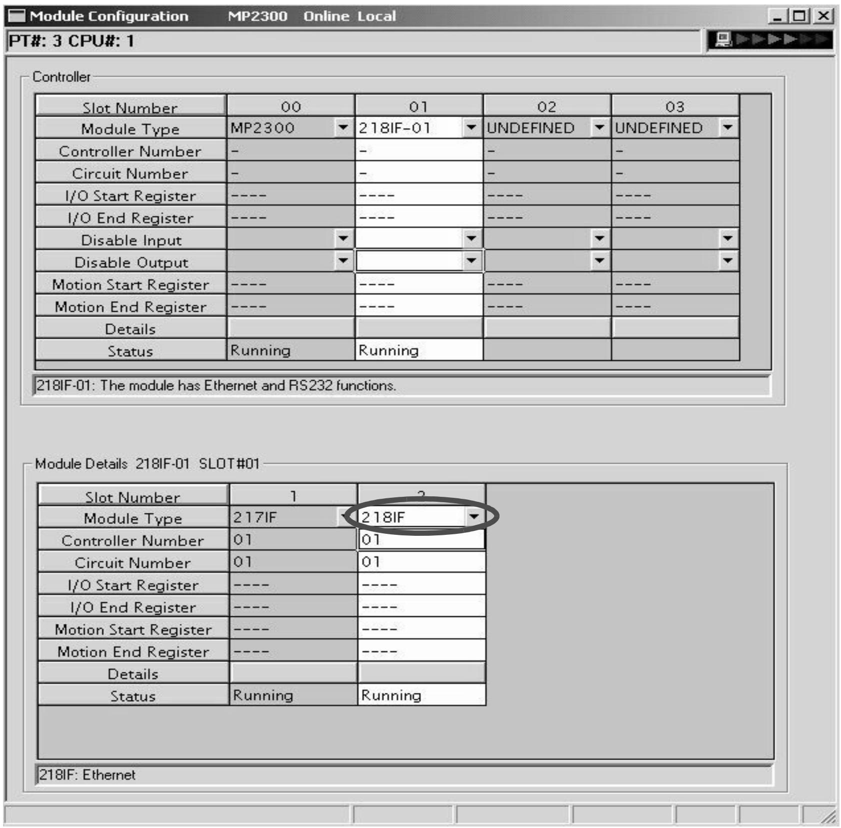


The communication setting and the ladder program creation are now finished, when MP2310 acts as a master.

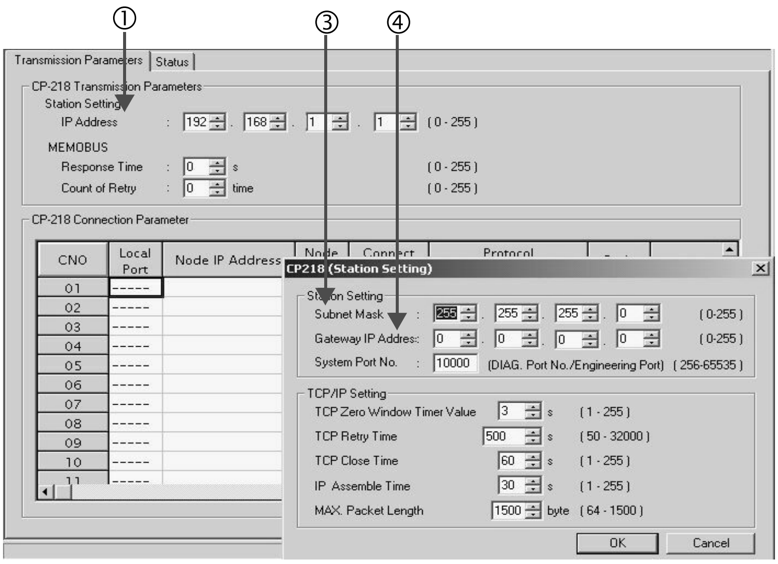
(2) How to Set up the Remote Equipment (MP2300) to Be Connected

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

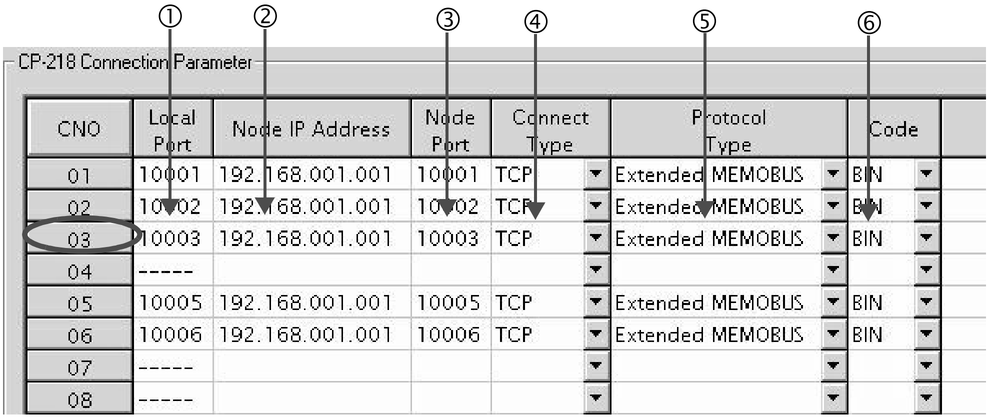
① Set **IP Address** (“192.168.001.001,” for example).
② Click **Edit**, and then click **Local Station: TCP/IP Setting** in the **Engineering Manager** Window.
③ Set **Subnet Mask** (“255.255.255.000,” for example).
④ Set **Gateway IP Address** (“000.000.000.000,” for example).

Caution

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

---

3. Set connection parameters.



CNO	Local Port	Node IP Address	Node Port	Connect Type	Protocol Type	Code
01	10001	192.168.001.001	10001	TCP	Extended MEMOBUS	BIN
02	10002	192.168.001.001	10002	TCP	Extended MEMOBUS	BIN
03	10003	192.168.001.001	10003	TCP	Extended MEMOBUS	BIN
04	-----					
05	10005	192.168.001.001	10005	TCP	Extended MEMOBUS	BIN
06	10006	192.168.001.001	10006	TCP	Extended MEMOBUS	BIN
07	-----					
08	-----					

Procedure to set up in the **CP-218 Connection Parameter** Window, for example, with a connection number 03

① Set **Local Port** (the port number “10003” used in the MP2300 side, for example).
② Set **Node IP Address** (the IP address “192.168.001.001” configured in the MP2310 side, for example).
③ Set **Node Port** (the port number “10003” configured in the MP2310 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.

---

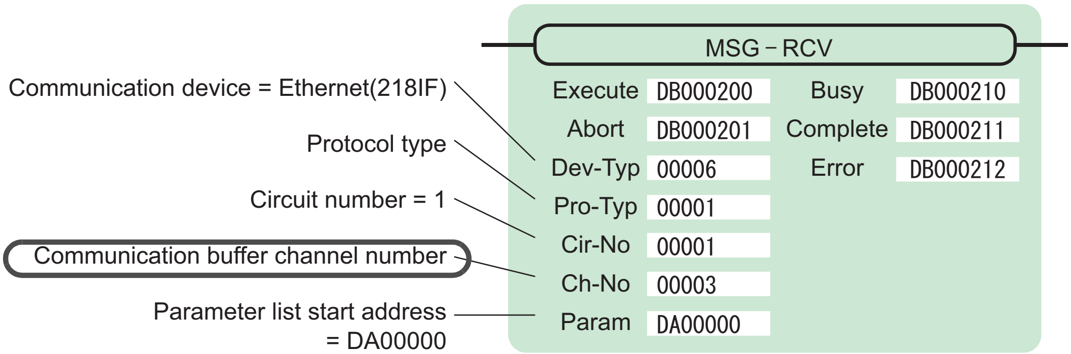
4. Create a ladder program with a message receive function (MSG-RCV) in it.

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 describing and executing this message receive function in a ladder program.

In addition, in order to support Read and Write by MP2310, 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 MP2310 side settings.



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

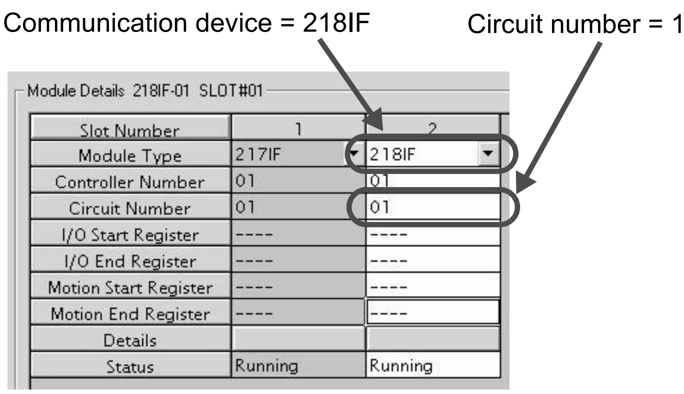


Fig. 6.10 MPE720 Module Configuration Definition Screen

Input/output definitions contents for message receive functions

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

Table 6.14 Input/Output Definitions for Message Receive Functions

I/O Definition	No.	Name	Setting Example	Contents
Input Item	1	Execute	DB000200	Executes a reception When Execute turns ON, the message reception is carried out.
	2	Abort	DB000201	Aborts a reception When Abort turns 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	00003	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 occurred 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

A parameter list setting example is as follows when receiving messages from a transmit source using the connection with a connection number = 3:

Table 6.15 Parameter List Setting Example1 (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	00003	PARAM02	IN	Connection number = 3 (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

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

A ladder program for receiving messages in the remote equipment (MP2300) side is similar to that in *6.2.3 (2) How to Set up the Remote Device (MP2300) to Be Connected* on page 6-39.
However, change Communication buffer channel number and Connection number respectively based on the I/O definition and parameter list settings.

(3) How to Start Communication

1. MP2300 side starts to receive the messages.

As the sample ladder program starts the message receive operation just after the system startup, you don’t need to operate it particularly. Normally, accept the default.

2. Turn Execute ON for the message transmit function in the MP2310 side to transmit messages.

The sample ladder program is created to transmit a message every one second when five seconds elapsed after the low-speed scan (or high-speed scan) startup.
The way to change the message transmission interval is similar to that in *6.2.1 (3) How to Start Communications* on page 6-15.

6.3 Communication with Touch Panel

This section explains how to communicate with a touch panel supporting for the Extended MEMOBUS protocol using the MP2310 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 MP2310 Acts as Slave

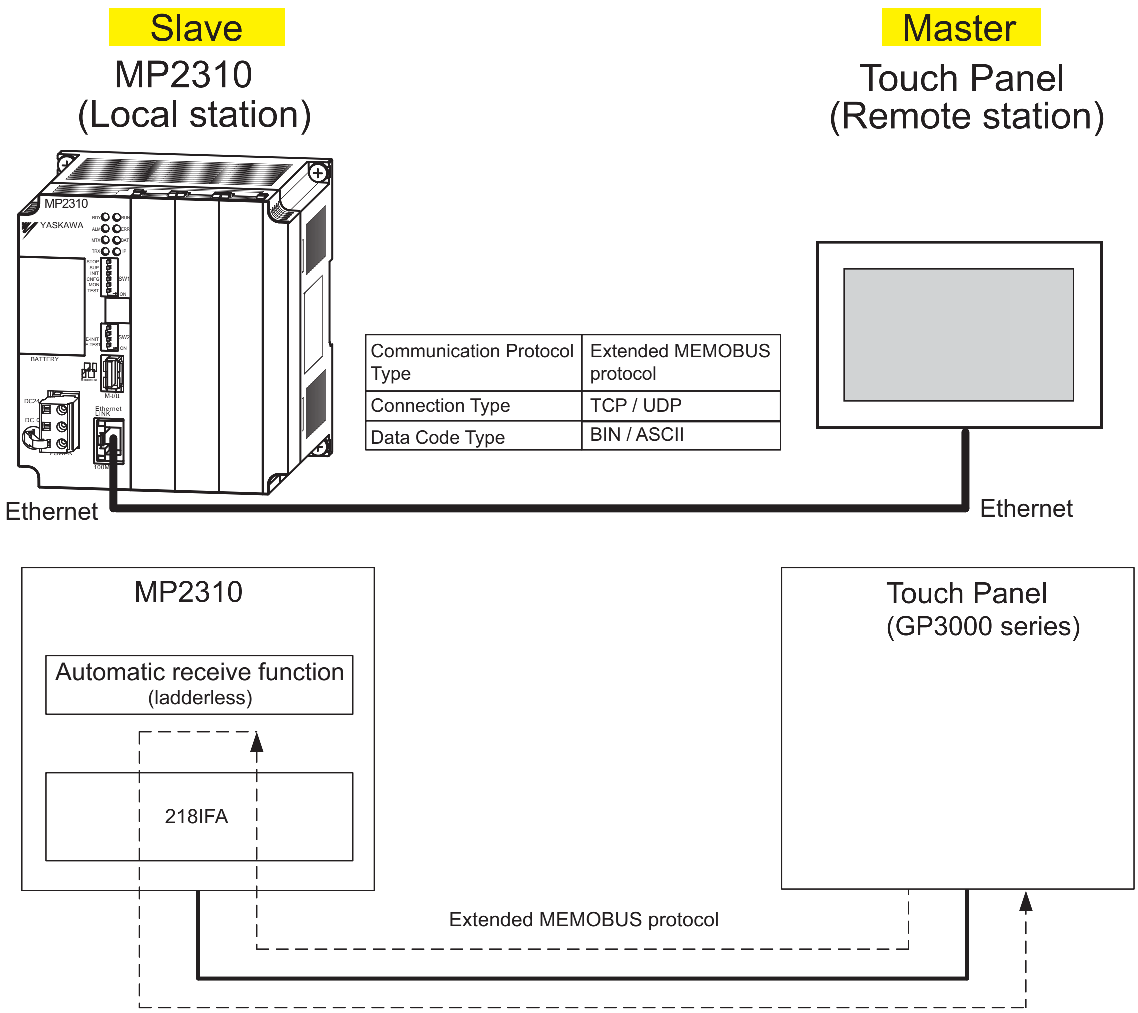
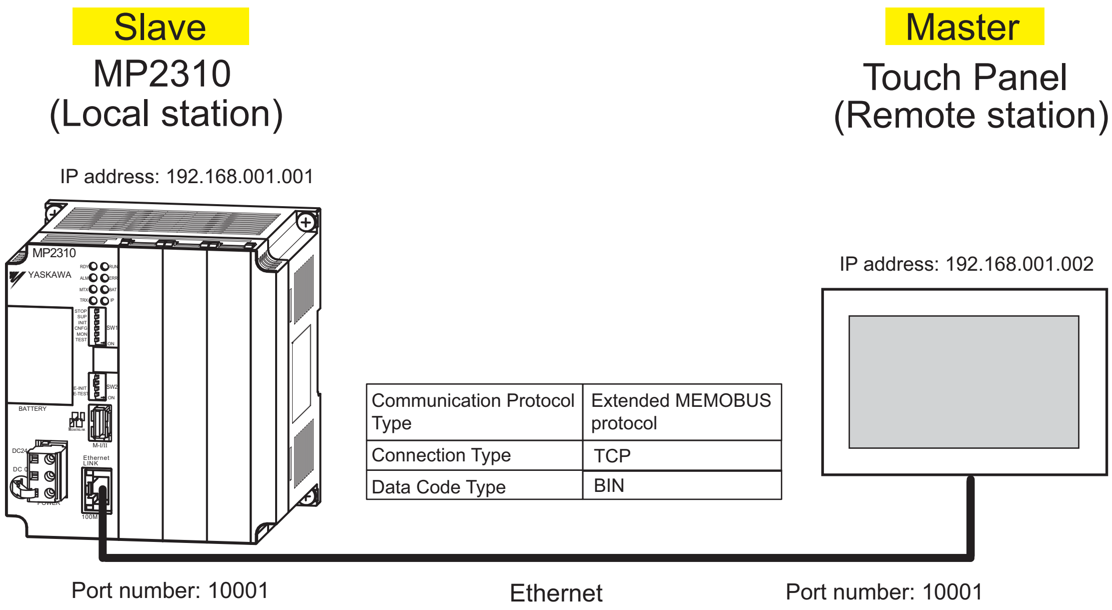


Fig. 6.11 Message Flow with Touch Panel (GP3000 series) when Automatic Receive Function Is Used

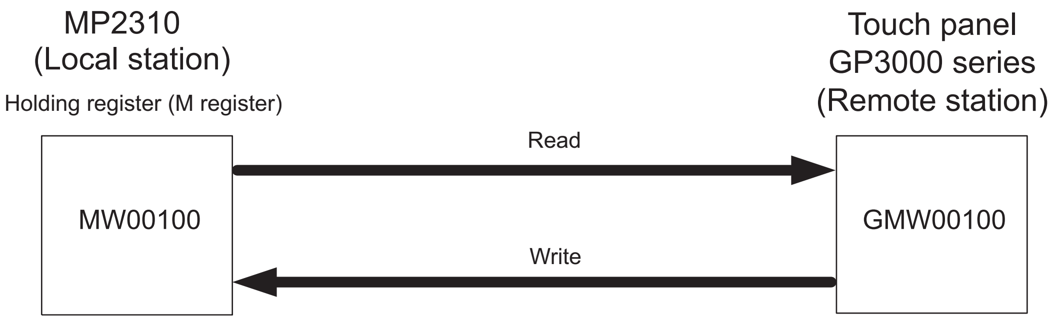
Note: Here, communication with the touch panel is carried out using the automatic receive function, but it can also use the message receive function (MSG-RCV). For information on how to set up when the message receive function (MSG-RCV) is used, refer to *6.2.2 (2) How to Set up the Remote Device (MP2300) to Be Connected* on page 6-25.

■ Setting Example

The following figure shows an example which displays the content of the MP2310 (slave) holding register (MW00100) on a touch panel and writes values from the touch panel to the same register.

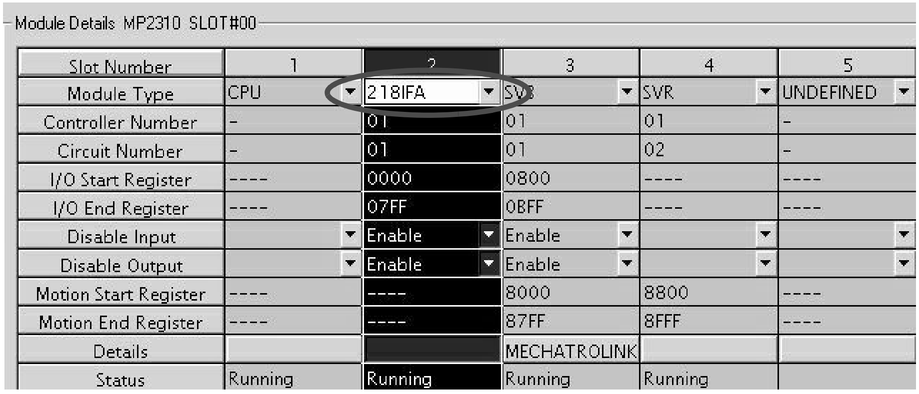


Communication Protocol Type	Extended MEMOBUS protocol
Connection Type	TCP
Data Code Type	BIN

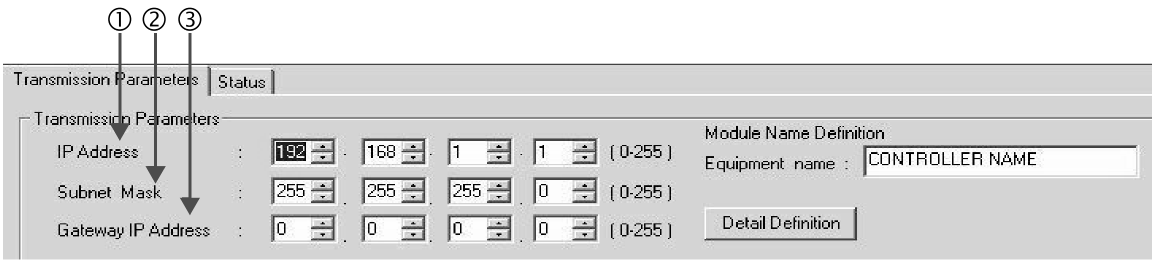


(1) How to Set up the MP2310 Side

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

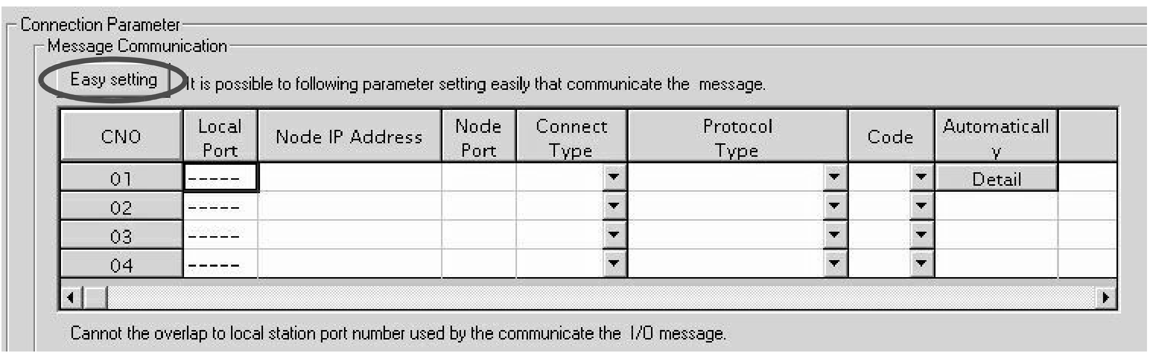
① Set **IP Address** ("192.168.001.001," for example).
② Set **Subnet Mask** ("255.255.255.000," for example).
③ Set **Gateway IP Address** ("000.000.000.000," for example).

■ Caution

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

---

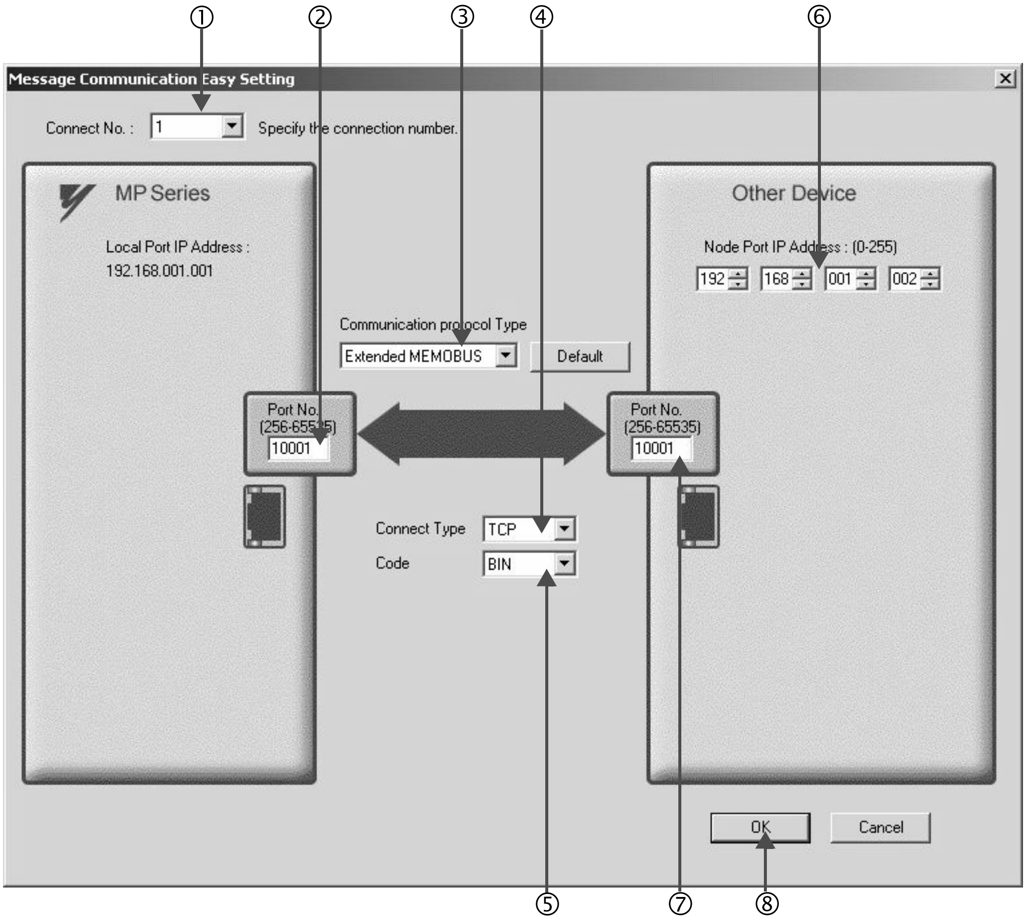
3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



Ethernet Communications

6

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 MP2310 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 (touch panel) to be connected ("192.168.001.002," for example).
⑦ Set **Port No.** of the other device (touch panel) to be connected ("10001," for example).
⑧ Click **OK**.

■ Caution

When message functions (MSG-SND, MSG-RCV) are used with the connection number 01, disable the automatic receive function. If message functions are used while the automatic receive function is enabled, the communications will not function properly.

Note: By default, the automatic receive function with a connection number 01 is set to "Enable."

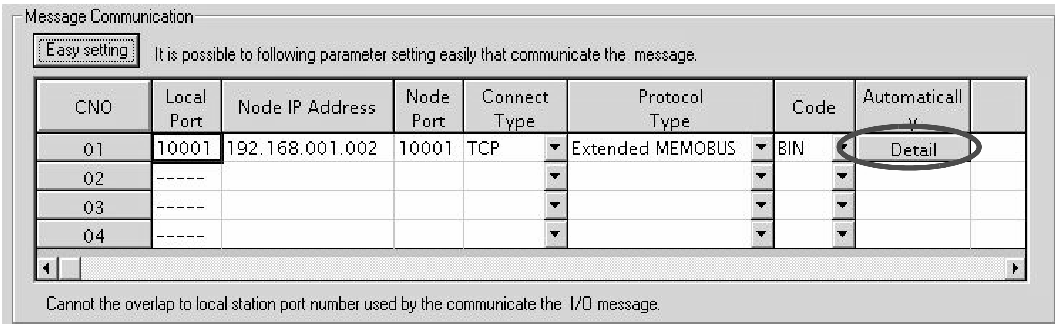
5. Click **Yes** in the parameter setting confirmation dialog box.

■ Caution

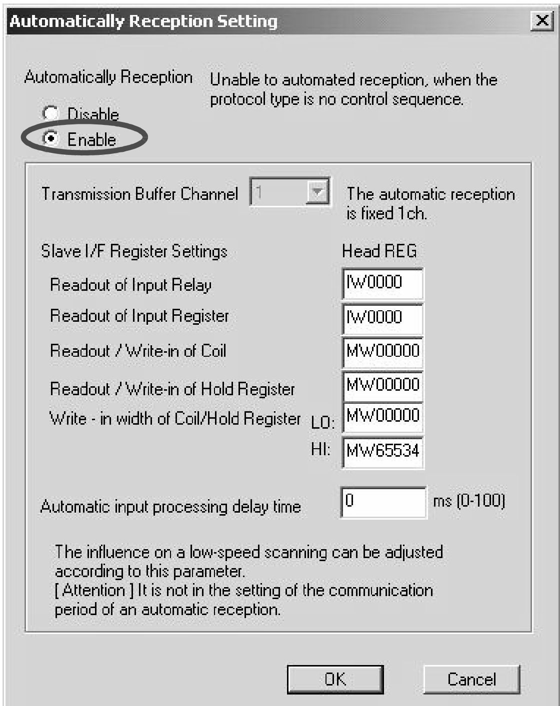
Note that when a parameter with the same connection number is already set and you click **Yes** in the parameter setting confirmation dialog, the setting will be overwritten by the parameter configured in the **Message Communication Easy Setting** Window.

---

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 2-21.

The automatic receive function for connecting the MP2310 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 MP2310 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 6.16 Indicator Type Setting (example)

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

4. Set up connected equipment.

Table 6.17 Connected Equipment

Manufacturer	YASKAWA Electric Corporation
Series	MEMOBUS Ethernet

5. Set up the way to connect.

Table 6.18 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 6.19 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

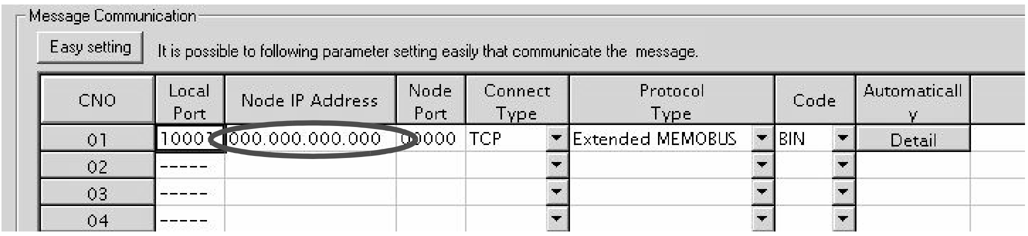
- If you don't check Automatic Assignment of the port number in the communication setting screen, the automatic assignment will be disabled, and the GP3000 series port number will be fixed at the setting value.

- 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 2-15.
  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 MP2310 (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.

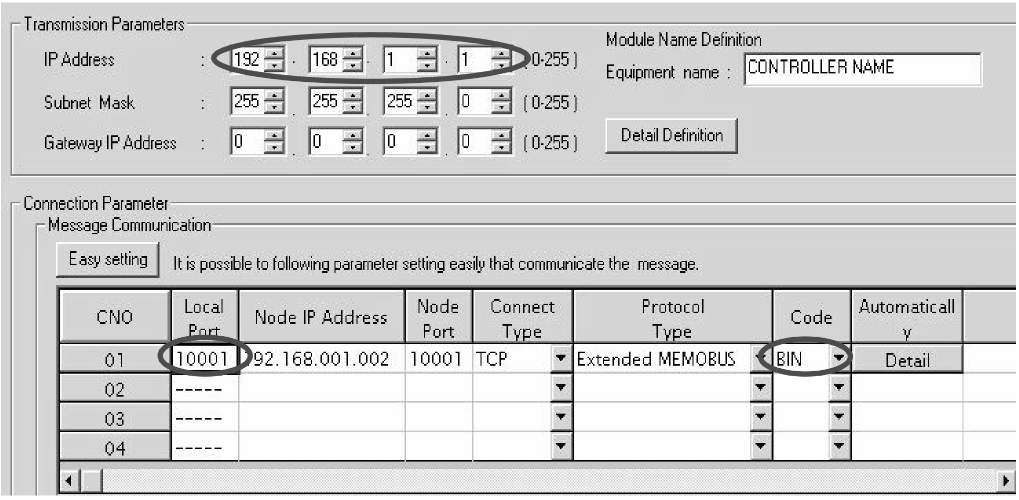
9. Set up the setting screen for each device.

In the setting screen for each device, set up a connected device (in this case, the MP2310).
Set the IP address, port number and data code in the same manner as the 218IFA screen of the MP2310.

Table 6.20 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

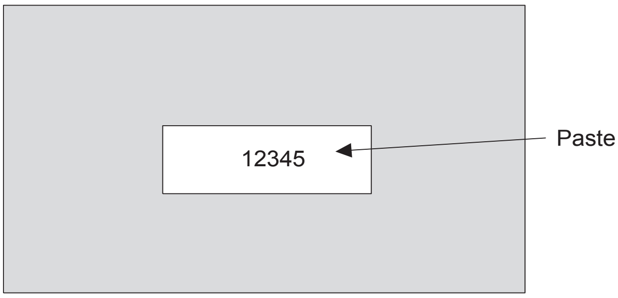
- Set up a unique IP address in the network.
  The MP2310 side IP address is set to "192.168.1.1" in self-configuration.
  For the IP address, check with your network administrator.

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

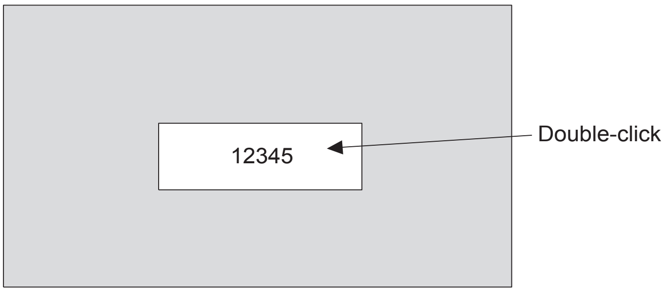
[b] Screen Creation Example

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 6.21 Data Indicator Detailed Setting

Display Data	Numeric display
Monitor Word Address	GMW00100

■ Relationship between GP-Pro EX address display and MP2310 register

Device	GP-Pro EX Address Display	MP2310 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 MP2310 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 MP2310 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 MP2310 and MELSEC (Q, A series) general-purpose PLC manufactured by Mitsubishi Electric Corporation, the MELSEC protocol (A-compatible IE frame) 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 MP2310 acts as a slave and a master respectively.
For using the MP2310 as a slave, we explain communication using the automatic receive function.
For using the MP2310 as a master, we explain communication using the I/O message communication function.

6.4.1 When the MP2310 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 MP2310 automatic receive function.

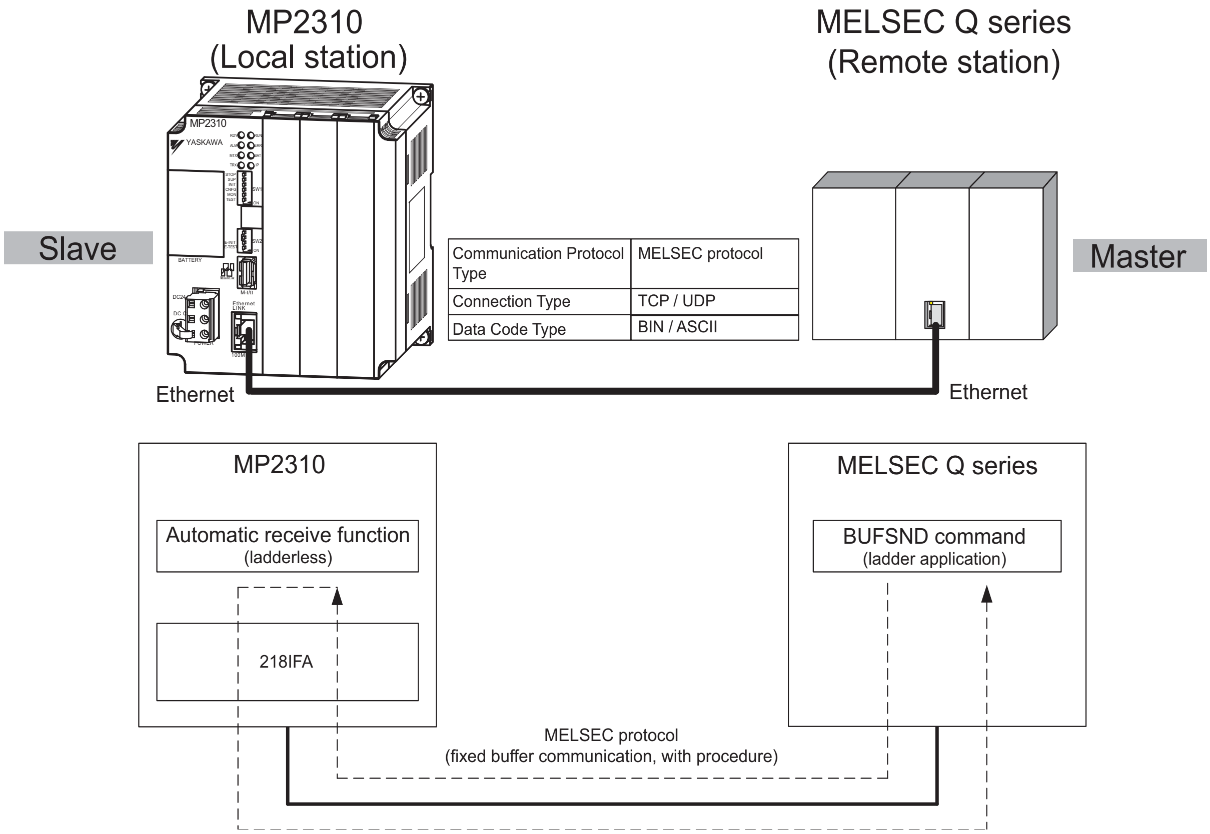


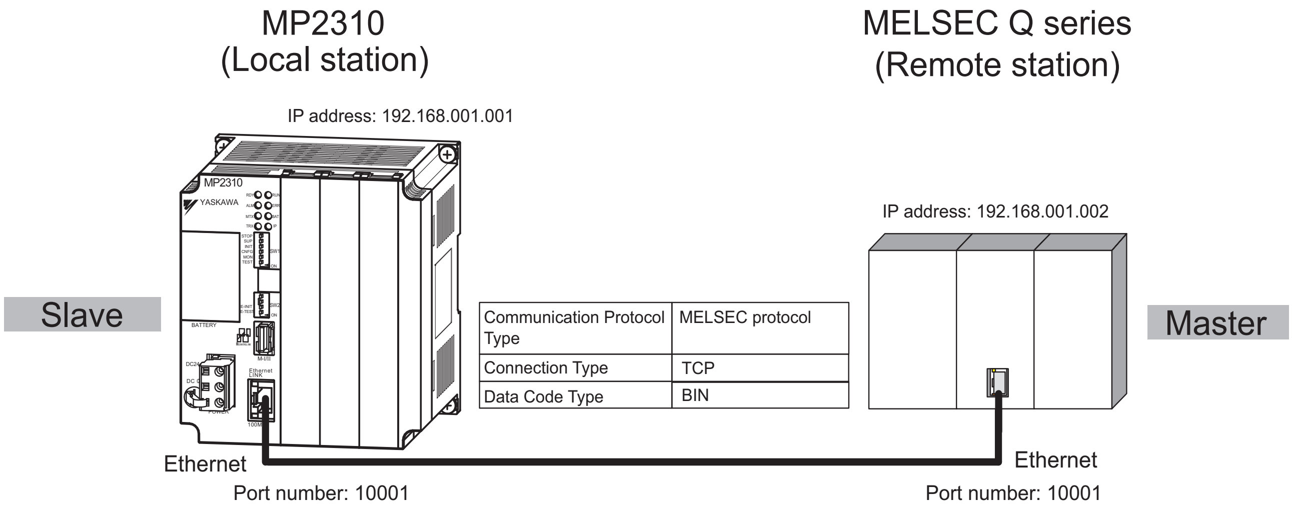
Fig. 6.12 Message Flow with the MELSEC Q Series when the Automatic Receive Function Is Used

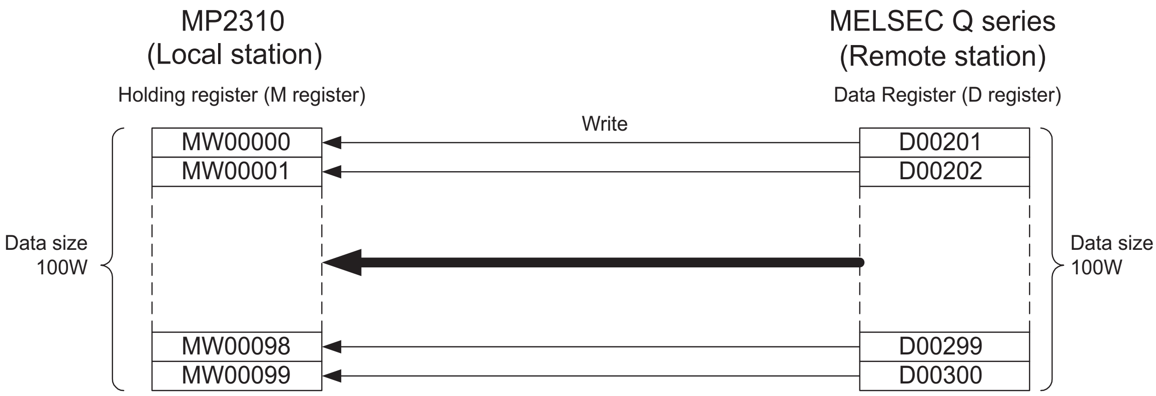
■ Caution

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 MP2310 (slave) using fixed buffer communication.
However, when the MP2310 acts as a slave, you cannot use the inter-CPU or random access communication, because of the MELSEC specifications.
In addition, use the message receive function (MSG-RCV) when communicating with multiple remote devices.

■ 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 MP2310 (slave) holding register (MW00000 to MW00099).



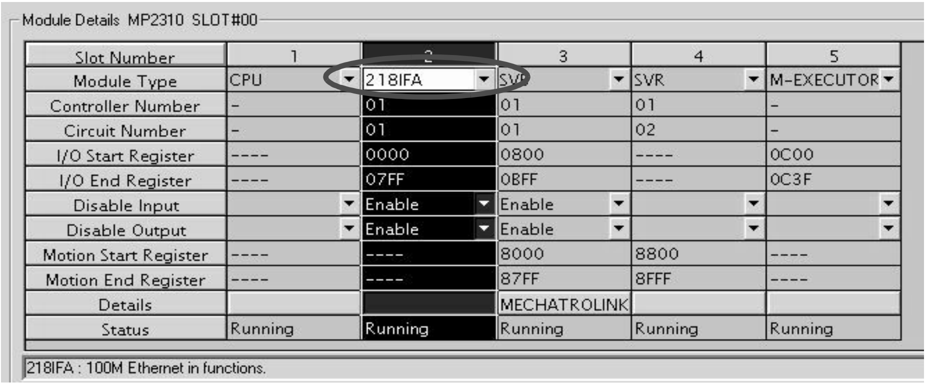


The particular setup procedure is explained in the subsequent pages.

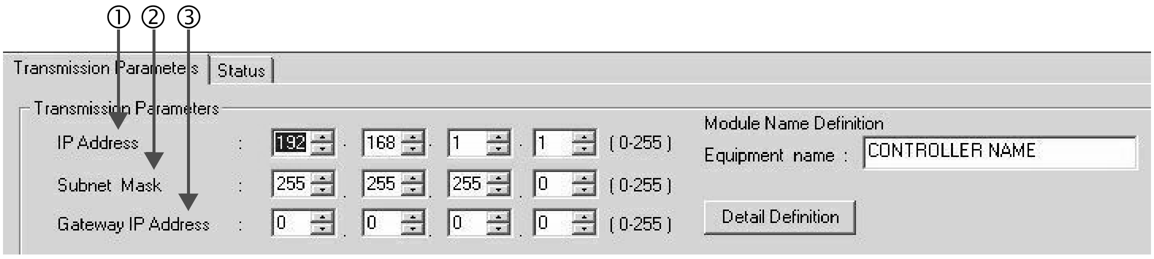
(1) How to Set up the MP2310 Side

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.

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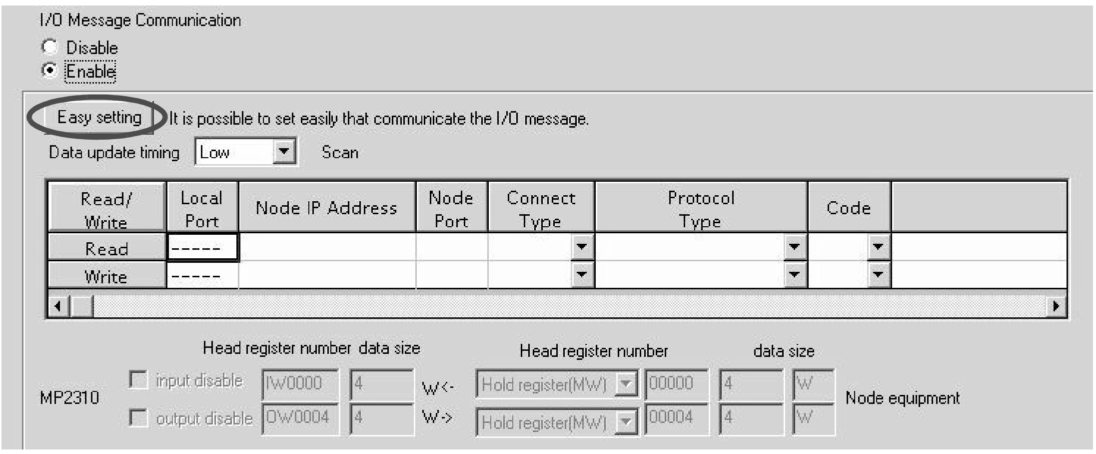
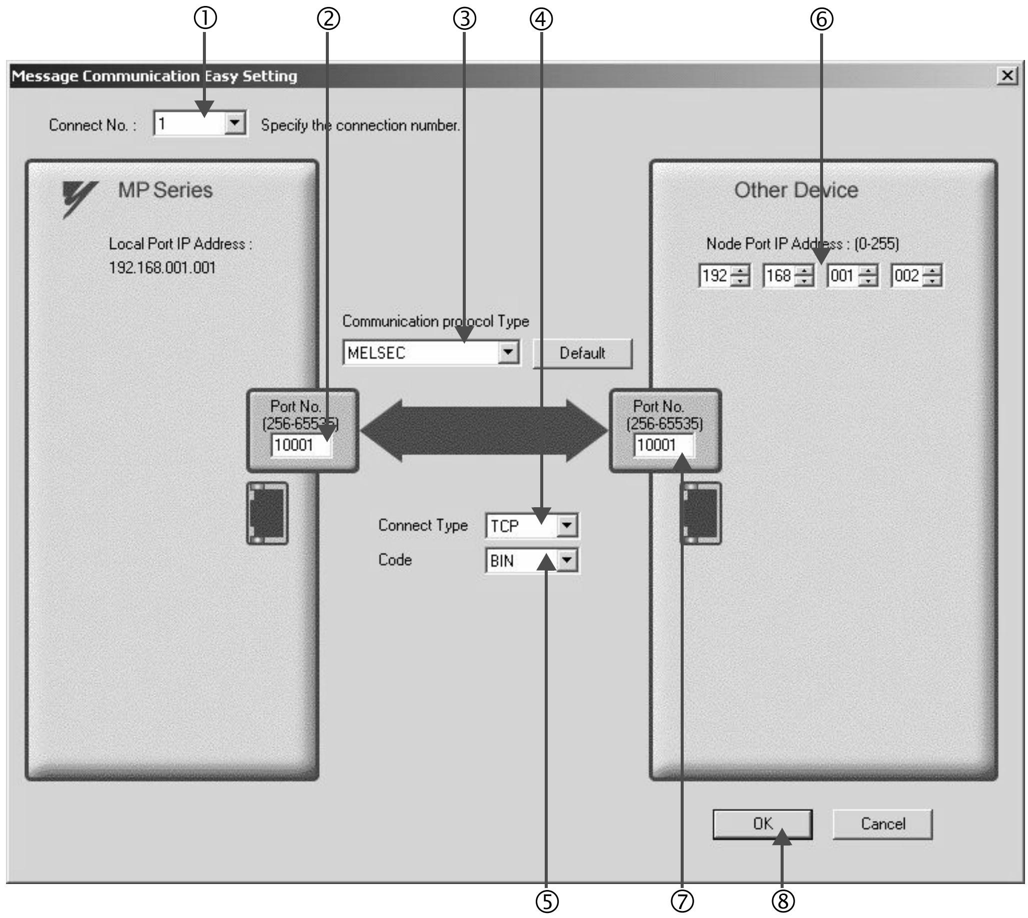
3. Click the **Easy Setting** Button in the **Message Communication** area of the connection parameter setting.



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 MP2310 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**.

■ Caution

When message functions (MSG-SND, MSG-RCV) are used with the connection number 01, disable the automatic receive function. If message functions are used while the automatic receive function is enabled, the communications will not function properly.

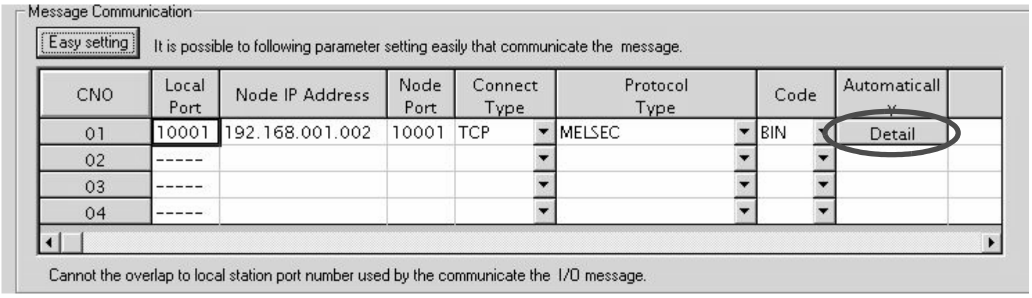
Note: By default, the automatic receive function with a connection number 01 is set to “Enable.”

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

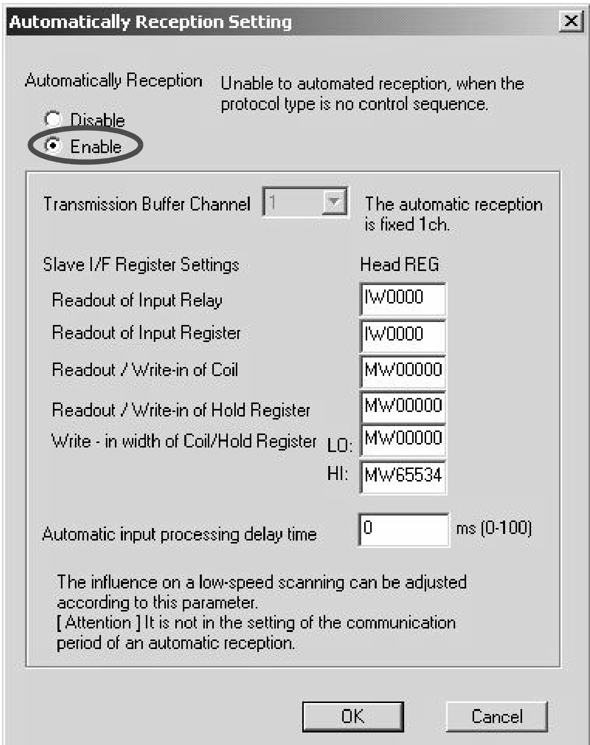
■ Caution

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 2-21.

The automatic receive function is now set up, when MP2310 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 MP2310 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 6.22 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 6.23 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 6.24 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 MP2310 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 MP2310 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 MP2310, and use a BUFSND command to transmit messages.

When messages are transmitted from the MESLSEC Q series, communication with the MP2310 will start.

6.4.2 When the MP2310 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 MP2310 I/O message communication function.

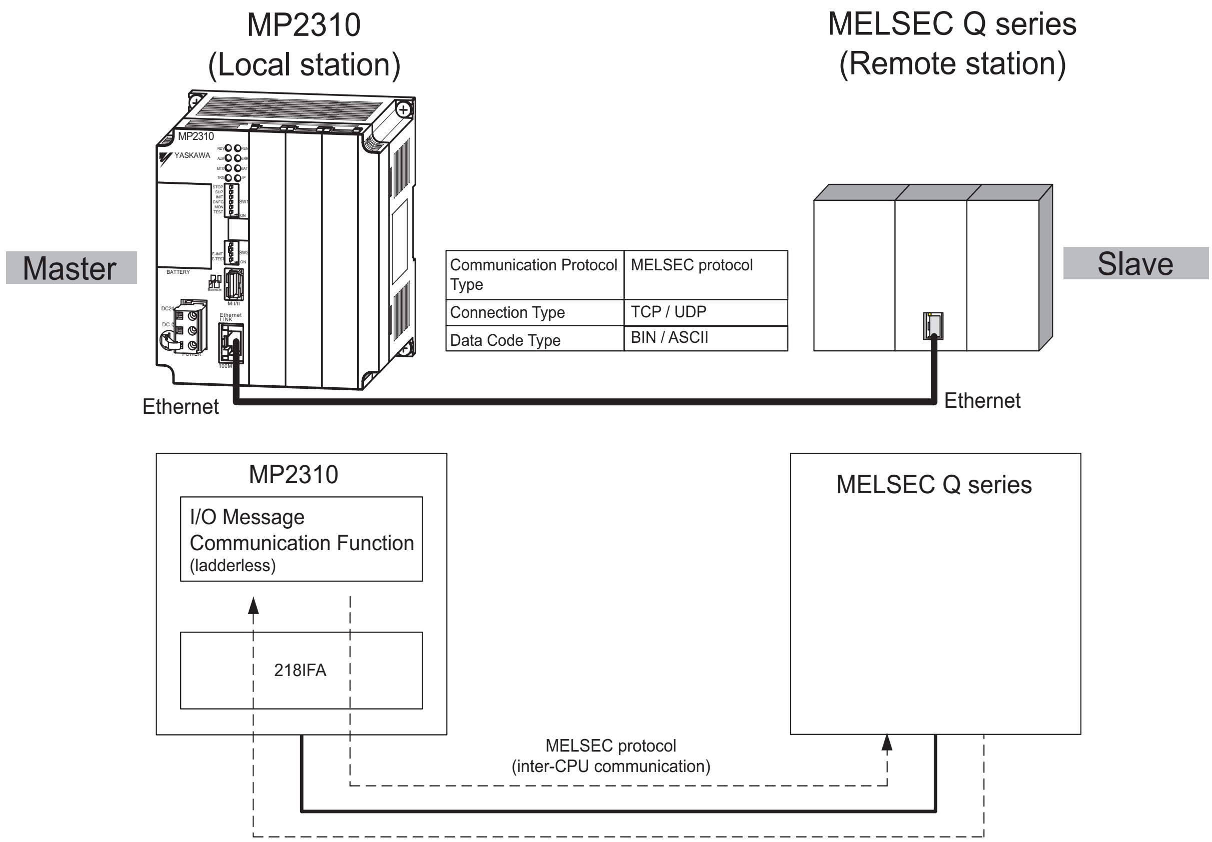


Fig. 6.13 Message Flow with MELSEC Q series when I/O Message Communication Function Is Used

■ 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.

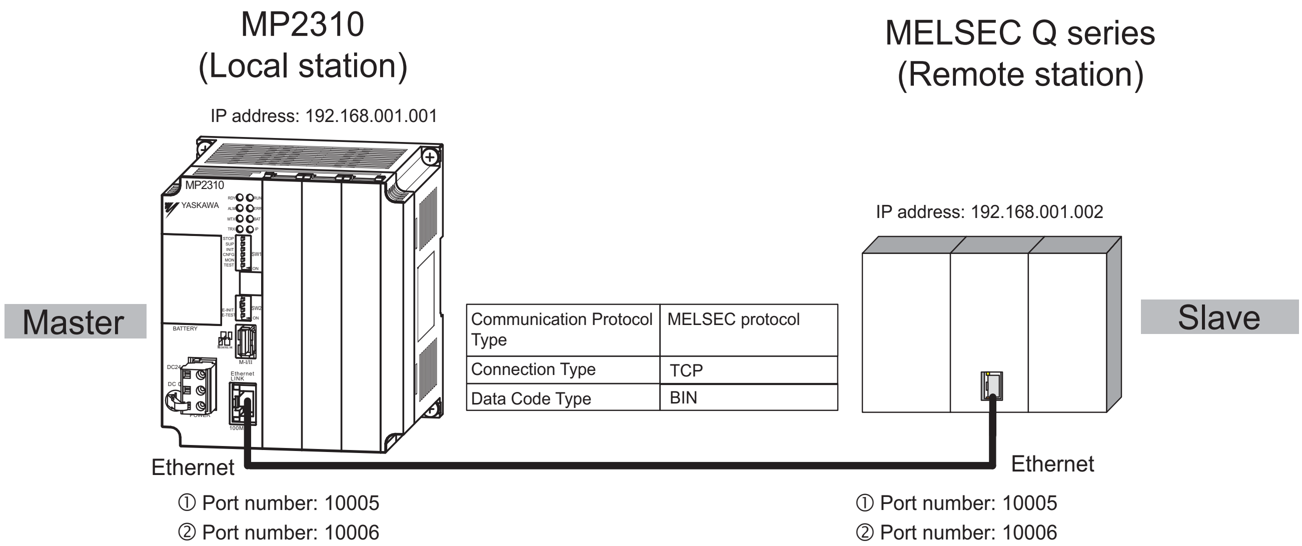
- Bit device register - - - - X, Y (read only), M, B
- Word device register - - - D, W, R

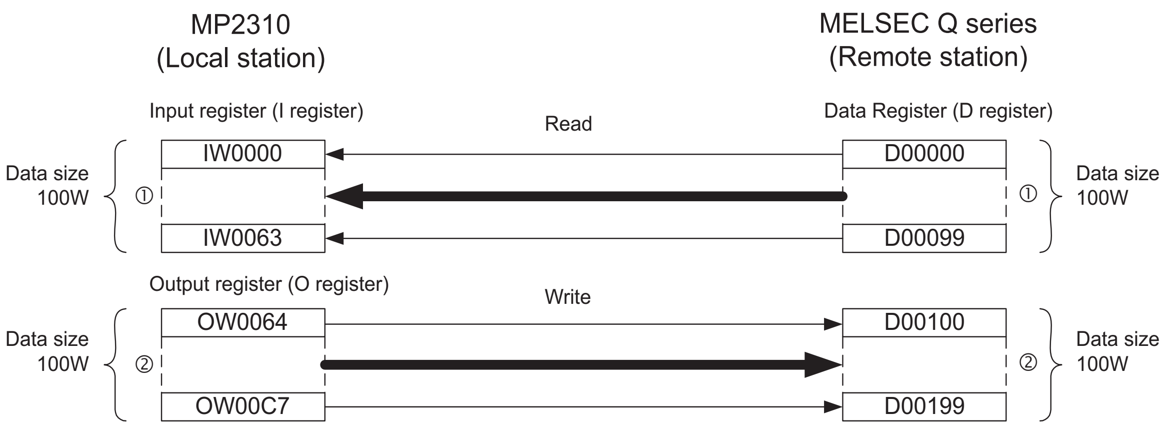
Note: A bit device register reads or writes on a per-word (16 bit) basis.

When communicating with multiple remote devices.
To carry out a fixed buffer/random access buffer communication when reading/writing registers other than those mentioned above, use the message transmit function (MSG-SND).

■ 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 MP2310 (master) and writing the content of an output register (OW0064 to OW00C7) of the MP2310 (master) in a data register (D00100 to D00199) of the MELSEC Q series (slave).



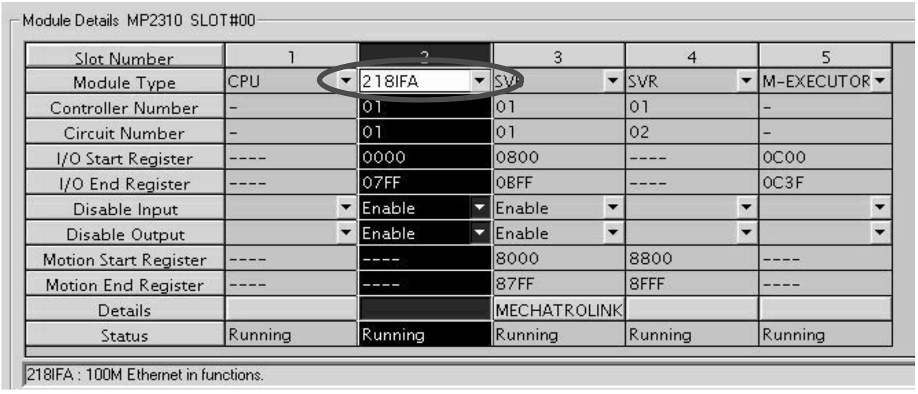


A particular setup procedure is explained in the subsequent pages.

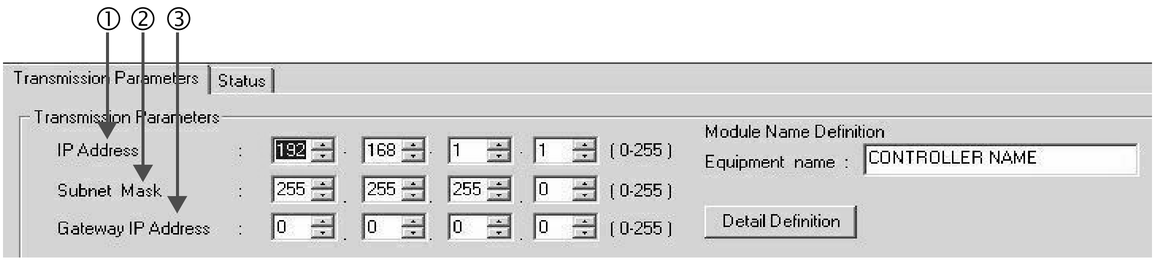
(1) How to Set up the MP2310 Side

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

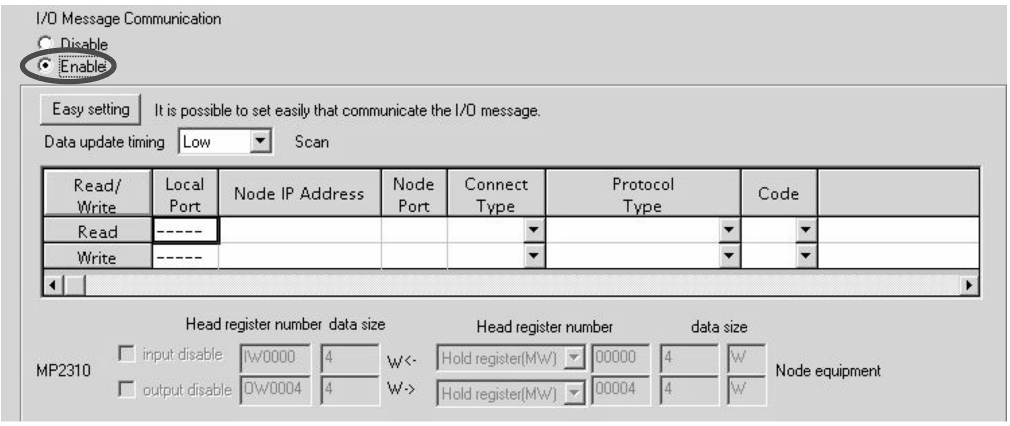
① Set **IP Address** ("192.168.001.001," for example).
② Set **Subnet Mask** ("255.255.255.000," for example).
③ Set **Gateway IP Address** ("000.000.000.000," for example).

■ Caution

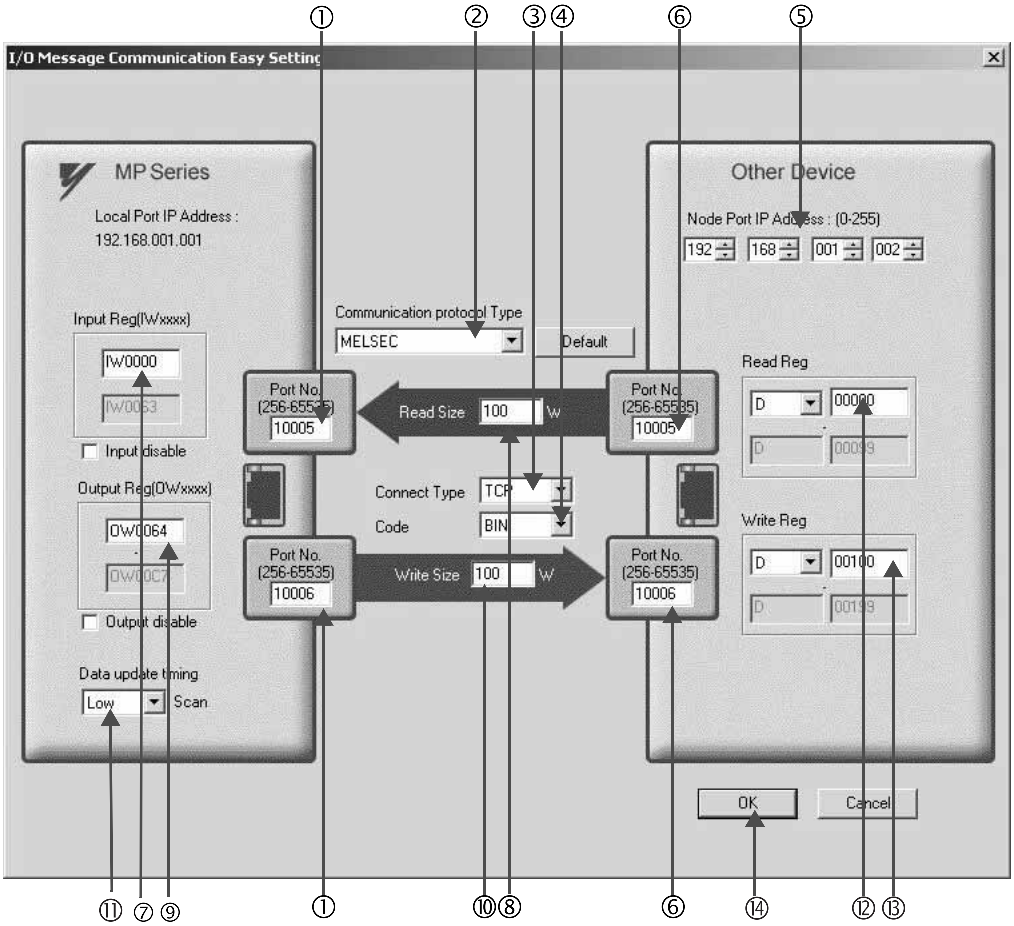
Set up a unique IP address in the network.
For the IP address, check with your network administrator.

---

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 MP2310 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 MP2310 (IW0000, for example).
⑧ Set **Read Size** of data to be read by the MP2310 (“100” W, for example).
⑨ Set a storage area (**Output Reg**) for data written by MP2310 (OW0064, for example).
⑩ Set **Write Size** of data written by the MP2310 (“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.

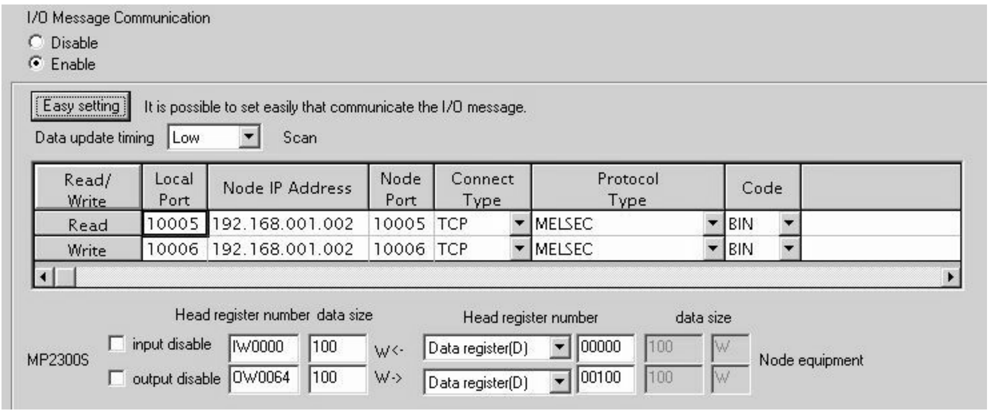
⑫ Set the register type and start address (**Read Reg**) of the remote device (MELSEC Q series) read by the MP2310 (“D00000,” for example).
⑬ Set the register type and start address (**Write Reg**) of the remote device (MELSEC Q series) written by the MP2310 (“D00100,” for example).
⑭ Click **OK**.

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 MP2310 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 MP2310 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 6.25 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 6.26 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 6.27 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 MP2310 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 and Inspection

This chapter explains daily and regular inspection items to ensure that the MP2310 can always be used at its best conditions.

7.1 Daily Inspections - 7-2

7.2 Regular Inspections - 7-3

7.3 Replacing the Basic Module Battery - 7-4

7.1 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 *Chapter 8 Troubleshooting*.
		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.

7.2 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 MP2310 may malfunction or break down.
  Contact your Yaskawa representative.

<table>
<tr><th>No.</th><th colspan="2">Inspection Item</th><th>Inspection Details</th><th>Criteria</th><th>Action</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Operating Environment</td><td>Ambient Temperature</td><td rowspan="3">Check the temperature and humidity with a thermometer and hygrometer, respectively. Check for corrosive gases.</td><td>0°C to 55°C</td><td rowspan="3">If the MP2310 is used inside a panel, treat the temperature inside the panel as the ambient temperature.</td></tr>
<tr><td>Ambient Humidity</td><td>30% to 95% RH</td></tr>
<tr><td>Atmosphere</td><td>There must be no corrosive gases.</td></tr>
<tr><td>2</td><td>Power Supply Voltage Check</td><td>PS Module</td><td>Measure the voltage between 24-VDC terminals.</td><td>19.2 to 28.8 VDC</td><td>Change the power supply as necessary.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Installation Conditions</td><td>Looseness and Excess Play</td><td>Attempt to move the Module.</td><td>The Module must be secured properly.</td><td>Retighten the screws.</td></tr>
<tr><td>Dust and Other Foreign Matter</td><td>Visually check.</td><td>The Module must be free from dust and other foreign matter.</td><td>Clean.</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Connection Conditions</td><td>Check the Terminal Screws for Looseness.</td><td>Check by retightening the screws.</td><td>The screws must be tight.</td><td>Retighten.</td></tr>
<tr><td>Gap between Crimp Terminals</td><td>Visually check.</td><td>There must be an appropriate gap between the terminals</td><td>Correct.</td></tr>
<tr><td>Looseness of Connectors</td><td>Visually check.</td><td>The screws must be tight.</td><td>Retighten the connector set screws.</td></tr>
<tr><td>5</td><td colspan="2">Battery</td><td>Check the BAT indicator on the front panel of the Basic Module.</td><td>The BAT indicator must be not lit.</td><td>If the BAT indicator is lit, replace the battery.</td></tr>
</table>

7.3 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.

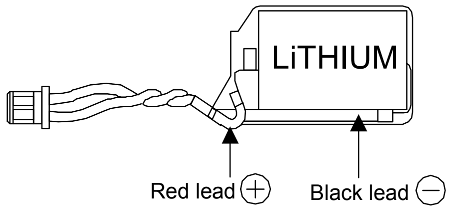


Fig. 7.1 JZSP-BA01 (Battery with Cable)

- 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 MP2310 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 MP2310 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 MP2310. Then, insert the replacement battery into the battery holder.

6. Check if the BAT indicator on the MP2310 is unlit.

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

8

Troubleshooting

This chapter explains the possible causes of errors and suggests corrective actions.

8.1 Basic Flow of Troubleshooting - - - - - 8-2

8.2 LED Indicator Meanings - - - - - 8-3

8.3 Problem Classification - - - - - 8-4

8.3.1 Overview - - - - - 8-4

8.3.2 MP2310 Error Check Flowchart - - - - - 8-5

8.4 Troubleshooting Details - - - - - 8-6

8.4.1 Operation Errors - - - - - 8-6

8.4.2 I/O Errors - - - - - 8-9

8.4.3 Watchdog Timer Timeout Errors - - - - - 8-10

8.4.4 Module Synchronization Errors (Ver. 2.75 or Later) - - - - - 8-10

8.4.5 System Errors - - - - - 8-11

8.1 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?

8.2 LED Indicator Meanings

The following table shows how to use the LED indicators to determine the operating status of the MP2310, 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.
	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, watchdog timer timeout error, or module synchronization error has occurred.	A hardware failure, watchdog timer timeout error, or module synchronization error has occurred. Refer to *8.3 Problem Classification* on page 8-4.
	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 system error has occurred. Refer to *8.4.5 System Errors* on page 8-11.
	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	A hardware failure has occurred. Replace the module.
Warnings	–	–	–	–	Lit	Battery alarm	Refer to *7.3 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	• Operation errors Refer to *8.4.1 Operation Errors* on page 8-6. • I/O errors Refer to *8.4.2 I/O Errors* on page 8-9.

8.3 Problem Classification

8.3.1 Overview

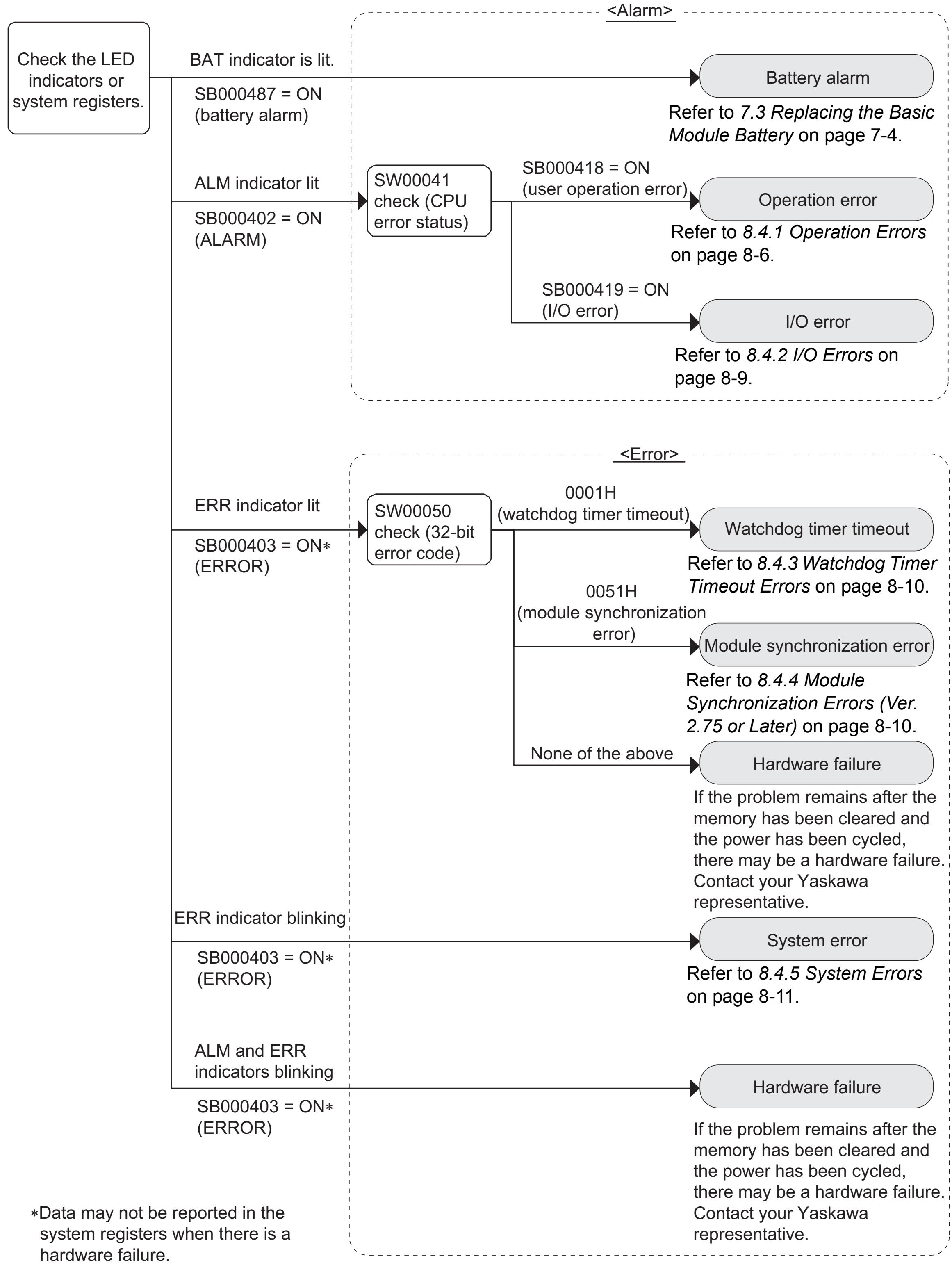
The following table shows MP2310 problems and LED indicator patterns.

Classification	Details of Problem	LED Indicator		
		ALM	ERR	BAT
Alarm	Battery alarm	Lit	Lit	Not lit
	Operation error	Not lit	Lit	Lit
	I/O error	Not lit	Lit	Lit
	Motion program alarm*1	Lit	Lit	Lit
	Axis alarm/warning *2	Lit	Lit	Lit
Error	Watchdog timer timeout error	Lit	Not lit	Lit
	Module synchronization error	Lit	Not lit	Lit
	System error	Lit	Blinking	Lit
	Hardware failure	Lit	Not lit	Lit
		Blinking	Blinking	Lit

* 1. If a motion program alarm occurs, refer to *10.Troubleshooting* in the *Machine Controller MP2000 Series User's Manual for Motion Programming* (manual number: SIEPC88070038) to remove the alarm.
* 2. If an axis alarm or warning occurs, refer to the user's manual of the Motion Module being used to clear the alarm.

8.3.2 MP2310 Error Check Flowchart

Use the following to troubleshoot a problem using the LED indicators or the system registers.



Troubleshooting

8

8.4 Troubleshooting Details

8.4.1 Operation Errors

If an operation error occurs, one of the following may be the cause.

- An incorrect operation was executed in a ladder program.
- An incorrect operation was executed in a motion program.
- An incorrect operation was executed in a sequence program.

If an operation error occurs, use the following procedure to identify the instruction that caused the operation error.

1. Identifying the drawing type and error details by checking SW00080 to SW00089.

The operation error details are stored in the following system registers according to the type of drawing in which the operation error occurred. For motion programs, the details are stored in the system registers for DWG.H.

<table>
<tr><th>Drawing Type</th><th>Error Details</th><th>Register No.</th><th>Description</th></tr>
<tr><td rowspan="2">DWG.A</td><td>Error count</td><td>SW00080</td><td rowspan="8">• Error count
Number of errors that occurred.

• Error code
Bit15 ····· 12 Bit11 ······ 0
Index error | Error code

For information on error codes, refer to A.4 User Operation Error Status on page A-8.</td></tr>
<tr><td>Error code</td><td>SW00081</td></tr>
<tr><td rowspan="2">DWG.I</td><td>Error count</td><td>SW00082</td></tr>
<tr><td>Error code</td><td>SW00083</td></tr>
<tr><td rowspan="2">DWG.H</td><td>Error count</td><td>SW00084</td></tr>
<tr><td>Error code</td><td>SW00085</td></tr>
<tr><td rowspan="2">DWG.L</td><td>Error count</td><td>SW00088</td></tr>
<tr><td>Error code</td><td>SW00089</td></tr>
</table>

Example: SW00085 is a Value Other Than 0000H

This indicates that an operation error occurred in the high-speed scan. In that case, if SW00084 is continuously incremented, it means that the instruction with the operation error has been executed continuously.

2. Identifying the drawing number by checking SW00122, SW00138, SW00154, and SW00186

<table>
<tr><th>Name</th><th>Register No.</th><th>Description</th></tr>
<tr><td>DWG.A error DWG number</td><td>SW00122</td><td rowspan="4">Parent drawing: FFFFH
Child drawing: xx00H (Hxx: child drawing number)
Grandchild drawing: xxyyH (Hyy: Grandchild drawing number)
Function: 8000H
Motion program/sequence program: F0xxH (Hxx: Program number)</td></tr>
<tr><td>DWG.I error DWG number</td><td>SW00138</td></tr>
<tr><td>DWG.H error DWG number</td><td>SW00154</td></tr>
<tr><td>DWG.L error DWG number</td><td>SW00186</td></tr>
</table>

3. Identifying the instruction causing the error in the drawing

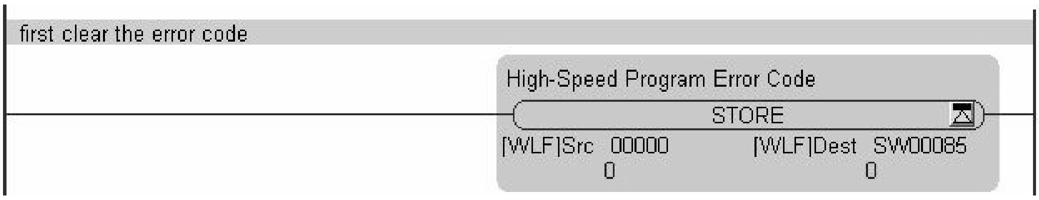
There are different methods to identify operation errors for integer operations and real-number operations. To identify operation errors using integer operations, refer to *Troubleshooting Procedure Example 1*.
To identify operation errors using real-number operations, refer to *Troubleshooting Procedure Example 2*.

Troubleshooting Procedure Example 1

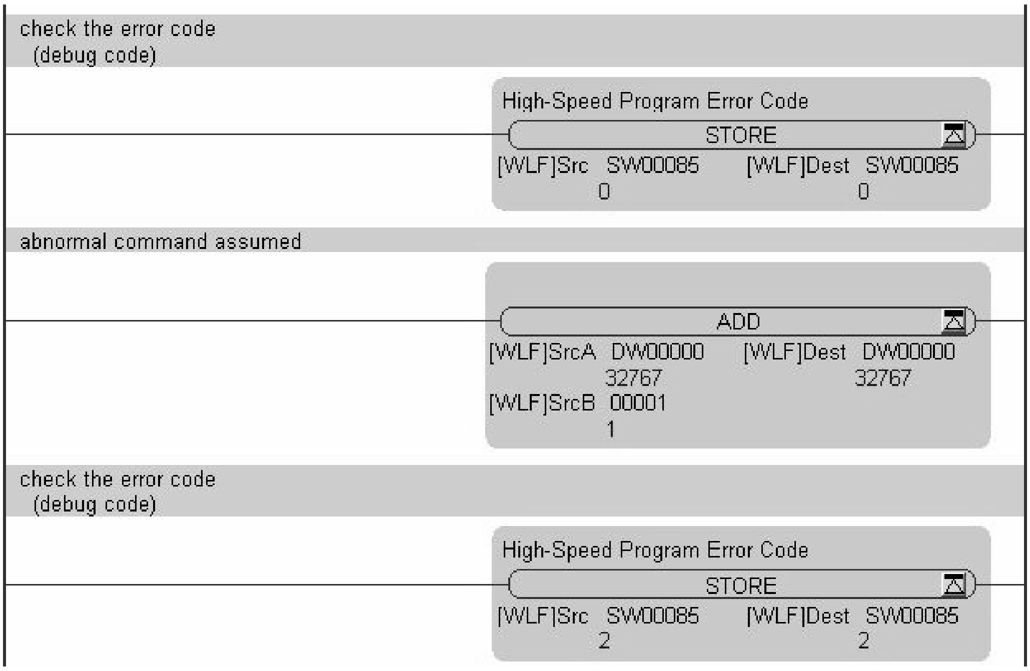
This section describes the procedures for troubleshooting if an operation error (0002H: Integer operation overflow) has occurred in DWG.H.

1. Identify the error DWG number from the system register (SW00154), and then open that drawing.

2. Create the following code at the start of the DWG.



3. Add the debugging code before and after the instruction that is thought to be in error.



4. Check the value of the register number for the debugging code.

If the number has changed from 0 (no error) to 2 (integer operation overflow), an integer operation overflow error has occurred.

5. Repeat steps 3 and 4 to identify the instruction that is causing the operation error.

■ Complement

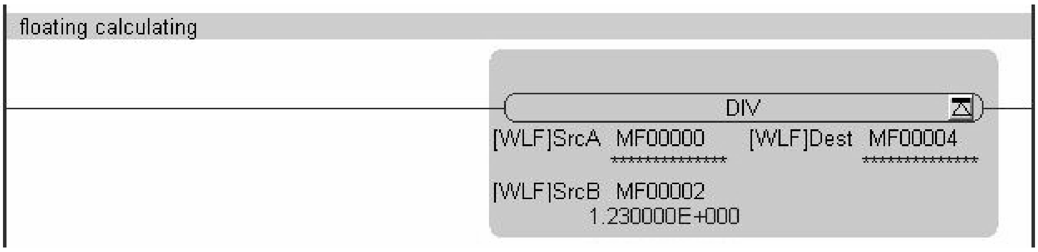
The debugging procedure above can be used only for integer operations and double-length integer operations.
The debugging procedure above cannot be used for real-number operations.

Troubleshooting Procedure Example 2

This section describes the procedures for troubleshooting if an operation error (0030H: Real-number operation - invalid operation (non-numeric)) has occurred in DWG.H.

1. Identify the error DWG number from the system register (SW00154), and then open that drawing.

2. Check the value for the real-number operation in the online monitor.



In this example, MF000000 for the DIV instruction is ************.
************ Indicates an incorrect (i.e., non-numeric) value for a real-number value. Executing a real-number operation using this value will generate an operation error (0030H: Real number operation - invalid operation (non-numeric)) from the system.

■ Complement

If an operation error occurs, one of the following may be the cause.

- The value has not been set in the registers (undefined data value).
- Bit, integer, and double-length integer operations are executed for a register that has overlapping addresses.

If a real number operation is executed, the real-number value must always be set in advance.

---

3. Repeat step 2 to identify the register that is causing the operation error.

8.4.2 I/O Errors

An I/O error may occur in the following cases.

- An Optional Module has been allocated, and the detailed settings for the Module have been made in the module configuration definitions.
- A cable has been removed or a Module failure has occurred during system operation.

If an I/O error occurs, you can check the I/O error by checking the following system registers.

Name	Register No.	Description
I/O error count	SW00200	Number of I/O errors (total of SW00201 and SW00203)
Input error count	SW00201	Number of input errors
Output error count	SW00203	Number of output errors

Using the following system registers, you can check the address of the I/O register (IW□□□□/OW□□□□) at which the error occurred.

Example: Detecting an I/O Error at an I/O Device Allocated to IW1234

1234H is reported in SW00202.

Name	Register No.	Description
Input error address	SW00202	Latest input error address (register number IW□□□□)
Output error address	SW00204	Latest output error address (register number OW□□□□)

After you check the I/O register address, identify the module slot on the Module Configuration Definition Window, and then check the I/O status in the following system registers.

Name	Register No.	Description
Input error address	SW00208 to SW00215	CPU Module
	SW00216 to W00223	Reserved by the system.
	SW00224 to W00231	Rack 1, slot 1 error status
	SW00232 to W00239	Rack 1, slot 2 error status
	SW00240 to W00247	Rack 1, slot 3 error status
	SW00248 to W00255	Rack 1, slot 4 error status
	···	···
	SW00496 to W00503	Rack 4, slot 9 error status

Troubleshooting

8

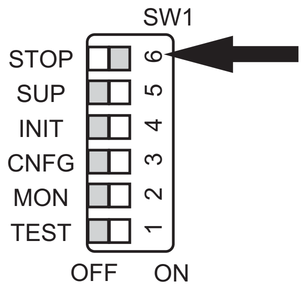
8.4.3 Watchdog Timer Timeout Errors

If a watchdog timer timeout error occurs, one of the following may be the cause.

- An infinite loop has occurred in a user program.
- A scan time over has occurred in a user program.
- A motion module*1 has failed.
- A watchdog timer timeout error has occurred in an MPU-01 Module.

* 1. Motion modules: PO-01, SVA-01, SVB-01, SVC-01, MPU-01
* 2. If a watchdog timer timeout error occurs when using an MPU-01 module, refer to *6. Troubleshooting* in the *Machine Controller MP2000 Series MPU-01 Multiple-CPU Module User's Manual* (manual number: SIEPC88078105).

If a watchdog timer timeout error occurs, it is important to identify whether the cause is the CPU module itself or another motion module.
To identify the cause, cycle the power with the CPU module program stopped and check if the problem has changed.



When the power is cycled with the STOP switch on the front of the CPU module set to ON, the CPU module will start with execution of the CPU module ladder program stopped.

If a watchdog timer timeout error does not occur after the CPU module program has been stopped, the problem is probably in the CPU module. Check if the program has any infinite loops in it.
If the problem remains, the motion module may have failed. Contact your Yaskawa representative.

8.4.4 Module Synchronization Errors (Ver. 2.75 or Later)

If a module synchronization error occurs, one of the following may be the cause.

- A motion module*1 has failed.
- A watchdog timer timeout error has occurred in an MPU-01 module.*2

* 1. Motion Modules: PO-01, SVA-01, SVB-01, SVC-01, MPU-01
* 2. If a module synchronization error occurs when using an MPU-01 module, refer to *6. Troubleshooting* in the *Machine Controller MP2000 Series MPU-01 Multiple-CPU Module User's Manual* (manual number: SIEPC88078105).

If a module synchronization error occurs (SW00050 = 00051H), the module synchronization error detection slot will be reported in the system registers as shown in the following table.

Register No.	Description
SW00076	Module synchronization error detection slot* □□yyH □□: Rack number (01 to 04) yy: Slot number (01 to 09)

* Module synchronization errors are reported for CPU system software version 2.75 or later.
For version 2.74 or earlier, it is reported as a watchdog timer timeout error.

If a module synchronization error has occurred, Contact your Yaskawa representative.

8.4.5 System Errors

If a system error occurs, one of the following may be the cause.

- Incorrect operation has been executed in the user program
- Incorrect installation environment
- Hardware failure

When using embedded C-language programming, a system error will cause the system to crash with the incorrect pointer access or incorrect operation using data with a floating point. Refer to the following table for the possible causes of the errors.

ERR LED No. of flashes	Error	Cause	Countermeasure
Three times	Address error (read) exception	Data of 16-bit words or 32-bit long words were read from an incorrect address.*	Check if the incorrect operations on the left have been executed and if so, make corrections.
Four times	Address error (write) exception	Data of 16-bit words or 32-bit long words were written on an incorrect address.*	
Five times	FPU exception	Incorrect operation (non-numeric operation, division by zero, or overflow) using a floating point was executed.	

* For details, refer to *10 Precautions* in *Machine Controller MP2000 Series Embedded C-language Programming Package Development Guide* (manual number: SIEPC88070025)

If embedded C-language programming or an incorrect operation in C-language was not attempted, a hardware error may be the cause of the system crash.
The causes of the hardware error can be divided into two types: installation environment and the hardware failures.
For troubleshooting errors caused by the installation environment, refer to *3.2 Basic Module Connections* on page 3-9.
If the installation environment is faultless and the same error still occurs after countermeasures were taken, the hardware may be damaged. Contact your Yaskawa representative or nearest office listed in the back cover for assistance.

MEMO

Appendices

A System Registers Lists - - - - A-2
- A.1 System Service Registers - - - - A-2
- A.2 System Status - - - - A-5
- A.3 System Error Status - - - - A-6
- A.4 User Operation Error Status - - - - A-8
- A.5 System Service Execution Status - - - - A-9
- A.6 User Operation Error Status Details - - - - A-10
- A.7 System I/O Error Status - - - - A-11
- A.8 Compact Flash Card-Related System Registers (CPU-02 and CPU-03 Modules for the MP2200 Only) - - - - A-12
- A.9 Interrupt Status - - - - A-13
- A.10 Module Information - - - - A-14
- A.11 MPU-01 System Status - - - - A-15
- A.12 Motion Program Information - - - - A-16

B SERVOPACK Parameter Data Flow - - - - A-19
- B.1 Operations and Parameter Data Flow - - - - A-19

C Initializing SERVOPACKs - - - - A-28

D Initializing the Absolute Encoder - - - - A-29
- D.1 Σ-V SERVOPACK - - - - A-29
- D.2 Σ-III SERVOPACK - - - - A-30
- D.3 Σ-II SERVOPACK - - - - A-31
- D.4 Σ-I SERVOPACK - - - - A-33

E Motion Parameter Details - - - - A-35
- E.1 Fixed Parameter List - - - - A-35
- E.2 Setting Parameter List - - - - A-37
- E.3 Monitoring Parameter List - - - - A-42

F How to Set up Communication Process - - - - A-46
- F.1 Preparation - - - - A-46
- F.2 Procedure - - - - A-46

G MSG-SND/ MSG-RCV Functions - - - - A-50
- G.1 Message Transmit Function (MSG-SND) - - - - A-50
- G.2 Message Receive Function (MSG-RCV) - - - - A-84
- G.3 Communication Buffer Channel - - - - A-115

Appendix A System Registers Lists

The system registers are prepared by the system of the MP2310. The system registers can be used to read error information, operating status, and other information.

	Contents
SW000000	System Service Registers
SW000030	System Status
SW000050	System Error Status
SW000080	User Operation Error Status
SW000090	System Service Execution Status
SW000110	User Operation Error Status Details
SW000190	Alarm Counter and Alarm Clear
SW000200	System I/O Error Status
SW000504	Reserved by the system.
SW000652	Compact Flash Card-Related System Registers (CPU-02 and CPU-03 Modules for the MP2200 Only)
SW000698	Interrupt Status
SW000800	Module Information
SW001312	Reserved by the system.
SW001411	MPU-01 Module System Status
SW002048	Reserved by the system.
SW003200	Motion Program Information
SW005200~ SW008191	Reserved by the system.

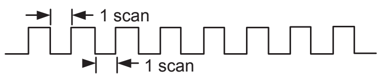
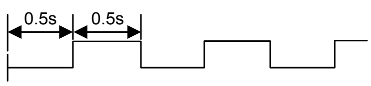
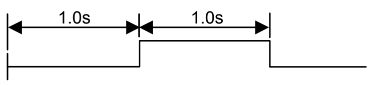
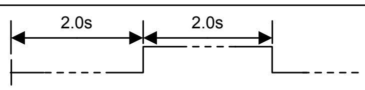
A.1 System Service Registers

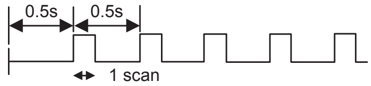
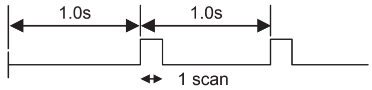
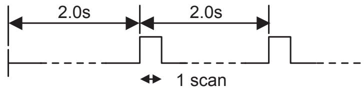
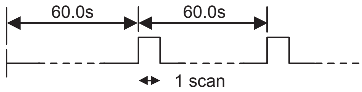
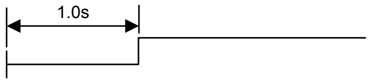
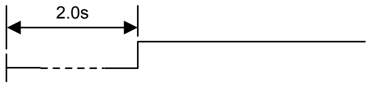
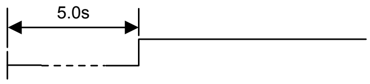
(1) Shared by All Drawings

Name	Register No.	Remarks
Reserved by the system.	SB000000	(Not used)
High-speed Scan	SB000001	ON for only the first scan after a high-speed scan is started.
Low-speed Scan	SB000003	ON for only the first scan after a low-speed scan is started.
Always ON	SB000004	Always ON (= 1)
Reserved by the system.	SB000005, SB000006	(Not used)
Executing High-speed Scan	SB000007	ON (=1) while executing a high-speed scan.
Reserved by the system.	SB000008 to SB00000F	(Not used)

(2) DWG.H Only

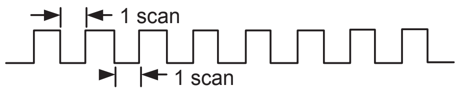
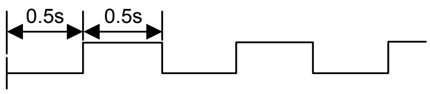
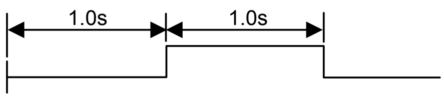
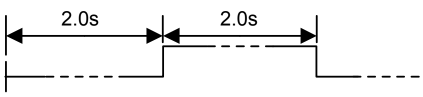
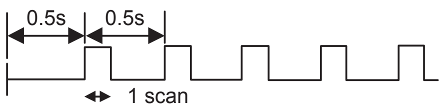
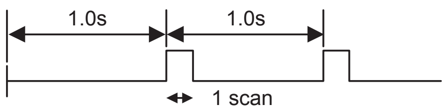
The following relays are reset at the start of the high-speed scan.

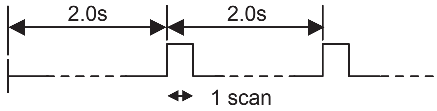
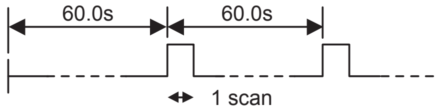
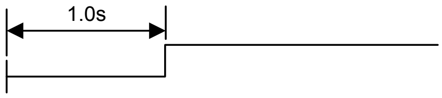
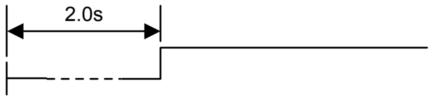
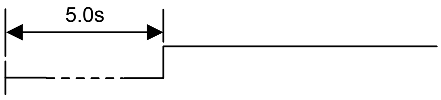
Name	Register No.	Remarks
1-scan Flicker Relay	SB000010	
0.5-s Flicker Relay	SB000011	
1.0-s Flicker Relay	SB000012	
2.0-s Flicker Relay	SB000013	

Name	Register No.	Remarks
0.5-s Sampling Relay	SB000014	
1.0-s Sampling Relay	SB000015	
2.0-s Sampling Relay	SB000016	
60.0-s Sampling Relay	SB000017	
1.0 s After Start of Scan Relay	SB000018	
2.0 s After Start of Scan Relay	SB000019	
5.0 s After Start of Scan Relay	SB00001A	

(3) DWG.L Only

The following relays are reset at the start of the low-speed scan.

Name	Register No.	Remarks
One-scan Flicker Relay	SB000030	
0.5-s Flicker Relay	SB000031	
1.0-s Flicker Relay	SB000032	
2.0-s Flicker Relay	SB000033	
0.5-s Sampling Relay	SB000034	
1.0-s Sampling Relay	SB000035	

Name	Register No.	Remarks
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	

(4) 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)
High-speed Scan Set Value 2	SW00007	High-speed Scan Set Value (1 μs)
High-speed Scan Current Value 2	SW00008	High-speed Scan Current Value (1 μs)
High-speed Scan Maximum Value 2	SW00009	High-speed Scan Maximum Value (1 μs)
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: Sun., 1: Mon., 2: Tues., 3: Wed., 4: Thurs., 5: Fri., 6: Sat.

(5) 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

A.2 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 by the system.	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.	–

Appendices

A

A.3 System Error Status

System error status is stored in registers SW00050 to SW00060. The following table shows the details when a system errors occurs.

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	
		0050H	EXIO error	
		0051H	Module synchronous error*1	
		00E0H	Address read exception error	
		0100H	Address write exception error	
		0120H	FPU exception error	
		0180H	Illegal general command error	
		01A0H	Illegal slot command error	
		01E0H	User break after command execution	
		0800H	General FPU inhibited exception error	
		0820H	Slot FPU inhibited exception error	
	SW00051	For system error analysis		
32-bit Addresses Generating Error	SW00052 SW00053	For system error analysis		
Error Task	SW00054	0000H: System 0001H: DWG.A	0002H: DWG.I 0003H: DWG.H	0005H: DWG.L
Program Type	SW00055	0000H: System 0001H: DWG.A	0002H: DWG.I 0003H: DWG.H	0005H: DWG.L 0008H: Function 000FH: Motion program/ Sequence program
Error Drawing Number	SW00056	Ladder program parent drawing: FFFFH Ladder program function: 8000H Ladder program child drawing: □□00H (H□□: Child drawing number) Ladder program grandchild drawing: □□yyH (Hyy: Grandchild drawing number) Motion program/Sequence program: F0□□H (H□□: Program number)		
Calling Drawing Type	SW00057	Type of drawing that calls the ladder program function in which an error occurred.		
		0001H: DWG.A 0002H: DWG.I 0003H: DWG.H	0005H: DWG.L 0008H: Ladder program function 000FH: Motion program/ Sequence program	0010H: Reserved by the system. 0011H: Reserved by the system.
Calling Drawing Number	SW00058	Number of drawing that calls the ladder program function in which an error occurred.		
		Parent drawing: FFFFH Function: 0100H	Child drawing: □□00H (H□□: Child drawing number) Grandchild drawing: □□yyH (Hyy: Grandchild drawing number)	
Calling Drawing STEP Number	SW00059	STEP number of the drawing that calls the ladder program function in which an error occurred. Zero when there is an error in the drawing.		

Name	Register No.	Description
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	Number of slot with a module synchronous error *2 □□yyH □□: Rack number (01 to 04) yy: Slot number (01 to 09)
	SW00078 and SW00079	Reserved by the system.

* 1. The CPU system program version 2.75 or later: 0051H will be reported.
  The CPU system program version is earlier than 2.75: 0001H (watchdog timer over error) will be reported.
* 2. The CPU system program version 2.75 or later: Number of slot with a module synchronous error will be reported.

A.4 User Operation Error Status

Error information for user operation errors in ladder programs is stored in registers SW00080 to SW00089.

(1) User Operation Error Status

<table>
<tr><th colspan="2">Name</th><th>Register No.</th><th>Description</th></tr>
<tr><td rowspan="2">DWG.A</td><td>Error Count</td><td>SW00080</td><td rowspan="8">• Error count
Number of error occurrences

• Error code
<table><tr><td>Bit15 ..... 12</td><td>Bit11 .... 0</td></tr><tr><td>Index error</td><td>Error Code</td></tr></table>
Refer to (2) User Operation Error Codes 1 on page A-8 or (3) User Operation Error Codes 2 on page A-9 for details.</td></tr>
<tr><td>Error Code</td><td>SW00081</td></tr>
<tr><td rowspan="2">DWG.I</td><td>Error Count</td><td>SW00082</td></tr>
<tr><td>Error Code</td><td>SW00083</td></tr>
<tr><td rowspan="2">DWG.H</td><td>Error Count</td><td>SW00084</td></tr>
<tr><td>Error Code</td><td>SW00085</td></tr>
<tr><td rowspan="2">DWG.L</td><td>Error Count</td><td>SW00088</td></tr>
<tr><td>Error Code</td><td>SW00089</td></tr>
</table>

(2) User Operation Error Codes 1

<table>
<tr><th></th><th>Error Code</th><th colspan="2">Error Contents</th><th colspan="2">System Default Setting</th></tr>
<tr><td rowspan="6">Integer Operations</td><td>0001H</td><td colspan="2">Integer operation - underflow</td><td colspan="2">–32768</td></tr>
<tr><td>0002H</td><td colspan="2">Integer operation - overflow</td><td colspan="2">32767</td></tr>
<tr><td>0003H</td><td colspan="2">Integer operation - division error</td><td colspan="2">The A register remains the same.</td></tr>
<tr><td>0009H</td><td colspan="2">Double-length integer operation - underflow</td><td colspan="2">–2147483648</td></tr>
<tr><td>000AH</td><td colspan="2">Double-length integer operation - overflow</td><td colspan="2">2147483647</td></tr>
<tr><td>000BH</td><td colspan="2">Double-length integer operation - division error</td><td colspan="2">The A register remains the same.</td></tr>
<tr><td rowspan="21">Real Number Operation</td><td>0010H</td><td colspan="2">Integer storage - non-numeric error</td><td colspan="2">Store not executed. [00000]</td></tr>
<tr><td>0011H</td><td colspan="2">Integer storage - underflow</td><td colspan="2">Store not executed. [–32768]</td></tr>
<tr><td>0012H</td><td colspan="2">Integer storage - overflow</td><td colspan="2">Store not executed. [+32767]</td></tr>
<tr><td>0021H</td><td colspan="2">Real number storage - underflow</td><td colspan="2">Store not executed. [–1.0E+38]</td></tr>
<tr><td>0022H</td><td colspan="2">Real number storage - overflow</td><td colspan="2">Store not executed. [1.0E+38]</td></tr>
<tr><td>0023H</td><td colspan="2">Real number operation - division-by-zero error</td><td colspan="2">Operation not executed.
[The F register remains the same.]</td></tr>
<tr><td>0030H</td><td colspan="2">Real number operation - invalid operation (non-numeric)</td><td colspan="2">Operation not executed.</td></tr>
<tr><td>0031H</td><td colspan="2">Real number operation - exponent underflow</td><td colspan="2">0.0</td></tr>
<tr><td>0032H</td><td colspan="2">Real number operation - exponent overflow</td><td colspan="2">Maximum value</td></tr>
<tr><td>0033H</td><td colspan="2">Real number operation - division error (non-numeric 0/0)</td><td colspan="2">Operation not executed.</td></tr>
<tr><td>0034H</td><td colspan="2">Real number storage - exponent underflow</td><td colspan="2">Stores 0.0.</td></tr>
<tr><td>0035H</td><td colspan="2">Real number operation - stack error</td><td colspan="2">–</td></tr>
<tr><td rowspan="9">0040H
to
0059H</td><td colspan="2">Standard System Functions
Real number operation errors</td><td colspan="2">Interrupt operation and output = 0.0</td></tr>
<tr><td>0040H: SQRT</td><td>0041H: SIN</td><td>0042H: COS</td><td>0043H: TAN</td></tr>
<tr><td>0044H: ASIN</td><td>0045H: ACOS</td><td>0046H: ATAN</td><td>0047H: EXP</td></tr>
<tr><td>0048H: LN</td><td>0049H: LOG</td><td>004AH: DZA</td><td>004BH: DZB</td></tr>
<tr><td>004CH: LIM</td><td>004DH: PI</td><td>004EH: PD</td><td>004FH: PID</td></tr>
<tr><td>0050H: LAG</td><td>0051H: LLAG</td><td>0052H: FGN</td><td>0053H: IFGN</td></tr>
<tr><td>0054H: LAU</td><td>0055H: SLAU</td><td>0056H: REM</td><td>0057H: RCHK</td></tr>
<tr><td>0058H: BSRCH</td><td>0059H: SQRT</td><td>–</td><td>–</td></tr>
<tr><td colspan="4">1000H, 2000H, or 3000H is added for an index error.</td></tr>
</table>

(3) User Operation Error Codes 2

	Error Code	Error Contents		System Default	
Integer - Real Number Operations	1000H	Index error within drawing		Execute again when corresponding to i,j = 0. The i and j registers remain the same.	
	2000H	Index error within function		Execute again when corresponding to i,j = 0. The i and j registers remain the same.	
	3000H	Index error within motion program or sequence program		Execute again when corresponding to i,j = 0. The i and j registers remain the same.	
Integer Operation	□060H to □0C9H (□ = 1,2, 3)	Integer system functions Index error		Operation stopped and output = input.	
		□06DH: PI	□06EH: PD	□06FH: PID	□070H: LAG
		□071H: LLAG	□072H: FGN	□073H: IFGN	□074H: LAU
		□075H: SLAU	□076H: FGN	□077H: IFGN	□08EH: INS
		□08FH: OUTS	□090H: ROTL	□091H: ROTR	□092H: MOVB
		□093H: MOVW	□094H: SETW	□095H: XCHG	□096H: LIMIT
		□097H: LIMIT	□098H: DZA	□099H: DZA	□09AH: DZB
		□09BH: DZB	□09CH: PWM	□09EH: SHFTL	□09FH: SHFTR
		□0A0H: BEXTEND	□0A1H: BPRESS	□0A2H: SORT	□0A4H: SORT
		□0A6H: RCHK	□0A7H: RCHK	□0A8H: COPYW	□0A9H: ASCII
		□0AAH: BINASC	□0ABH: ASCBIN	□0ACH: BSRCH	□0ADH: BSRCH
		□0AEH: TIMEADD	□0AFH: TIMSUB	□0B1H: SPEND	□0C0H: TBLBR
		□0C1H: TBLBW	□0C2H: TBLSRL	□0C3H: TBLSRC	□0C4H: TBLCL
		□0C5H: TBLMW	□0C6H: QTBLR	□0C7H: QTBLRI	□0C8H: QTBLW
		□0C9H: QTBLWI	–	–	–

A.5 System Service Execution Status

System service execution status is stored in registers SW00090 to SW00103. The following tables show the details on the execution status of system service.

(1) 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

(2) 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

A.6 User Operation Error Status Details

Detailed information about user operation errors in ladder programs is stored in registers SW00110 to SW00189.

<table>
<tr><th rowspan="2">Name</th><th colspan="4">Register No.</th><th rowspan="2">Description</th></tr>
<tr><th>DWG.A</th><th>DWG.I</th><th>DWG.H</th><th>DWG.L</th></tr>
<tr><td>Error Count</td><td>SW00110</td><td>SW00126</td><td>SW00142</td><td>SW00174</td><td rowspan="7">• Descriptions of the error count and the error code are the same as those in A.4 User Operation Error Status on page A-8.
• Error Drawing Number
Parent drawing: FFFFH
Child drawing: □□00H (H□□: Child drawing number)
Grandchild drawing: □□yyH (Hyy: Grandchild drawing number)
Function: 8000H
Motion program/Sequence program: F0□□H (H□□: Program number)
• Reference Source Drawing Number
Number of the drawing reference source in which an error occurred.
• Reference Source DWG Step Number
Step number of the drawing reference source in which an error occurred.
Zero when there is an error in the parent drawing.</td></tr>
<tr><td>Error Code</td><td>SW00111</td><td>SW00127</td><td>SW00143</td><td>SW00175</td></tr>
<tr><td>Reserved by the system.</td><td>SW00112
to
SW00121</td><td>SW00128
to
SW00137</td><td>SW00144
to
SW00153</td><td>SW00176
to
SW00185</td></tr>
<tr><td>Error Drawing Number</td><td>SW00122</td><td>SW00138</td><td>SW00154</td><td>SW00186</td></tr>
<tr><td>Reference Source Drawing Number</td><td>SW00123</td><td>SW00139</td><td>SW00155</td><td>SW00187</td></tr>
<tr><td>Reference Source DWG Step Number</td><td>SW00124</td><td>SW00140</td><td>SW00156</td><td>SW00188</td></tr>
<tr><td>Reserved by the system.</td><td>SW00125</td><td>SW00141</td><td>SW00157</td><td>SW00189</td></tr>
</table>

A.7 System I/O Error Status

Data that show details when a system I/O error occurs are stored in register numbers SW00192 to SW00503.

Name	Register No.	Remarks
Current alarm	SW00190	Cleared when the power is turned ON.
Number of alarm history records	SW00191	Number of alarm history records
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 (register number IW□□□□)
Output error count	SW00203	Number of output errors
Output error address	SW00204	Latest output error address (register number OW□□□□)
Reserved by the system.	SW00205	Not used.
	SW00206	
	SW00207	
I/O error status	SW00208 to SW00215	CPU module error status
	SW00216 to SW00223	Reserved by the system.
	SW00224 to SW00231	Rack 1, slot 1 error status
	SW00232 to SW00239	Rack 1, slot 2 error status
	SW00240 to SW00247	Rack 1, slot 3 error status
	SW00248 to SW00255	Rack 1, slot 4 error status
	...	...
	SW00496 to SW00503	Rack 4, slot 9 error status

A.8 Compact Flash Card-Related System Registers (CPU-02 and CPU-03 Modules for the MP2200 Only)

Information on the operation status of the compact flash card (CF card) is stored in registers SW00652 to SW00659. These registers are used to hold status reports only for a CPU-02 or CPU-03 module used with an MP2200 that is compatible with the CF card.
In other models, these registers are reserved for the system.

Specifications	Register No.		Description	
Whole capacity of Compact Flash Card	SL00652		Unit: Byte	
Card Status	SW00654	SB006540	0: Compact Flash card not mounted	1: Compact Flash card mounted
		SB006541	0: Power not supplied	1: Power being supplied
		SB006542	0: Compact Flash card not identified	1: Compact Flash card being identified
		SB006543	0: No Compact Flash card access	1: Compact Flash card being accessed
		SB006544	0: –	1: FAT file system being checked
		SB006545 to SB00654F	Reserved by the system.	
FAT Type	SW00655	0001H	FAT12	
		0002H	FAT16	
		0003H	FAT32	
Reserved by the system.	SW00656		–	
Reserved by the system.	SW00657		–	
Batch Load/Save	SW00658	SB006580	During batch load	
		SB006581	Compact Flash card read-out error	
		SB006582	Load file model mismatched	
		SB006583	Load file write-in error	
		SB006584	Flash-storage error	
		SB006585	No batch load folder exists.	
		SB006586	Load error due to prohibition of load (program write protection)	
		SB006587	Reserved by the system.	
		SB006588	During a batch save	
		SB006589	Compact Flash card write-in error	
		SB00658A	Save file read-out error	
		SB00658B	Security error	
		SB00658C to SB00658F	Reserved by the system.	
Reserved by the system.	SW00659		–	

A.9 Interrupt Status

A.9.1 Interrupt Status List

Name	Register No.	Remarks
Interrupt information	SW00698	Interrupt detection count
	SW00699	Number of interrupting modules
	SW00700 SW00701 SW00702	Interrupting module 1
	SW00703 SW00704 SW00705	Interrupting module 2
	: :	
	SW00787 SW00788 SW00789	Interrupting module 30

A.9.2 Details on Interrupting Module

	F 8	7 0	(Bit number)
SW00xx+0	Rack	Slot	mmssH
SW00xx+1	Interrupt type		
SW00xx+2	Hardware interrupt cause register value		

(1) Rack

mm = 01 to 04 (01 only for the MP2300 module)
The number of the rack where the module that caused the interrupt is mounted is reported.

(2) Slot

ss = 01 to 09 (02 to 04 for the MP2300 module)

(3) Interrupt type

1: CPU IO (MP2100, MP2100M, MP2101, MP2101M, MP2101T, MP2101TM, MP2300): DI interrupt
2: LIO-01/LIO-02/LIO-04/LIO-05: DI interrupt
3: LIO-01/LIO-02/LIO-06/CNTR-01: Counter interrupt

A.10 Module Information

Name	Register No.	Remarks
CPU information	SW00800	MP2310 ID (C382H)
	SW00801	CPU hardware version (BCD)
	SW00802	CPU software version (BCD)
	SW00803	Number of subslots (0005H)
	SW00804	CPU function module ID (C312H)
	SW00805	CPU function module status
	SW00806	218IFA function module ID (8623H)
	SW00807	218IFA function module status
	SW00808	SVB function module ID (9116H)
	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.
Slot 1 information	SW00816	Module ID
	SW00817	Hardware version (BCD)
	SW00818	Software version (BCD)
	SW00819	Number of subslots
	SW00820	Function module 1, function module ID
	SW00821	Function module 1, function module status
	SW00822	Function module 2, function module ID
	SW00823	Function module 2, function module status
Slot 2 information	SW00824 to SW00831	Same as above
Slot 3 information	SW00832 to SW00839	Same as above
Reserved by the system.	SW00840 to SW01095	Reserved by the system.

A.11 MPU-01 System Status

Name	Register No.	Remarks
MPU-01 #1 Status	SW01411	Status of MPU-01 module circuit 1
MPU-01 #1 Error Status	SW01412	Error status of MPU-01 module circuit 1
MPU-01 #2 Status	SW01413	Status of MPU-01 module circuit 2
MPU-01 #2 Error Status	SW01414	Error status of MPU-01 module circuit 2
MPU-01 #3 Status	SW01415	Status of MPU-01 module circuit 3
MPU-01 #3 Error Status	SW01416	Error status of MPU-01 module circuit 3
MPU-01 #4 Status	SW01417	Status of MPU-01 module circuit 4
MPU-01 #4 Error Status	SW01418	Error status of MPU-01 module circuit 4
MPU-01 #5 Status	SW01419	Status of MPU-01 module circuit 5
MPU-01 #5 Error Status	SW01420	Error status of MPU-01 module circuit 5
MPU-01 #6 Status	SW01421	Status of MPU-01 module circuit 6
MPU-01 #6 Error Status	SW01422	Error status of MPU-01 module circuit 6
MPU-01 #7 Status	SW01423	Status of MPU-01 module circuit 7
MPU-01 #7 Error Status	SW01424	Error status of MPU-01 module circuit 7
MPU-01 #8 Status	SW01425	Status of MPU-01 module circuit 8
MPU-01 #8 Error Status	SW01426	Error status of MPU-01 module circuit 8
MPU-01 #9 Status	SW01427	Status of MPU-01 module circuit 9
MPU-01 #9 Error Status	SW01428	Error status of MPU-01 module circuit 9
MPU-01 #10 Status	SW01429	Status of MPU-01 module circuit 10
MPU-01 #10 Error Status	SW01430	Error status of MPU-01 module circuit 10
MPU-01 #11 Status	SW01431	Status of MPU-01 module circuit 11
MPU-01 #11 Error Status	SW01432	Error status of MPU-01 module circuit 11
MPU-01 #12 Status	SW01433	Status of MPU-01 module circuit 12
MPU-01 #12 Error Status	SW01434	Error status of MPU-01 module circuit 12
MPU-01 #13 Status	SW01435	Status of MPU-01 module circuit 13
MPU-01 #13 Error Status	SW01436	Error status of MPU-01 module circuit 13
MPU-01 #14 Status	SW01437	Status of MPU-01 module circuit 14
MPU-01 #14 Error Status	SW01438	Error status of MPU-01 module circuit 14
MPU-01 #15 Status	SW01439	Status of MPU-01 module circuit 15
MPU-01 #15 Error Status	SW01440	Error status of MPU-01 module circuit 15
MPU-01 #16 Status	SW01441	Status of MPU-01 module circuit 16
MPU-01 #16 Error Status	SW01442	Error status of MPU-01 module circuit 16

A.12 Motion Program Information

■ System Work Number 1 to 8

System Work Number		System Work 1	System Work 2	System Work 3	System Work 4	System Work 5	System Work 6	System Work 7	System Work 8
Executing Main Program No.		SW03200	SW03201	SW03202	SW03203	SW03204	SW03205	SW03206	SW03207
Status		SW03264	SW03322	SW03380	SW03438	SW03496	SW03554	SW03612	SW3670
Control Signal		SW03265	SW03323	SW03381	SW03439	SW03497	SW03555	SW03613	SW3671
Parallel 0	Program Number	SW03266	SW03324	SW03382	SW03440	SW03498	SW03556	SW03614	SW3672
	Block Number	SW03267	SW03325	SW03383	SW03441	SW03499	SW03557	SW03615	SW3673
	Alarm Code	SW03268	SW03326	SW03384	SW03442	SW03500	SW03558	SW03616	SW3674
Parallel 1	Program Number	SW03269	SW03327	SW03385	SW03443	SW03501	SW03559	SW03617	SW3675
	Block Number	SW03270	SW03328	SW03386	SW03444	SW03502	SW03560	SW03618	SW3676
	Alarm Code	SW03271	SW03329	SW03387	SW03445	SW03503	SW03561	SW03619	SW3677
Parallel 2	Program Number	SW03272	SW03330	SW03388	SW03446	SW03504	SW03562	SW03620	SW3678
	Block Number	SW03273	SW03331	SW03389	SW03447	SW03505	SW03563	SW03621	SW3679
	Alarm Code	SW03274	SW03332	SW03390	SW03448	SW03506	SW03564	SW03622	SW3680
Parallel 3	Program Number	SW03275	SW03333	SW03391	SW03449	SW03507	SW03565	SW03623	SW3681
	Block Number	SW03276	SW03334	SW03392	SW03450	SW03508	SW03566	SW03624	SW3682
	Alarm Code	SW03277	SW03335	SW03393	SW03451	SW03509	SW03567	SW03625	SW3683
Parallel 4	Program Number	SW03278	SW03336	SW03394	SW03452	SW03510	SW03568	SW03626	SW3684
	Block Number	SW03279	SW03337	SW03395	SW03453	SW03511	SW03569	SW03627	SW3685
	Alarm Code	SW03280	SW03338	SW03396	SW03454	SW03512	SW03570	SW03628	SW3686
Parallel 5	Program Number	SW03281	SW03339	SW03397	SW03455	SW03513	SW03571	SW03629	SW3687
	Block Number	SW03282	SW03340	SW03398	SW03456	SW03514	SW03572	SW03630	SW3688
	Alarm Code	SW03283	SW03341	SW03399	SW03457	SW03515	SW03573	SW03631	SW3689
Parallel 6	Program Number	SW03284	SW03342	SW03400	SW03458	SW03516	SW03574	SW03632	SW3690
	Block Number	SW03285	SW03343	SW03401	SW03459	SW03517	SW03575	SW03633	SW3691
	Alarm Code	SW03286	SW03344	SW03402	SW03460	SW03518	SW03576	SW03634	SW3692
Parallel 7	Program Number	SW03287	SW03345	SW03403	SW03461	SW03519	SW03577	SW03635	SW3693
	Block Number	SW03288	SW03346	SW03404	SW03462	SW03520	SW03578	SW03636	SW3694
	Alarm Code	SW03289	SW03347	SW03405	SW03463	SW03521	SW03579	SW03637	SW3695
Logical axis #1 Program Current Position		SL03290	SL03348	SL03406	SL03464	SL03522	SL03580	SL03638	SL3696
Logical axis #2 Program Current Position		SL03292	SL03350	SL03408	SL03466	SL03524	SL03582	SL03640	SL3698
Logical axis #3 Program Current Position		SL03294	SL03352	SL03410	SL03468	SL03526	SL03584	SL03642	SL3700
Logical axis #4 Program Current Position		SL03296	SL03354	SL03412	SL03470	SL03528	SL03586	SL03644	SL3702
Logical axis #5 Program Current Position		SL03298	SL03356	SL03414	SL03472	SL03530	SL03588	SL03646	SL3704
Logical axis #6 Program Current Position		SL03300	SL03358	SL03416	SL03474	SL03532	SL03590	SL03648	SL3706
Logical axis #7 Program Current Position		SL03302	SL03360	SL03418	SL03476	SL03534	SL03592	SL03650	SL3708
Logical axis #8 Program Current Position		SL03304	SL03362	SL03420	SL03478	SL03536	SL03594	SL03652	SL3710
Logical axis #9 Program Current Position		SL03306	SL03364	SL03422	SL03480	SL03538	SL03596	SL03654	SL3712
Logical axis #10 Program Current Position		SL03308	SL03366	SL03424	SL03482	SL03540	SL03598	SL03656	SL3714
Logical axis #11 Program Current Position		SL03310	SL03368	SL03426	SL03484	SL03542	SL03600	SL03658	SL3716

System Work Number	System Work 1	System Work 2	System Work 3	System Work 4	System Work 5	System Work 6	System Work 7	System Work 8
Logical axis #12 Program Current Position	SL03312	SL03370	SL03428	SL03486	SL03544	SL03602	SL03660	SL3718
Logical axis #13 Program Current Position	SL03314	SL03372	SL03430	SL03488	SL03546	SL03604	SL03662	SL3720
Logical axis #14 Program Current Position	SL03316	SL03374	SL03432	SL03490	SL03548	SL03606	SL03664	SL3722
Logical axis #15 Program Current Position	SL03318	SL03376	SL03434	SL03492	SL03550	SL03608	SL03666	SL3724
Logical axis #16 Program Current Position	SL03320	SL03378	SL03436	SL03494	SL03552	SL03610	SL03668	SL3726

■ System Word Number 9 to 16

System Work Number		System Work 9	System Work 10	System Work 11	System Work 12	System Work 13	System Work 14	System Work 15	System Work 16
Executing Main Program No.		SW03208	SW03209	SW03210	SW03211	SW03212	SW03213	SW03214	SW03215
Status		SW03728	SW03786	SW03844	SW03902	SW03960	SW04018	SW04076	SW04134
Control Signal		SW03729	SW03787	SW03845	SW03903	SW03961	SW04019	SW04077	SW04135
Parallel 0	Program Number	SW03730	SW03788	SW03846	SW03904	SW03962	SW04020	SW04078	SW04136
	Block Number	SW03731	SW03789	SW03847	SW03905	SW03963	SW04021	SW04079	SW04137
	Alarm Code	SW03732	SW03790	SW03848	SW03906	SW03964	SW04022	SW04080	SW04138
Parallel 1	Program Number	SW03733	SW03791	SW03849	SW03907	SW03965	SW04023	SW04081	SW04139
	Block Number	SW03734	SW03792	SW03850	SW03908	SW03966	SW04024	SW04082	SW04140
	Alarm Code	SW03735	SW03793	SW03851	SW03909	SW03967	SW04025	SW04083	SW04141
Parallel 2	Program Number	SW03736	SW03794	SW03852	SW03910	SW03968	SW04026	SW04084	SW04142
	Block Number	SW03737	SW03795	SW03853	SW03911	SW03969	SW04027	SW04085	SW04143
	Alarm Code	SW03738	SW03796	SW03854	SW03912	SW03970	SW04028	SW04086	SW04144
Parallel 3	Program Number	SW03739	SW03797	SW03855	SW03913	SW03971	SW04029	SW04087	SW04145
	Block Number	SW03740	SW03798	SW03856	SW03914	SW03972	SW04030	SW04088	SW04146
	Alarm Code	SW03741	SW03799	SW03857	SW03915	SW03973	SW04031	SW04089	SW04147
Parallel 4	Program Number	SW03742	SW03800	SW03858	SW03916	SW03974	SW04032	SW04090	SW04148
	Block Number	SW03743	SW03801	SW03859	SW03917	SW03975	SW04033	SW04091	SW04149
	Alarm Code	SW03744	SW03802	SW03860	SW03918	SW03976	SW04034	SW04092	SW04150
Parallel 5	Program Number	SW03745	SW03803	SW03861	SW03919	SW03977	SW04035	SW04093	SW04151
	Block Number	SW03746	SW03804	SW03862	SW03920	SW03978	SW04036	SW04094	SW04152
	Alarm Code	SW03747	SW03805	SW03863	SW03921	SW03979	SW04037	SW04095	SW04153
Parallel 6	Program Number	SW03748	SW03806	SW03864	SW03922	SW03980	SW04038	SW04096	SW04154
	Block Number	SW03749	SW03807	SW03865	SW03923	SW03981	SW04039	SW04097	SW04155
	Alarm Code	SW03750	SW03808	SW03866	SW03924	SW03982	SW04040	SW04098	SW04156
Parallel 7	Program Number	SW03751	SW03809	SW03867	SW03925	SW03983	SW04041	SW04099	SW04157
	Block Number	SW03752	SW03810	SW03868	SW03926	SW03984	SW04042	SW04100	SW04158
	Alarm Code	SW03753	SW03811	SW03869	SW03927	SW03985	SW04043	SW04101	SW04159
Logical axis #1 Program Current Position		SL03754	SL03812	SL03870	SL03928	SL03986	SL04044	SL04102	SL04160
Logical axis #2 Program Current Position		SL03756	SL03814	SL03872	SL03930	SL03988	SL04046	SL04104	SL04162
Logical axis #3 Program Current Position		SL03758	SL03816	SL03874	SL03932	SL03990	SL04048	SL04106	SL04164
Logical axis #4 Program Current Position		SL03760	SL03818	SL03876	SL03934	SL03992	SL04050	SL04108	SL04166
Logical axis #5 Program Current Position		SL03762	SL03820	SL03878	SL03936	SL03994	SL04052	SL04110	SL04168
Logical axis #6 Program Current Position		SL03764	SL03822	SL03880	SL03938	SL03996	SL04054	SL04112	SL04170

System Work Number	System Work 9	System Work 10	System Work 11	System Work 12	System Work 13	System Work 14	System Work 15	System Work 16
Logical axis #7 Program Current Position	SL03766	SL03824	SL03882	SL03940	SL03998	SL04056	SL04114	SL04172
Logical axis #8 Program Current Position	SL03768	SL03826	SL03884	SL03942	SL04000	SL04058	SL04116	SL04174
Logical axis #9 Program Current Position	SL03770	SL03828	SL03886	SL03944	SL04002	SL04060	SL04118	SL04176
Logical axis #10 Program Current Position	SL03772	SL03830	SL03888	SL03946	SL04004	SL04062	SL04120	SL04178
Logical axis #11 Program Current Position	SL03774	SL03832	SL03890	SL03948	SL04006	SL04064	SL04122	SL04180
Logical axis #12 Program Current Position	SL03776	SL03834	SL03892	SL03950	SL04008	SL04066	SL04124	SL04182
Logical axis #13 Program Current Position	SL03778	SL03836	SL03894	SL03952	SL04010	SL04068	SL04126	SL04184
Logical axis #14 Program Current Position	SL03780	SL03838	SL03896	SL03954	SL04012	SL04070	SL04128	SL04186
Logical axis #15 Program Current Position	SL03782	SL03840	SL03898	SL03956	SL04014	SL04072	SL04130	SL04188
Logical axis #16 Program Current Position	SL03784	SL03842	SL03900	SL03958	SL04016	SL04074	SL04132	SL04190

Appendix B SERVOPACK Parameter Data Flow

In systems connected to MECHATROLINK, SERVOPACK parameters can be read directly from the MP2310. (Refer to *11.1 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 MP2310 and the SERVOPACK. It is thus necessary to consider the relationship between the settings in both memory areas.

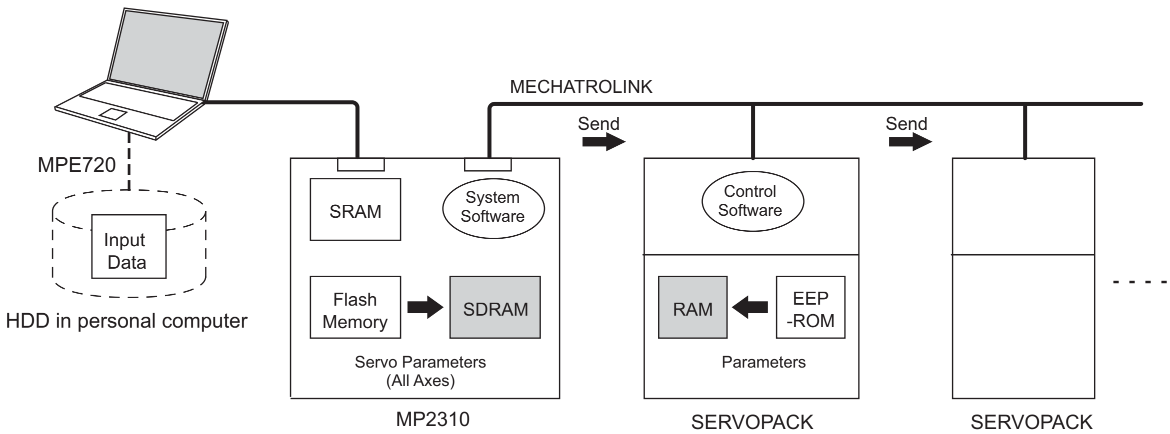
B.1 Operations and Parameter Data Flow

(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 MP2310's flash memory*1 for all axes is copied to SDRAM*2.
Some gain-related settings are sent from the MP2310 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.

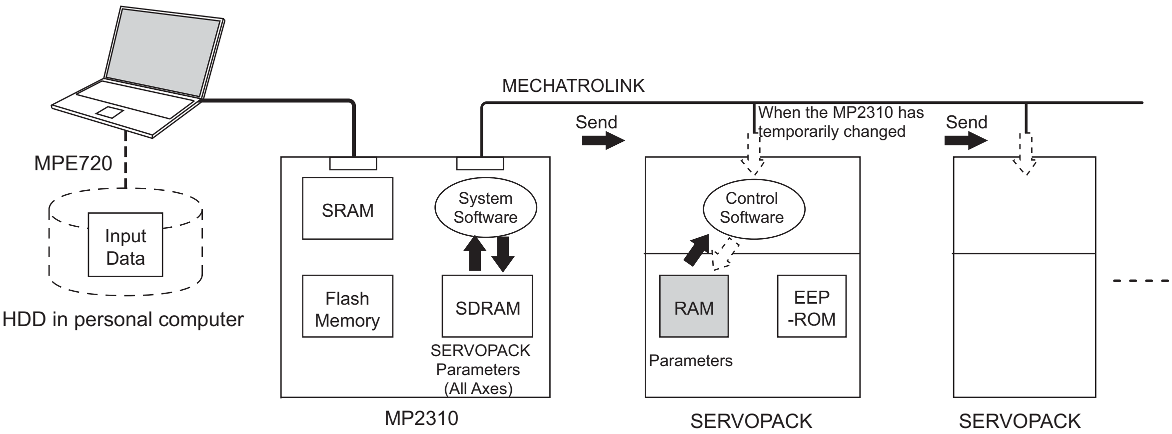


• Indicates data has been written.

(2) Normal Operation

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

2. Some of MP2310 setting parameters and commands temporarily change SERVOPACK parameters. Refer to *Chapter 4* in the *Machine Controller MP2000-series Built-in SVB/SVB-01 Motion Module User's Manual* (manual no. SIEPC88070033) for details. RAM in the SERVOPACK are written.

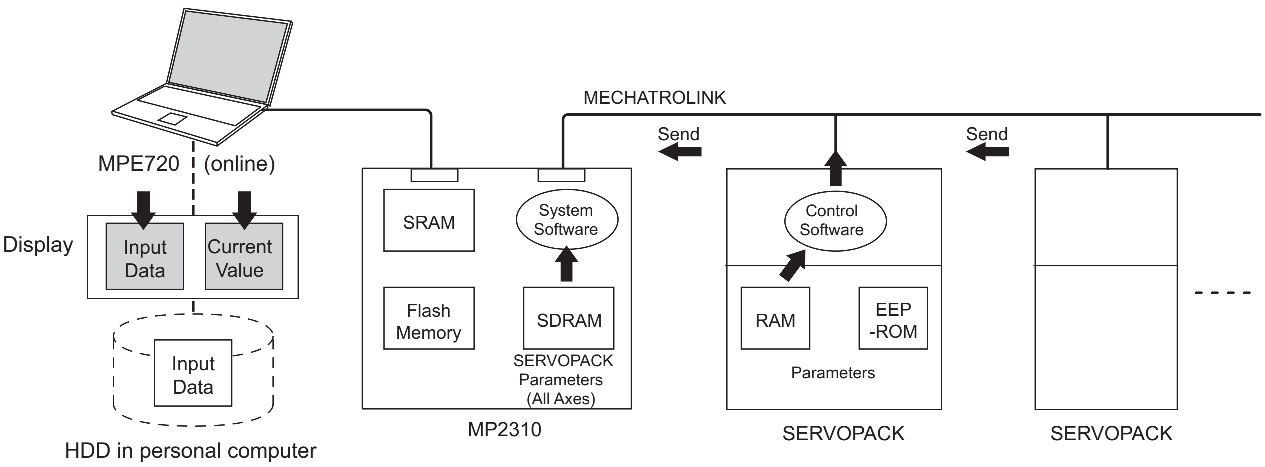


- Indicates data has been written.
- Parameters held in the SERVOPACK's RAM are displayed on a Digital Operator connected to the SERVO-PACK. They are also written to EEPROM when the DATA/ENTER Key is pressed.

(3) When the SERVOPACK Tab Page Is Open

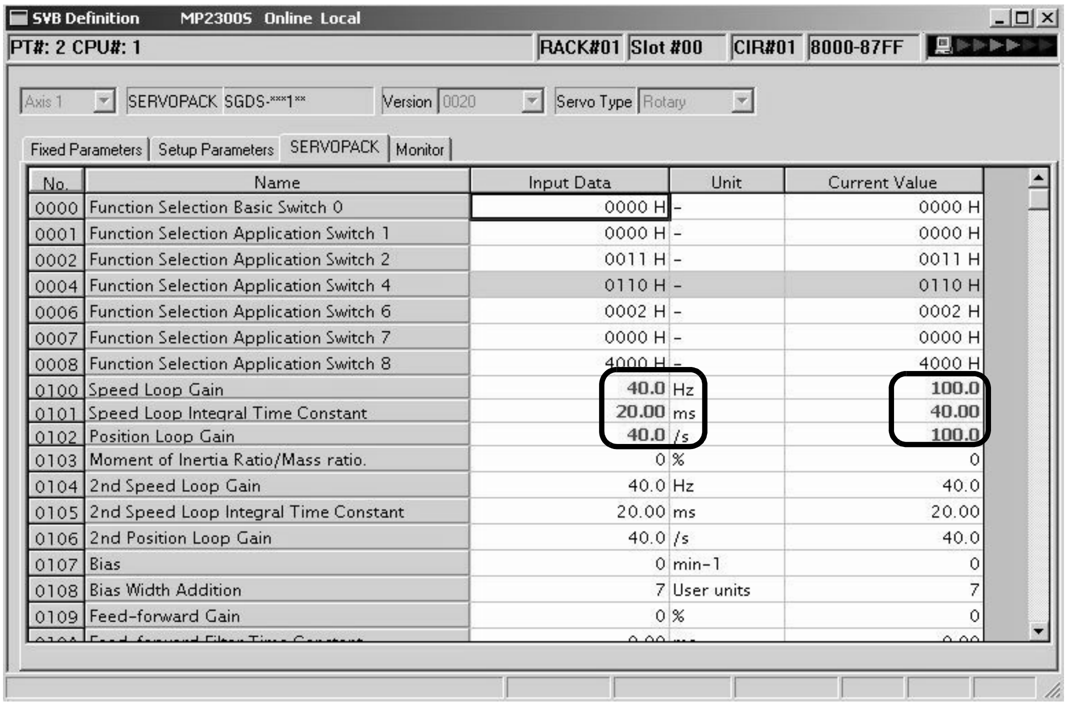
The data flow for SERVOPACK parameters is as follows when the SERVOPACK Tab Page is open in the SVB Definitions Window on the MPE720 (refer to *2.2.5 (5) SVB Definition* on page 2-42 for details on how to open the SERVO-PACK Tab Page.)

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 MP2310's SDRAM values to the ***Input Data*** in the **SERVOPACK** Tab Page.



- Indicates data has been written.

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
0108	Bias Width Addition	7	User units	7
0109	Feed-forward Gain	0	%	0

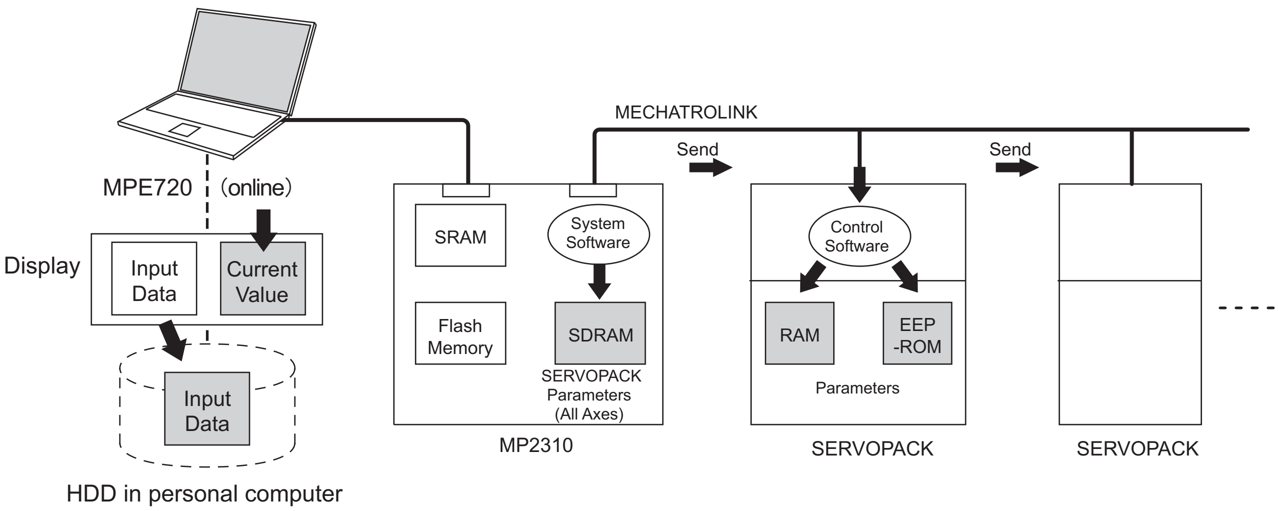
(4) SERVOPACK Parameters Saved in the MPE720

The data flow for SERVOPACK parameters is as follows when ***File - Save*** is selected from the **SERVOPACK** Tab Page:

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 MP2310
- RAM and EEPROM of the SERVOPACK

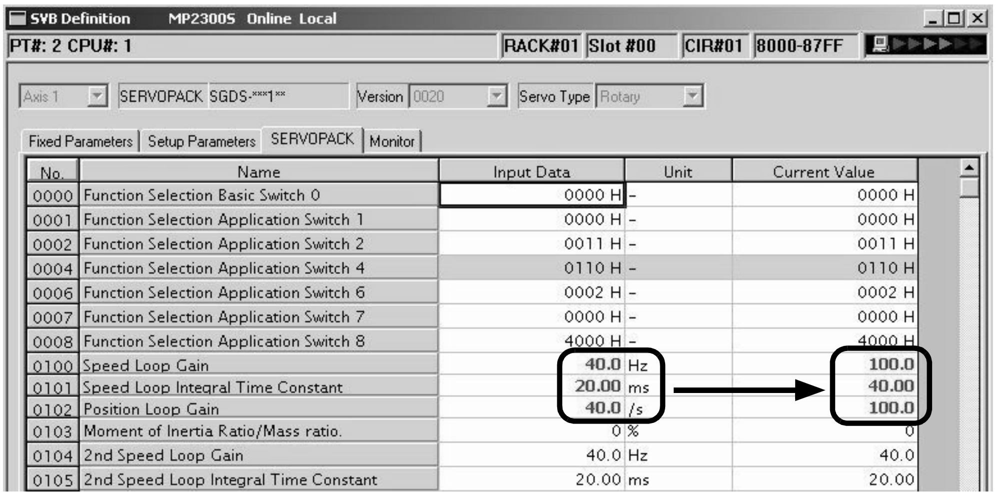
2. After having completed writing the parameters, the MPE720 updates the values in **Current Value** on the **SERVOPACK** Tab Page with the SERVOPACK parameter values stored in the RAM.



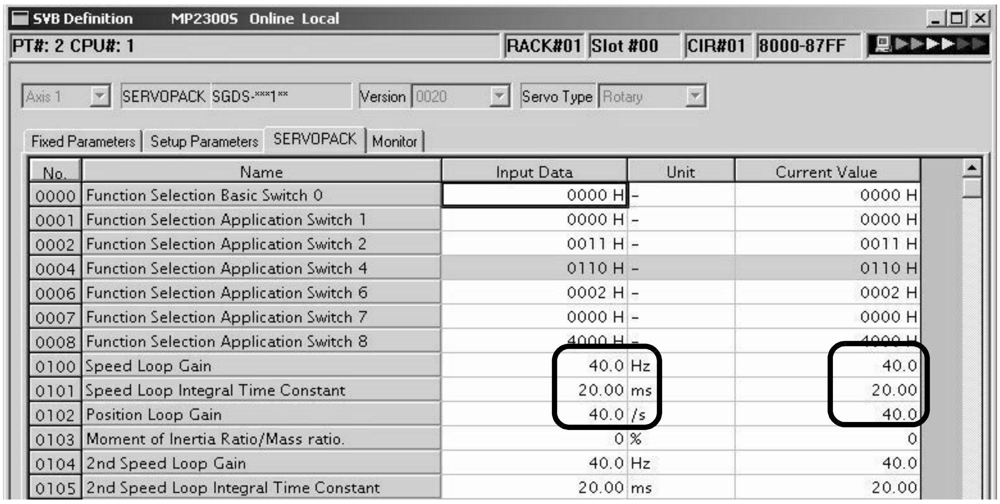
- Indicates data has been written.

3. The following figure shows a display example after having executed save operation on the **SERVO-PACK** 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

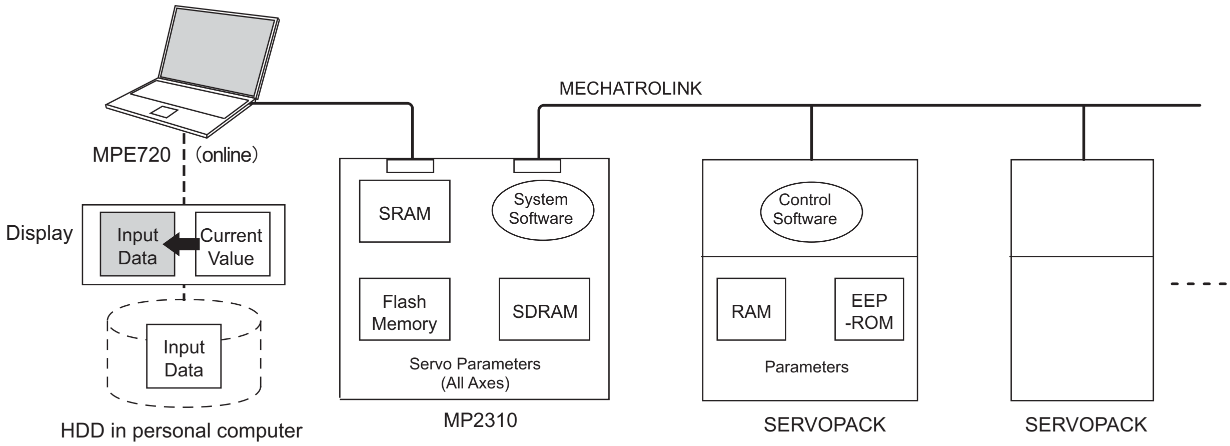


- The saving operation of SERVOPACK parameters can be used for writing data after SERVOPACK replacement because it writes all the parameters of the relevant axis.

(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 **SERVO-PACK** Tab in the SVB Definition Window on the MPE720:

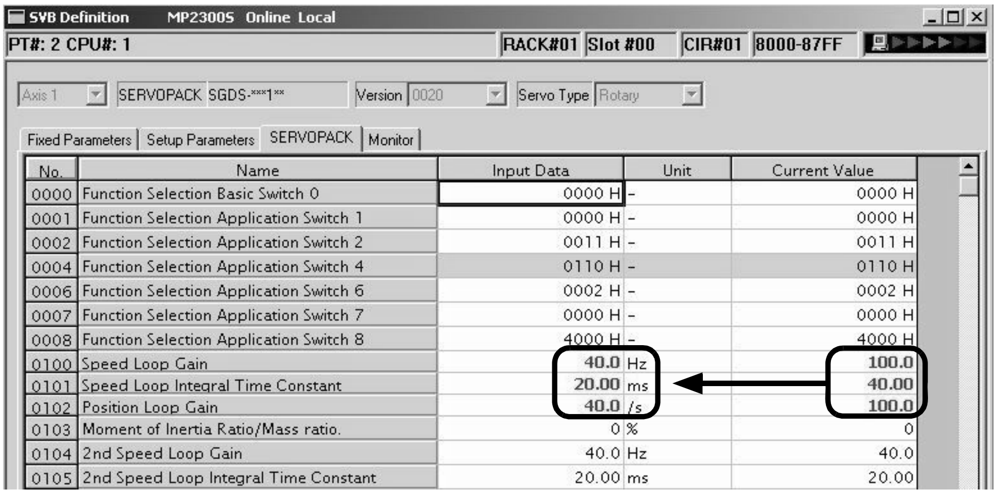
1. The MPE720 copies the values currently displayed in **Current Value** to **Input Data** on the **SERVO-PACK** Tab and displays.



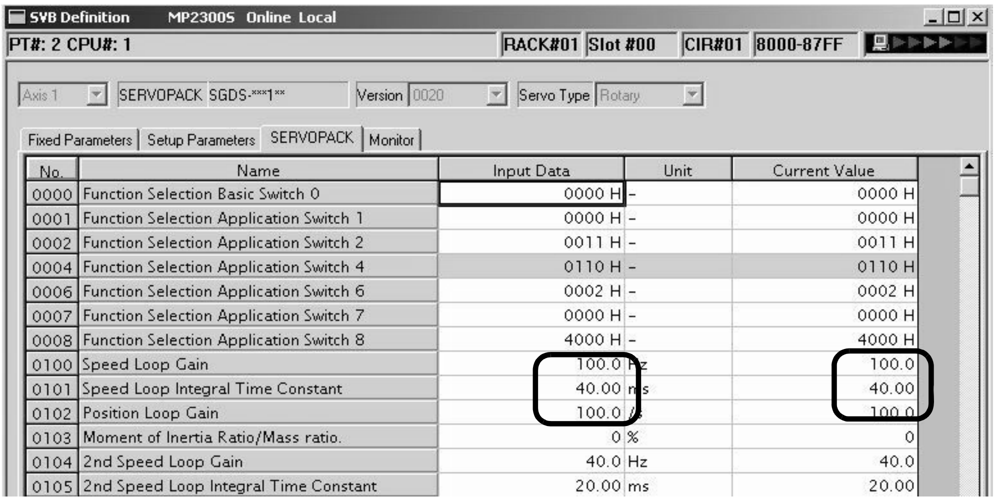
- ▭ Indicates data has been written.

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



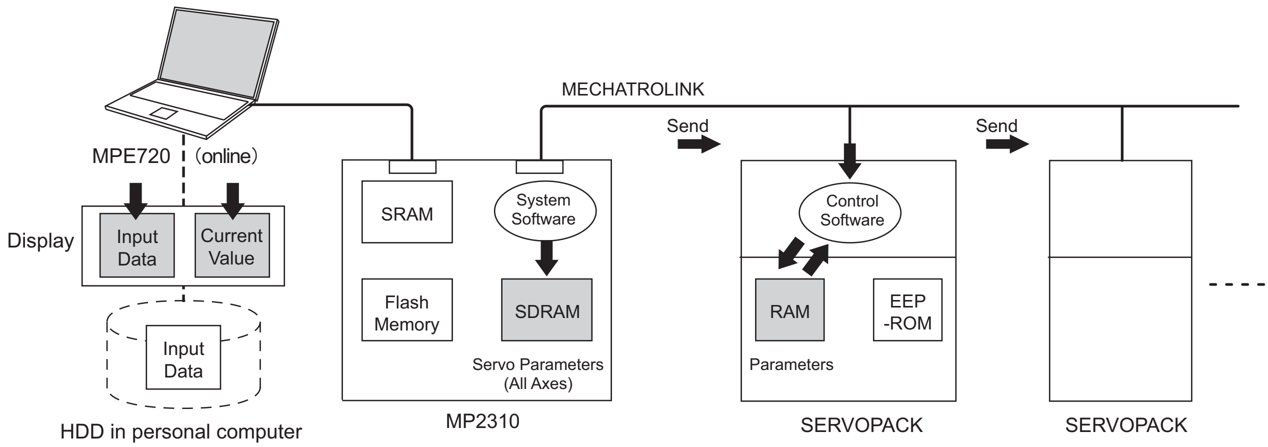
(6) Changing Parameters in the SERVOPACK Tab Page

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 MP2310
- RAM of the SERVOPACK

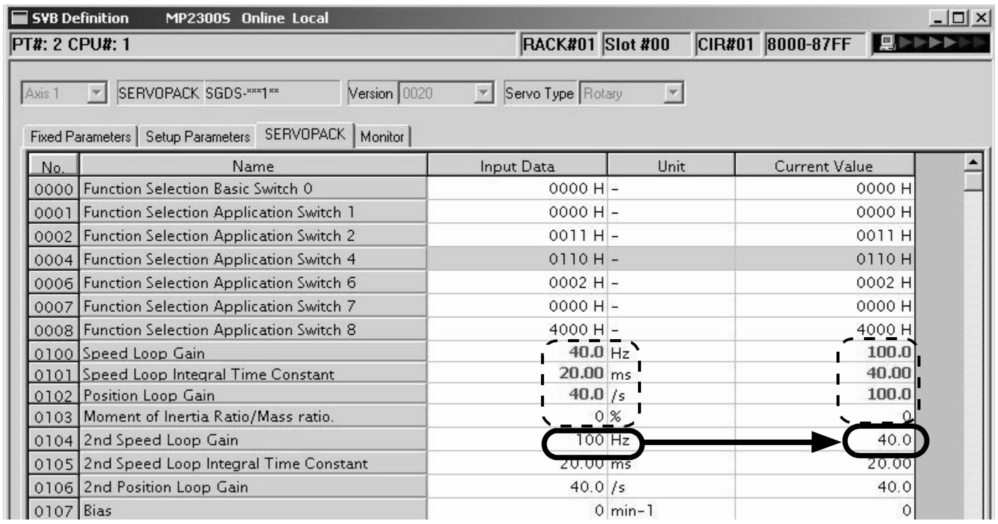
2. After having completed writing, the MPE720 updates the values in **Input Data** on the **SERVOPACK** Tab Page with the parameter values stored in the RAM of the SERVOPACK.



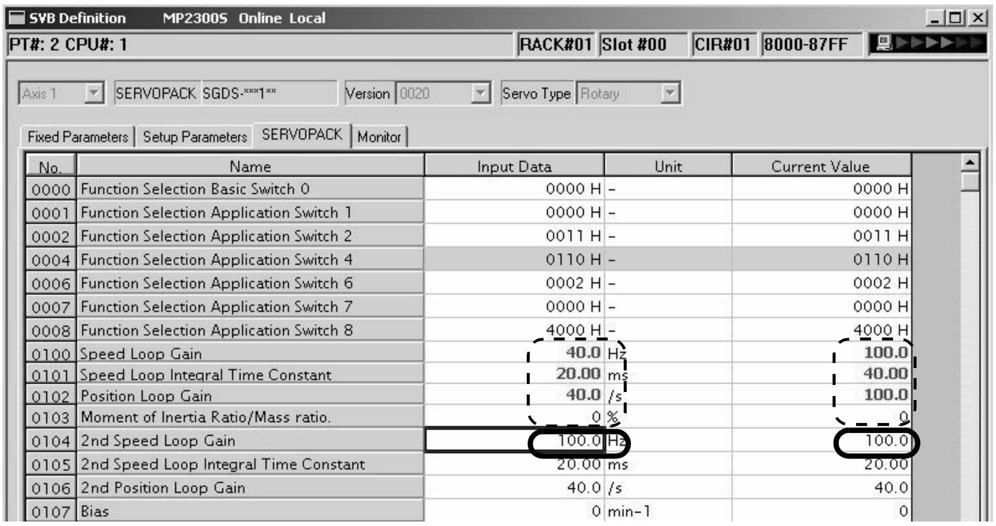
- Indicates data has been written.

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



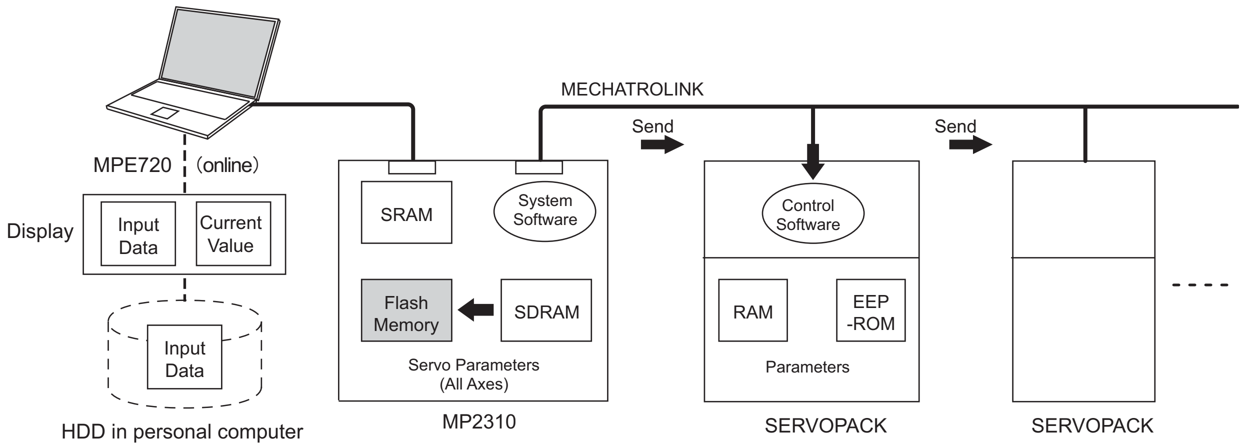
After having pressed ENTER Key



(7) Saving Data to Flash Memory

The data flow for SERVOPACK parameters is as follows when saving the parameters to flash memory on the MPE720.

1. The MP2310 writes the parameters data (**Input Data**) held in SDRAM to flash memory.



- Indicates data has been written.
- 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.

```
BB        —FUNCTION—
Fn004
Fn005
Fn006
Fn007
```

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

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

6. Press the DATA Key again and execute Fn005.

   "Parameter Init" will flash during initialization.

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

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

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

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

Appendix D Initializing the Absolute Encoder

The procedures for initializing an absolute encoder for Σ-I, Σ-II, Σ-III, and Σ-V SERVOPACKs are given below.

- Refer to *9.2.1 System Startup Flowchart* in the *Machine Controller MP2000-series Built-in 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.

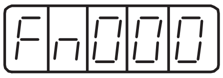
This completes setting up the absolute encoder. Turn the power supply OFF and then back ON to reset the SERVOPACK.

D.3 Σ-II SERVOPACK

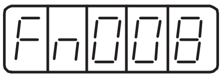
- Refer to the following manuals for information on Σ-II SERVOPACKs.
  Σ-II Series SGM□□/SGDH User's Manual (SIEP S800000 05)
  Σ-II Series SGM□□/SGDM User's Manual (SIEP S800000 15)

(1) Initialization Using a Hand-held Digital Operator

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

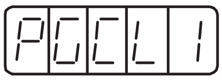


2. Select parameter Fn008 by pressing the LEFT (<) and RIGHT (>) Keys to select the digit to be changed and then using the UP (∧) and DOWN (∨) Keys to change the value of the digit.



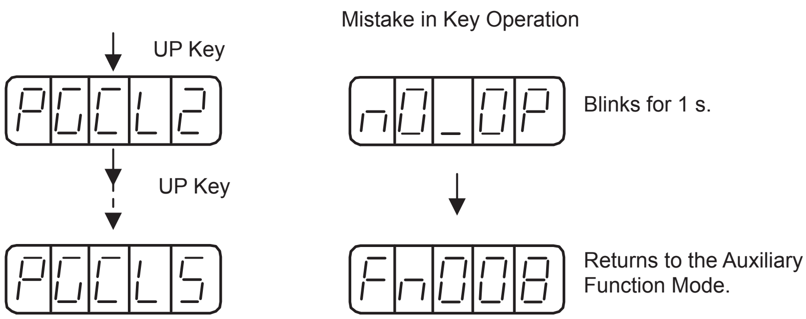
3. Press the DATA/ENTER Key.

The following display will appear.



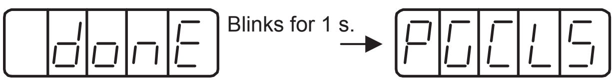
4. The rightmost digit will be incremented each time the UP (∧) Key is pressed. Press the UP (∧) Key several times until "PGCL5" is displayed.

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.

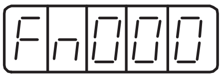
The display will change as shown below and the clear operation will be performed for multiturn data for the absolute encoder.



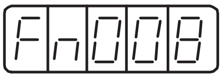
This completes initializing the absolute encoder. Reset the SERVOPACK to turn the power supply OFF and then back ON.

(2) Initialization Using the Built-in Panel Operator

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

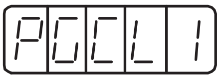


2. Press the UP (▲) and DOWN (▼) Keys to select parameter Fn008.



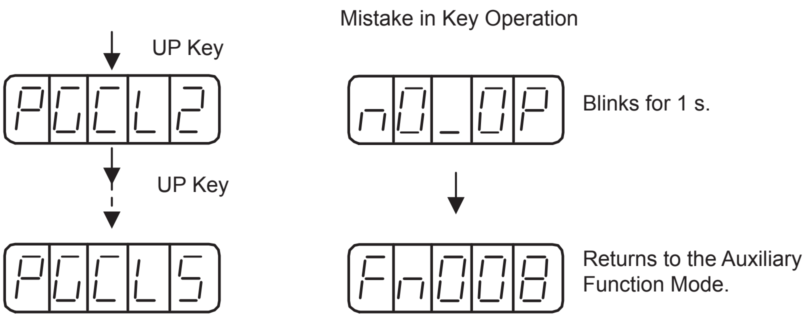
3. Press the DATA/ENTER Key for more than one second.

The following display will appear.



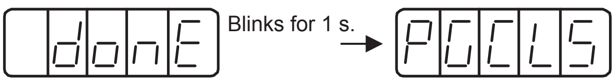
4. The rightmost digit will be incremented each time the UP (▲) Key is pressed. Press the UP (▲) Key several time until “PGCL5” is displayed.

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

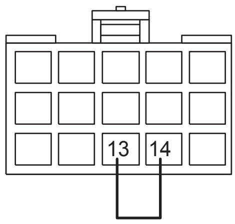
- Refer to the following manuals for information on Σ-I SERVOPACKS.
  Σ Series SGM□/SGD User's Manual (Manual No. SIE-S800-26.3)
  Σ Series SGM□/SGDB High-speed Field Network MECHATROLINK-compatible AC Servo Driver User's Manual (Manual No. SIE-S800-26.4)

(1) Initializing a 12-bit Absolute Encoder

Use the following procedure to initialize a 12-bit absolute encoder.

1. Properly connect the SERVOPACK, Servomotor, and MP2310.

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 MP2310.

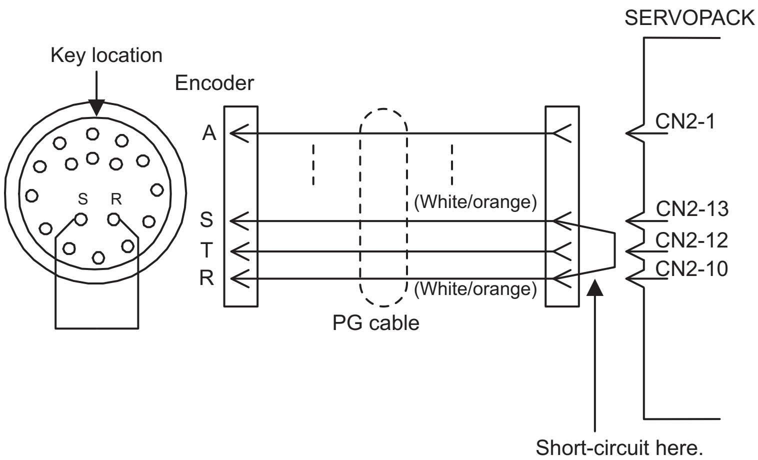
2. Discharge the large-capacity capacitor in the encoder using one of the following methods.

■ 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 2-44 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 (0: Enabled/1: Disabled)	Yes	
		Bits 1 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 Acceleration/ Acceleration Time Constant	Unit is according to OW□□03, bits 4 to 7 (Speed Unit).	Yes	Yes
OL□□38	Straight Line Deceleration/ 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/Acceleration 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 MECHATROLINK 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 (SERVOPACK 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 MP2310.
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
MP2310	JEPMC-MP2310-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

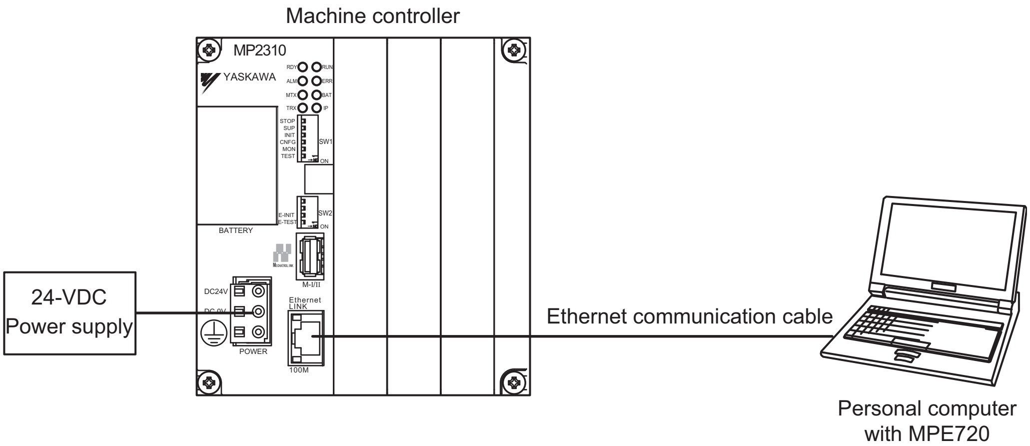
(3) Necessary Others

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

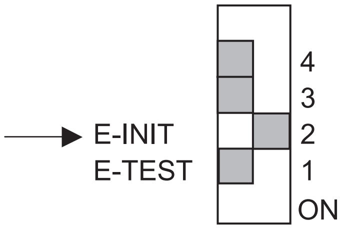
F.2 Procedure

1. Turn OFF the MP2310 24-VDC power supply.

2. Wire MPE720 and MP2310.



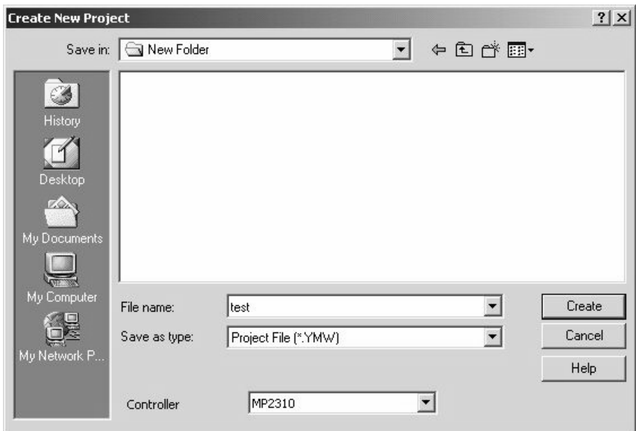
3. Turn ON E-INIT of DIP switch (SW2) in the MP2310 main unit.



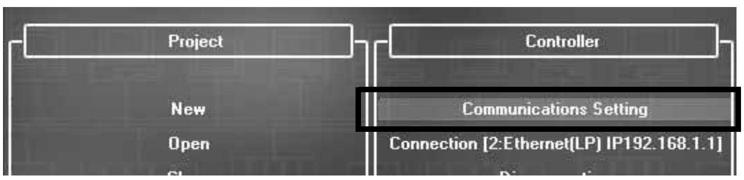
4. Turn ON the 24-VDC power supply of the MP2310, and confirm that the RDY, RUN, and IP LEDs are lit on the MP2310 main unit.
When the IP LED is lit, you can confirm that the MP2310 side has successfully retrieved an IP address.

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

6. Create a new PLC folder.



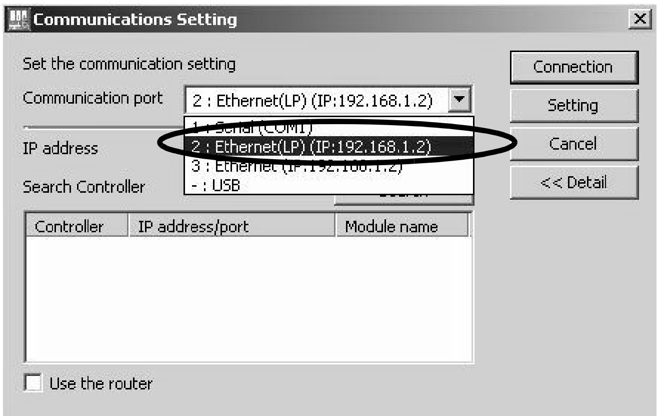
7. Click **Communications Setting**.



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)
MP2310 Built-in Ethernet	218IFA	

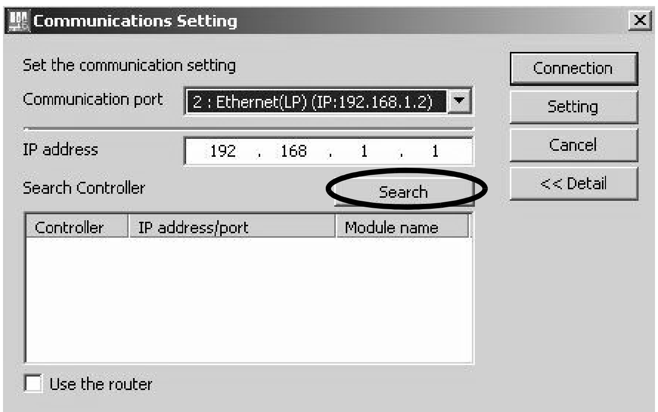
■ When there are multiple LAN ports on the personal computer

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.

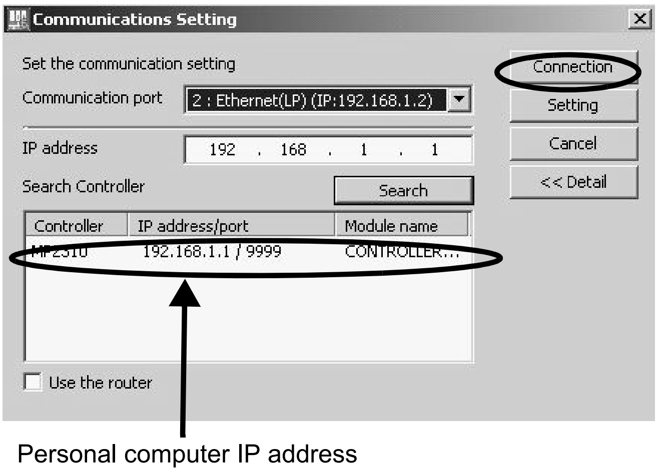
■ Controller search function

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

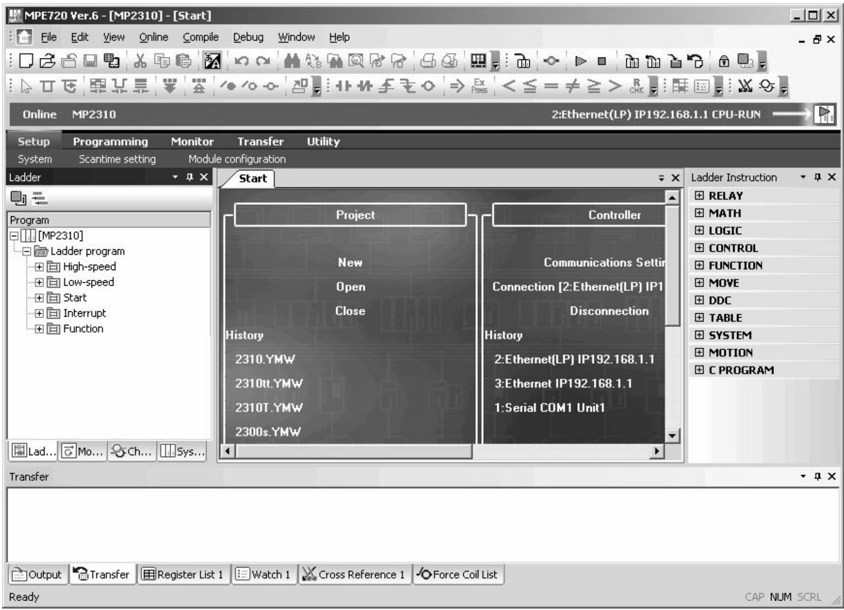
9. Click the **Search** Button.



10. A controller search list will appear. Select the found controller and click the **Connection** Button.



11. MPE720 connects to the controller.

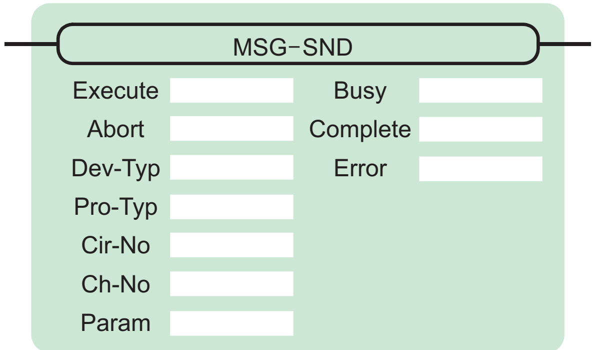


Appendix G MSG-SND/ MSG-RCV Functions

G.1 Message Transmit Function (MSG-SND)

This section explains the message transmit function (MSG-SND) used in a ladder program when transmitting messages.

G.1.1 Specification Overview of the Message Transmit Function

Function Name	MSG-SND			
Function	Transmits messages to a remote station on the circuit specified by the communication device type. Supports multiple protocols. Keep the execution command (Execute) until Complete or Error turns ON.			
Function Definition				
I/O Definition	No.	Name	I/O Option (*1)	Contents
Input Item	1	Execute	B-VAL	Executes a transmission
	2	Abort	B-VAL	Forcibly ends a transmission
	3	Dev-Typ	I-REG	Communication device type Ethernet (218IF) = 6, Ethernet (218IFA) = 16
	4	Pro-Typ	I-REG	Communication protocol MEMOBUS (*2) = 1, non-procedure 1 (*3) = 2, non-procedure 2 (*3) = 3
	5	Cir-No	I-REG	Circuit number Ethernet (218IF) = 1 to 8, Ethernet (218IFA) = 1 to 8
	6	Ch-No	I-REG	Communication buffer channel number Ethernet (218IF) = 1 to 10, Ethernet (218IFA) = 1 to 4
	7	Param	Address input	Parameter list start address (MA, DA)
Output Item	1	Busy	B-VAL	In process
	2	Complete	B-VAL	Process completed
	3	Error	B-VAL	Error has occurred

* 1. The meanings of I/O options are as follows:
B-VAL: Specify I/O by bit type data.
I-REG: Specify I/O by integer type data. When specifying, set an integer type register number.
As for the input only, it can be a constant (literal).
Address input: The address of the specified register (any integer register) is passed to the function.

* 2. When transmitting in MEMOBUS, Extended MEMOBUS, MELSEC, OMRON, or MODBUS/TCP protocol, set the communication protocol (Pro-Typ) to MEMOBUS(=1). The communication device automatically converts the protocol.

* 3. Non-procedure 1: In non-procedural communication, data is transmitted on a per-word basis.
Non-procedure 2: In non-procedural communication, data is transmitted on a per-byte basis.

G.1.2 I/O Item Details of the Message Transmit Function

(1) Input Item

The following table shows registers available for each input item.

Input Item	I/O Option	Available Register
Execute Abort	B-VAL	Every bit type register (except #, C registers), Same as above with subscript
Dev-typ Pro-Typ Cir-No Ch-No	I-REG	Every integer type register, Same as above with subscript, Constant
Param	Address input	Register address (except #, C registers), Same as above with subscript

1. Execute (executes a transmission)

Specifies a bit to command execution of a message transmission.
When the Execute bit turns ON, message transmission is implemented. To execute the process, a ladder program or the like needs to be used to switch it ON/OFF.

Note: Keep Execute (executes a transmission) ON until Complete (process completed) or Error (error occurred) is turned ON. When the command turns ON, the message transmission is implemented. To continuously command the transmit execution, make sure to turn Execute (executes a transmission) OFF for one scan or more.

2. Abort (forcibly ends a transmission)

Specify a bit to command a forced terminated of a message transmission.
When the Abort bit turns ON, the message transmission is forcibly terminated. Abort takes precedence over Execute.
In order to execute the forced abort, a ladder program or the like needs to be used to switch it ON/OFF.

3. Dev-Typ (communication device type)

Specify the type code of the communication device.

Communication Device	Type Code
Ethernet (218IF)	6
Ethernet (218IFA)	16

4. Pro-Typ (communication protocol)

Specify the type code of the communication device.

Type Code	Communication Protocol	Remarks
1	MEMOBUS	Set the type code to “1” when also transmitting using Extended MEMOBUS, MELSEC, or MODBUS/TCP protocol. The communication device automatically converts the protocol.
2	Non-procedure 1 (per word)	Data is transmitted on a per-word basis in non-procedural communication. No response is received from the remote.
3	Non-procedure 2 (per byte)	Data is transmitted on a per-byte basis in the non-procedural communication. No response is received from the remote.

5. Cir-No (line number)

Specify a circuit number for the communication device.
Specify it in accordance with the circuit number displayed in the MPE720 Module Configuration Definition Window.

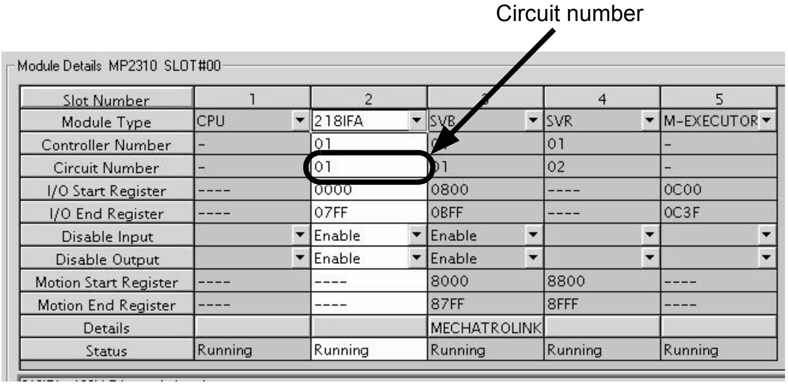


Fig. A.1 MPE720 Module Configuration Definition Window

The following table shows the scope of circuit numbers.

Communication Device	Valid Circuit Number
Ethernet (218IF or 218IFA)	1 to 8

6. Ch-No (communication buffer channel number)

Specify the channel of the communication buffer.
It can be any channel in the scope. However, when starting up multiple functions at the same time, set a unique channel for each function. If you do not start up multiple functions at the same time, the channel numbers can duplicate each other.
The following table shows the scope of channel numbers.

Communication Device	Valid Channel Number
Ethernet (218IF)	1 to 10
Ethernet (218IFA)	1 to 4

When the communication device is Ethernet (218IFA), because the communication buffer common to the transmission and reception has four channels, four transmissions (or receptions) are available at the same time by using channels 1 to 4.

Note: 1. As many MSG-SND (or MSG-RCV) functions as lines used at the same time are required.
2. For information on communication buffer channels, refer to *G.3 Communication Buffer Channel* on page A-115.

7. Param (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. In the parameter list, enter the function code and its relevant parameter data. Also, process result and status are output.

Note: For more information about the parameter list, refer to the parameter details for each protocol from *G.1.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols* on page A-56 to *G.1.7 Function Setting and Parameter Details for Non-procedural Protocol* on page A-75.

Example: When “DA00000” is specified as a parameter list start address.

Register	Parameter list F ··· ···· ···· ··· 0
DW00000	PRAM00
DW00001	PRAM01
DW00002	PRAM02
DW00003	PRAM03
DW00004	PRAM04
DW00005	PRAM05
DW00006	PRAM06
DW00007	PRAM07
DW00008	PRAM08
DW00009	PRAM09
DW00010	PRAM10
DW00011	PRAM11
DW00012	PRAM12
DW00013	PRAM13
DW00014	PRAM14
DW00015	PRAM15
DW00016	PRAM16

(2) Output Item

The following table shows the registers available for each output item.

Input Item	I/O Option	Available Register
Busy Complete Error	B-VAL	Every bit type register (except #, C registers), Same as above with subscript

1. Busy (in process)

Specify a bit that reports a message is transmitting.
The Busy bit is ON while executing a message transmission or forced abort process.
Keep Execute or Abort ON while Busy is ON.

2. Complete (process completed)

Specify a bit that reports that message transmission has ended.
When a message transmission or forced abort process is completed properly, the Complete bit will turn ON only for one scan.

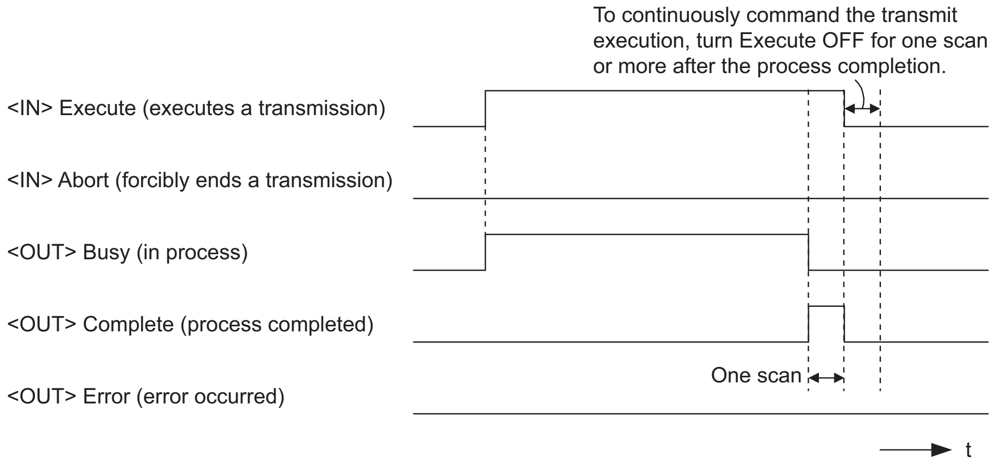
3. Error (error occurred)

Specify a bit that reports that an error has occurred in the message transmission.
When an error occurs, the Error bit will turn ON only for one scan.

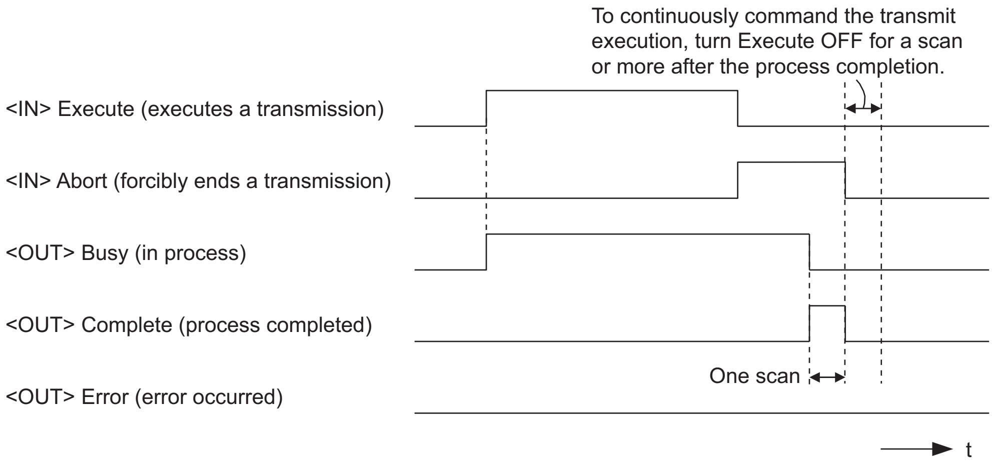
Note: For more information about the error cause, refer to *G.1.4 (2) Process Result (PARAM00)* on page A-57 and *G.1.4 (3) Status (PARAM00)* on page A-58.

A timing chart of bit type I/O items in the MSG-SND function is as follows:

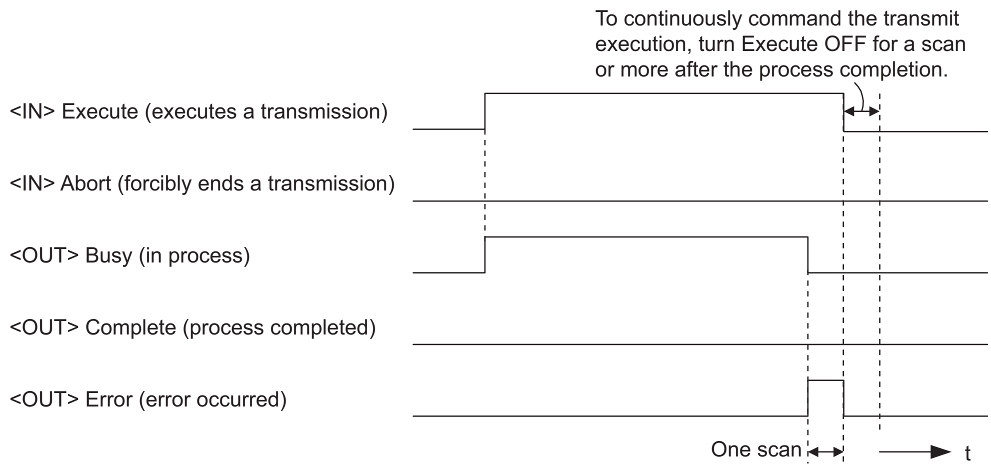
[In Normal Condition]



[When Forcibly Aborted]



[When Error Occurs]



G.1.3 Message Transmit Function Parameter List (Param) Overview

The param of the MSG-SND function has a parameter list structure composed of 17 words. (The value of the Param itself is the start address (MA, DA) of the parameter list.)
In the parameter list, enter a connection number, function code and its relevant parameter data. Process results and status are also output.
When MEMOBUS or non-procedure is used as a communication protocol, the parameter list is as follows:

Note: Parameter details are explained in the parameter details for each protocol type. Refer to the following items:

- *G.1.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols* on page A-56
- *G.1.5 Function Setting and Parameter Details for MELSEC Protocol* on page A-65
- *G.1.6 Function Setting and Parameter Details for MODBUS/TCP Protocol* on page A-70
- *G.1.7 Function Setting and Parameter Details for Non-procedural Protocol* on page A-75

(1) MEMOBUS Parameter List

Param No.	IN/OUT	Contents	Description
00	OUT	Process result	Process result is output.
01	OUT	Status	The status of the communication device is output.
02	IN	Connection number	Specifies the remote destination.
03	IN	Option	Sets a unique setting for each communication device.
04	IN	Function code	Sets a function code to transmit.
05	IN	Data address	Specifies the start address of the data.
06	IN	Data size	Sets the data size for a read/write request.
07	IN	Remote CPU number	Sets a remote CPU number.
08	IN	Coil offset	Sets the coil's offset word address.
09	IN	Input relay offset	Sets the offset word address of an input relay.
10	IN	Input register offset	Sets the offset word address of an input register.
11	IN	Holding register offset	Sets the offset word address of a holding register.
12	SYS	Reserved 1	
13 to 16	SYS	Reserved 2	

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

(2) Non-procedual Parameter List

Param No.	IN/OUT	Contents	Description
00	OUT	Process result	Process result is output.
01	OUT	Status	The status of the communication device is output.
02	IN	Connection number	Specifies the remote destination.
03	IN	(unused)	
04	IN	(unused)	
05	IN	Data address	Specifies the start address of the data.
06	IN	Data size	Sets the data size for a write request.
07	IN	(unused)	
08	IN	(unused)	
09	IN	(unused)	
10	IN	(unused)	
11	IN	Register offset	Sets the offset word address of the register.
12	SYS	Reserved 1	
13 to 16	SYS	Reserved 2	

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

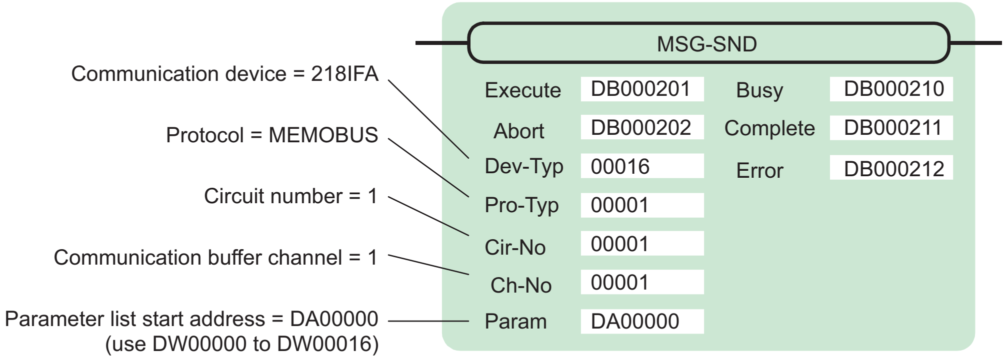
G.1.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols

This section explains the MSG-SND function setting and its parameter list details when MEMOBUS or Extended MEMOBUS is used as a protocol type.

(1) Message Transmit Function Setting

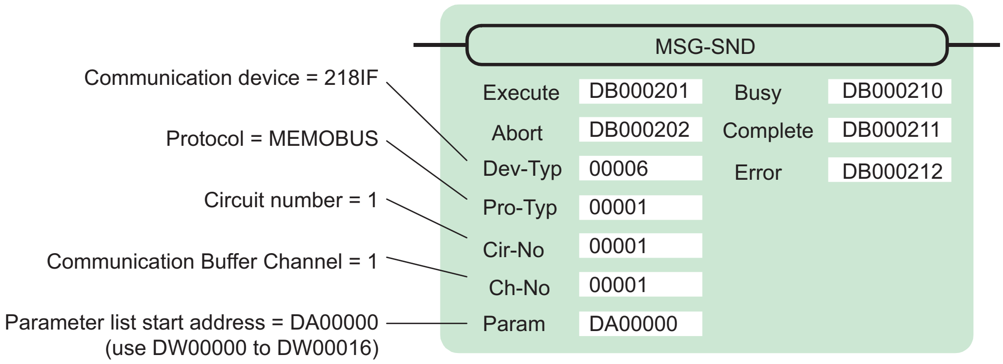
(a) 218IFA Setting Example

An example of a function setting when 218IFA is used as a communication device follows:
Set the protocol type to MEMOBUS even when used in Extended MEMOBUS protocol.
Set the circuit number in accordance with the line number allocated to the target 218IFA.
Set a unique communication buffer channel for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(b) 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS even when used in Extended MEMOBUS protocol.
Set the circuit number in accordance with the line number allocated to the target 218IF.
Set a unique communication buffer channel for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(2) Process Result (PARAM00)

Process result is output to the upper byte. Lower byte is used for system analysis.

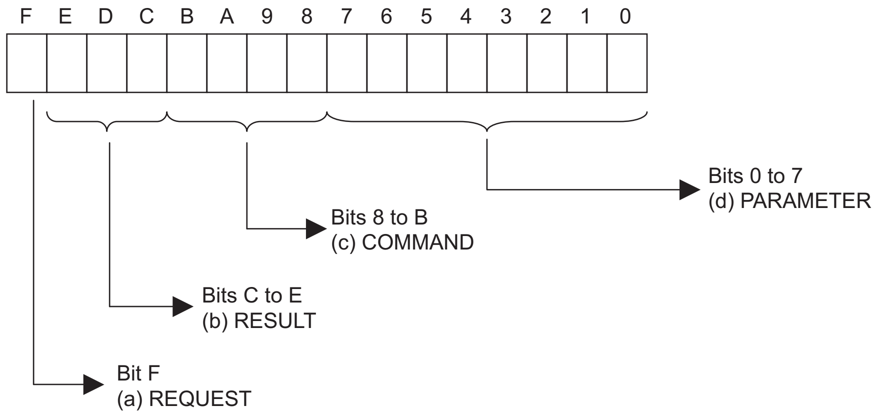
Value of Process Result	Meaning
00□□H	In process (Busy)
10□□H	Process completed (Complete)
8y□□H	Error occurred (Error)

When an error occurs, take corrective action by referring to the following error contents:

Value of Process Result	Error Contents	Description
80□□H	–	Reserved
81□□H	Function code error	Unused function code was transmitted or received. Check PARAM04 (function code).
82□□H	Error in setting address	The following setting is out of the setting range. Check the setting. PARAM05 (data address) PARAM08 (coil offset) PARAM09 (input relay offset) PARAM10 (input register offset) PARAM11 (holding register offset)
83□□H	Data size error	The transmit or receive data size is out of the setting range. Check PARAM04 (data size).
84□□H	Error in setting circuit number	The circuit number is out of the setting range. Check Cir-No (circuit number) of the MSG-SND function.
85□□H	Error in setting channel number	The communication buffer channel number is out of the setting range. Check Ch-No (communication buffer channel number) of the MSG-SND function.
86□□H	Connection number error	The connection number is out of the setting range. Check PARAM02 (connection number).
87□□H	–	Reserved
88□□H	Communication section error	An error response was returned from the communication section (communication device). Check the equipment connection. In addition, confirm communication with the remote device.
89□□H	Device select error	Unavailable device is set. Check Dev-Typ (communication device type) of the MSG-SND function.

(3) Status (PARAM00)

Outputs status of the communication section (communication device).
The following figure shows the bit assignment and the bit assignment details is listed in the table (a) and after.



(a) REQUEST (request)

Outputs whether the MSG-SND function is requesting processing.

Bit State	Description
1	Requesting processing.
0	The acceptance of the process request is complete.

(b) RESULT (result)

Outputs the execution result of the MSG-SND function

Code	Abbreviation	Meaning
0	CONN_NG	In Ethernet communication, transmit error or connection error is complete
1	SEND_OK	Normal transmission complete
2	REC_OK	Normal reception complete
3	ABORT_OK	Forced abort complete
4	FMT_NG	Parameter format error
5	SEQ_NG	Command sequence error
6	RESET_NG	Reset state
7	REC_NG	Data reception error (error detected in the lower layer program)

(c) COMMAND (command)

Outputs a process command for the MSG-SND function. The executed process contents may differ depending on the command.

Code	Abbreviation	Meaning
1	U_SEND	General-purpose message transmission (for non-procedural protocol)
2	U_REC	General-purpose message reception (for non-procedural protocol)
3	ABORT	Forced termination
8	M_SEND	MEMOBUS command transmission: Completed when response is received
9	M_REC	MEMOBUS command reception: Accompanies a response transmission
C	MR_SEND	MEMOBUS response transmission

(d) PARAMETER (parameter)

When RESULT(process result) = 4 (FMT_NG: parameter format error), an error code in the table below is output. Otherwise, the connection number is output.

RESULT (process result)	Code (Hex)	Meaning
When RESULT (process result) = 4 (FMT_NG: parameter format error)	00	No error
	01	Connection number is out of range
	02	Time error for monitoring to receive MEMOBUS response
	03	Error in setting retransmit count
	04	Error in setting cyclic area
	05	CPU number error
	06	Data address error
	07	Data size error
	08	Function code error
Others	xx	Connection number

(4) Connection Number (PARAM02)

Specify the remote destination.
When the communication device is Ethernet (218IF/218IFA), set the connection number.
The following table shows the range of settings.

Communication Device	Connection Number	Remarks
Ethernet (218IF)	1 to 20	Transmits to the remote station set for the specified connection number.
Ethernet (218IFA)	1 to 4	Same as above

Note: When the communication device is Ethernet (218IF/218IFA), set the connection number in accordance with the connection number in the 218IF/218IFA Parameter Setting Window for the MPE720 module configuration definition.

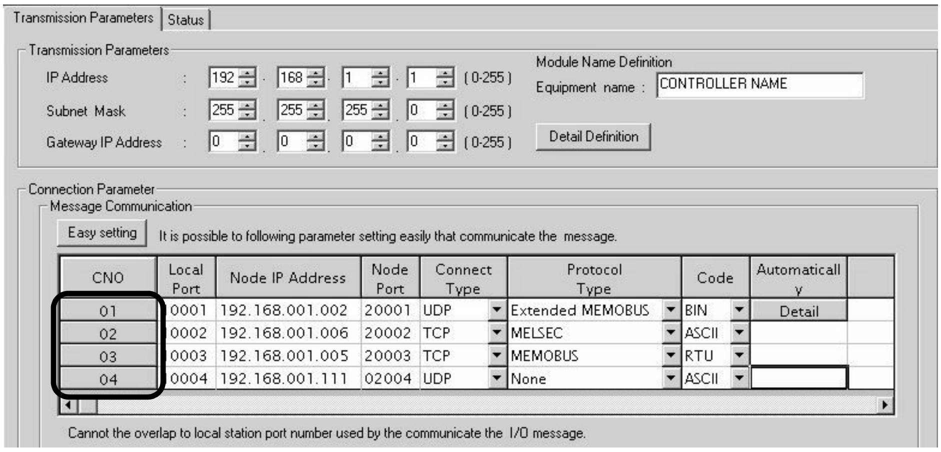


Fig. A.2 218IFA Parameter Setting Screen for the MPE720 Module Configuration Definition

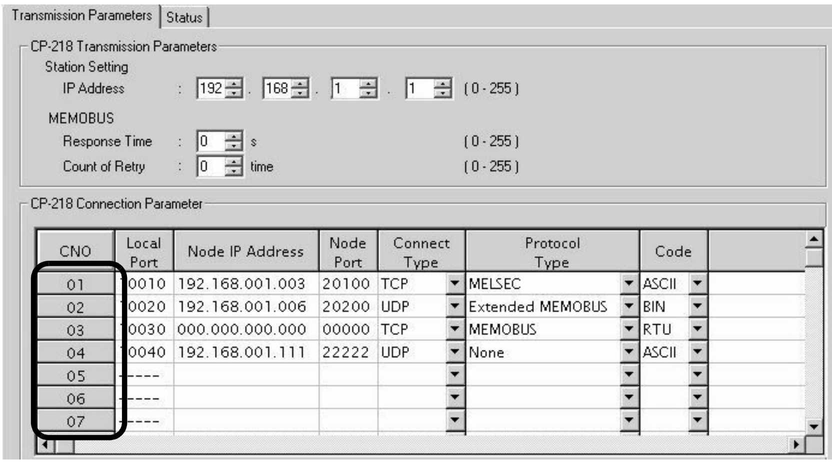


Fig. A.3 218IF Parameter Setting Screen for the MPE720 Module Configuration Definition

(5) Option (PARAM03)

Choose a unique setting for each communication device.
When the protocol is MEMOBUS or Extended MEMOBUS, this is not used, and no setting is necessary.

(6) Function Code (PARAM04)

Set a function code to transmit.
The functions (read coil or input relay state, write to holding register, etc.) registered in the function codes are made available by specifying the code.
The following table shows the function codes available when using a MEMOBUS or Extended MEMOBUS protocol.

Table A.1 Function Code List (MEMOBUS, Extended MEMOBUS)

Function Code	Target Data Type	Function	Protocol Type	
			Extended MEMOBUS	MEMOBUS
00H	–	Unused	–	–
01H	B	Reads coil state	√	√
02H	B	Reads input relay state	√	√
03H	W	Reads holding register content	√	√
04H	W	Reads input register content	√	√
05H	B	Changes single coil state	√	√
06H	W	Writes to single holding register	√	√
07H	–	Unused	–	–
08H	–	Loopback test	√	√
09H	W	Reads holding register content (extended)	√	–
0AH	W	Reads input register content (extended)	√	–
0BH	W	Writes to holding register (extended)	√	–
0CH	–	Unused	–	–
0DH	W	Discontinuously reads holding register (extended)	√	–
0EH	W	Discontinuously writes to holding register (extended)	√	–
0FH	B	Changes multiple coil states	√	√
10H	W	Writes to multiple holding registers	√	√

Note: 1. B: Bit type, W: Integer type
2. √: Available, -: Not available
3. Transmit and receive registers in the master operation mode are MW (MB) only.
4. In slave operation mode, the coil, holding register, input relay, and input register are MB, MW, IB, IW respectively.

(7) Data Address (PARAM05)

Specify the start address of the data.
The address must be input in decimal or hexadecimal numbers.
Example: When the start address is MW01000, specify “1000 (decimal)” or “3E8H (hexadecimal).”
The range of data addresses may differ, depending on the function code.
The following table shows the valid ranges of data addresses when using a MEMOBUS or Extended MEMOBUS protocol.

Table A.2 Valid Range of Data Addresses (MEMOBUS, Extended MEMOBUS)

<table>
<tr><th rowspan="2">Function Code</th><th rowspan="2">Target Data Type</th><th rowspan="2">Function</th><th colspan="2">Valid Range of Data Addresses</th></tr>
<tr><th>Ethernet (218IF)</th><th>Ethernet (218IFA)</th></tr>
<tr><td>00H</td><td>–</td><td>Unused</td><td colspan="2">Disable</td></tr>
<tr><td>01H</td><td>B</td><td>Reads coil state*1</td><td colspan="2">0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>02H</td><td>B</td><td>Reads input relay state*1</td><td colspan="2">0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>03H</td><td>W</td><td>Reads holding register content*2</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>04H</td><td>W</td><td>Reads input register content*2</td><td>0 to 32767 (0 to 7FFFH)</td><td>0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>05H</td><td>B</td><td>Changes single coil state*1</td><td colspan="2">0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>06H</td><td>W</td><td>Writes to single holding register*2</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>07H</td><td>–</td><td>Unused</td><td colspan="2">Disable</td></tr>
<tr><td>08H</td><td>–</td><td>Loopback test</td><td colspan="2">Disable</td></tr>
<tr><td>09H</td><td>W</td><td>Reads holding register content (extended)*2</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>0AH</td><td>W</td><td>Reads input register content (extended)*2</td><td>0 to 32767 (0 to 7FFFH)</td><td>0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>0BH</td><td>W</td><td>Writes to holding register (extended)*2</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>0CH</td><td>–</td><td>Unused</td><td colspan="2">Disable</td></tr>
<tr><td>0DH</td><td>W</td><td>Discontinuously reads holding register (extended)*3</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>0EH</td><td>W</td><td>Discontinuously writes to holding register (extended)*3</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
<tr><td>0FH</td><td>B</td><td>Changes multiple coil states*1</td><td colspan="2">0 to 65535 (0 to FFFFH)</td></tr>
<tr><td>10H</td><td>W</td><td>Writes to multiple holding registers*2</td><td colspan="2">0 to 65534 (0 to FFFEH)</td></tr>
</table>

* 1. Request for reading/writing coil or input relay: Specifies the start bit address of data
* 2. Request for continuously reading/writing register: Specifies the start word address of data
* 3. Request for discontinuously reading/writing register: Specifies the start M register number of the address table

Note: Address Table
An address table is used for specifying addresses indirectly in order to indicate discontinuous data. The PARAM06 (data size) sizes of addresses at the beginning of the M register set by PARAM05 (data address) are used as an address table.
When reading, specify the remote station's address to read for the data addresses 1-n. Read values are stored locally according to the data addresses 1-n.
When writing, data stored in the local data addresses 1-n is picked up and written into the remote station’s data addresses 1-n.
The address table used when discontinuously reading/writing registers is as follows:

		Address table	
PARAM05 →	MW□□□□□	Data address 1	
	MW□□□□□+1	Data address 2	
		:	
	MW□□□□□+(n-1)	Data address n	n: Data size (PARAM06)

(8) Data Size (PARAM06)

Set the data size (number of bits or words) for the read/write request.
Be sure that the last data address determined based on the offset, data address, and data size does not go beyond the scope of the data addresses.
The range of data addresses may differ, depending on the function code and communication device.
The following table shows the valid ranges of data sizes when using a MEMOBUS or Extended MEMOBUS protocol.

Table A.3 Valid Range of Data Sizes (MEMOBUS, Extended MEMOBUS)

Function Code	Target Data Type	Function	Valid Range of Data Sizes	
			Ethernet(218IF)	Ethernet(218IFA)
00H	–	Unused	Disable	
01H	B	Reads coil state*1	1 to 2000	
02H	B	Reads input relay state*1	1 to 2000	
03H	W	Reads holding register content*2	1 to125	
04H	W	Reads input register content*2	1 to 125	
05H	B	Changes single coil state	Disable	
06H	W	Writes to single holding register	Disable	
07H	–	Unused	Disable	
08H	–	Loopback test	Disable	
09H	W	Reads holding register content (extended)*2	1 to 508	1 to 2044 (BIN) 1 to 1020 (ASCII)
0AH	W	Reads input register content (extended)*2	1 to 508	1 to 2044 (BIN) 1 to 1020 (ASCII)
0BH	W	Writes to holding register (extended)*2	1 to 507	1 to 2043 (BIN) 1 to 1019 (ASCII)
0CH	–	Unused	Disable	
0DH	W	Discontinuously reads holding register (extended)*2	1 to 508	1 to 2044 (BIN) 1 to 1020 (ASCII)
0EH	W	Discontinuously writes to holding register (extended)*2	1 to 254	1 to 1022 (BIN) 1 to 510 (ASCII)
0FH	B	Changes multiple coil states*1	1 to 800	
10H	W	Writes to multiple holding registers*2	1 to 100	

* 1. Specifies the number of bits
* 2. Specifies the number of words
Note: Data size in the table is represented as a decimal number.

(9) Remote CPU Number (PARAM07)

Set a remote CPU number.
When the remote device is MP2☐00 series, specify “1”.
When the remote device is a controller manufactured by YASKAWA Electric Corporation, but other than the MP2☐00 series, and comprises multiple CPU modules, specify the destination CPU number.
Otherwise, specify “0”.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify the offset addresses of read data storage areas and write data source of the transmission side.
The address for the transmission side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.1.8 Relationship between Data Address, Data Size, and Offset for MSG-SND Function* on page A-80.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table lists the offset parameters.

Table A.4 Offset Parameter List

Parameter	Content	Description
PARAM08	Coil offset	Sets the coil's offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ, depending on the function code.
The following table provides the valid parameters for each function code.

Table A.5 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter	Protocol Type	
			Extended MEMOBUS	MEMOBUS
01H	Reads coil state	PARAM08	√	√
02H	Reads input relay state	PARAM09	√	√
03H	Reads holding register content	PARAM11	√	√
04H	Reads input register content	PARAM10	√	√
05H	Changes single coil state	PARAM08	√	√
06H	Writes to single holding register	PARAM11	√	√
09H	Reads holding register content (extended)	PARAM11	√	–
0AH	Reads input register content (extended)	PARAM10	√	–
0BH	Writes to holding register (extended)	PARAM11	√	–
0DH	Discontinuously reads holding register (extended)	PARAM11	√	–
0EH	Discontinuously writes to holding register (extended)	PARAM11	√	–
0FH	Changes multiple coil states	PARAM08	√	√
10H	Writes to multiple holding registers	PARAM11	√	√

Note: √: Available, -: Not available

(11) Reserved by System 1 (PARAM12)

Used by system (the channel number of the communication buffer in use is stored).

Note: Before the first scan during power up, make sure to set it to “0” by using a user program.
After that, the register is used by the system, so never change the value with the user program.

(12) Reserved by System 2 (PARAM13 to PARAM16)

Used by the system. Never change the value with the user program, etc.

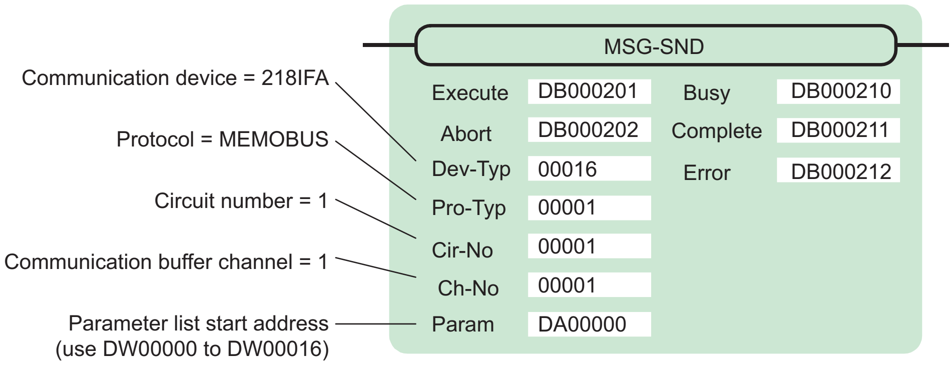
G.1.5 Function Setting and Parameter Details for MELSEC Protocol

This section explains MSG-SND function setting and its parameter list details when MELSEC is used as a protocol.

(1) Message Transmit Function Setting

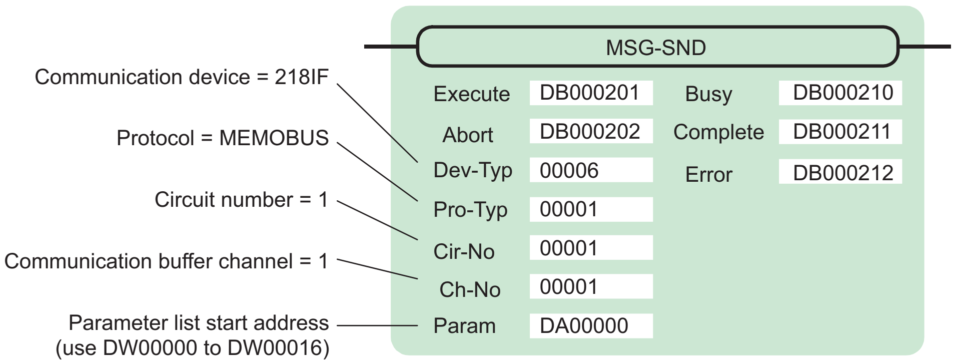
(a) 218IFA Setting Example

An example of a function setting when 218IFA is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MELSEC protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(b) 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MELSEC protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(2) Process Result (PARAM00)

Refer to *G.1.4 (2) Process Result (PARAM00)* on page A-57.

(3) Status (PARAM01)

Refer to *G.1.4 (3) Status (PARAM00)* on page A-58.

(4) Connection Number (PARAM02)

Refer to *G.1.4 (4) Connection Number (PARAM02)* on page A-60.

(5) Option (PARAM03)

Choose a unique setting for each communication device.
This is not used by the MELSEC protocol, and does not require setting when MELSEC is used.

(6) Function Code (PARAM04)

Set a function code to transmit.
The functions (read bit/word device, write to word device, etc.) registered in the function codes are made available by specifying the code.
The following table lists function codes used with the MELSEC protocol.

Table A.6 Function Code List

Function Code	MELSEC ACPU Common Command	Target Data Type	Function
01H/02H	00H	B	Reads bit device in units
03H/04H/09H/0AH	01H	W	Reads word device in units
05H/0FH	02H	B	Writes to bit device in units
06H/0BH/10H	03H	W	Writes to word device in units
08H	16H	–	Loopback test
0EH	05H	B	Specifies a device number for each word device at random and sets/resets each device
31H	60H	W	Writes to the fixed buffer in words
32H	61H	W	Reads from the random access buffer in words
33H	62H	W	Writes to the random access buffer in words

Note: 1. B: Bit type, W: Integer type
2. AnCPU dedicated commands are not supported. When accessing AnCPU, also use the ACPU common commands. You cannot access the AnCPU extended file register.

(7) Data Address (PARAM05)

Specify the start address of the data.
The address must be input in decimal or hexadecimal numbers.
Example: When the start address is MW01000, specify “1000 (decimal)” or “3E8H (hexadecimal).”
The valid range of usable function codes and data addresses may differ, depending on the device type and device range of the MELSEC side.
The following table gives the valid ranges of data addresses when using MELSEC as a protocol.

Table A.7 Valid Range of Data Addresses (MELSEC bit device)

Device	Device Range of ACPU Common Commands	Decimal/ Hexa-decimal	Function Code	Valid Range of Data Addresses	Corresponding Register Number
X	X0000 to X07FF	Hexadecimal	02H: Input relay	0 to 2047	MB000000 to MB00127F
Y	Y0000 to Y07FF	Hexadecimal	01H/0FH: Coil	0 to 2047	MB000000 to MB00127F
M	M0000 to M2047	Decimal	01H/05H/0FH: Coil	2048 to 4095	MB001280 to MB00255F
M	M9000 to M9255	Decimal	01H/05H/0FH: Coil	4096 to 4351	MB002560 to MB00271F
B	B0000 to B03FF	Hexadecimal	01H/05H/0FH: Coil	4352 to 5375	MB002720 to MB00335F
F	F0000 to F0255	Decimal	01H/05H/0FH: Coil	5376 to 631	MB003360 to MB00351F
TS	TS000 to TS255	Decimal	02H: Input relay	2048 to 2303	MB001280 to MB00143F
TC	TC000 to TC255	Decimal	02H: Input relay	2304 to 2559	MB001440 to MB00159F
CS	CS000 to CS255	Decimal	02H: Input relay	2560 to 2815	MB001660 to MB00175F
CC	CC000 to CC255	Decimal	02H: Input relay	2816 to 3071	MB001760 to MB00191F
M	M2048 to M8191	Decimal	01H/05H/0FH: Coil	8192 to 14335	MB005120 to MB00895F

Table A.8 Valid Range of Data Addresses (MELSEC word device)

Device	Device Range of ACPU Common Commands	Decimal/ Hexa-decimal	Function Code	Valid Range of Data Addresses	Corresponding Register Number
TN	TN000 to TN255	Decimal	04H/0AH: Input register	0 to 255	MW00000 to MW0255
CN	CN000 to CN255	Decimal	04H/0AH: Input register	256 to 511	MW00256 to MW00511
D	D0000 to D1023	Decimal	03H/06H/09H/0BH/ 0EH/10H: Holding register	0 to 1023	MW00000 to MW01023
D (special)	D9000 to D9255	Decimal	03H/06H/09H/0BH/ 0EH/10H: Holding register	1024 to 1279	MW01024 to MW01279
W	W0000 to W03FF	Hexadecimal	03H/06H/09H/0BH/ 0EH/10H: Holding register	1280 to 2303	MW01280 to MW02303
R	R0000 to R8191	Decimal	03H/06H/09H/0BH/ 0EH/10H: Holding register	2304 to 10495	MW02304 to MW10495
D	D1024 to D6143	Decimal	03H/06H/09H/0BH/ 0EH/10H: Holding register	10496 to 15615	MW10496 to MW15615

Note: 1. The device range may differ according to the MELSEC sequencer even within the device range. For more information, refer to the MELSEC manual.
2. The register number corresponding to MP2☐00 can be adjusted by the offset setting of the MSG-SND function.

(8) Data Size (PARAM06)

Set the data size (number of bits or words) for the read/write request.
Be sure that the last data address determined based on the offset, data address, and data size does not go beyond the scope of the data addresses.
The range of data addresses may differ, depending on the function code and communication device.
The following table gives the valid ranges of data sizes when using MELSEC as a protocol.

Table A.9 Valid Range of Data Sizes

Function Code	MELSEC ACPU Common Command	Function	Valid Range of Data Sizes	
			Ethernet(218IF)	Ethernet(218IFA)
01H/02H	00H	Reads bit device in units	1 to 256 units	
03H/04H/ 09H/0AH	01H	Reads word device in units	1 to 256 units	
05H/0FH	02H	Writes to bit device in units	1 to 256 units	
06H/0BH/ 10H	03H	Writes to word device in units	1 to 256 units	
08H	16H	Loopback test	–	
0EH	05H	Specifies a device number for each word device at random and sets/resets each word device	1 to 40 units	
31H	60H	Writes to the fixed buffer in words	See the table below.	
32H	61H	Reads from the random access buffer in words		
33H	62H	Writes to the random access buffer in words		

Function	Connection Type	Code	Valid Range of Data Sizes	
			Ethernet(218IF)	Ethernet(218IFA)
Writes to the fixed buffer in words	TCP	BIN	1 to 507 words	1 to 727 words
		ASCII	1 to 362 words	1 to 362 words
	UDP	BIN	1 to 507 words	1 to 1017 words
		ASCII	1 to 507 words	1 to 508 words
Reads from the random access buffer in words	TCP	BIN	1 to 508 words	1 to 728 words
		ASCII	1 to 363 words	1 to 363 words
	UDP	BIN	1 to 508 words	1 to 1017 words
		ASCII	1 to 508 words	1 to 508 words
Writes to the random access buffer in words	TCP	BIN	1 to 507 words	1 to 726 words
		ASCII	1 to 361 words	1 to 361 words
	UDP	BIN	1 to 508 words	1 to 1017 words
		ASCII	1 to 508 words	1 to 508 words

Note: The restricted data size when using TCP is the maximum size transmitted using one segment.
The segment size is determined by MTU (maximum transfer unit) as a TCP data transfer unit.
The valid range of data sizes mentioned above is for MTU = 1500 bytes.

(9) Remote CPU Number (PARAM07)

Refer to *G.1.4 (9) Remote CPU Number (PARAM07)* on page A-63.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify the offset addresses of the read data storage area and the write data source of the transmission side. The address for the transmission side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.1.8 Relationship between Data Address, Data Size, and Offset for MSG-SND Function* on page A-80.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table provides the offset parameters.

Table A.10 Offset Parameter List

Parameter	Contents	Description
PARAM08	Coil offset	Sets the coil's offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ according to function code.
The following table provides the valid parameters for each function code.

Table A.11 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter
01H	Reads coil state	PARAM08
02H	Reads input relay state	PARAM09
03H	Reads holding register content	PARAM11
04H	Reads input register content	PARAM10
05H	Changes single coil state	PARAM08
06H	Writes to single holding register	PARAM11
09H	Reads holding register content (extended)	PARAM11
0AH	Reads input register content (extended)	PARAM10
0BH	Writes to holding register (extended)	PARAM11
0EH	Discontinuously writes to holding register (extended)	PARAM11
0FH	Changes multiple coil states	PARAM08
10H	Writes to multiple holding registers	PARAM11
31H	Write to fixed buffer	PARAM11
32H	Reads the random access buffer	PARAM11
33H	Writes to the random access buffer	PARAM11

(11) Reserved by System 1 (PARAM12)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set it to “0” by using the user program. After that, the register is used by system. Do not change the value thereafter with the user program.

(12) Reserved by System 2 (PARAM13-PARAM16)

Used by system. Never change this value with the user program, etc.

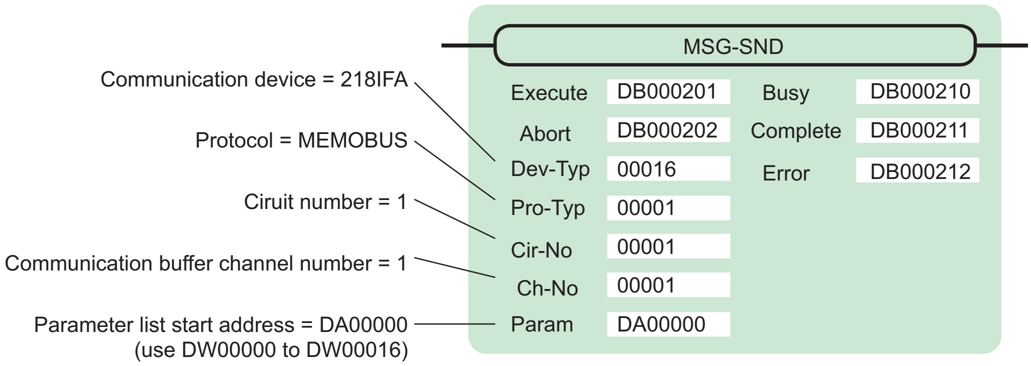
G.1.6 Function Setting and Parameter Details for MODBUS/TCP Protocol

This section explains the MSG-SND function setting and its parameter list details when MODBUS/TCP is used as a protocol type.

(1) Message Transmit Function Setting

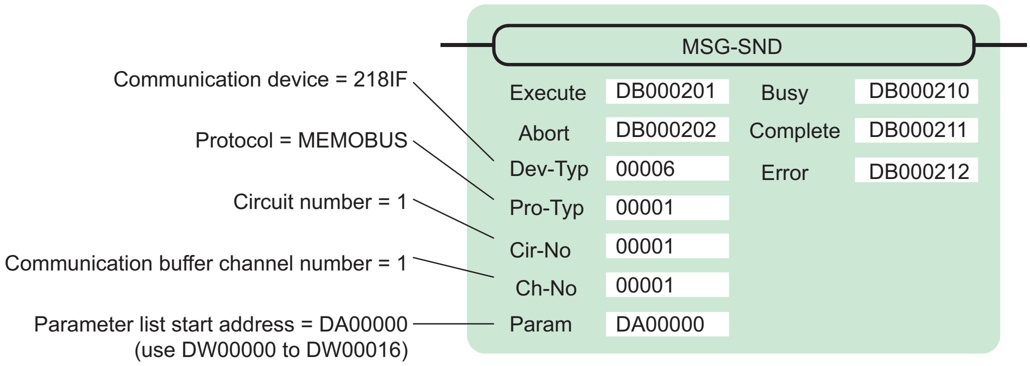
(a) 218IFA Setting Example

An example of a function setting when 218IFA is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MODBUS/TCP protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(b) 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MODBUS/TCP protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(2) Process Result (PARAM00)

Refer to *G.1.4 (2) Process Result (PARAM00)* on page A-57.

(3) Status (PARAM01)

Refer to *G.1.4 (3) Status (PARAM00)* on page A-58.

(4) Connection Number (PARAM02)

Refer to *G.1.4 (4) Connection Number (PARAM02)* on page A-60.

(5) Option (PARAM03)

Choose a unique setting for each communication device.
The following table provides the scope of the setting.

Communication Device	Valid Range	Remarks
Ethernet(218IF or 218IFA)	0 to 247, 255	Set a remote unit ID when MODBUS/TCP protocol is used. When the transmission target is MP2☐00 series, specify “0.”

(6) Function Code (PARAM04)

Set a function code to transmit.
The functions (read coil and input relay state, write to holding register, etc.) registered in the function codes are made available by specifying the code.
The following table shows the available function codes when using MODBUS/TCP as a protocol.

Table A.12 Function Code List (MODBUS/TCP)

Function Code	Target Data Type	Function	Communication device	
			Ethernet(218IF)	Ethernet(218IFA)
00H	–	Unused	–	–
01H	B	Reads coil state	√	√
02H	B	Reads input relay state	√	√
03H	W	Reads holding register content	√	√
04H	W	Reads input register content	√	√
05H	B	Changes single coil state	√	√
06H	W	Writes to single holding register	√	√
07H : 0EH	–	Unused	–	–
0FH	B	Changes multiple coil states	√	√
10H	W	Writes to multiple holding registers	√	√
11H : 15H	–	Unused	–	–
16H	W	Mask writes to holding register	–	√
17H	W	Reads/Writes multiple holding registers	–	√

Note: 1. B: Bit type, W: Integer type
2. √: Available, -: Not available
3. Transmit and receive registers in the master operation mode are MW (MB) only.
4. In the slave operation mode, coil, holding register, input relay, and input register are MB, MW, IB, IW respectively.

(7) Data Address (PARAM05)

Specify the start address of the data.
The address must be a decimal or hexadecimal number.
Example: When the start address is MW01000, specify “1000 (decimal)” or “3E8H (hexadecimal).”
The range of data addresses may differ according to the function code.
The following table gives the valid ranges of data addresses when using MODBUS/TCP as a protocol.

Table A.13 Valid Range of Data Addresses (MODBUS/TCP)

Function Code	Target Data Type	Function	Valid Range of Data Addresses
00H	–	Unused	Disable
01H	B	Reads coil state	0 to 65535 (0 to FFFFH)
02H	B	Reads input relay state	0 to 65535 (0 to FFFFH)
03H	W	Reads holding register content	0 to 65534 (0 to FFFEH)
04H	W	Reads input register content	0 to 32767 (0 to 7FFFH)
05H	B	Changes single coil state	0 to 65535 (0 to FFFFH)
06H	W	Writes to single holding register	0 to 65534 (0 to FFFEH)
07H : 0EH	–	Unused	Disable
0FH	B	Changes multiple coil states	0 to 65535 (0 to FFFFH)
10H	W	Writes to multiple holding registers	0 to 65534 (0 to FFFEH)
11H : 15H	–	Unused	Disable
16H	W	Mask writes to holding register*1, *2	0 to 65534 (0 to FFFEH)
17H	W	Reads/Writes multiple holding register*1, *3	0 to 65534 (0 to FFFEH)

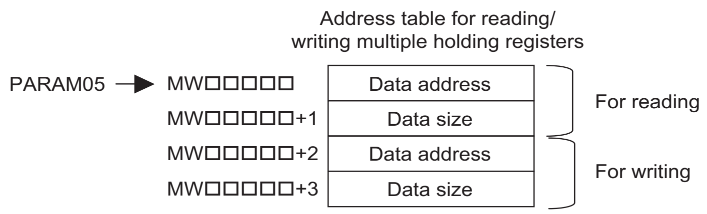
* 1. Invalid when Ethernet (218IF) is used.
* 2. Mask write request to holding register: Specify the start M register number of the remote address-cum-local data table
* 3. Request for reading/writing multiple holding registers: Specify the start M register number of an address table

Note: 1. Data table
A data table used for a mask write request to the holding register is used for storing mask data. The two words of addresses at the beginning of the M register specified by PARAM05 (data address) are used as an address table.
Specify AND and OR mask data for the data table.
Note that PARAM05 (data address) used for the mask write request to the holding register doubles as the start M register number in the local station, which is also used for specifying the start data address and as the data table in the remote station for mask writing.
The contents of the data table used when mask writing to the holding register is as follows:

Data table for mask writing to holding register

		Data table for mask writing to holding register
PARAM05 →	MW□□□□□	AND mask data
	MW□□□□□+1	OR mask data

2. Address table
   An address table used for the read/write request to the multiple holding registers is used for specifying addresses indirectly in order to indicate read/write data. The four words of addresses at the beginning of the M register set by PARAM05 (data address) are used as an address table.
   For the address table, specify a data address and data size for reading and a data address and data size for writing.
   Read behaves same as “Reads holding register content (function code: 03H)”. Write behaves same as “Writes to multiple holding registers (function code: 10H)”.
   The address table used when reading/writing multiple holding registers is as follows:



(8) Data Size (PARAM06)

Set the data size (number of bits or words) for the read/write request.
Be sure that the last data address determined based on the offset, data address, and data size does not go beyond the scope of the data addresses.
The range of data sizes may differ, depending on the function code.
The following table gives the valid ranges of data sizes when using MODBUS/TCP as a protocol.

Table A.14 Valid Range of Data Sizes (MODBUS/TCP)

Function Code	Target Data Type	Function	Valid Range of Data Addresses
00H	–	Unused	Disable
01H	B	Reads coil state*1	1 to 2000
02H	B	Reads input relay state*1	1 to 2000
03H	W	Reads holding register content*2	1 to 125
04H	W	Reads input register content*2	1 to 125
05H	B	Changes single coil state*1	Disable
06H	W	Writes to single holding register*2	Disable
07H : 0EH	–	Unused	Disable
0FH	B	Changes multiple coil states*1	1 to 00
10H	W	Writes to multiple holding registers*2	1 to 100
11H : 15H	–	Unused	Disable
16H	W	Mask writes to holding register*2, *3	Disable
17H	W	Reads/Writes multiple holding registers*2, *3	Read: 1 to 125 Write: 1 to 100

* 1. Specify the number of bits
* 2. Specify the number of words
* 3. Invalid when Ethernet (218IF) is used.
Note: The data size in the table is represented in decimal number.

(9) Remote CPU Number (PARAM07)

Refer to *G.1.4 (9) Remote CPU Number (PARAM07)* on page A-63.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify the offset addresses of the read data storage area and the write data source of the transmission side.
The address for the transmission side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.1.8 Relationship between Data Address, Data Size, and Offset for MSG-SND Function* on page A-80.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table lists the offset parameters.

Table A.15 Offset Parameter List

Parameter	Contents	Description
PARAM08	Coil offset	Sets the coil’s offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ, depending on the function code.
The following table lists the valid parameters for each function code.

Table A.16 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter
01H	Reads coil state	PARAM08
02H	Reads input relay state	PARAM09
03H	Reads holding register content	PARAM11
04H	Reads input register content	PARAM10
05H	Changes single coil state	PARAM08
06H	Writes to single holding register	PARAM11
0FH	Changes multiple coil states	PARAM08
10H	Writes to multiple holding registers	PARAM11
16H	Mask writes to holding register	PARAM11
17H	Reads/Writes multiple holding registers	PARAM11

(11) Reserved by System 1 (PARAM12)

Used by system (the channel number of communication buffer in use is stored).

Note: At the first scan during power up, make sure to set it to “0” by using the user program. After that, the register is used by system. Do not change the value thereafter with the user program.

(12) Reserved by System 2 (PARAM13 to PARAM16)

Used by system. Never change the value with the user program, etc.

G.1.7 Function Setting and Parameter Details for Non-procedural Protocol

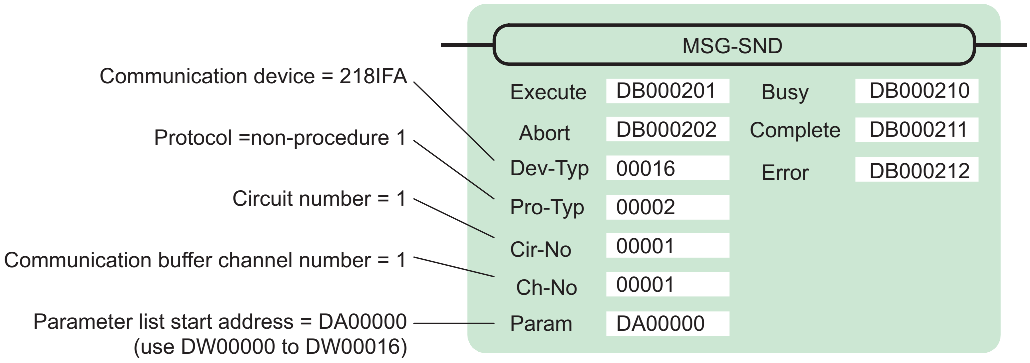
This section explains the MSG-SND function setting and its parameter list details when non-procedure is used as a protocol.

Note: Non-procedure communication protocol transmits the M register content intact without a protocol conversion. You can create any protocol in accordance with the remote equipment.

(1) Message Transmit Function Setting

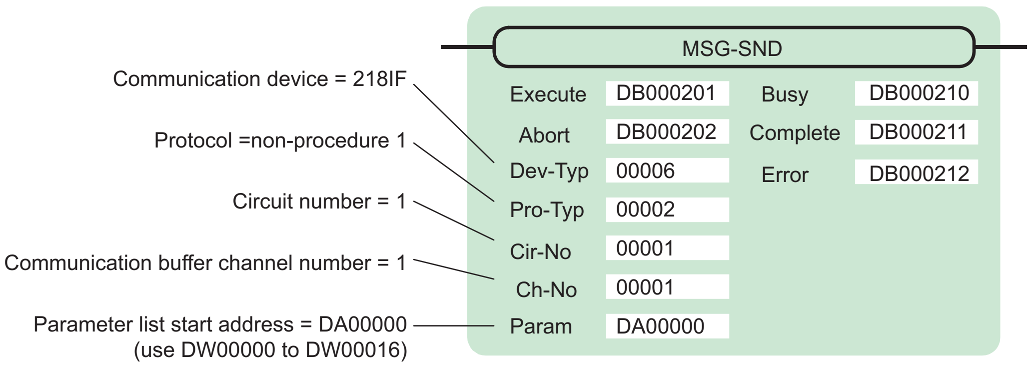
(a) 218IFA Setting Example

An example of a function setting when 218IFA is used as a communication device is as follows:
When non-procedure 2 (per byte) is used, set the Pro-Typ field to “00003” (non-procedure 1 (per word)).
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(b) 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
When non-procedure 2 (per byte) is used, set the Pro-Typ field to “00003” (non-procedure 1 (per word)) .
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.1.2 (1) Input Item* on page A-51 and *G.1.2 (2) Output Item* on page A-53.



(2) Process Result (PARAM00)

The process result is output to the upper byte. The lower byte is used for system analysis.

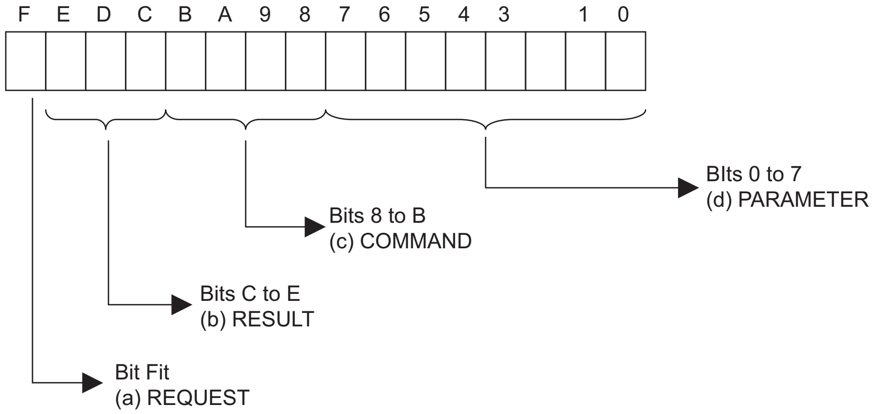
Value of Process Result	Meaning
00□□H	In process (Busy)
10□□H	Process completed (Complete)
8y□□H	Error occurred (Error)

When an error occurs, take corrective action by referring to the following error contents:

Value of Process Result	Error Contents	Description
80□□H	–	Reserved
81□□H	–	–
82□□H	Error in setting address	The following setting is out of range. Check the setting. PARAM05 (data address) PARAM11 (register offset)
83□□H	Data size error	The transmit or receive data amount is out of range. Check PARAM06 (data size).
84□□H	Error in setting circuit number	The circuit number is out of range. Check Cir-No (circuit number) of the MSG-SND function.
85□□H	Error in setting channel number	The communication buffer channel number is out of range. Check Ch-No (communication buffer channel number) of the MSG-SND function.
86□□H	Connection number error	The connection number is out of range. Check PARAM02 (connection number).
87□□H	–	Reserved
88□□H	Communication section error	An error response was returned from the communication section (communication device). Check the equipment connection. In addition, confirm that the remote device is open to communication.
89□□H	Device select error	Unavailable device is set. Check Dev-Typ (communication device type) of the MSG-SND function.

(3) Status (PARAM01)

Outputs status of the communication section (communication device).
The following figure illustrates bit assignment. Bit assignment details are listed in the table below.



(a) REQUEST (request)

Outputs whether MSG-SND function is requesting a process.

Bit State	Contents
1	Requesting processing
0	The acceptance of process request is completed

(b) RESULT (result)

Outputs an execution result of the MSG-SND function

Code	Abbreviation	Meaning
0	CONN_NG	In Ethernet communications, transmit error or connection error is complete
1	SEND_OK	Normal transmission complete
2	REC_OK	Normal reception complete
3	ABORT_OK	Forced abort complete
4	FMT_NG	Parameter format error
5	SEQ_NG	Command sequence error
6	RESET_NG	Reset state
7	REC_NG	Data reception error (error detected in the lower layer program)

(c) COMMAND (command)

Outputs a process command for the MSG-SND function. The executed process contents can be found according to the command.

Code (Hex)	Abbreviation	Meaning
1	U_SEND	General-purpose message transmission
2	U_REC	General-purpose message reception
3	ABORT	Forced abort
8	M_SEND	MEMOBUS command transmission: Complete when response is received (for MEMOBUS protocol)
9	M_REC	MEMOBUS command reception: Accompanies a response transmission (for MEMOBUS protocol)
C	MR_SEND	MEMOBUS response transmission (for MEMOBUS protocol)

(d) PARAMETER (parameter)

When RESULT (process result) = 4 (FMT_NG: parameter format error), an error code in the table below is output. Otherwise, the connection number is output.

RESULT (process result)	Code (Hex)	Meaning
When RESULT (process result) = 4 (FMT_NG: parameter format error)	00	No error
	01	Connection number is out of range
	02	Time error while monitoring to receive MEMOBUS response (for MEMOBUS protocol)
	03	Error in setting retransmit count
	04	Error in setting cyclic area
	05	CPU number error
	06	Data address error
	07	Data size error
	08	Function code error (for MEMOBUS protocol)
Others	xx	Connection number

(4) Connection Number (PARAM02)

Refer to *G.1.4 (4) Connection Number (PARAM02)* on page A-60.

(5) Data Address (PARAM05)

Specify the start address of the data.
The address must be input in a decimal or hexadecimal number.
Example: When the start address is MW01000, specify “1000 (decimal)” or “3E8H (hexadecimal).”
The following table provides the valid ranges of the data addresses.

Table A.17 Valid Range of Data Addresses (non-procedure)

Non-procedural Type	Target Data Type	Function	Valid Range of Data Addresses	
			Ethernet(218IF)	Ethernet(218IFA)
Non-procedure 1	W	Transmits data in words	0 to 65534 (0 to FFFEH)	
Non-procedure 2	B	Transmits data in bytes*1	0 to 65534 (0 to FFFEH)	

* 1. The unit for address setting is word address.

(6) Data Size (PARAM06)

Set the data size (number of bits or words) for the write request.
Be sure that the last data address determined based on the offset, data address, and data size does not go beyond the scope of the data addresses.
The valid range of data sizes may differ according to the communication device.

Table A.18 Valid Range of Data Sizes (non-procedure)

Non-procedural Type	Target Data Type	Function	Valid Range of Data Sizes	
			Ethernet (218IF)	Ethernet (218IFA)
Non-procedure 1	W	Transmits data in words*1	1 to 510	1 to 2046 (BIN) 1 to 1023 (ASCII)
Non-procedure 2	B	Transmits data in bytes*2	1 to 1020	1 to 4092 (BIN) 1 to 2046 (ASCII)

* 1. Specify the number of words
* 2. Specify the number of bytes
Note: The data size in the table is represented in decimal numbers.

(7) Register Offset (PARAM11)

Specify the offset address of write data source in the transmission side.
The address for the transmission side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.1.8 Relationship between Data Address, Data Size, and Offset for MSG-SND Function* on page A-80.
2. The offset cannot be a negative value.
Example: When specifying 1000 words of offset for the register address:
PARAM11=1000

(8) Reserved by System 1 (PARAM12)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set this to “0” by the user program. After that, the register is used by system, so do not change the value with the user program.

(9) Reserved by System 2 (PARAM13-PARAM16)

Used by system. Do not change the value with the user program, etc.

G.1.8 Relationship between Data Address, Data Size, and Offset for MSG-SND Function

The relationship between data address, data size, and offset is as follows, when transmitted with offset:

(1) When Reading

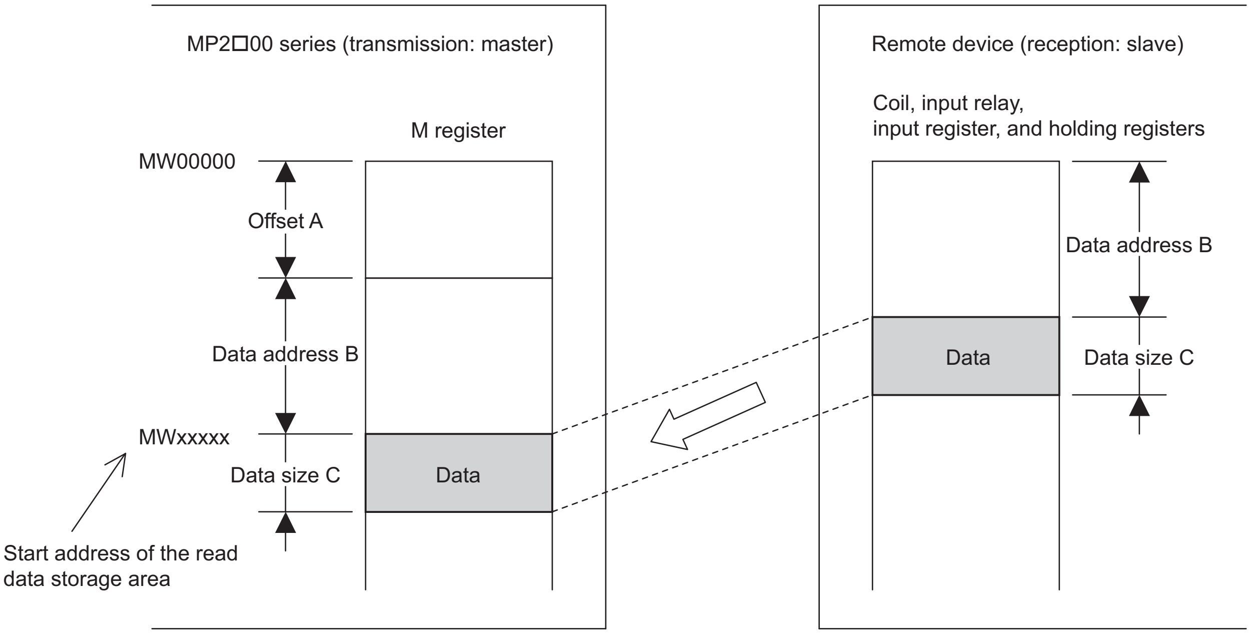


Fig. A.4 Data Flow when Reading

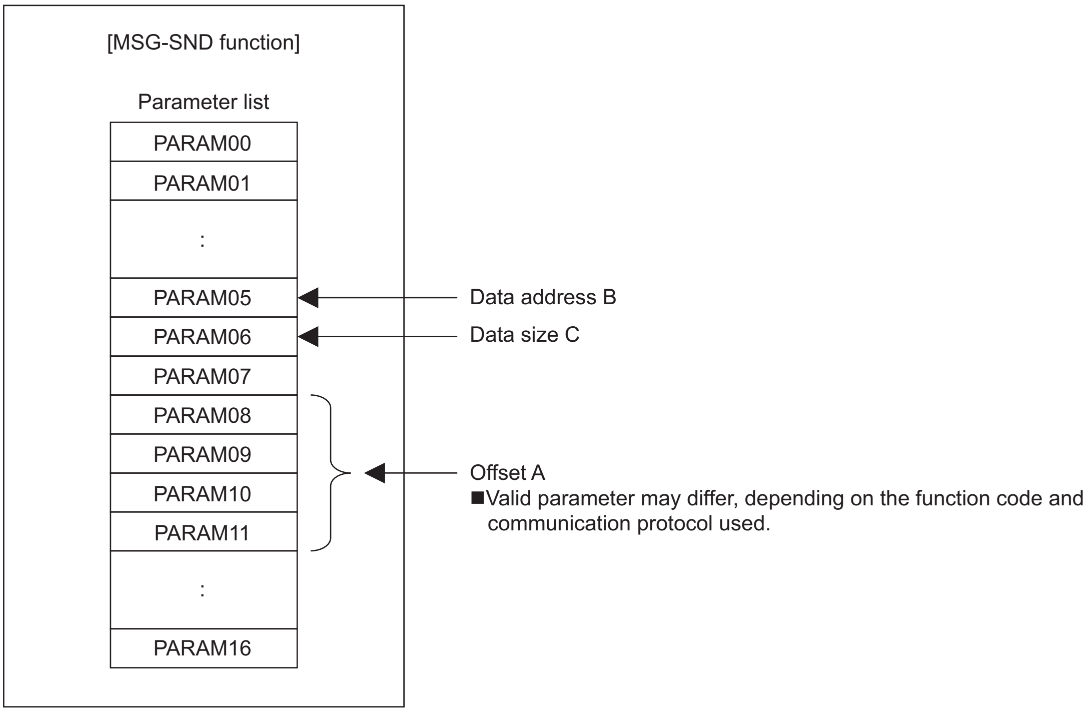


Fig. A.5 Parameter Setting

(2) When Writing

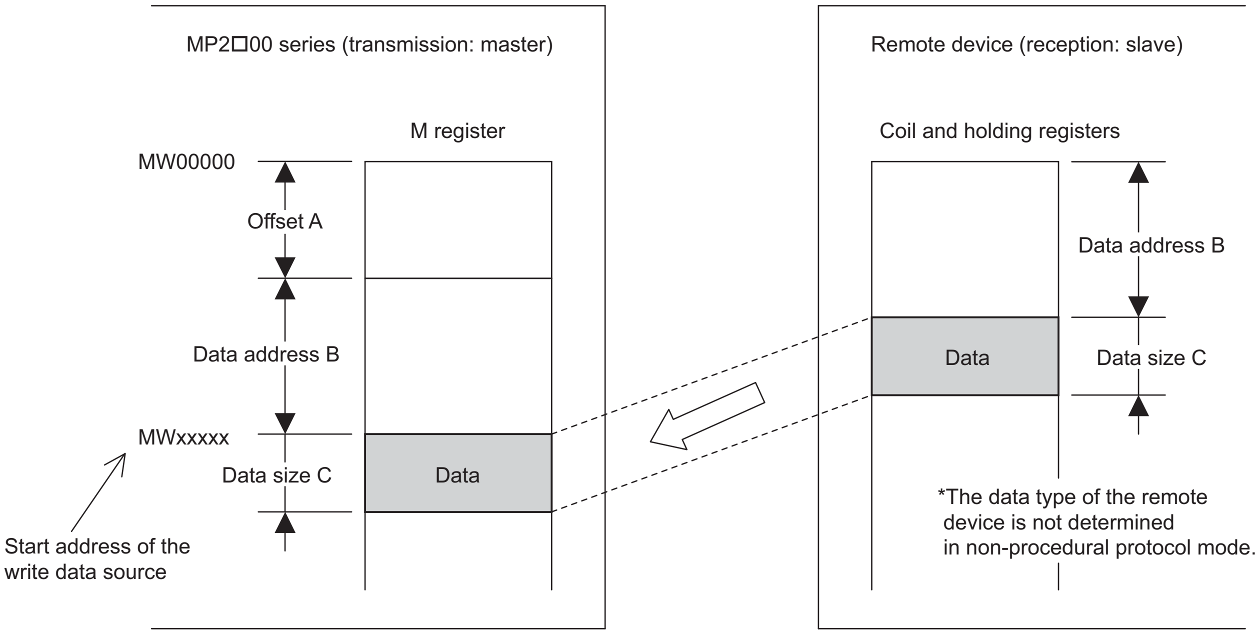


Fig. A.6 Data Flow when Writing

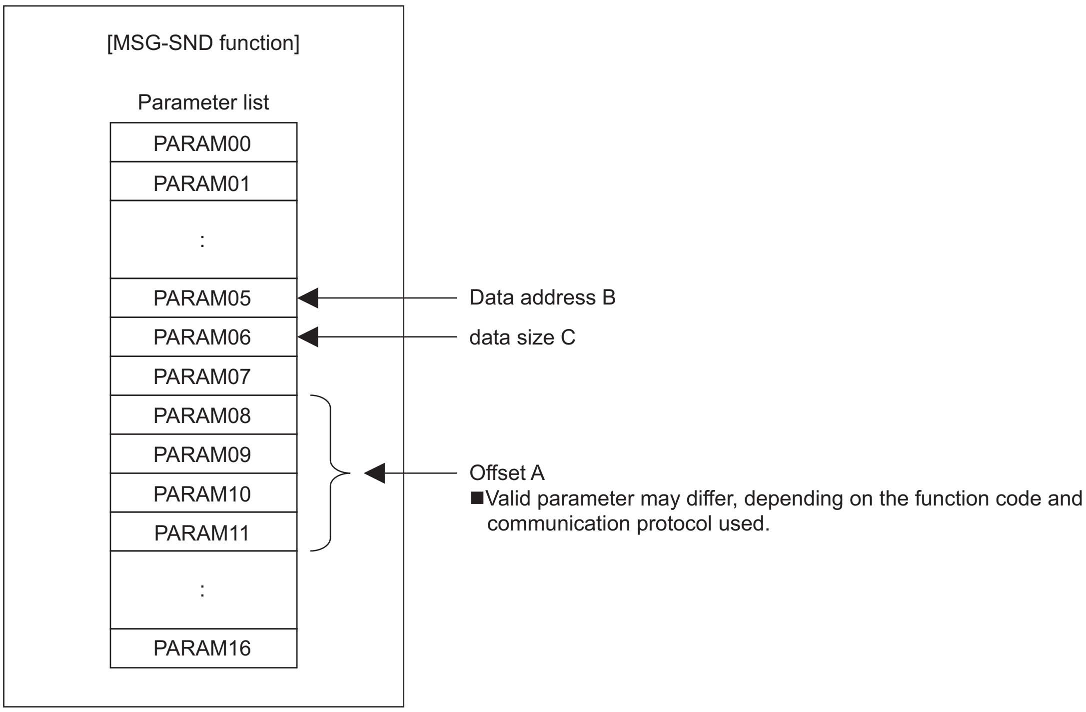
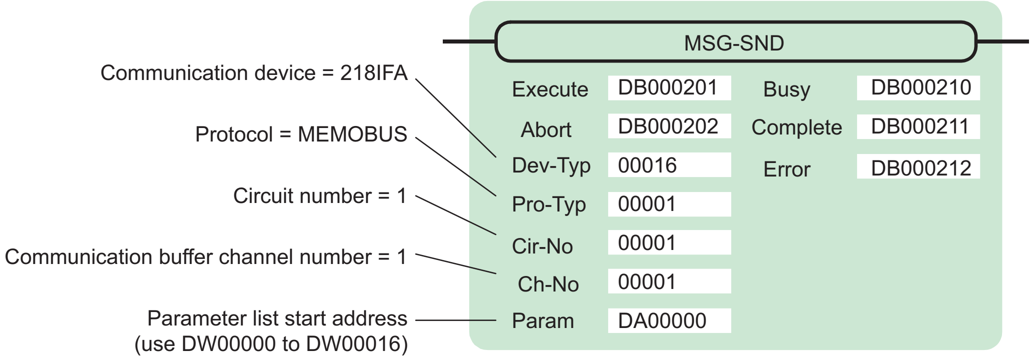


Fig. A.7 Parameter Setting

Example: When reading coil state with offset:
The various setting values and their relationships with the data of the remote device are as follows, when transmitting "reading coil state" with offset in MEMOBUS protocol:

- Description of the MSG-SND function in ladder program



- Parameter list setting of the MSG-SND function

Table A.19 Parameter List Setting

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	00001	PARAM04	IN	Function code=1 (reads coil state)
DW00005	08192	PARAM05	IN	Data address=8192 bits (512 words)
DW00006	00100	PARAM06	IN	Data size=100
DW00007	00001	PARAM07	IN	Remote CPU number=1
DW00008	01000	PARAM08	IN	Coil offset=1000 words
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 (zero clear at startup)
DW00013	–	PARAM13	SYS	Reserved
DW00014	–	PARAM14	SYS	Reserved
DW00015	–	PARAM15	SYS	Reserved
DW00016	–	PARAM16	SYS	Reserved

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

- Relationship with the Data of the Remote Device
  The following figure shows the data flow when transmitting “reads coil state” with offset:
  When transmission and reception are carried out normally in the figure below, the coil state in the device is stored in MW01512 and after of MP2310.

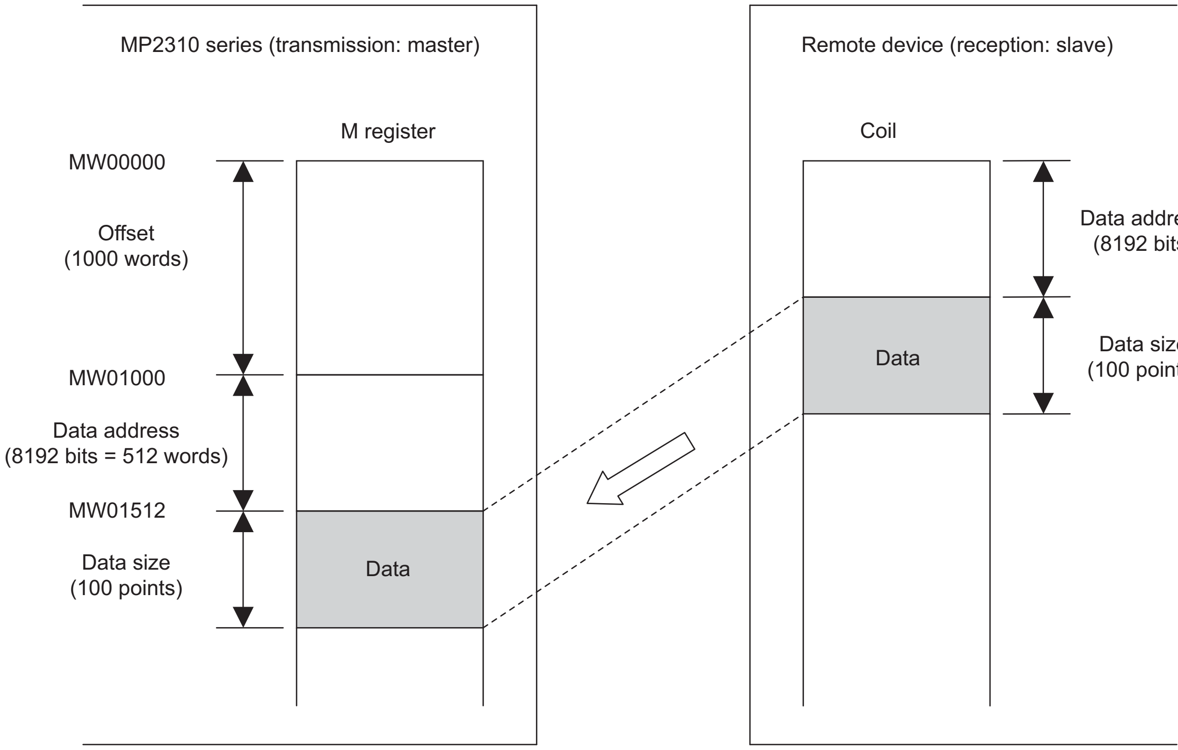
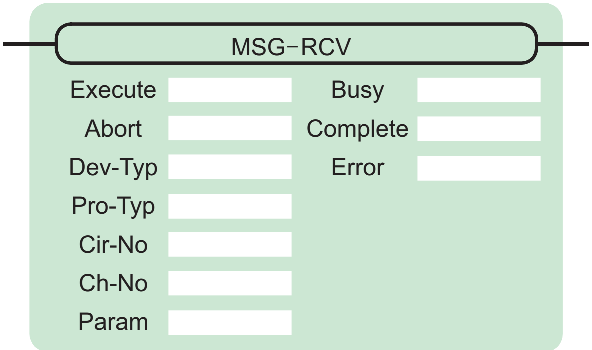


Fig. A.8 Reading Example of Coil State

G.2 Message Receive Function (MSG-RCV)

This section explains how the message receive function (MSG-RCV) is used in a ladder program when receiving messages.

G.2.1 Specification Overview of the Message Receive Function

Function Name	MSG-RCV			
Function	Receives messages from the remote station on the circuit specified by the communication device type. Supports multiple protocol types. Keep the execution command (Execute) until Complete or Error turns ON.			
Function Definition				
I/O Definition	No.	Name	I/O Option (*1)	Contents
Input Item	1	Execute	B-VAL	Executes a reception
	2	Abort	B-VAL	Forcibly ends a reception
	3	Dev-Typ	I-REG	Communication device type Ethernet (218IF) = 6, Ethernet (218IFA) = 16
	4	Pro-Typ	I-REG	Communication protocol MEMOBUS*2 = 1, non-procedure 1*3 = 2, non-procedure 2*3 = 3
	5	Cir-No	I-REG	Line number Ethernet (218IF) = 1-8, Ethernet (218IFA) = 1 to 8
	6	Ch-No	I-REG	Communication buffer channel number Ethernet (218IF) = 1-10, Ethernet (218IFA) = 1 to 4
	7	Param	Address input	Parameter list start address (MA, DA)
Output Item	1	Busy	B-VAL	In process
	2	Complete	B-VAL	Process completed
	3	Error	B-VAL	Error occurred

* 1. The meanings of I/O options are as follows:
B-VAL: Specify I/O by bit type data.
I-REG: Specify I/O by integer type data. When specifying, set an integer type register number.
As for the input only, it can be a constant (literal).
Address input: The address of the specified register (any integer register) is passed to the function.

* 2. When transmitting in MEMOBUS, Extended MEMOBUS, MELSEC, OMRON, or MODBUS/TCP protocol, set the communication protocol (Pro-Typ) to MEMOBUS(=1). The communication device automatically converts the protocol.

* 3. 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.

G.2.2 I/O Item Details of the Message Receive Function

(1) Input Item

The following table indicates the registers available for each input item.

Input Item	I/O Option	Available Register
Execute Abort	B-VAL	Every bit type register (except #, C registers), Same as above with subscript
Dev-typ Pro-Typ Cir-No Ch-No	I-REG	Every integer type register, Same as above with subscript, Constant
Param	Address input	Register address (except #, C registers), Same as above with subscript

1. Execute (executes a reception)

Specify a bit to command execution of a message reception.
When Execute turns ON, the message reception is carried out. In order to execute the process, a ladder program or the like needs to be used to switch the bit ON/OFF.

Note: Keep Execute (executes a reception) until Complete (process completed) or Error (error occurred) is turned ON. When the command turns ON, the message reception is carried out.
To continuously command the receive execution, make sure to turn Execute (executes a reception) OFF for one scan or more.

2. Abort (forcibly ends a reception)

Specify a bit to command a forced abort of a message reception.
When Abort turns ON, the message reception is forcibly terminated. Abort takes precedence over Execute.
In order to execute the forced abort, a ladder program or the like needs to be used to switch the bit ON/OFF.

3. Dev-Typ (communication device type)

Specify the type of communication device.

Device	Type Code
Ethernet (218IF)	6
Ethernet (218IFA)	16

4. Pro-Typ (communication protocol)

Specify the communication protocol.

Type Code	Communication Protocol	Remarks
1	MEMOBUS	Set the type code to “1” when also transmitting using Extended MEMOBUS, MELSEC, or MODBUS/TCP protocol. The communication device will automatically convert the protocol.
2	Non-procedure 1 (per word)	Data is received on a per-word basis in non-procedural communication. No response is transmitted to the remote.
3	Non-procedure 2 (per byte)	Data is received on a per-byte basis in non-procedural communication. No response is transmitted to the remote.

5. Cir-No (circuit number)

Specify a circuit number for the communication device.
Specify it in accordance with the circuit number displayed in the **MPE720 Module Configuration Definition** Window.

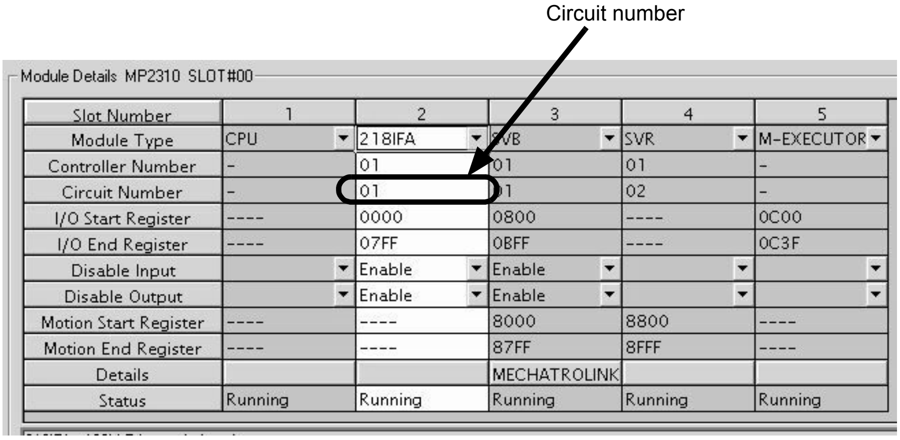


Fig. B.9 MPE720 Module Configuration Definition Window

The following table indicates the range of valid circuit numbers.

Communication device	Valid Circuit Number
Ethernet (218IF･218IFA)	1 to 8

6. Ch-No (communication buffer channel number)

Specify the channel number of a communication buffer.
It can be any channel number in the range. However, when starting multiple functions at the same time, set a unique channel for each function. (If you do not start up multiple functions at the same time, the channel numbers can duplicate each other.)
The following table indicates the range of valid channel numbers.

Communication device	Valid Channel Number
Ethernet (218IF)	1 to 10
Ethernet (218IFA)	1 to 4

When the communication device is Ethernet (218IFA), because the communication buffer common to the transmission and reception have four channels, four receptions (or transmissions) are available at the same time by using channel numbers 1 to 4.

Note: 1. As many MSG-RCV (or MSG-SND) functions as lines used at the same time are required.
2. For information on communication buffer channel, refer to *G.3 Communication Buffer Channel* on page A-115.

7. Param (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. In the parameter list, enter the function code and its relevant parameter data. Additionally, process result and status are output.

Note: For more information about the parameter list, refer to the parameter details for each protocol from *G.2.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols* on page A-91 to *G.2.7 Function Setting and Parameter Details for Non-procedural Protocol* on page A-106.

Example: When “DA00000” is specified as a parameter list start address:

Register	Parameter list F ··· ···· ···· ··· 0
DW00000	PRAM00
DW00001	PRAM01
DW00002	PRAM02
DW00003	PRAM03
DW00004	PRAM04
DW00005	PRAM05
DW00006	PRAM06
DW00007	PRAM07
DW00008	PRAM08
DW00009	PRAM09
DW00010	PRAM10
DW00011	PRAM11
DW00012	PRAM12
DW00013	PRAM13
DW00014	PRAM14
DW00015	PRAM15
DW00016	PRAM16

(2) Output Item

The following table lists the registers available for each output item.

Input Item	I/O Option	Available Register
Busy Complete Error	B-VAL	Every bit type register (except #, C registers), Same as above for subscript

1. Busy (in process)

Specify a bit to report message reception.
The Busy bit is turned ON while executing message reception or a forced abort process.
Keep Execute or Abort ON while Busy is ON.

2. Complete (process completed)

Specify a bit to report message reception ended.
When message reception or a forced abort process is completed properly, the Complete bit will turn ON only for one scan.

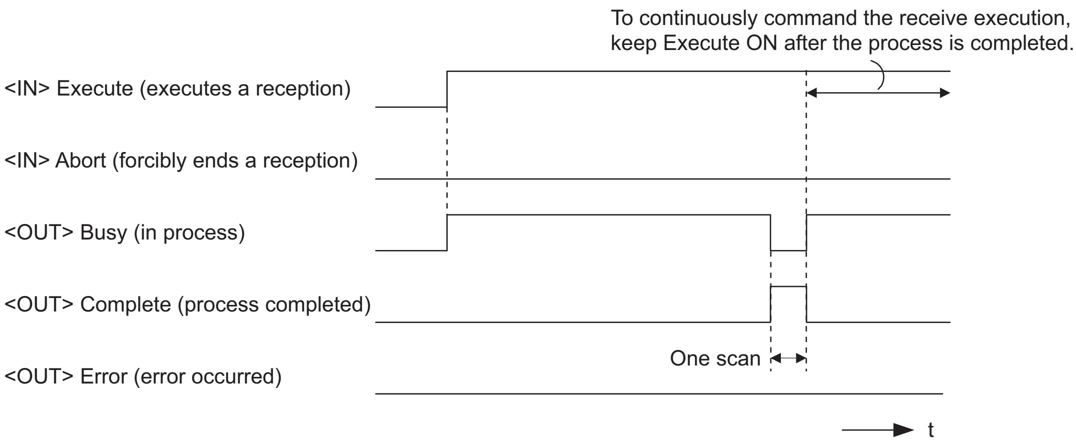
3. Error (error occurred)

Specify a bit to report when an error occurs in the message reception.
When an error occurs, the Error bit will turn ON only for one scan.

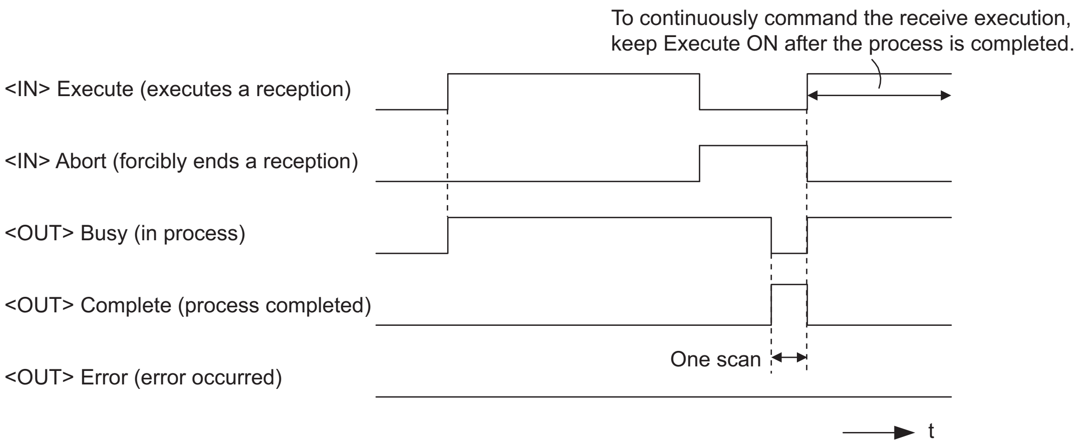
Note: For more information about the error cause, refer to *G.2.4 (2) Process Result (PARAM00)* on page A-92 and *G.2.4 (3) Status (PARAM01)* on page A-93.

A timing chart of bit type I/O items in the MSG-RCV function follows:

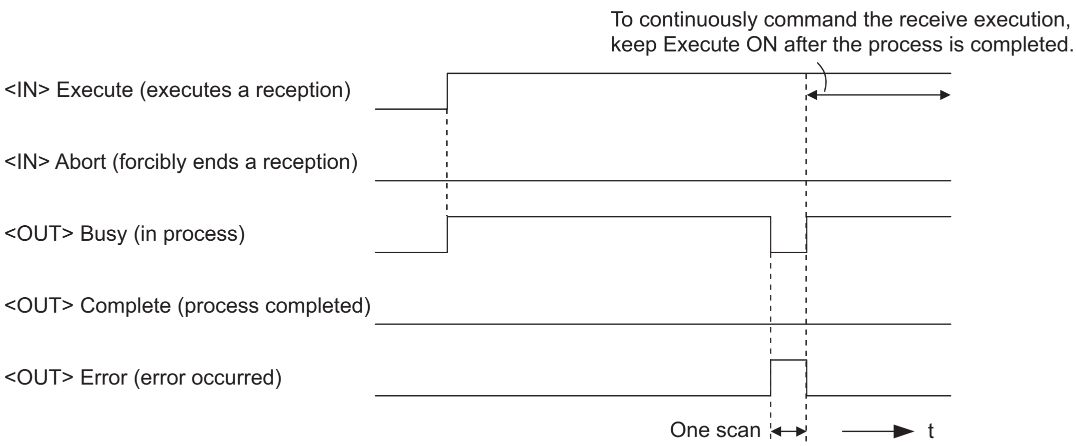
[In Normal Condition]



[When Forcibly Aborted]



[When Error Occurred]



G.2.3 Message Receive Function Parameter List (Param) Overview

Param of the MSG-RCV function has a parameter list structure composed of 17 words. (The value of Param itself is the start address (MA, DA) of the parameter list.)

In the parameter list, enter the function code and its relevant parameter data. Process result and status are also output.

When MEMOBUS and non-procedure are used as a transmission protocol, the parameter list is as follows:

Note: Parameter details are explained in the parameter details for each protocol type. Refer to the following items:

- *G.2.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols* on page A-91
- *G.2.5 Function Setting and Parameter Details for MELSEC Protocol* on page A-98
- *G.2.6 Function Setting and Parameter Details for MODBUS/TCP Protocol* on page A-102
- *G.2.7 Function Setting and Parameter Details for Non-procedural Protocol* on page A-106

(1) MEMOBUS Parameter List

Param No.	IN/OUT	Contents	Description
00	OUT	Process result	Outputs process results.
01	OUT	Status	Outputs the status of the communication device.
02	IN	Connection number	Specifies the remote source.
03	OUT	Option	Outputs a unique value for each communication device.
04	OUT	Function code	Outputs a function code requested from the transmission side.
05	OUT*	Data address	Outputs the start address of data requested from the transmission side.
06	OUT	Data size	Outputs the read/write data size requested from the transmission side.
07	OUT	Remote CPU number	Outputs the remote CPU number.
08	IN	Coil offset	Sets the coil's offset word address.
09	IN	Input relay offset	Sets the offset word address of an input relay.
10	IN	Input register offset	Sets the offset word address of an input register.
11	IN	Holding register offset	Sets the offset word address of a holding register.
12	IN	Write range LO	Sets the start address for a write range.
13	IN	Write range HI	Sets the last address for a write range.
14	SYS	Reserved 1	
05 to 16	SYS	Reserved 2	

* It is IN/OUT for MODBUS/TCP.

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

Appendices

A

(2) Non-procedural Parameter List

Param No.	IN/OUT	Contents	Description
00	OUT	Process result	Outputs the process results.
01	OUT	Status	Outputs the status of the communication device.
02	IN	Connection number	Specifies the remote source.
03	OUT	Not used	
04	OUT	Not used	
05	OUT	Not used	
06	OUT	Data size	Outputs the write data size requested from the transmission side.
07	OUT	Not used	
08 to 11	IN	Not used	
12	IN	Register offset	Sets the register's offset word address.
13	IN	Write range HI	Sets the last address for a write range.
14	SYS	Reserved 1	
15 to 16	SYS	Reserved 2	

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

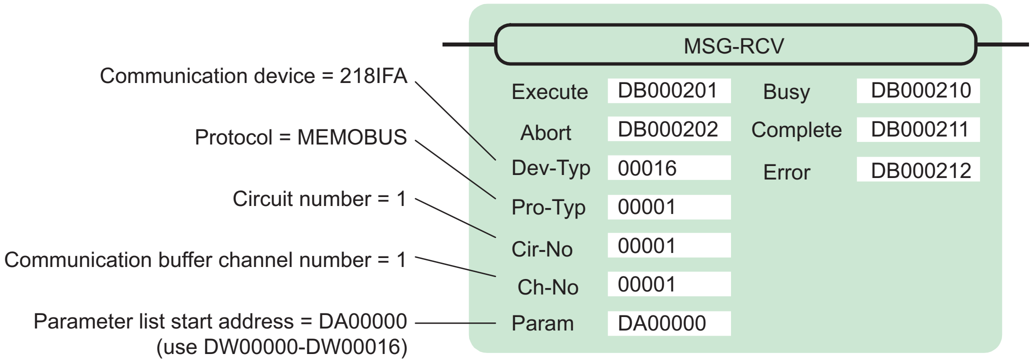
G.2.4 Function Setting and Parameter Details for MEMOBUS and Extended MEMOBUS Protocols

This section explains the MSG-RCV function setting and its parameter list details when MEMOBUS or Extended MEMOBUS is used as a protocol.

(1) Message Receive Function Setting

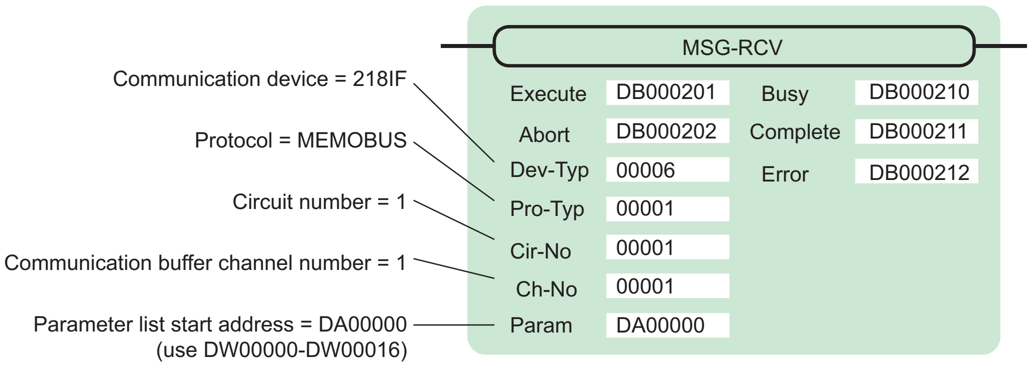
[a] 218IFA Setting Example

An example of a function setting when 218IFA is used as a communication device follows:
Set the protocol type to MEMOBUS even when used in Extended MEMOBUS protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



[b] 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS even when used in Extended MEMOBUS protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



(2) Process Result (PARAM00)

The process result is output to the upper byte. The lower byte is used for system analysis.

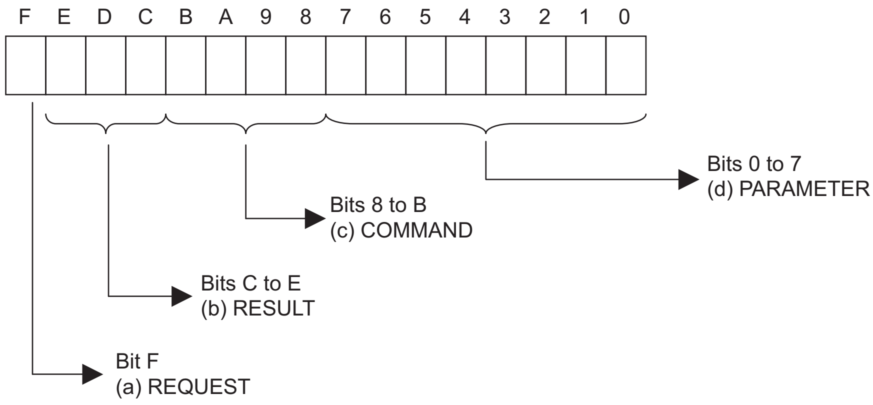
Value of Process Result	Meaning
00□□H	In process (Busy)
10□□H	Process completed (Complete)
8y□□H	Error occurred (Error)

When an error occurs, take corrective action by referring to the following error contents:

Value of Process Result	Error Contents	Description
80□□H	–	Reserved
81□□H	Function code error	Unused function code was received. Check the source function code. The following setting is out of range. Check the setting.
82□□H	Error in setting address	Data address (request from transmission side) PARAM08 (coil offset) PARAM09 (input relay offset) PARAM10 (input register offset) PARAM11 (holding register offset)
83□□H	Data size error	The received data size is out of range. Check the source data size.
84□□H	Error in setting circuit number	The circuit number is out of range. Check Cir-No (circuit number) of the MSG-RCV function.
85□□H	Error in setting channel number	The communication buffer channel number is out of range. Check Ch-No (communication buffer channel number) of the MSG-RCV function.
86□□H	Connection number error	The connection number is out of range. Check PARAM02 (connection number).
87□□H	–	Reserved
88□□H	Communication section error	An error response was returned from the communication section (communication device). Check the equipment connection. In addition, check that the remote device is open to communication.
89□□H	Device select error	Unavailable device is set. Check Dev-Typ (communication device type) of the MSG-RCV function.

(3) Status (PARAM01)

Outputs status of the communication section (communication device).
The following figure shows the bit assignment. Bit assignment details are listed in the tables following.



[a] REQUEST (request)

Outputs whether MSG-RCV function is requesting a process.

Bit State	Contents
1	Requesting processing
0	The acceptance of process request is completed

[b] RESULT (result)

Outputs the execution result of the MSG-RCV function.

Code	Abbreviation	Meaning
0	CONN_NG	In Ethernet communication, transmission or connection error is completed
1	SEND_OK	Normal transmission complete
2	REC_OK	Normal reception complete
3	ABORT_OK	Forced abort complete
4	FMT_NG	Parameter format error
5	SEQ_NG	Command sequence error
6	RESET_NG	Reset state
7	REC_NG	Data reception error (error detected in the lower layer program)

[c] COMMAND (command)

Outputs a process command for the MSG-RCV function. The executed process contents can be found according to the command.

Code (Hex)	Abbreviation	Meaning
1	U_SEND	General-purpose message transmission (for non-procedural protocol)
2	U_REC	General-purpose message reception (for non-procedural protocol)
3	ABORT	Forced abort
8	M_SEND	MEMOBUS command transmission: Completed when response is received
9	M_REC	MEMOBUS command reception: Accompanies a response transmission
C	MR_SEND	MEMOBUS response transmission

[d] PARAMETER (parameter)

When RESULT(process result) = 4 (FMT_NG: parameter format error), an error code in the table below is output. Otherwise, the connection number is output.

RESULT (process result)	Code (Hex)	Meaning
When RESULT (process result) =4 (FMT_NG: parameter format error)	00	No error
	01	Connection number is out of range
	02	Time error for monitoring to receive MEMOBUS response
	03	Error in setting retransmit count
	04	Error in setting cyclic area
	05	CPU number error
	06	Data address error
	07	Data size error
	08	Function code error
Others	xx	Connection number

(4) Connection Number (PARAM02)

Specify the remote source.
When the communication device is Ethernet (218IF or 218IFA), set the connection number.
The following table shows the setting range.

Communication Device	Connection Number	Remarks
Ethernet (218IF)	1 to 20	Receives from the remote station set for the specified connection number.
Ethernet (218IFA)	1 to 4	Same as above

Note: When the communication device is Ethernet (218IF/218IFA), set the connection number in accordance with the connection number in the 218IF/218IFA Parameter Setting Window for the MPE720 module configuration definition.

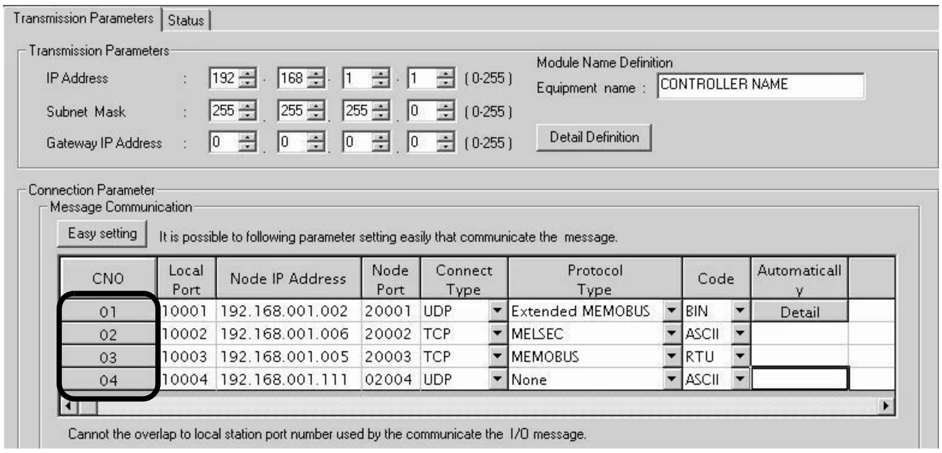


Fig. B.10 218IFA Parameter Setting Screen for the MPE720 Module Configuration Definition Window

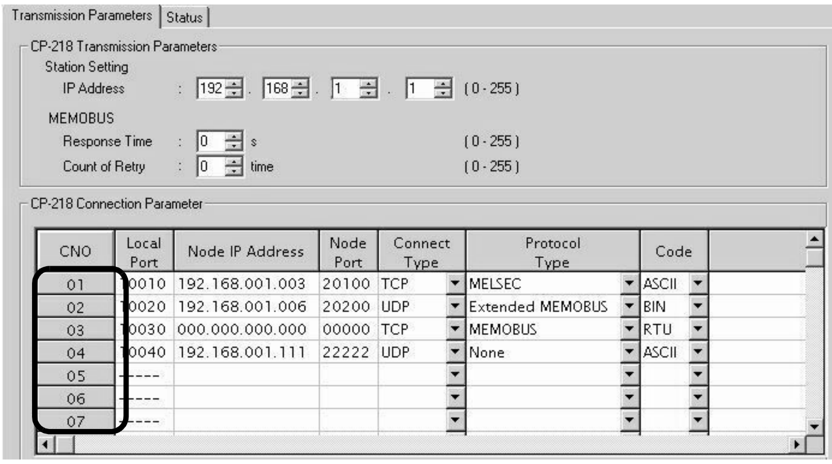


Fig. B.11 218IF Parameter Setting Screen for the MPE720 Module Configuration Definition Window

(5) Option (PARAM03)

A unique value is output for each communication device.
Not used for the MEMOBUS or Extended MEMOBUS protocols.

(6) Function Code (PARAM04)

Received function code is output.
The following table lists function codes available when using MEMOBUS or Extended MEMOBUS as a protocol.

Table B.20 Function Code List (MEMOBUS, Extended MEMOBUS)

Function Code	Target Data Type	Function	Protocol	
			Extended MEMO-BUS	MEMOBUS
00H	–	Unused	–	–
01H	B	Reads coil state	√	√
02H	B	Reads input relay state	√	√
03H	W	Reads holding register content	√	√
04H	W	Reads input register content	√	√
05H	B	Changes single coil state	√	√
06H	W	Writes to single holding register	√	√
07H	–	Unused	–	–
08H	–	Loopback test	√	√
09H	W	Reads holding register content (extended)	√	–
0AH	W	Reads input register content (extended)	√	–
0BH	W	Writes to holding register (extended)	√	–
0CH	–	Unused	–	–
0DH	W	Discontinuously reads holding register (extended)	√	–
0EH	W	Discontinuously writes to holding register (extended)	√	–
0FH	B	Changes multiple coil states	√	√
10H	W	Writes to multiple holding registers	√	√

Note: 1. B: Bit type, W: Integer type
2. √: Available, -: Not available
3. Transmit and receive registers in the master operation mode are MW (MB) only.
4. In the slave operation mode, coil, holding register, input relay, and input register are MB, MW, IB, IW respectively.

(7) Data Address (PARAM05)

A data address requested from the transmission side is output.

(8) Data Size (PARAM06)

The read/write data size (number of bits or words) requested from the transmission side is output.

(9) Remote CPU Number (PARAM07)

When the remote equipment is MP2□00 series, “1” is output.
When the remote equipment is a controller manufactured by YASKAWA Electric Corporation other than MP2□00 series and is comprised of multiple CPU modules, the remote CPU number is output.
Otherwise, “0” is output.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify an offset address for the reception side data address.
The address for the reception side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function* on page A-111.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table lists the offset parameters.

Table B.21 Offset Parameter List

Parameter	Contents	Description
PARAM08	Coil offset	Sets the coil's offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ according to the function code.
The following table lists the valid parameters for each function code.

Table B.22 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter	Protocol Type	
			Extended MEMOBUS	MEMOBUS
01H	Reads coil state	PARAM08	√	√
02H	Reads input relay state	PARAM09	√	√
03H	Reads holding register content	PARAM11	√	√
04H	Reads input register content	PARAM10	√	√
05H	Changes single coil state	PARAM08	√	√
06H	Writes to single holding register	PARAM11	√	√
09H	Reads holding register content (extended)	PARAM11	√	–
0AH	Reads input register content (extended)	PARAM10	√	–
0BH	Writes to holding register (extended)	PARAM11	√	–
0DH	Discontinuously reads holding register (extended)	PARAM11	√	–
0EH	Discontinuously writes to holding register (extended)	PARAM11	√	–
0FH	Changes multiple coil states	PARAM08	√	√
10H	Writes to multiple holding registers	PARAM11	√	√

Note: √: Available, -: Not available

(11) Write Range (PARAM12, PARAM13)

Sets an available address range for the write request from the transmission side. A write request which is out of this available address range will cause an error.

Specify the address range (PARAM12, PARAM13) as a word address.

Note: 1. In MP9□0/ MP2□00 series, the data storage area for the write request from the transmission side is M register.
2. The write range parameter enables you to specify the range of M register which permits writing messages.

The following table indicates the write range parameters.

Table B.23 Write Range Parameter List

Parameter	Contents	Description
PARAM12	Write range LO	Start address of the write range
PARAM13	Write range HI	Last address of the write range

Specify the write range so that the expression below is met:

0 ≤ Write range LO ≤ Write range HI ≤ Maximum address of M register

This write range is effective for the following function codes:

05H (changes single coil state)
06H (writes to single holding register)
0BH (writes to holding register (extended))
0EH (discontinuously writes to holding register (extended))
0FH (changes multiple coil states)
10H (writes to multiple holding registers)

Example: When setting the address of M register which permits writing to 1000 to 1999:
PARAM12=1000
PARAM13=1999
The reception side will return an error against a write request to an address other than MW01000 to MW01999, and will not write it.

(12) Reserved by System 1 (PARAM14)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set this to “0” with the user program. After that, the register is used by system, so do not change the value with the user program.

(13) Reserved by System 2 (PARAM15, PARAM16)

Used by system. Do not change the value with the user program, etc.

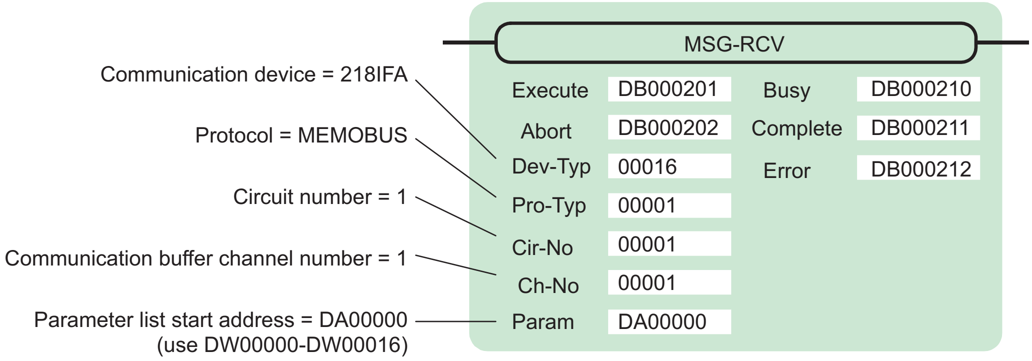
G.2.5 Function Setting and Parameter Details for MELSEC Protocol

This section explains the MSG-RCV function setting and its parameter list details when MELSEC is used as a protocol.

(1) Message Receive Function Setting

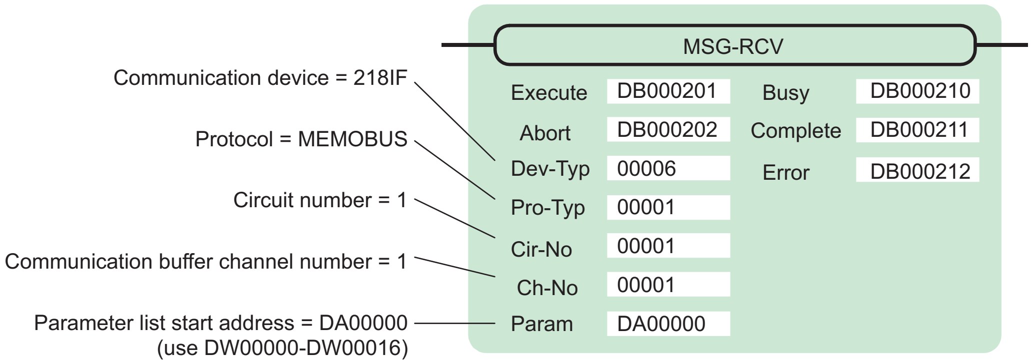
[a] 218IFA Setting Example

An example of a function setting when 218IFA is used as a transmission device follows:
Set the protocol type to MEMOBUS when used in MELSEC protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



[b] 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MELSEC protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



(2) Process Result (PARAM00)

Refer to *G.2.4 (2) Process Result (PARAM00)* on page A-92.

(3) Status (PARAM01)

Refer to *G.2.4 (3) Status (PARAM01)* on page A-93.

(4) Connection Number (PARAM02)

Refer to *G.2.4 (4) Connection Number (PARAM02)* on page A-94.

(5) Option (PARAM03)

A unique value is output for each communication device.
Not used for the MELSEC protocol.

(6) Function Code (PARAM04)

Received function code is output.
The following table lists the function codes available when using the MELSEC protocol.

Table B.24 Function Code List (MELSEC)

Function Code	MELSEC ACPU Common Command	Target Data Type	Function
01H/02H	00H	B	Reads bit device in units
03H/04H/09H/0AH	01H	W	Reads word device in units
05H/0FH	02H	B	Writes to bit device in units
06H/0BH/10H	03H	W	Writes to word device in units
08H	16H	–	Loopback test
0EH	05H	B	Specifies a device number for each word device at random and sets/resets each word device
31H	60H	W	Writes to the fixed buffer in words
32H	61H	W	Reads from the random access buffer in words (unable to receive for MP2□00 series)
33H	62H	W	Writes to the random access buffer in words

Note: 1. B: Bit type, W: Integer type
2. AnCPU dedicated commands are not supported. Commands for extended file register are not supported.

(7) Data Address (PARAM05)

A data address requested from the transmission side is output.

(8) Data Size (PARAM06)

The read/write data size (number of bits or words) requested from the transmission side is output.

(9) Remote CPU Number (PARAM07)

Refer to *G.2.4 (9) Remote CPU Number (PARAM07)* on page A-96.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify an offset address for the reception side data address.
The address for the reception side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function* on page A-111.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table lists the offset parameters.

Table B.25 Offset Parameter List

Parameter	Contents	Description
PARAM08	Coil offset	Sets the coil's offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ according to the function code.
The following table lists the valid parameters for the function codes.

Table B.26 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter
01H	Reads coil state	PARAM08
02H	Reads input relay state	PARAM09
03H	Reads holding register content	PARAM11
04H	Reads input register content	PARAM10
05H	Changes single coil state	PARAM08
06H	Writes to single holding register	PARAM11
09H	Reads holding register content (extended)	PARAM11
0AH	Reads input register content (extended)	PARAM10
0BH	Writes to holding register (extended)	PARAM11
0EH	Discontinuously writes to holding register (extended)	PARAM11
0FH	Changes multiple coil states	PARAM08
10H	Writes to multiple holding registers	PARAM11
31H	Writes to fixed buffer	PARAM11
32H	Reads the random access buffer	Invalid
33H	Writes to the random access buffer	PARAM11

(11) Write Range (PARAM12, PARAM13)

Sets an available address range for a write request from the transmission side. A write request which is out of this available address range will cause an error.

Specify the address range (PARAM12, PARAM13) as a word address.

Note: 1. In MP9□0/MP2□00 series, the data storage area for the write request from the transmission side is the M register.

2. The write range parameter enables you to specify the range of M register which permits writing messages.

The following table shows the write range parameters.

Table B.27 Write Range Parameter List

Parameter	Contents	Description
PARAM12	Write range LO	Start address of the write range
PARAM13	Write range HI	Last address of the write range

Specify the write range so that the expression below is met:

0 ≤ Write range LO ≤ Write range HI ≤ Maximum address of M register

This write range is effective for the following function codes:

05H (changes single coil state)
06H (writes to single holding register)
0BH (writes to holding register (extended))
0EH (discontinuously writes to holding register (extended))
0FH (changes multiple coil states)
10H (writes to multiple holding registers)
31H (writes to fixed buffer)
33H (writes to the random access buffer)

Example: When setting the address of the M register which permits writing to 1000 to 1999:
PARAM12=1000
PARAM13=1999
The reception side will return an error against a write request to an address other than MW01000 to MW01999, and will not write it.

(12) Reserved by System 1 (PARAM14)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set this to “0” by user program. After that, the register is used by system, so do not change the value with the user program.

(13) Reserved by System 2 (PARAM15, PARAM16)

Used by system. Do not change the value with the user program, etc.

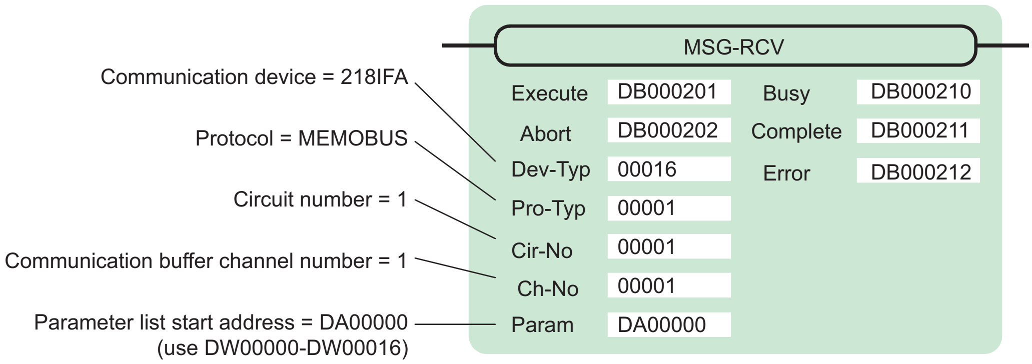
G.2.6 Function Setting and Parameter Details for MODBUS/TCP Protocol

This section explains the MSG-RCV function setting and its parameter list details when MODBUS/TCP is used as a protocol.

(1) Message Receive Function Setting

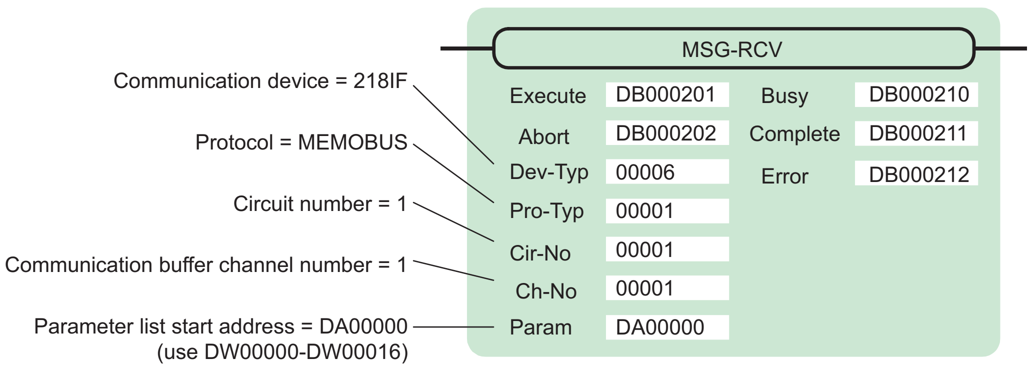
[a] 218IFA Setting Example

An example of a function setting when 218IFA is used as a transmission device follows:
Set the protocol type to MEMOBUS when used in MODBUS/TCP protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to in *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



[b] 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
Set the protocol type to MEMOBUS when used in MODBUS/TCP protocol.
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



(2) Process Result (PARAM00)

Refer to *G.2.4 (2) Process Result (PARAM00)* on page A-92.

(3) Status (PARAM01)

Refer to *G.2.4 (3) Status (PARAM01)* on page A-93.

(4) Connection Number (PARAM02)

Refer to *G.2.4 (4) Connection Number (PARAM02)* on page A-94.

(5) Option (PARAM03)

A unique value is output for each communication device. The output details are as follows:

Communication device	Output Details
Ethernet (218IF·218IFA)	A remote unit ID is output when MODBUS/TCP protocol is used.

(6) Function Code (PARAM04)

Received function code is output.
The following table lists the function codes available when using the MODBUS/TCP protocol.

Table B.28 Function Code List (MODBUS/TCP)

Function Code	Target Data Type	Function	Protocol Type	
			Ethernet (218IF)	Ethernet (218IFA)
00H	–	Not used	–	–
01H	B	Reads coil state	√	√
02H	B	Reads input relay state	√	√
03H	W	Reads holding register content	√	√
04H	W	Reads input register content	√	√
05H	B	Changes single coil state	√	√
06H	W	Writes to single holding register	√	√
07H : 0EH	–	Not used	–	–
0FH	B	Changes multiple coil states	√	√
10H	W	Writes to multiple holding registers	√	√
11H : 15H	–	Not used	–	–
16H	W	Mask writes to holding register	–	√
17H	W	Reads/Writes multiple holding registers	–	√

Note: 1. B: Bit type, W: Integer type
2. √: Available, -: Not available
3. Transmit and receive registers in the master operation mode are MW (MB) only.
4. In the slave operation mode, coil, holding register, input relay, and input register are MB, MW, IB, IW respectively.

(7) Data Address (PARAM05)

A data address requested from the transmission side is output.
However, when reading/writing multiple holding registers (function code: 17H), enter a start M register number for the address table. The four words of addresses at the beginning of the M register set by PARAM05 (data address) are used as an address table. In this address table, read address, read size, write address, and write size requested from the transmission side are output.
For more information about the address table, refer to *G.1.6 (7) Data Address (PARAM05)* on page A-72.

(8) Data Size (PARAM06)

The read/write data size (number of bits or words) requested from the transmission side is output.

(9) Remote CPU Number (PARAM07)

Refer to *G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function* on page A-111.

(10) Offset (PARAM08, PARAM09, PARAM10, PARAM11)

Specify an offset address for the reception side data address.
The address for the reception side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function* on page A-111.
2. The offset cannot be a negative value.

The offset parameter is prepared for each target data type.
The following table lists the offset parameters.

Table B.29 Offset Parameter List

Parameter	Contents	Description
PARAM08	Coil offset	Sets the coil’s offset word address.
PARAM09	Input relay offset	Sets the offset word address of an input relay.
PARAM10	Input register offset	Sets the offset word address of an input register.
PARAM11	Holding register offset	Sets the offset word address of a holding register.

The valid offset parameter may differ according to the function code.
The following table lists the valid parameters for each function code.

Table B.30 Valid Parameter List for Offset of Each Function Code

Function Code	Function	Valid Offset Parameter
01H	Reads coil state	PARAM08
02H	Reads input relay state	PARAM09
03H	Reads holding register content	PARAM11
04H	Reads input register content	PARAM10
05H	Changes single coil state	PARAM08
06H	Writes to single holding register	PARAM11
0FH	Changes multiple coil states	PARAM08
10H	Writes to multiple holding registers	PARAM11
16H	Mask writes to holding register	PARAM11
17H	Reads/Writes multiple holding registers	PARAM11

(11) Write Range (PARAM12, PARAM13)

Sets an available address range for the write request from the transmission side. A write request which is out of this available address range will cause an error.
Specify the address range (PARAM12, PARAM13) as a word address.

Note: 1. In MP9□0/MP2□00 series, the data storage area for the write request from the transmission side is the M register.
2. The write range parameter enables you to specify the range of the M register which permits writing messages.

The following table indicates the write range parameters.

Table B.31 Write Range Parameter List

Parameter	Contents	Description
PARAM12	Write range LO	Start address of the write range
PARAM13	Write range HI	Last address of the write range

Specify the write range so that the expression below is met:

$0 \leq$ Write range LO $\leq$ Write range HI $\leq$ Maximum address of M register

This write range is effective for the following function codes:

05H (changes single coil state)
06H (writes to single holding register)
0BH (writes to holding register (extended))
0FH (changes multiple coil states)
10H (writes to multiple holding registers)
16H (mask writes to holding register)
17H (reads/writes multiple holding registers)

Example: When setting the address of the M register which permits writing to 1000 to 1999:
PARAM12=1000
PARAM12=1000
PARAM13=1999
The reception side will return an error against a write request to an address other than MW01000 to MW01999, and will not write it.

(12) Reserved by System 1 (PARAM14)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set this to “0” by user program. After that, the register is used by system, so do not change the value with the user program.

(13) Reserved by System 2 (PARAM15, PARAM16)

Used by system. Do not change the value with the user program, etc.

G.2.7 Function Setting and Parameter Details for Non-procedural Protocol

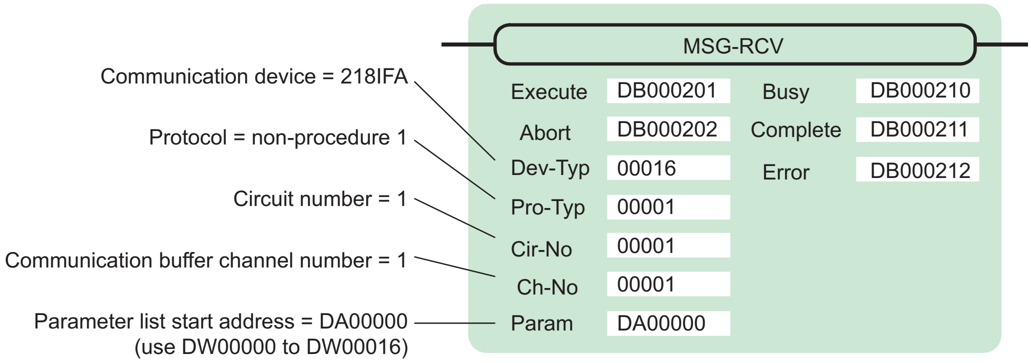
This section explains the MSG-RCV function setting and its parameter list details when non-procedure is used as a protocol.

Note: Non-procedure communication protocol stores the received data in the M register intact without a protocol conversion.
You can receive any protocol in accordance with the remote device.

(1) Message Receive Function Setting

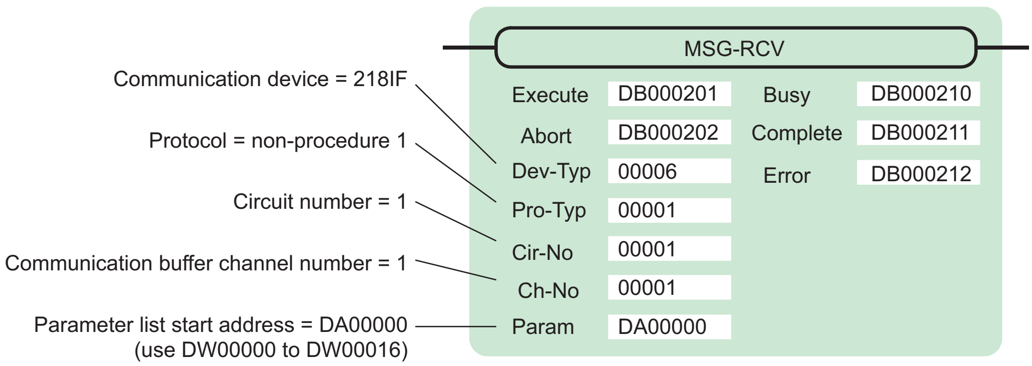
[a] 218IFA Setting Example

An example of a function setting when 218IFA is used as a transmission device follows:
When non-procedure 2 (per byte) is used, set the Pro-Typ field to “00003”. (non-procedure 1 (per word))
Set the circuit number in accordance with the circuit number allocated to the target 218IFA.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



[b] 218IF Setting Example

An example of a function setting when 218IF is used as a communication device follows:
When non-procedure 2 (per byte) is used, set the Pro-Typ field to “00003”. (non-procedure 1 (per word))
Set the circuit number in accordance with the circuit number allocated to the target 218IF.
Set a unique communication buffer channel number for the same circuit.
For information on the register number, refer to *G.2.2 (1) Input Item* on page A-85 and *G.2.2 (2) Output Item* on page A-87.



(2) Process Result (PARAM00)

The process result is output to the upper byte. The lower byte is used for system analysis.

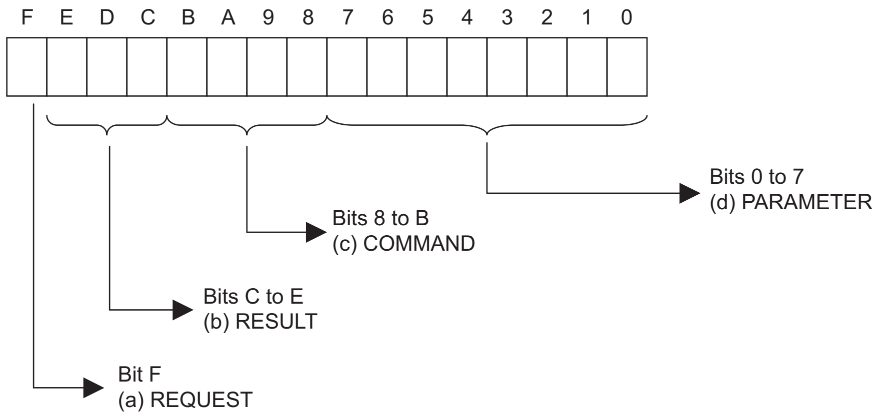
Value of Process Result	Meaning
00□□H	In process (Busy)
10□□H	Process completed (Complete)
8y□□H	Error occurred (Error)

When an error occurs, investigate it by referring to the following error contents:

Value of Process Result	Error Contents	Description
80□□H	–	Reserved
81□□H	–	–
82□□H	Error in setting address	The following setting is out of range. Check the setting. PARAM11 (holding register offset)
83□□H	Data size error	The received data size is out of range. Check the source data size.
84□□H	Error in setting circuit number	The circuit number is out of range. Check Cir-No (circuit number) of the MSG-RCV function.
85□□H	Error in setting channel number	The communication buffer channel number is out of range. Check Ch-No (communication buffer channel number) for the MSG-RCV function.
86□□H	Connection number error	The connection number is out of range. Check PARAM02 (connection number).
87□□H	–	Reserved
88□□H	Communication section error	An error response was returned from the communication section (communication device). Check the equipment connection. In addition, check that the remote device is open to communication.
89□□H	Device select error	Unavailable device is set. Check Dev-Typ (communication device type) of the MSG-RCV function.

(3) Status (PARAM01)

Outputs status of the communication section (communication device). The following figure shows the bit assignment. The bit assignment details are listed in the following tables.



[a] REQUEST (request)

Outputs whether MSG-RCV function is requesting a process.

Bit State	Contents
1	Requesting to process
0	The acceptance of process request is completed

[b] RESULT (result)

Outputs the execution result of the MSG-RCV function

Code	Abbreviation	Meaning
0	CONN_NG	In Ethernet communications, transmit error or connection error is completed
1	SEND_OK	Normal transmission completed
2	REC_OK	Normal reception completed
3	ABORT_OK	Forced abort completed
4	FMT_NG	Parameter format error
5	SEQ_NG	Command sequence error
6	RESET_NG	Reset state
7	REC_NG	Data reception error (error detected in the lower layer program)

[c] COMMAND (command)

Outputs a process command for the MSG-RCV function The executed process content can be found according to the command.

Code (Hex)	Abbreviation	Meaning
1	U_SEND	General-purpose message transmission
2	U_REC	General-purpose message reception
3	ABORT	Forced abort
8	M_SEND	Command transmission: Completed when response is received (for MEMOBUS protocol)
9	M_REC	Command reception: Accompanies a response transmission (for MEMOBUS protocol)
C	MR_SEND	Response transmission (for MEMOBUS protocol)

[d] PARAMETER (parameter)

When RESULT (process result) = 4 (FMT_NG: parameter format error), an error code in the following table is output. Otherwise, the connection number is output.

RESULT (process result)	Code (Hex)	Meaning
When RESULT (process result) = 4 (FMT_NG: parameter format error)	00	No error
	01	Connection number is out of range
	02	Time error while monitoring to receive MEMOBUS response (for MEMOBUS protocol)
	03	Error in setting retransmit count
	04	Error in setting cyclic area
	05	CPU number error
	06	Data address error
	07	Data size error
	08	Function code error (for MEMOBUS protocol)
Others	xx	Connection number

(4) Connection Number (PARAM02)

Refer to *G.2.4 (4) Connection Number (PARAM02)* on page A-94.

(5) Data Size (PARAM06)

A data size requested from the transmission side is output.
In case of non-procedure 1, the number of words is output.
In case of non-procedure 2, the number of bytes is output.

(6) Register Offset (PARAM12)

Specify an offset address for the reception side data address.
The address for the reception side will be displaced by the number of words designated by the offset.

Note: 1. For more information, refer to *G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function* on page A-111.
2. The offset cannot be a negative value.

In case of non-procedure, received continuous data is stored in the M register. Setting the register offset enables you to specify a start address of the M register as a storage area.

Example: When specifying MW01000 for the start address of the M register for storing received data:
PARAM12=1000

(7) Write Range HI (PARAM13)

Sets an available address range for the write request from the transmission side. A write request which is out of this available address range will cause an error.
Specify the write range (PARAM13) as a word address.

Note: The write range parameter enables you to specify the range of the M register which permits writing messages.

Specify the write range so that the expression below is met:

0 ≤ Write range HI ≤ Maximum address of M register

Example: When setting the last address of the M register which permits writing to 1999:
PARAM13=1999
The reception side will return an error against a write request to an address other than MW00000 to MW01999, and will not write it.

(8) Reserved by System 1 (PARAM14)

Used by system (the channel number of the communication buffer in use is stored).

Note: At the first scan during power up, make sure to set this to “0” by user program.
After that, the register is used by system, so do not change the value with the user program.

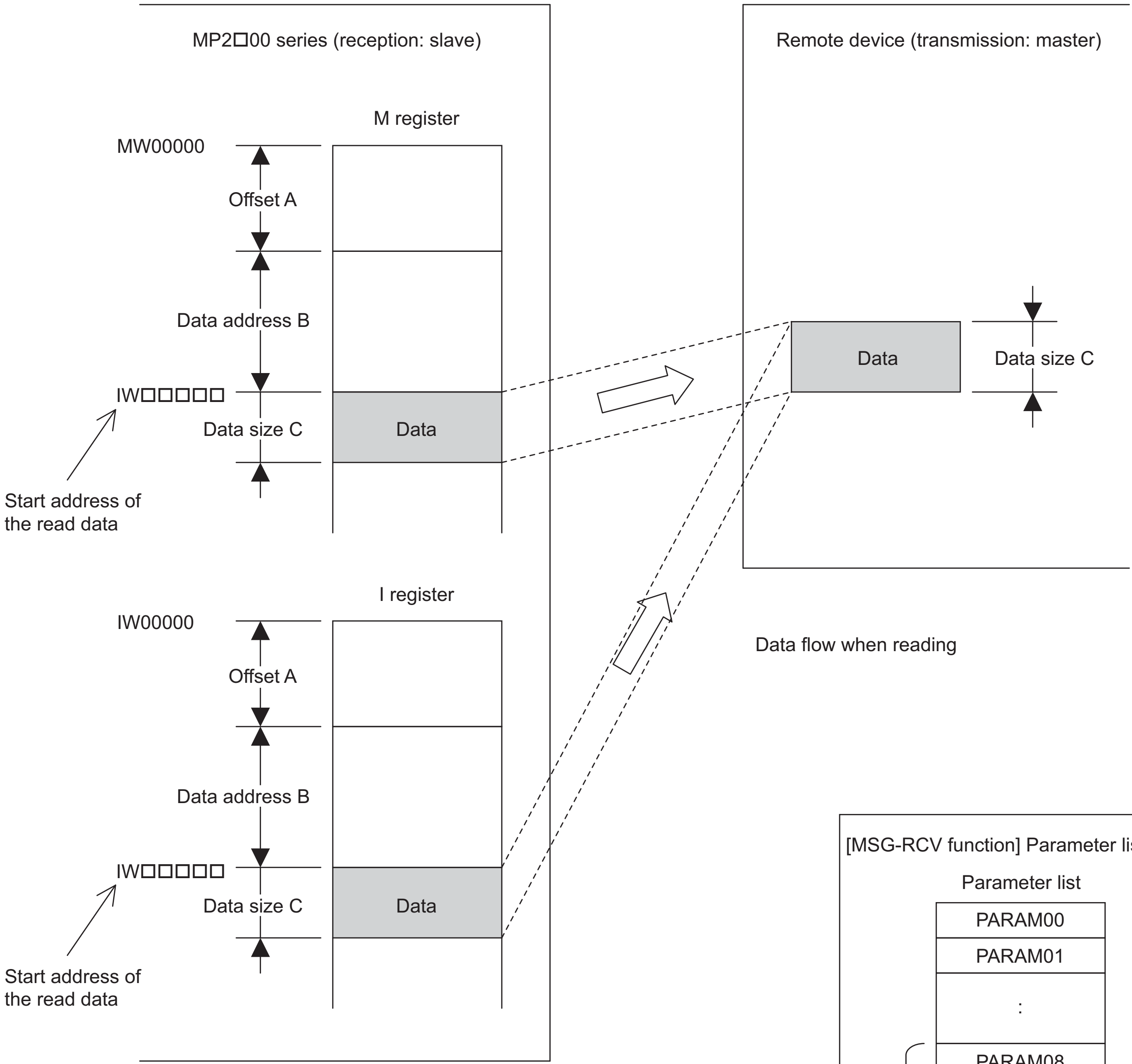
(9) Reserved by System 2 (PARAM15, PARAM16)

Used by system. Do not change the value with the user program, etc.

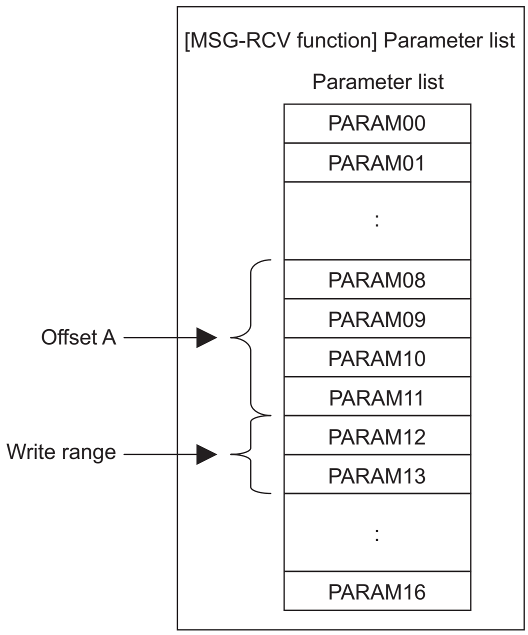
G.2.8 Relationship between Data Address, Data Size, and Offset for MSG-RCV Function

The relationships between data address, data size, and offset when received with offset are as follows:

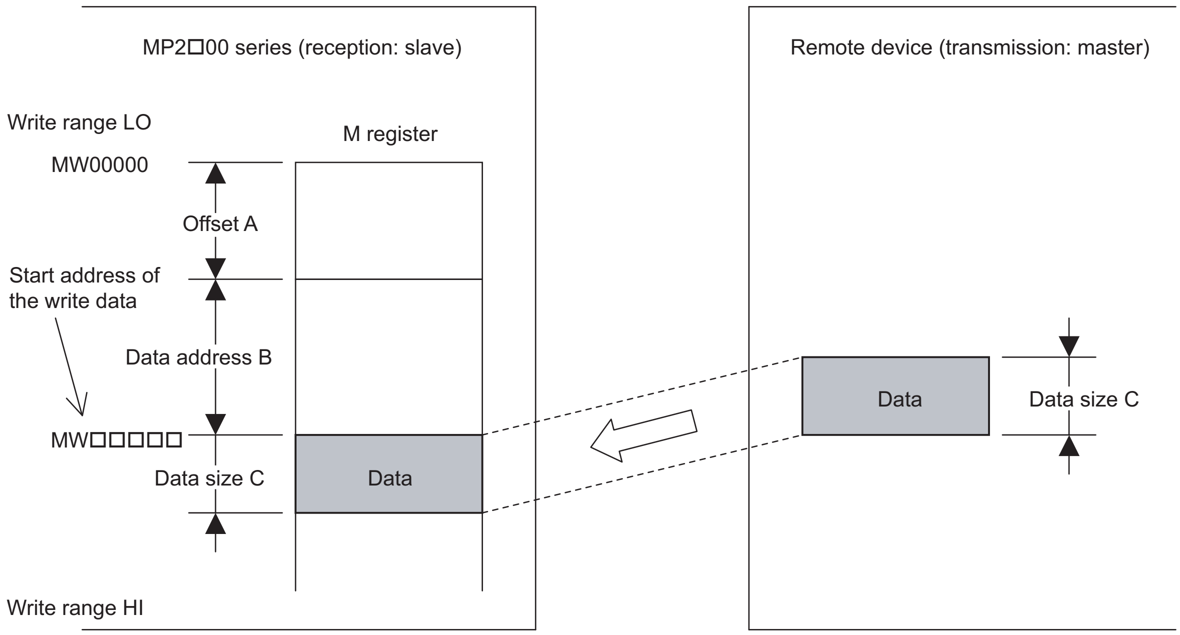
(1) When Reading



- Transmission side sets the data address B and the data size C.
- In case of non-procedure, read cannot be received.
- The valid offset parameter may differ according to each data type.
- The data type and register correspond as follows:
  Coil: MB□□□□□□, holding register: MW□□□□□
  Input relay: IB□□□□□, input register: IW□□□□

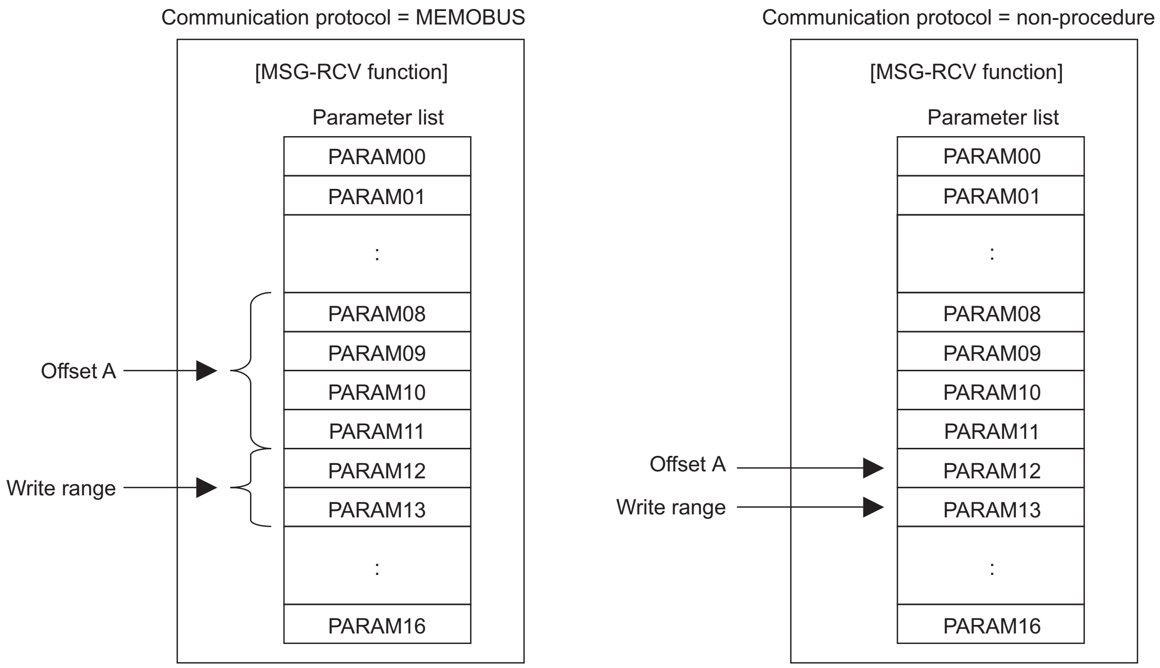


(2) When Writing



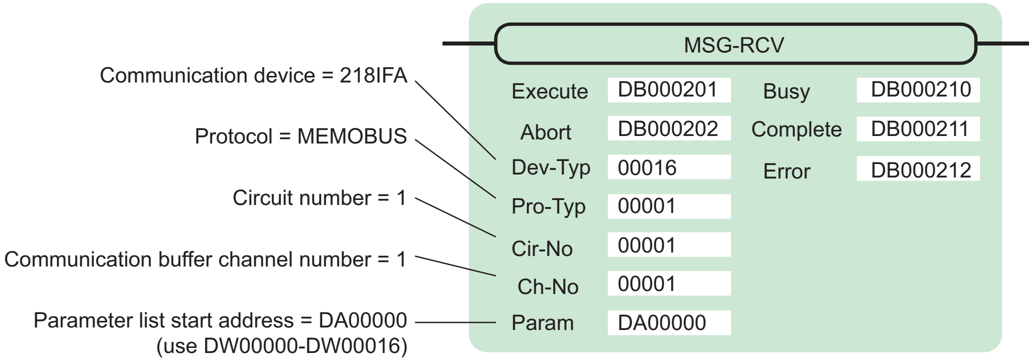
Data flow when writing

- ♦ Transmission side sets the data address B and the data size C.
- ♦ In case of non-procedure, write cannot be received.
- ♦ The valid offset parameter may differ according to each data type.
- ♦ The data type and register correspond as follows:
  Coil: MB□□□□□□, holding register: MW□□□□□



Example: "Writes to multiple holding registers" with offset is received:
When "writes to multiple holding registers" with offset is received in MEMOBUS protocol, various setting values and the relationship with the data of remote equipment are as follows:

- Description of the MSG-RCV function in ladder program



- Parameter list setting of the MSG-RCV function

Table B.32 Parameter List Setting

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	OUT	Option (setting unnecessary)
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	01000	PARAM11	IN	Holding register offset = 1000 words
DW00012	00000	PARAM12	IN	Write range LO = 0
DW00013	65534	PARAM13	IN	Write range HI = 65534
DW00014	-	PARAM14	SYS	Reserved (zero clear at startup)
DW00015	-	PARAM15	SYS	Reserved
DW00016	-	PARAM16	SYS	Reserved

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

- Relationship with the Remote Device Data
  The following figure shows the data flow when receiving “writes to multiple holding registers” with offset: When transmission and reception are carried out normally in the figure below, the data in the remote device is stored in MW03000 and after of MP2310.

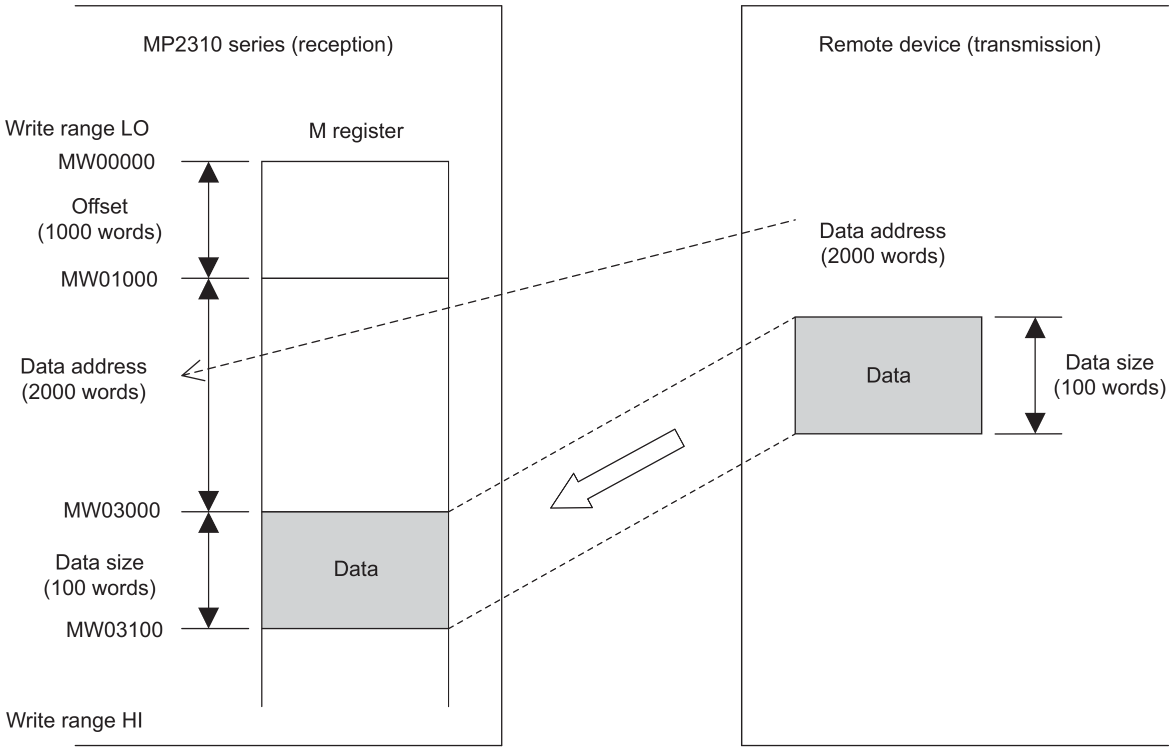


Fig. B.12 Writing Example to Multiple Holding Registers

G.3 Communication Buffer Channel

A communication buffer channel is used for giving and receiving data between the MSG-SND/ MSG-RCV function and communication device. This data buffer is composed of single or multiple channels, and each channel is distinguished by a communication buffer channel number.
The communication buffer channel is associated with a connection by setting the input item **Ch-No** (communication buffer channel number) of the MSG-SND/ MSG-RCV function and PARAM02 (connection number) in Param (parameter list).

A connection is configuration information for communication between local and remote stations, and is set in the **218IF/218IFA Parameter Setting** Window of the MPE720 module configuration definition.

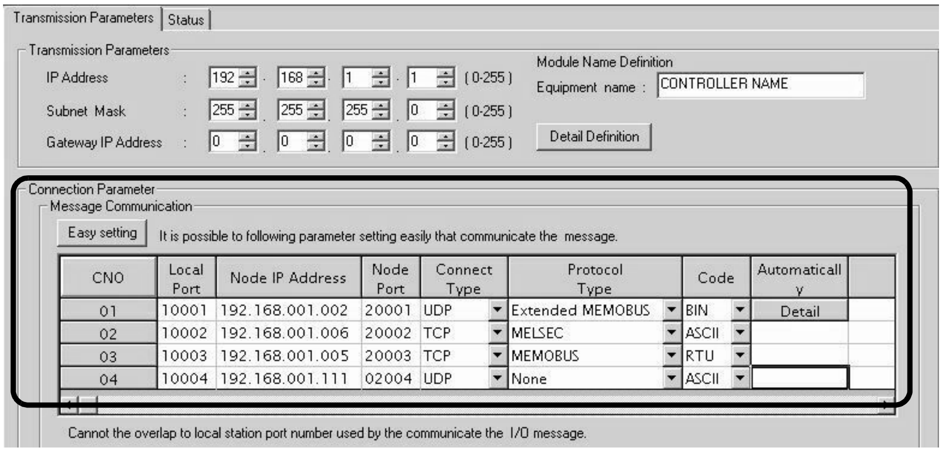


Fig. C.13 218IFA Parameter Setting Window for the MPE720 Module Configuration Definition

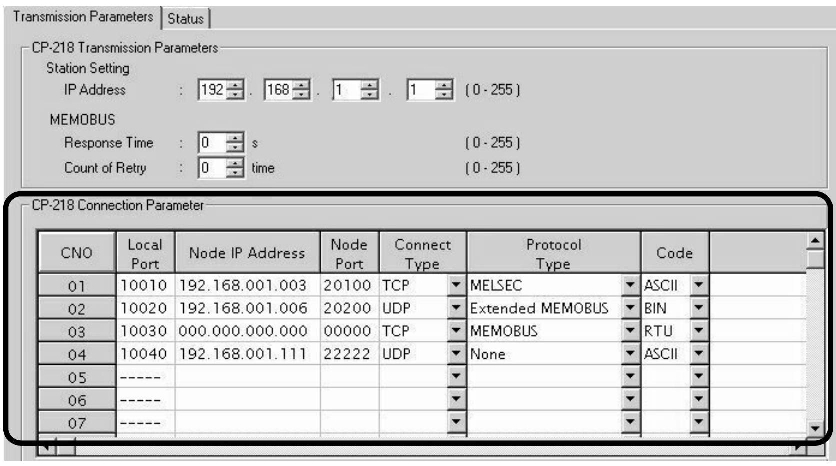
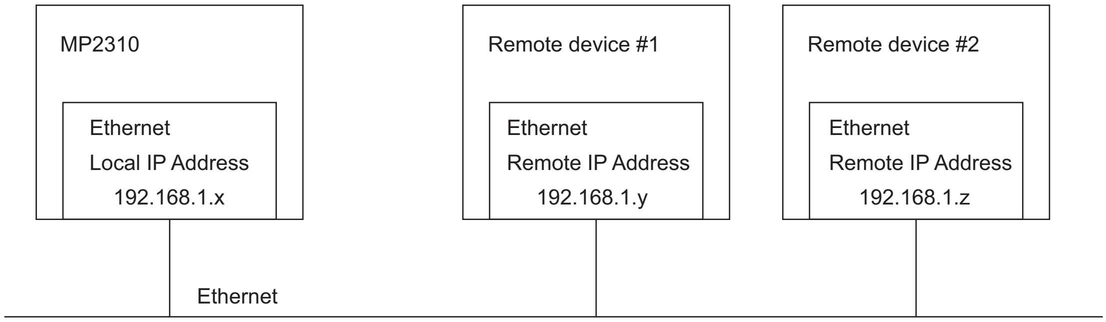


Fig. C.14 218IF Parameter Setting Window for the MPE720 Module Configuration Definition

A schematic diagram of the communication buffer channel is shown in the next page.

Appendices

A



Network block diagram

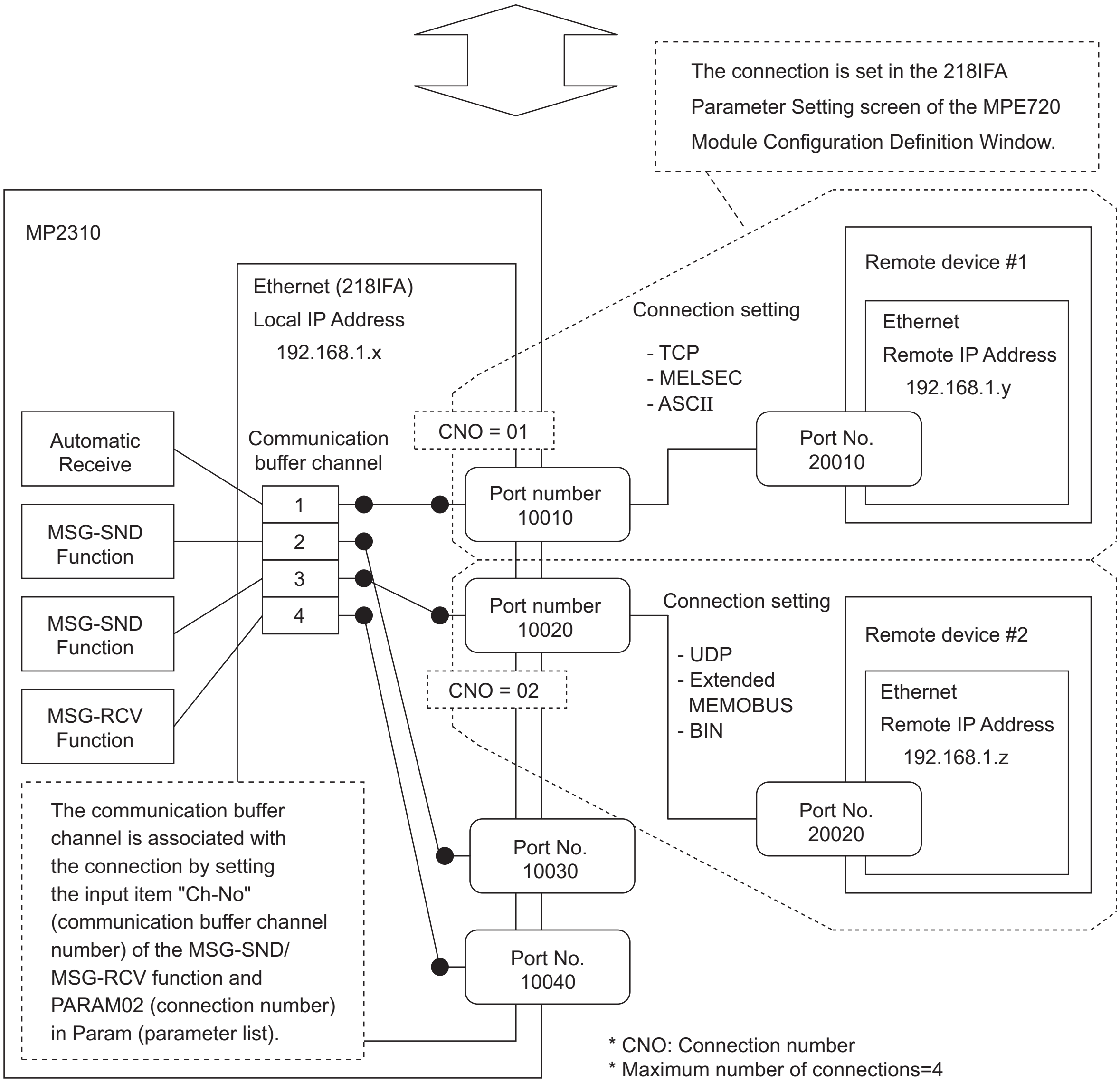


Fig. C.15 Schematic Diagram for Communication Buffer Channel

INDEX

Symbols

registers - 5-34
*****I/O - 2-40
*****SERVO - 2-40

Numerics

100Base-TX - 3-15
10Base-T - 3-15
17-byte mode - 2-38
215AIF-01 module - 2-59
217IF-01 module - 2-59
218IF-01 module - 2-59
218IF-02 module - 2-59
218IFA definition - 5-49
218IFA module - 2-11
 configuration definition - 2-13
 detailed screen - 2-14
 functions - 2-11
 specification - 2-12
260IF-01 module - 2-59
261IF-01 module - 2-59
32-byte mode - 2-38

A

a way to immediately control a motion program from external equipmen 5-18
accessories - 1-9
address - 5-37
AI-01 module - 2-59
alarm code - A-16
allocation contact interlock - 5-18
ambient operating humidity - 2-2
ambient operating temperature - 2-2
ambient storage humidity - 2-2
ambient storage temperature - 2-2
AO-01 module - 2-59
ARP - 2-12
automatic negotiation - 2-12
automatic receive setting screen - 2-21

B

basic flow of troubleshooting - 8-2
basic module - 2-7
 appearance - 1-3
 connections - 3-9
 external appearance - 2-60
 indicators - 2-8
 replacing the battery - 7-4
 specifications - 2-10
 switch settings - 2-8
battery - 1-9
bit - 5-37
block number - A-16
built-in SVB module - 2-29

C

cables - 1-8, 3-12
child drawings - 5-29
CNTR-01 module - 2-59
communication buffer channel - A-115
communication cycle - 2-38
communication interface - 2-12
communication methods - 6-2
communication module - 2-59
communication protocols - 2-12
communication with other MP series - 6-3
communication with PLC manufactured by Mitsubishi Electric Corporation - 6-73
communication with touch panel - 6-63
compact flash card-related system registers (CPU-02 and CPU-03 modules for the MP2200 only) - A-12
connection parameter - 2-18, 2-23
connection procedure - 3-11
connectors - 3-9
constants registers - 5-34
control signal - 5-15, A-16
cooling method - 2-2
corrosive gas - 2-2
cover for optional slot - 1-9

D

D registers - 5-34
daily inspections - 7-2
data registers - 5-34
data types - 5-37
definition information updated with self-configuration - 5-49
details of program information used by work n - 5-25
details on interrupting module - A-13
difference between Ethernet (LP) and Ethernet - A-48
differences from SVB simulation mode - 2-46
DIN rail mounting - 3-2
DIN rail mounting parts - 1-9
DIP switch settings - 5-2
direct designation - 5-11
DO-01 module - 2-59
double-length integer - 5-37
drawing A - 5-29
drawing execution control - 5-30
drawing H - 5-29
drawing I - 5-29
drawing L - 5-29
DWG - 5-29
DWG registers - 5-34
DWG.A - 5-29
DWG.H - 5-29
DWG.I - 5-29
DWG.L - 5-29

E

EEPROM - A-19
electrical operating conditions - 2-2
encoder cable - 4-4
environmental conditions - 2-2
Ethernet - 2-11
 cable - 3-15
 communication methods - 6-2
 connection example - 3-16
 connector details - 3-15
executing main program No. - A-16
executing motion - 4-14
external function registers - 5-35

F

fixed parameter list - A-35
fixing a DIN rail - 3-4
flash memory - A-19

function input registers - 5-35
function output registers - 5-35
function registers - 5-35
functions- 5-29, 5-33

G

grandchild drawings - 5-29
ground - 2-2
ground to 100 Ω max - 2-2
groups - 5-6

H

hierarchical structure of drawings - 5-31
how to operate work register - 5-17
how to set up communication process - - - - - - - - - - - - - - - - - - - A-46

I

I/O errors - 8-9
I/O map tab - 2-40
I/O message - 2-23, 2-25
ICMP - 2-12
indirect designation - 5-12
INIT- 5-42
INIT switch and RAM data - 5-42
initializing the absolute encoder - A-29
input registers - 5-34
input/output module - 2-59
installation requirements - 2-2
integer - 5-37
internal function registers - 5-35
interpolation override - 5-16
interrupt status list - A-13
IP - 2-12

J

jog operation - 4-8
JZSP-BA01 - 7-4

L

ladder drawings - 5-29
ladder drawings (DWG) - 5-29
ladder program - 5-29
LAN cable - 4-4
LED indicator meanings - 8-3
link assignment tab page - 2-39
LIO-01/ LIO-02 module - 2-59
LIO-04/ LIO-05 module - 2-59

M

main program - 5-6, 5-26
maximum number of slave stations - 2-33
mechanical operating conditions- 2-2
MECHATROLINK
    cable - 3-12
    communication specifications - 2-33
    compatible devices - 1-7
    connector - 3-11
    modules - 1-7
    SERVOPACKs - 1-7
    transmission definition - 2-36
MELSEC protocol - 6-73
message communication - 2-18, 2-20, 2-21
message receive function (MSG-RCV) - - - - - - - - - - - - - - - - - - - A-84
message transmit function (MSG-SND)- - - - - - - - - - - - - - - - - - - A-50
M-EXECUTOR definition- 5-51
M-EXECUTOR module - 2-47
    configuration definition - 2-49
    control register mapping window - 2-53
    execution scheduling - 2-56
    function overview - 2-47
    initializing - 4-9
    program definition screen - 2-51
    program execution registration screen - - - - - - - - - - - - - - - - 2-55
    specification - 2-48
M-EXECUTOR module (motion program executor) - - - - - - - - - - 2-47
module synchronization errors (ver.2.75 or later) - - - - - - - - - - - 8-10
monitoring parameter list - A-42
motion control function specifications- 2-5
motion control functions - 2-31
motion parameter details- A-35
motion program- 5-6
    calling a motion program - 5-11
    executor - 2-47
    monitor the motion program execution information- - - - - - - 5-23
    program numbers- 5-6
    status flag - 5-14
mounting to DIN rail - 3-3
MP2310
    error check flowchart - 8-5
    external appearance - 2-60
    features - 1-2
    general specifications - 2-2
    method- 3-2
    mount direction - 3-5
    product specifications- 2-3
MP2310 modules- 1-4
MPE720- 1-9
MSG-RCV - A-84
MSG-SND - A-50
MSG-SND/MSG-RCV functions - A-50
multiple group operation- 5-6

N

noise resistance - 2-2

O

online self-diagnosis - 5-4
operating altitude- 2-2
operation error processing drawings - 5-29
operation errors - 8-6
operation start - 5-4
operation stop - 5-4
option module - 2-58
option module overview list - 2-58
optional cover - 3-8
optional modules - 1-4
    installing - 3-8
    removing - 3-6
optional SVB - 2-29
options- 1-9
output registers - 5-34

P

parent drawings- 5-29
PLC function specifications- 2-4
PO-01 module- 2-58
pollution level- 2-2
power supply connector - 1-9, 3-10
precaution on using MP2310 - 5-52
precautions when setting and changing scan time - - - - - - - - - - - 5-54
precautions when setting or changing module configuration definition files - 5-53

precautions when user definition file is configured/changed - - - - 5-52
problem classification- 8-4
processing time - 2-46
program control method - 2-48
program current position- A-16
program number - A-16
programming - 4-9
programming tool - 1-9

R

RAM - A-19
real number - 5-37
recommended ferritic core- 3-18
register designation - 5-39
register designation method- 5-39
register number direct designation - 5-39
registers - 5-34
regular inspections- 7-3
repeater - 2-33
repeater HUB - 3-16
replacing and adding optional modules - - - - - - - - - - - - - - - - - - - 3-6
replacing the battery- 7-4

S

S register - 5-23
scan processing drawing - 5-30
scan time set value examples - 5-55
screwed method- 3-2
SDRAM- A-19
self configuration of each module- 5-46
self-configuration - 4-5, 5-4, 5-40
  procedure using MPE720 - 5-43
  procedure using the DIP switch - - - - - - - - - - - - - - - - - - - 5-41
self-configuration for all the modules - - - - - - - - - - - - - - - - - - 5-43
self-diagnosis at startup - 5-4
sequence program - 2-47, 5-26
  alarm - 5-28
  calling a sequence program - 5-27
  program numbers- 5-26
  status flag - 5-28
SERVOPACK initialization - A-28
SERVOPACK parameter data flow - A-19
setting parameter list - A-37
shock resistance- 2-2
simple setting screen - 2-20, 2-25
single group operation - 5-6
SRAM - A-19
starting motion program from an external signal - - - - - - - - - - - - 4-16
startup sequence - 5-3
startup sequence flow - 5-3
startup sequence operation details- 5-4
status - A-16
status tab page- 2-41
sub program - 5-6, 5-26
subscripts i, j- 5-38
SVA-01 module- 2-58
SVB
  features - 2-29
  specifications - 2-31
SVB definition - 2-42
SVB definition window - 2-42
SVB module definitions - 5-50
SVB-01 module- 2-58
SVR - 2-44
SVR definition - 5-51
SVR execution timing - 2-46
symbol designation - 5-39
system
  configuration example - 2-30
  connection example- 3-19
  error status - A-6
  register lists - A-2
  registers- 5-34
  service registers - A-2
  standard system functions- 5-33
  status- A-5
  system work number - 5-17
  total number of system works - 5-17
  work - A-16
system configuration example - 1-5
system error
  I/O error status - A-11
  if a system error occurs - 8-11
  module information - A-14
  service execution status - A-9
system startup- 4-2
  executing motion - 4-14
  programming - 4-12
  self configuration - 4-5
  test run - 4-6
  wiring - 4-3

T

TCP - 2-12
terminating resistor - 1-9
terminator - 1-9, 3-12
terminator (terminating resistor) - 4-4
terminator connections- 3-14
transmission bytes- 2-38
transmission distance- 2-34
transmission parameter tab - 2-37
troubleshooting details - 8-6
types and execution timing of user program- - - - - - - - - - - - - - - - 5-5
types of registers - 5-34

U

UDP - 2-12
user functions - 5-33
user operation error codes 1 - A-8
user operation error codes 2 - A-9
user operation error status- A-8
user operation error status details - A-10
user programs - 5-5

V

vibration resistance - 2-2
virtual motion module
  SVR - 2-44

W

watchdog timer timeout errors- 8-10
when MP2310 acts as master (I/O message communication function is used) - 6-34
when MP2310 acts as slave (automatic receive function is used)- 6-63
when the MP2310 acts as a slave (ladder program which uses a MSG-RCV function) - 6-16
when the MP2310 acts as master (I/O message communication function is used) - 6-80
when the MP2310 acts as master (ladder program which uses MSG-SND function) - 6-47

when the MP2310 acts as slave (automatic receive function
is used) - 6-3, 6-73
wild card I/O - 2-40
wild card servo - 2-40
without using a ladder program - 2-47
work register - 5-13, 5-28

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			All chapters	Revision: All revised.
			4.3.2	Revision: Screen shot in step4
			4.4.1	Revision: Screen shots in step1 and 2
			4.4.2	Revision: Screen shots in step1 and 2
			4.5.3	Revision: Screen shots in step1 and 2
			5.1	Deletion: 5.1.4 LED Indicator Details
			Chapter 7	Revision: Structure Deletion: 7.2 Troubleshooting
			Chapter 8	Addition: New chapter
			Back cover	Revision: Address, format
May 2010	<0>	3	2.2.2 (2)	Revision: Description of the indicator status of the IP.
April 2010		2	Preface	Addition: Terms Used to Describe “Torque”
			1.5.1	Revision: Application of MP2310 Basic Module and SVB-01 Revision: Model of MP2310 Basic Module and SVB-01 JEPMC-W6011-□□ → JEPMC-W6010-□□
			2.2.3	Addition: Allowable Power Loss Time
			4.2.2	Addition: Step 6
			4.4.1	Addition: Description of Note 1
			5.2.2 (5) [b]	Revision: Description in parentheses of MSEE work resisters address hexadecimal number → decimal number
			5.2.4 (1), (3)	Revision: Types of Drawings FSTART command → FUNC command
			6.2.4 (1)	Revision: Parameter list setting example for the message transmit function MW00000 → MW00400 connection number = 1 → connection number = 3
			6.3.1 (1)	Revision: The other device to be connected in step 4 ⑥ and ⑦ MP2300 → touch panel
			7.2.4 (5) [c]	Revision: Table 7.4 Ladder Program User Operation Error Codes 2 □06DH: PD → □06EH: PD
September 2009		1	Preface	Addition: Warranty
			Back cover	Revision: Address
January 2008		–	–	First edition

Machine Controller MP2310

Basic Module

USER'S MANUAL

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