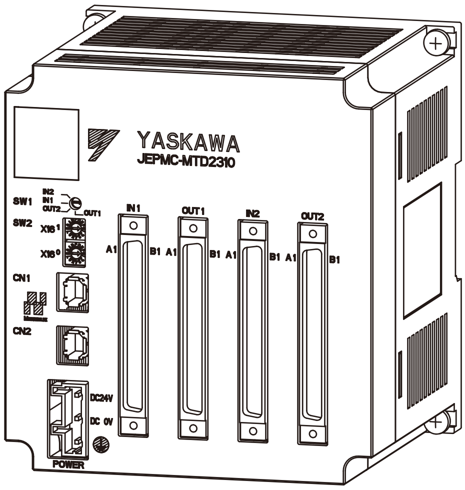
YASKAWA

MECHATROLINK-III Compatible

I/O Module

USER'S MANUAL

Model JEPMC-MTD2310-E
JEPMC-MTA2900-E
JEPMC-MTA2910-E
JEPMC-MTP2900-E
JEPMC-MTP2910-E



MANUAL NO. SIEP C880781 04B

Preface

Please read this manual to ensure correct usage of the MECHATROLINK-III compatible I/O Modules. Keep this manual in a safe place for future reference.

Using this Manual

■ Basic Terms

Unless otherwise specified, the following definitions are used:

- MECHATROLINK : Generic term for Motion Network MECHATROLINK-III
- M-III : MECHATROLINK-III

■ Visual Aids

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

IMPORTANT	Indicates important information that should be memorized or minor precautions, such as precautions that will result in alarms if not needed.
INFO	Indicates supplemental information.
◀ EXAMPLE ▶	Indicates application examples.
TERMS	Describes technical terms that are difficult to understand, or appear in the text without an explanation being given.

■ Trademarks

- MECHATROLINK is a trademark of the MECHATROLINK Members Association.
- Ethernet is a trademark of Xerox Corporation.
- Windows 2000, Windows XP, and Windows Vista are trademarks or registered trademarks of Microsoft Corporation.
- Adobe and Adobe Reader are trademarks or registered trademarks of Adobe Systems Incorporated.
- Pentium is a trademark or registered trademark of Intel Corporation.
- InstallShield is a registered trademark of InstallShield Software Corporation.
- Other product and company names mentioned in this manual may be the trademarks or registered trademarks of their respective owners. Trademark symbols and registered trademark symbols are not used in this manual.

About Software

■ Usage Notes

- Reverse compiling or assembly of this software is strictly prohibited.
- Use of this software in whole or in part by a third party through transfer, exchange, resale, and so forth, is strictly prohibited without the prior agreement of Yaskawa Electric Corporation.
- Copyright and all other rights for this software are reserved by Yaskawa Electric Corporation.

Notes on Using WindowsXP

- If using NTFS, log on as an administrator or as a user with administrator privileges to use IOWin.

  Note: If IOWin runs in Limited User mode with NTFS, the necessary settings cannot be read into the application program, and an error may occur at start up or the program may not successfully run.
  If using FAT32, IOWin can be run in Limited User mode.

- When using IOWin, do not change the active window to another window for another application program even if using the Multi-user function.

  Note: If the active window is changed while IOWin is running, the window that shows the status of the job cannot be viewed and may result in an accident or harm to personnel or the motor.

Safety Information

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

⚠ WARNING	Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.
⚠ CAUTION	Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation. In some situations, the precautions indicated could have serious consequences if not heeded.
⊘ PROHIBITED	Indicates prohibited actions that must not be performed. For example, this symbol would be used as follows to indicate that fire is prohibited: 🚫.
❗ MANDATORY	Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory: ⏚.

Safety Precautions

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

⚠ WARNING

- Before starting operation in combination with the machine, ensure that an emergency stop procedure has been provided and is working correctly.
- Do not touch anything inside the MECHATROLINK devices.
- Observe all procedures and precautions given in this manual for trial operation.

  Operating mistakes can cause damage to the machine or even accidents resulting in injury or death.
- 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.
- 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 module.
- Do not attempt to modify the module in any way.

  There is a risk of injury or device damage.
- Do not remove the top front cover, cables, or connectors from the SERVOPACK while the power is ON.

  There is a risk of electrical shock.
- Do not come close to the machine immediately after resetting an instantaneous power interruption to avoid an unexpected restart. Take appropriate measures to ensure safety against an unexpected restart.

  There is a risk of injury.

■ Storage and Transportation

⚠ CAUTION

- Do not store or install the module 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 module 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 module 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 module or place heavy objects on the module.

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

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

  There is a risk of an accident.
- Do not subject the module 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 measures to provide protection against shorts in external wiring.

  There is a risk of fire.
- Provide sufficient shielding when using the I/O Modules in the following locations.

  There is a risk of device damage.
  - Noise, such as from static electricity
  - Strong electromagnetic or magnetic fields
  - Radiation
  - Near power lines
- Built-in fuses do not protect the output elements. Connect a fuse appropriate for the load specifications in series with the load.

  There is a risk of fire, damage to the load equipment, or damage to the output circuits if there is a load short-circuit or overload.
- The customer must not replace the built-in fuses.

  There is a risk of output module accident or malfunction. Also any failures caused by ignoring this caution will invalidate the guarantee. Yaskawa replaces built-in fuses.
- To connect an induction load, connect the flywheel diode in parallel to the induction load to reduce surge voltage.

  There is a risk of output circuit damage.
- Each module is not protected against lightning surge. Do not employ overhead wiring.

  There is a risk of device damage due to lightning.

■ Operations

⚠ CAUTION

- Connect a fuse appropriate for the load specifications in series with the load.

  There is a risk of fire, damage to the load equipment, or damage to the output circuits if there is a load short-circuit or overload.

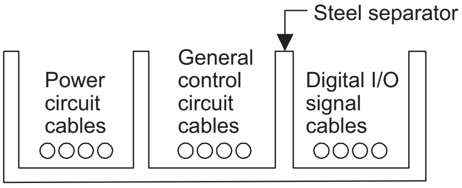
■ Selecting, Separating, and Laying External Cables

⚠ CAUTION

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

⚠ CAUTION

- Do not attempt to disassemble the MECHATROLINK device.

  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.

■ Disposal

⚠ CAUTION

- Dispose of the module 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 (hereinafter 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.

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1

MECHATROLINK-III System Outline

This chapter outlines the MECHATROLINK-III system and provides configuration examples.

1.1 Overview of the MECHATROLINK-III System

This section outlines the MECHATROLINK-III system and describes its characteristics.

1.1.1 What is a MECHATROLINK-III System?

Basically, a MECHATROLINK-III system comprises one MECHATROLINK-III master module and a group of MECHATROLINK-III slave modules, which are MECHATROLINK-III-compatible devices.

The configuration of a MECHATROLINK-III system is shown below.

- A MECHATROLINK-III system is a motion network intended to control multiple servo drives and perform distributed control of multiple I/O modules.
- The network of a MECHATROLINK-III system follows a master/slave method.

1.1.2 System Characteristics

The characteristics of MECHATROLINK-III systems are as follows:

- These systems achieve refresh speeds of the same high level as local I/O. Some master modules allow selection of the refresh speed, and the number of stations that can be connected in the same network varies.
- Connections to a MECHATROLINK-III module can be made with an Ethernet cable (CAT5e STP, shielded twisted pair cable). With wiring savings and the distribution of I/O, systems can be constructed simply and at low cost.
- As a measure against system failures, slave stations where an error has occurred can be identified.

  The system also has an automatic disconnection/reconnection function for slave stations where errors have occurred.

1.1.3 Transmission Specifications

The transmission specifications of MECHATROLINK-III are shown below.

Item	MECHATROLINK-III Specifications
Communication Method	MECHATROLINK-III
Form of Transmission Lines	Cascade type, star type
Transmission Line	Electrical bus
Maximum Distance Between Stations	100 m
Minimum Distance Between Stations	No restriction
Baud Rate	100 Mbps
Transmission Cycle	31.25 μs to 64 ms[*1]
Maximum Number of Stations Connected	62
Transmission Control System	Cyclic communication Event-driven communication
Access Control System	2: N[*2]
Transmission Mode	Control transmission
Error Detection	FCS check

* 1. Some communications cycles cannot be used depending on the specifications of the master module. Check the user's manual of the master module that you are using.

* 2. The system is 2: N only when a C2 master module (tool) is used. In other cases, it is 1: N.

TERMS

Automatic disconnection

When an error is detected in the communication with a slave station, the master station disconnects the slave with which the communication error has been detected and continues communication with other slaves in the normal status. This process is called automatic disconnection.

Automatic reconnection

The master station accesses the disconnected slave station in each communication cycle and reconnects to the slave station if the master station confirms that the slave station has recovered to the normal status. This process is called automatic reconnection.

1.1.4 Maximum Number of Slave Stations

The maximum number of slave stations that can be connected to a master module is explained here.

(1) Transmission Cycle Setting and Maximum Number of Slave Stations

The relationship between the transmission cycle setting of the MECHATROLINK-III system and the maximum number of slave stations differs according to the specifications of the master module used. For details, refer to the user’s manual of the master module being used.

(2) Transmission Distance and Maximum Number of Slave Stations

The relationship between the transmission distance and the maximum number of slave stations differs according to the specifications of the master module used.

For details, refer to the user’s manual of the master module being used.

1.1.5 Precautions on the System

(1) Number of Slave Stations

The maximum number of slave stations varies depending on the "message communication used/not used" and "number of retry stations" settings. For details, refer to the user’s manual of the master module being used.

(2) Number of Transmission Bytes Setting

In a MECHATROLINK-III system, make the number of transmission bytes setting the same for the master and slave stations.

(3) Connection Cable

Use the standard cables as connection cables. The models that can be used are as follows.

Name/Specifications/External Appearance	Type	Length
MECHATROLINK-III Cable (MECHATROLINK-III Connector - MECHATROLINK-III Connector) 	JEPMC-W6012-A2-E	0.2 m
	JEPMC-W6012-A5-E	0.5 m
	JEPMC-W6012-01-E	1 m
	JEPMC-W6012-02-E	2 m
	JEPMC-W6012-03-E	3 m
	JEPMC-W6012-04-E	4 m
	JEPMC-W6012-05-E	5 m
	JEPMC-W6012-10-E	10 m
	JEPMC-W6012-20-E	20 m
	JEPMC-W6012-30-E	30 m
	JEPMC-W6012-50-E	50 m
MECHATROLINK-III Cable (MECHATROLINK-III Connector - MECHATROLINK-III Connector with Ferrite Core) 	JEPMC-W6013-10-E	10 m
	JEPMC-W6013-20-E	20 m
	JEPMC-W6013-30-E	30 m
	JEPMC-W6013-50-E	50 m
	JEPMC-W6013-75-E	75 m
	JEPMC-W6013-100-E	100 m
MECHATROLINK-III Cable (MECHATROLINK-III Connector - Loose Wires at the Other End) 	JEPMC-W6014-A5-E	0.5 m
	JEPMC-W6014-01-E	1 m
	JEPMC-W6014-03-E	3 m
	JEPMC-W6014-05-E	5 m
	JEPMC-W6014-10-E	10 m
	JEPMC-W6014-30-E	30 m
	JEPMC-W6014-50-E	50 m

(4) Terminator (Terminating Resistor)

No terminator (terminating resistor) is required with MECHATROLINK-III.

1.2 MECHATROLINK-III System Configuration

This section describes the devices compatible with MECHATROLINK-III systems and indicates the points to note about them.

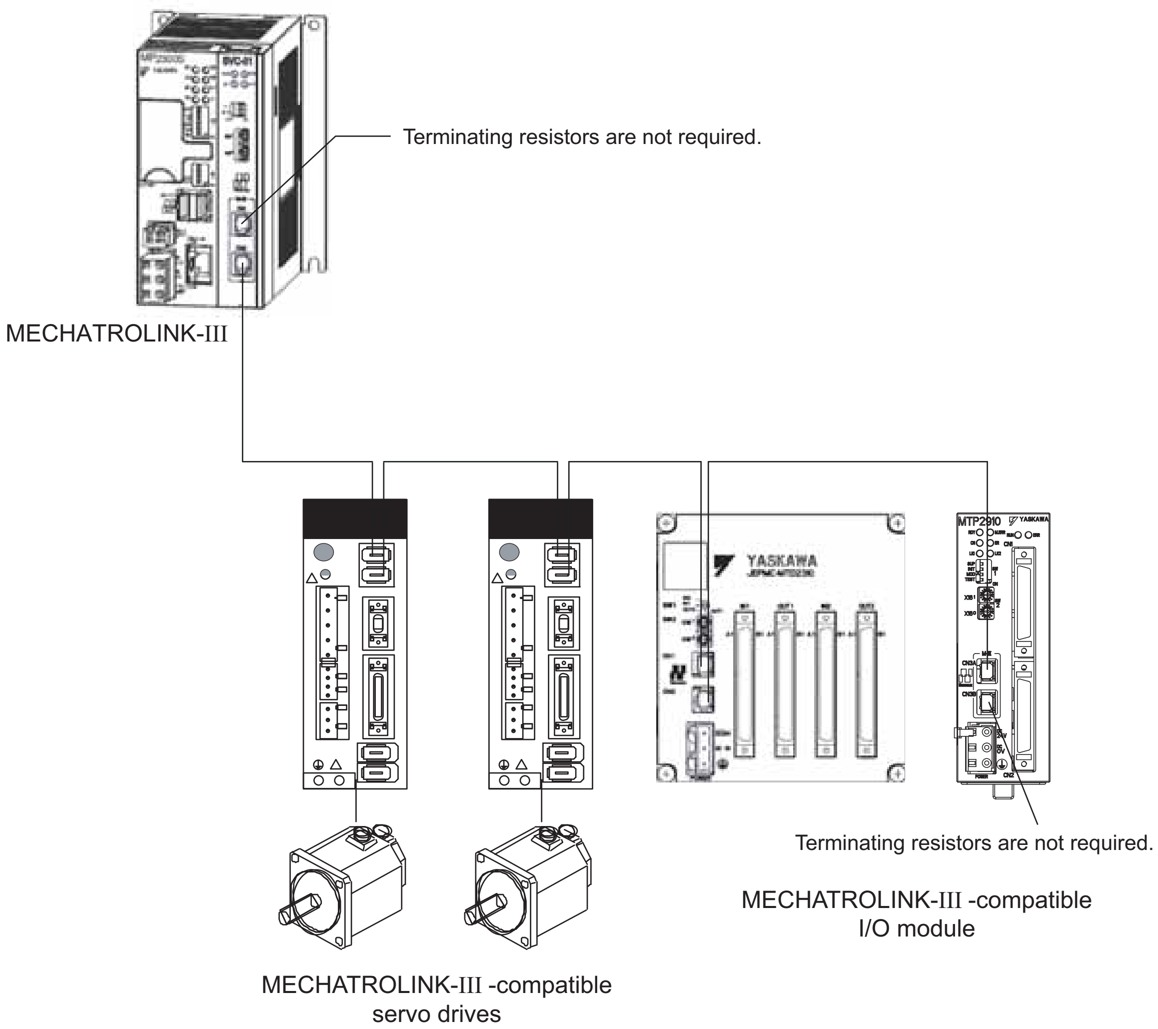
1.2.1 Compatible Master Modules

You need to select a master module that supports the standard I/O profile of MECHATROLINK-III to use this product.

For details on MECHATROLINK-III-compatible products, refer to the website of the MECHATROLINK Members Association at http://www.mechatrolink.org/.

1.2.2 System Configuration Example

An example configuration for a system using MECHATROLINK-III is shown below.



IMPORTANT

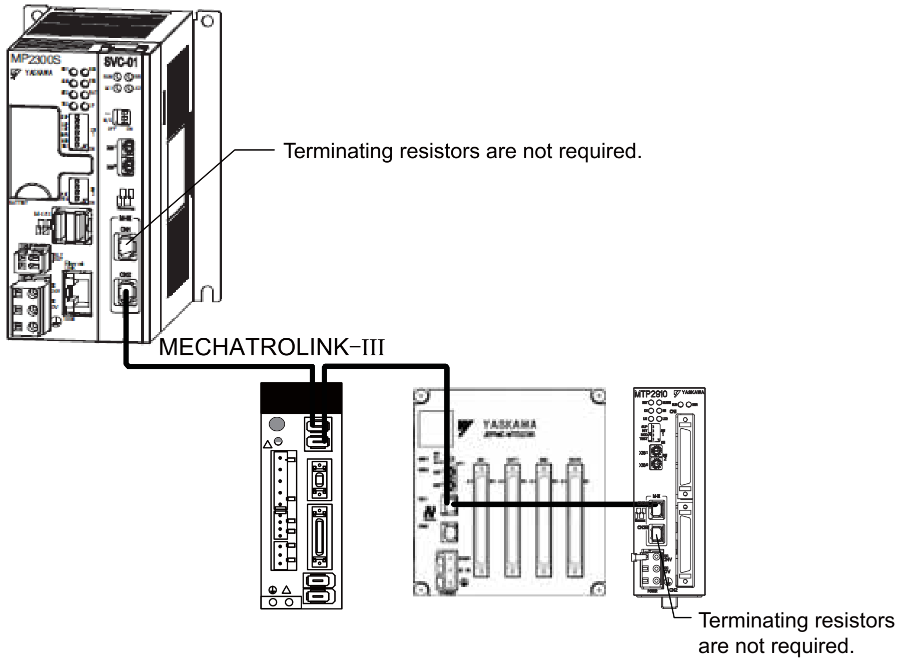
In the following circumstances, all output data is OFF:

- When the power is turned OFF.
- When a fuse has blown.
- When the module fails.

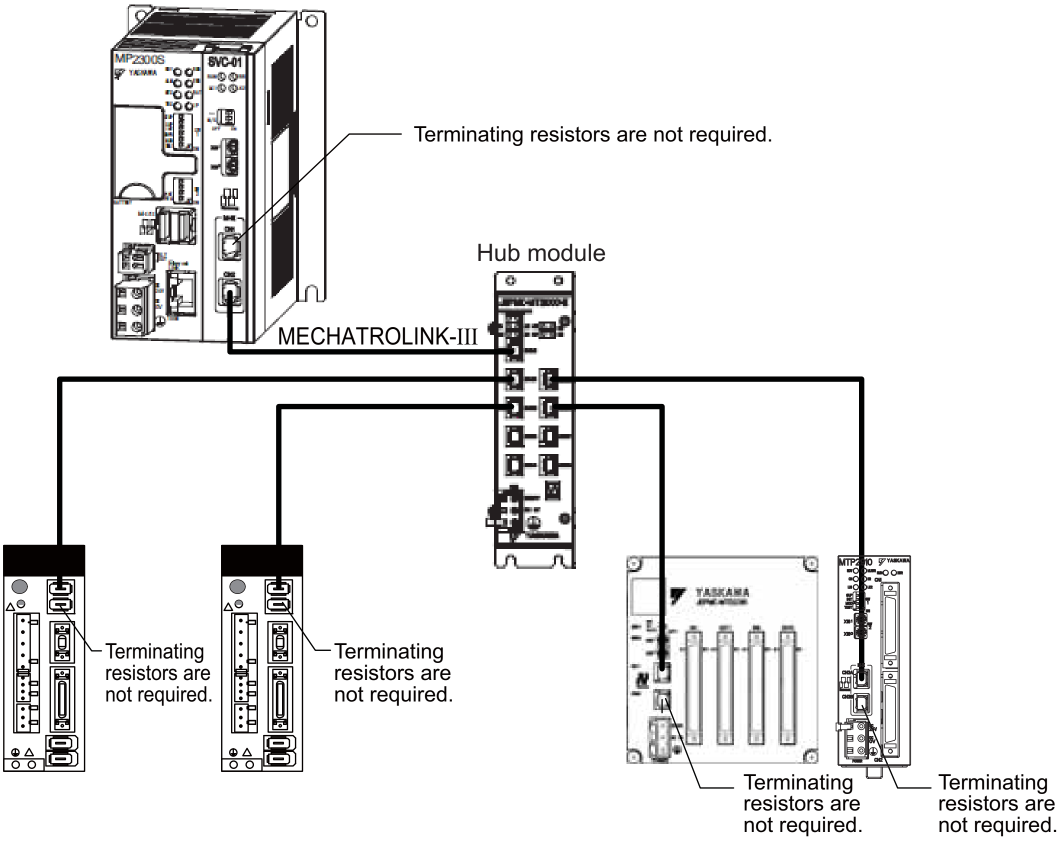
1.2.3 System Connection Example

Three modes are available to connect the master module and slave modules: cascade connection, star connection, and mixed cascade/star connection. Connection examples with each connection mode are shown below.

(a) Example of Cascade Connection



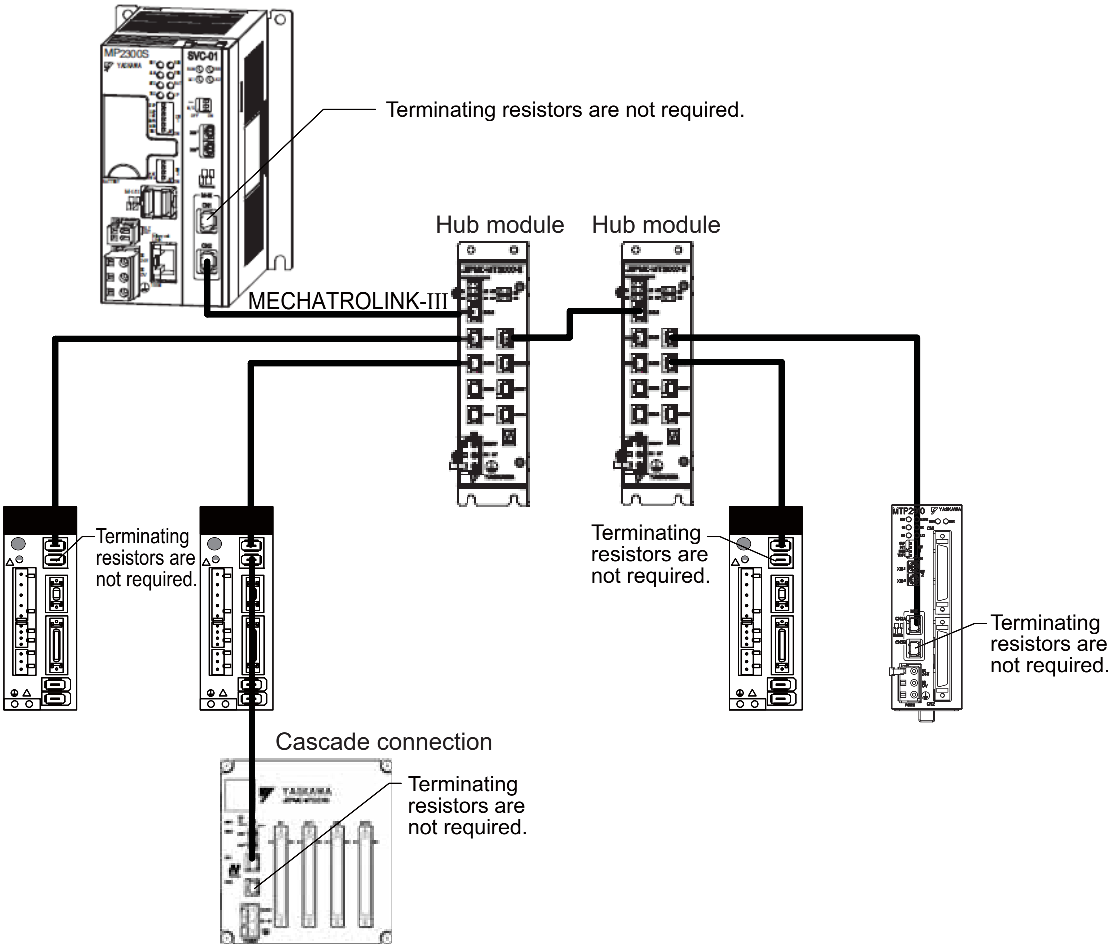
(b) Example of Star Connection



IMPORTANT

When hotswapping a MECHATROLINK-III compatible I/O module from the network, set the number of retries for the master device to three or more.

(c) Example of Mixed Cascade/Star Connection



IMPORTANT

When hotswapping a MECHATROLINK-III compatible I/O module from the network, set the number of retries for the master device to three or more.

2

Setup Tool IOWin

This chapter provides an overview and a description of features, startup, and operation methods of the IOWin.

2.1 Overview

This section includes an overview of the IOWin, and explains its features and preparation prior to use.

2.1.1 Overview and Features

IOWin is a software tool used to setup Yaskawa MECHATROLINK-III compatible I/O modules.

This software features easy-to-use functions to connect modules to a controller and to set parameters.

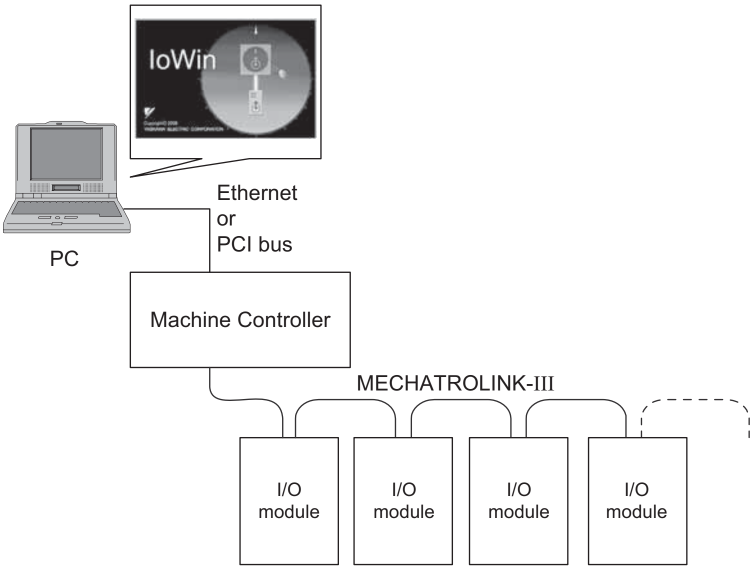
Main Functions

- Editing parameters
- Printing parameters
- Monitoring of MECHATROLINK-III command/response data

Either of the following two connection methods can be used to connect the IOWin to the master device.

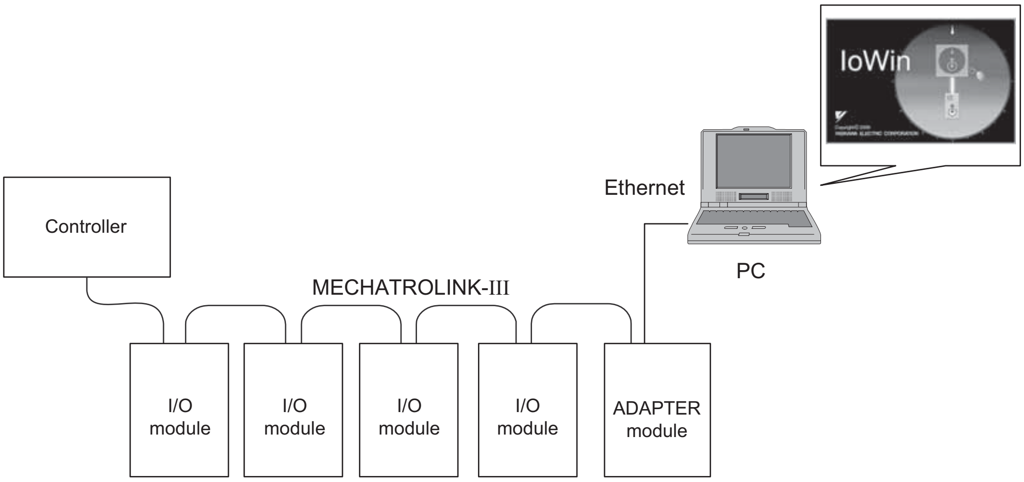
(1) When the Master Device is a Yaskawa MP2000 Series Machine Controller

Connect the IOWin to the Machine Controller using an Ethernet communication cable to control the I/O modules connected to the MECHATROLINK-III network.



(2) When the Master Device is Not a Yaskawa MP2000 Series Machine Controller

Connect the IOWin to an ADAPTER Module (Model: JEPMC-MT2020-E by Yaskawa) using an Ethernet communication cable to control the I/O modules connected to the MECHATROLINK-III network.



2.1.2 Compatible Devices

The IOWin is compatible with the following MECHATROLINK-III compatible I/O modules.

- JEPMC-MTA2900-E
- JEPMC-MTA2910-E
- JEPMC-MTP2900-E
- JEPMC-MTP2910-E

2.1.3 System Requirements

(1) When the Master Device is a Yaskawa MP2000 Series Machine Controller

IOWin requires the following system configuration.

<table>
<tr><td rowspan="9">Personal Computer (PC)</td><td colspan="2">PC/AT DOS/V-compatible device
Note: Operation cannot be assured on the NEC PC9821 series.</td></tr>
<tr><td>CPU</td><td>Pentium 200 MHz or faster</td></tr>
<tr><td>Main Memory</td><td>64 MB min. (96 MB or larger is recommended.)</td></tr>
<tr><td>Free Hard Disk Space</td><td>350 MB min.
(400 MB or larger is recommended for installation.)</td></tr>
<tr><td>Resolution (Monitor)</td><td>XVGA monitor
(1024 × 768 or greater using a small font)</td></tr>
<tr><td>Number of Colors</td><td>256 colors min. (65536 colors or more is recommended.)</td></tr>
<tr><td>Operating System (OS)</td><td>• Windows 2000
• Windows XP [*1]
• Windows Vista</td></tr>
<tr><td>Communication Interface</td><td>Ethernet</td></tr>
<tr><td>Others</td><td>CD-ROM drive (for installation only)</td></tr>
<tr><td>IOWin</td><td colspan="2">Ver. 1.00 or later</td></tr>
<tr><td>Engineering Tool MPE720 [*2]</td><td colspan="2">MPE720 Ver. 6 (Ver. 6.23 or later)
MPE720 Ver. 6 Lite (Ver. 6.23 or later)</td></tr>
<tr><td>Controller</td><td colspan="2">Machine Controller MP2000 Series
<table>
<tr><th>Controller</th><th>MECHATROLINK Module</th><th>Version No.</th></tr>
<tr><td>MP2100M</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2101M</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2101T</td><td>SVC (built-in CPU)</td><td>Ver. 2.74 or later</td></tr>
<tr><td rowspan="2">MP2101TM</td><td>SVC (built-in CPU)</td><td>Ver. 2.75 or later</td></tr>
<tr><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2200 CPU-03</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2200 CPU-04</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2310</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
<tr><td>MP2300S</td><td>SVC-01 Module</td><td>Ver. 1.03 or later</td></tr>
</table>
Note: The following settings are required.
• Enable the message communication function of the MECHATROLINK master.
• Set the number of retry stations to 1 or more
• Set the number of retry stations to a value bigger than the number of times of retry. (Number of retry stations - Number of times of retry) ≥ 1</td></tr>
</table>

* 1. When using PC applied HotfixQ328310 files, IOWin may or may not be installed. If it cannot be installed, use HotfixQ329623.

* 2. For installation and operation methods, refer to *MP2000 Series Machine Controller Engineering Tool MPE720 Ver. 6 User's Manual* (manual no.: SIEP C880700 30).

(2) When the Master Device is Not a Yaskawa MP2000 Series Machine Controller

IOWin requires the following system configuration.

Personal Computer (PC)	PC/AT DOS/V-compatible device Note: Operation cannot be assured on the NEC PC9821 series.	
	CPU	Pentium 200 MHz or faster
	Main Memory	64 MB min. (96 MB or larger is recommended.)
	Free Hard Disk Space	350 MB min. (400 MB or larger is recommended for installation.)
	Resolution (Monitor)	XVGA monitor (1024 × 768 or greater using a small font)
	Number of Colors	256 colors min. (65536 colors or more is recommended.)
	Operating System (OS)	• Windows 2000 • Windows XP * • Windows Vista
	Communication Interface	Ethernet
	Others	CD-ROM drive (for installation only)
IOWin	Ver. 1.00 or later	
ADAPTER Module	Yaskawa ADAPTER Module Model: JEPMC-MT2020-E	

* If using a PC applied HotfixQ328310 files, IOWin may or may not be installed. If it cannot be installed, use HotfixQ329623.

2.2 Installing and Uninstalling IOWin

2.2.1 Installation

To install IOWin, run the setup file and the installation process will begin. In this process, IOWin and the related files will be installed, or stored on the hard disk.

Operating conflicts may arise with other programs during installation. Be sure to close all other programs before installing IOWin.

Install the IOWin by using the following procedure:

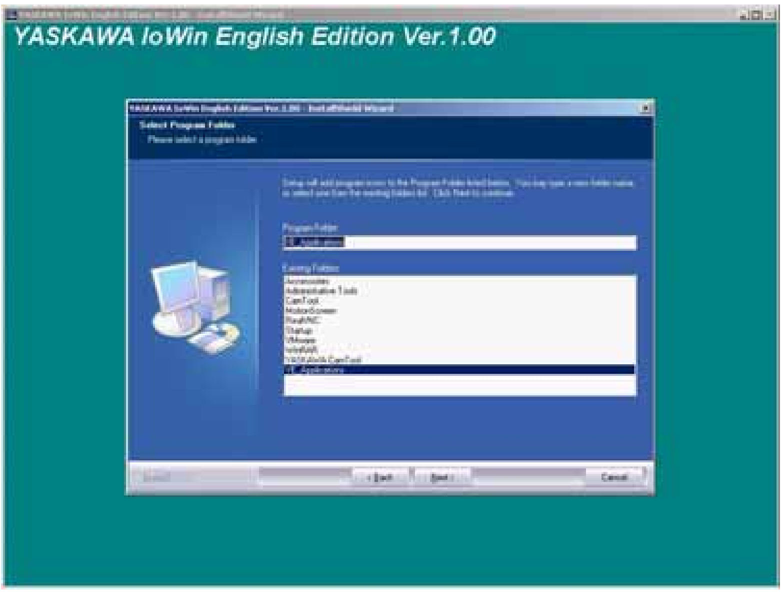
1. Insert the CD-ROM into the CD-ROM drive (the D-drive for example).
2. Open Explorer, load the CD-ROM contents, and double click **D:\ENG\IOWin\Setup.exe**.

   A message will appear, welcoming you to the IOWin.

3. Click **Next** to continue.

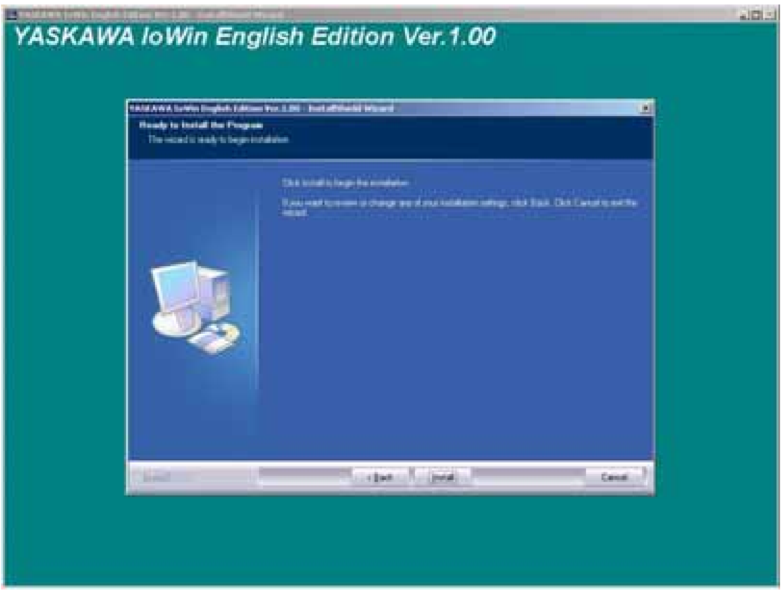
4. Read the software license agreement. If you agree, select the **I accept the terms of the licence agreement** check box, and click **Next** to continue.

5. Follow the onscreen instructions to choose a destination folder for the IOWin program, and click **Next** to continue.



6. Select the program group to create the IOWin icon.

   "YE_Applications" is the default setting. After selecting the program group or folder, click **Next** to continue.

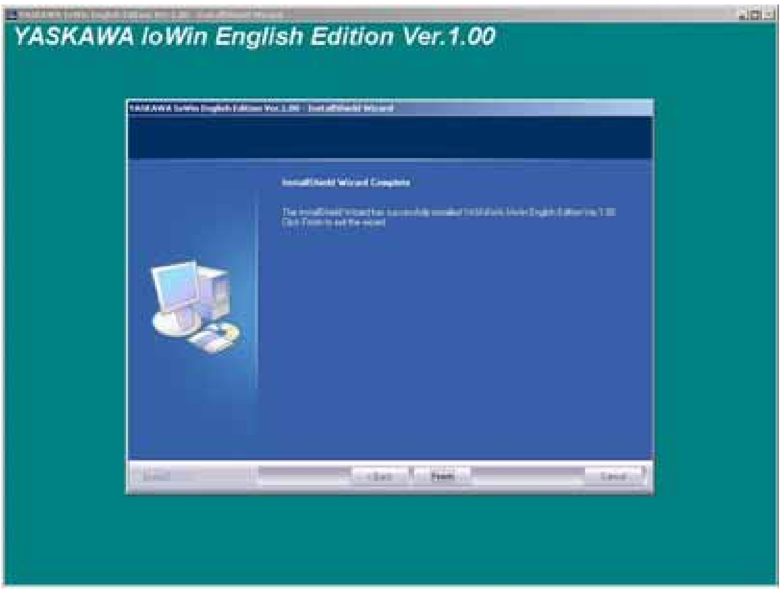


7. Click **Install**.

   The files will be copied from the CD-ROM to the PC. A progress bar will show the copying status as a percentage of completion.

Note: If new versions of the PC support files are needed to install IOWin, a window will appear asking whether to overwrite the current version or to cancel the installation.
IOWin may not run correctly if the new versions of the support files are not installed.

If IOWin has been successfully installed, the following dialog box will appear.



8. Click **Finish** to complete the setup.

2.2.2 Uninstallation

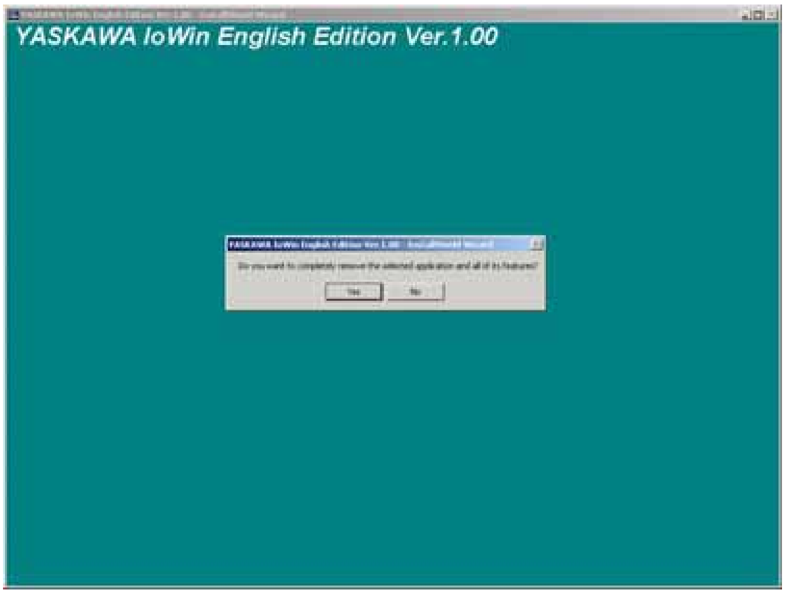
Uninstall the IOWin program by using the following procedure.

1. Click the **Start** button on Taskbar to open the start menu.
2. Select **Settings** to open the Submenu.
3. Click **Control Panel** to open the control panel window.
4. Click the **Add/Remove Programs** icon. The Add/Remove Programs Properties box will appear.

YASKAWA Communication Manager	Size	840KB
YASKAWA Electronic CamTool	Size	2.03MB
YASKAWA Engineering Tool MPE720	Size	2.93MB
YASKAWA IoWin English Edition Ver.1.00	Size	50.1MB
Click here for support information.	Used	rarely
	Last Used On	6/22/2010
To change this program or remove it from your computer, click Change or Remove.		
YASKAWA Ladder Works	Size	1.22MB
YASKAWA MPE720 Ver.6	Size	79.3MB
YASKAWA SigmaWin+ English Edition Ver.5.30	Size	276MB

5. Click **YASKAWA IOWin English Edition** as the program to be removed, and then click **Remove**.

   A confirmation message will appear asking if you are sure you want to remove the program.



6. Click **YES** to start removing the program. When the program has been successfully removed, the following window will appear telling you that uninstallation is complete.

7. Click **Finish** to complete the uninstallation process.

2.3 Starting IOWin

Start IOWin using the following method.

2.3.1 Starting IOWin

To start IOWin, use one of the following methods:

- from the Start menu
- from a shortcut

(1) From the Start Menu

To start IOWin from the **Start** menu:

1. Click the **Start** button.
2. Select **Program** to open Submenu.
3. Open the **YE_Applications** folder.
4. Click **IoWin English Edition**.

(2) From a Shortcut

To start IOWin from a shortcut on the desktop:

1. Open the **YE_Applications** folder on the desktop.
2. Click **IoWin English Edition**.

IOWin Startup Screen

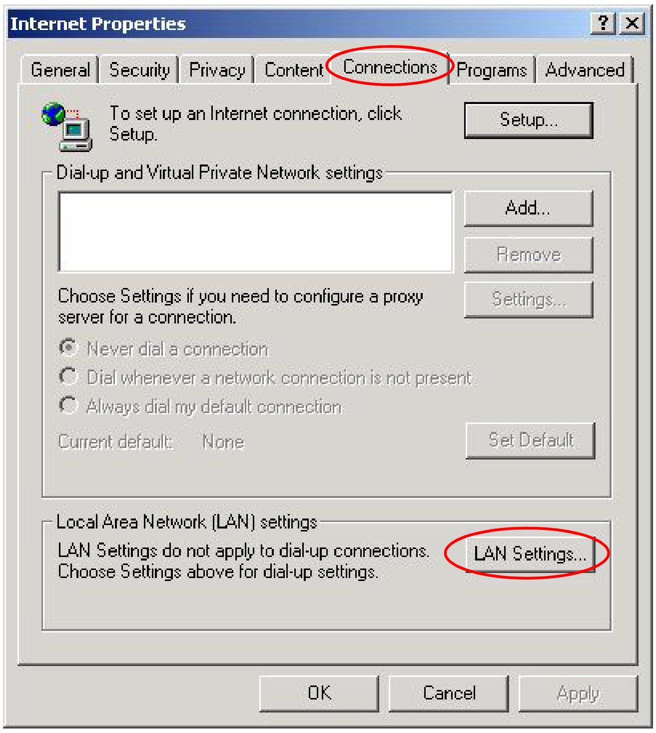
2.3.2 Selecting an I/O Module

Note: 1. When using a controller other than a Yaskawa MP2000 series Machine Controller, connect the IOWin-equipped PC to Yaskawa ADAPTER Module model JEPMC-MT2020-E using an Ethernet communication cable before starting the procedure described below.

2. When using the Yaskawa Machine Controller MP2100 or MP2500, start the procedure from step 12. (No need to set the IP address of the IOWin-equipped PC.)

When connecting the IOWin-equipped PC to a controller, the IP address of the PC must be set in advance.

1. Select ***Start - Settings - Control Panel*** on the task bar.
2. Click the **Internet Options** icon. The **Internet Properties** dialog box will appear.



To set up an Internet connection, click Setup.

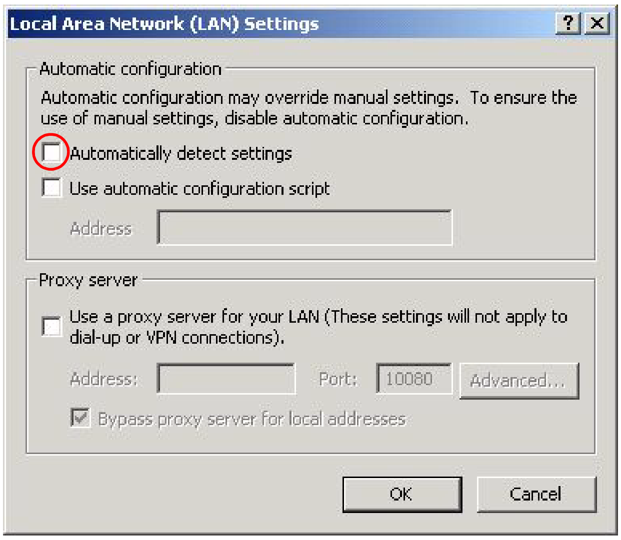
Choose Settings if you need to configure a proxy server for a connection.

○ Never dial a connection
○ Dial whenever a network connection is not present
○ Always dial my default connection

Current default: None

LAN Settings do not apply to dial-up connections. Choose Settings above for dial-up settings.

3. Select the **Connections** tab, and then click **LAN Settings** on the **Connections** tab page. The **Local Area Network (LAN) Settings** dialog box will appear.



Automatic configuration may override manual settings. To ensure the use of manual settings, disable automatic configuration.

☐ Automatically detect settings

☐ Use automatic configuration script

Address

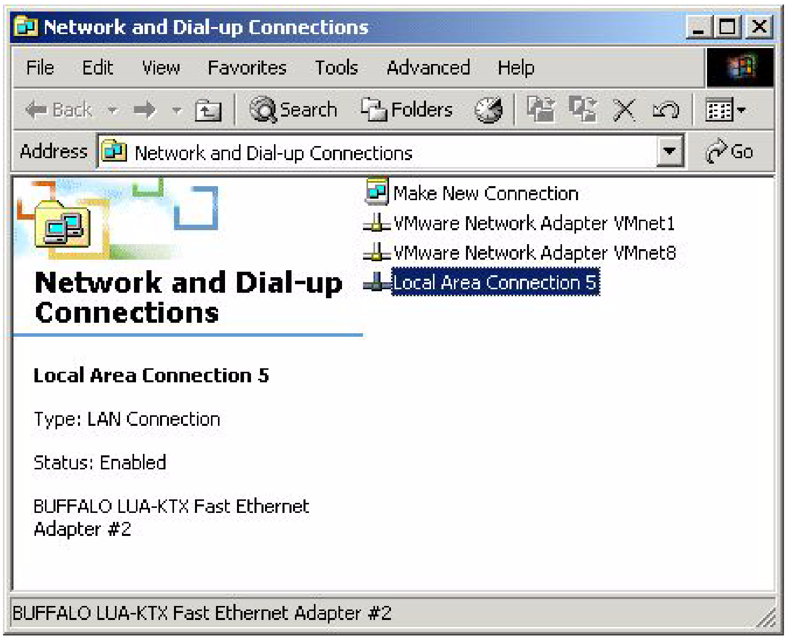
☐ Use a proxy server for your LAN (These settings will not apply to dial-up or VPN connections).

Address: Port: 10080

☑ Bypass proxy server for local addresses

4. Confirm that the **Automatically detect settings** check box is clear and then click **OK**.
5. Select ***Start - Settings - Control Panel*** on the task bar. The control panel folder will appear.

6. Click the **Network Connections** icon. **The Network and Dial-up Connections** window will appear.



Local Area Connection 5

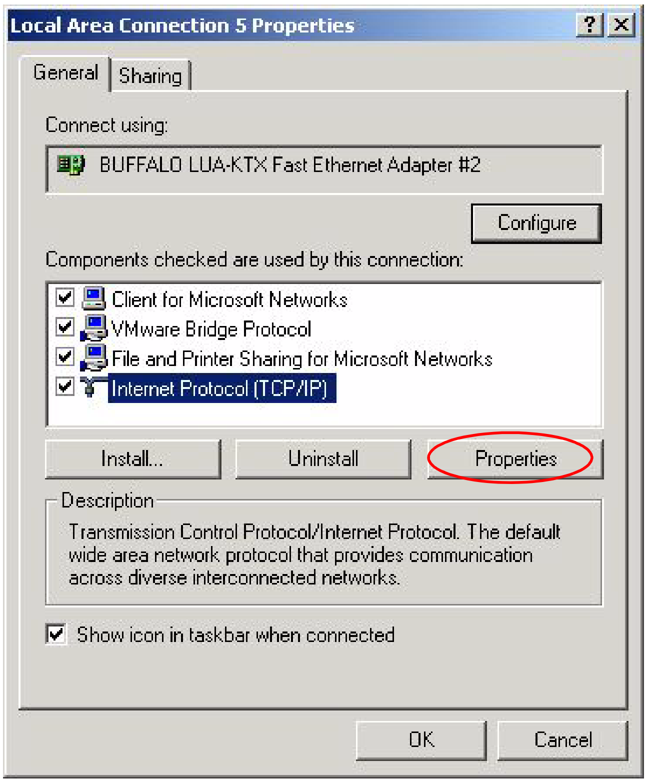
Type: LAN Connection

Status: Enabled

BUFFALO LUA-KTX Fast Ethernet Adapter #2

BUFFALO LUA-KTX Fast Ethernet Adapter #2

7. Select **Local Area Connection 5**, and click **Change settings of this connection** under **Network Tasks**. **The Local Area Connection 5 Properties** dialog box will appear.



Connect using:

BUFFALO LUA-KTX Fast Ethernet Adapter #2

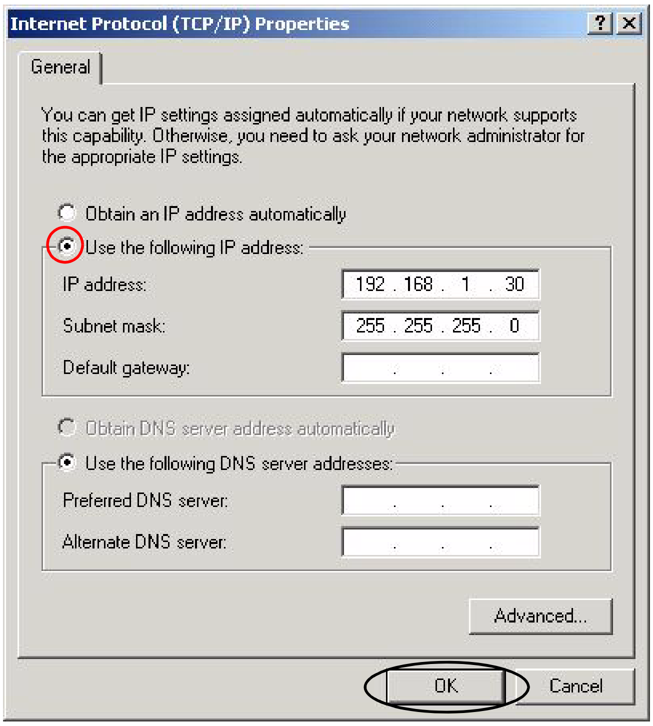
Components checked are used by this connection:

☑ Client for Microsoft Networks
☑ VMware Bridge Protocol
☑ File and Printer Sharing for Microsoft Networks
☑ Internet Protocol (TCP/IP)

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☑ Show icon in taskbar when connected

8. Select the **Internet Protocol (TCP/IP)** check box, and then click **Properties**. The **Internet Protocol (TCP/IP) Properties** dialog box will appear.


Internet Protocol (TCP/IP) Properties

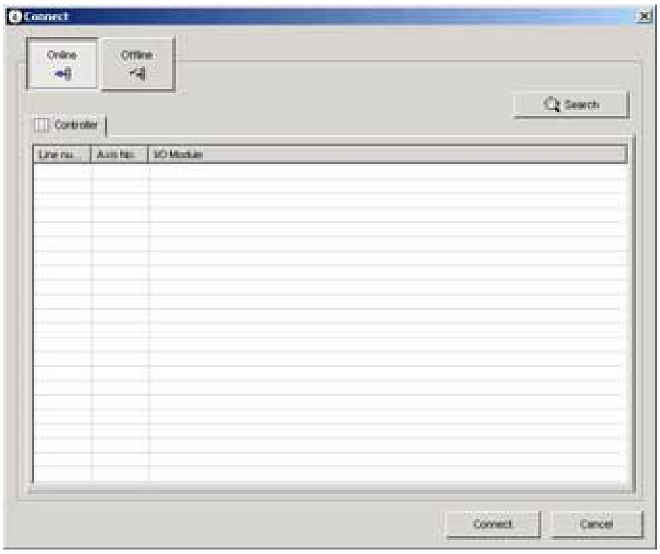
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 192 . 168 . 1 . 30
Subnet mask: 255 . 255 . 255 . 0
Default gateway: . . .

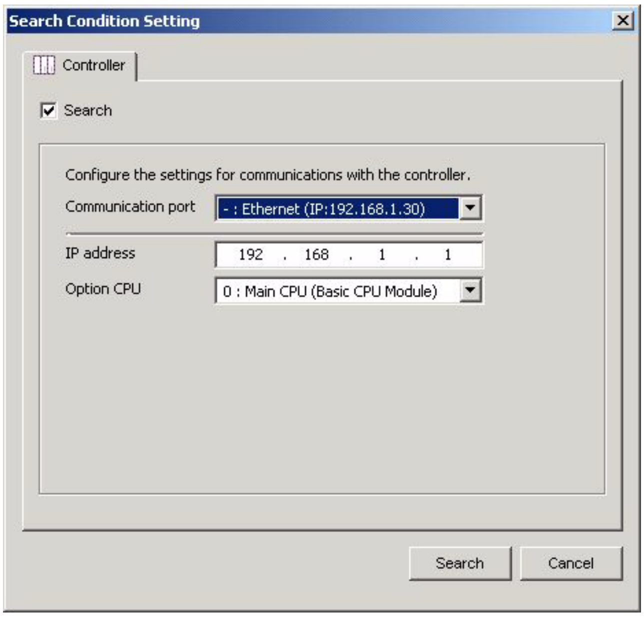
○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

9. Click **Use the following IP address**, and type the desired IP address in the **IP address** box and “255 255 255 0” in the **Subnet mask** box. Then, click **OK** to close the dialog box.

10. When IOWin is initially started, the **Connect** dialog box will appear.



11.Click **Search**. The **Search Condition Setting** dialog box will appear.



☑ Search

Configure the settings for communications with the controller.

Communication port: - : Ethernet (IP:192.168.1.30)

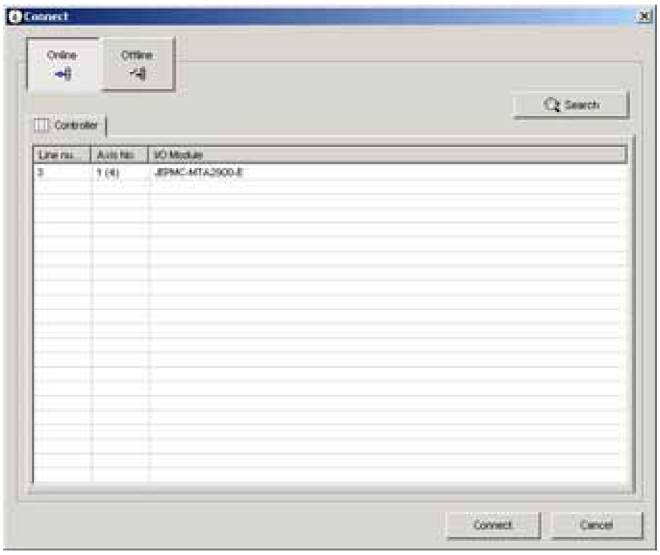
IP address: 192 . 168 . 1 . 1

Option CPU: 0 : Main CPU (Basic CPU Module)

12.In the **Communication port** list, select a communication port to use for connection with the controller. Then, click **Search**.

<When the MP2100 or MP2500 is Selected>

The search for connectable I/O modules via the MECHATROLINK communications cable will start, and the search results will be displayed in the **Connect** window.

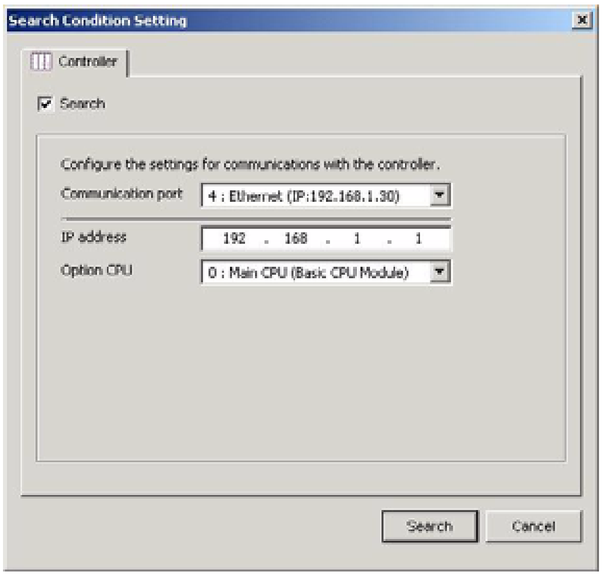


Line no.	Axis No.	I/O Module
3	1 (4)	JEPMC-MTA2900-E

Note: The search function detects only those modules that can be connected to a controller through MECHATROLINK communication cable.
For SVA Modules, PO Modules, and SVR Modules, "Cannot connect via xxx" will be displayed. (xxx is a module name.)

<When Ethernet or Ethernet (LP) is Selected>

a) The **Search Condition Setting** dialog box will appear.



☑ Search

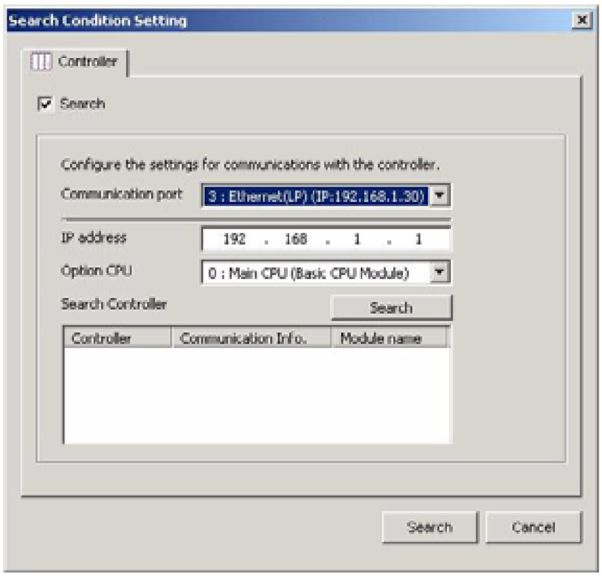
Configure the settings for communications with the controller.

Communication port: 4 : Ethernet (IP:192.168.1.30)

IP address: 192 . 168 . 1 . 1

Option CPU: 0 : Main CPU (Basic CPU Module)

When Ethernet is Selected



☑ Search

Configure the settings for communications with the controller.

Communication port: 3 : Ethernet(LP) (IP:192.168.1.30)

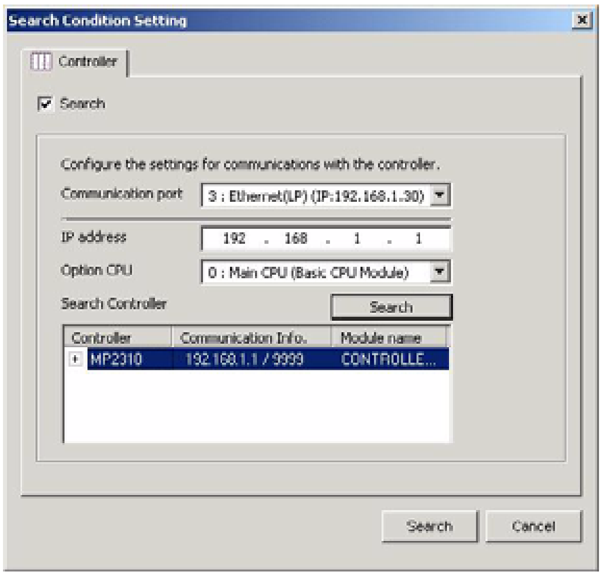
IP address: 192 . 168 . 1 . 1

Option CPU: 0 : Main CPU (Basic CPU Module)

When Ethernet (LP) is Selected

b) Select the **Search** check box on the **Controller** tab page.

Under **Search Controller** list, the controller name, IP address/port, and module name will be displayed.



☑ Search

Configure the settings for communications with the controller.

Communication port: 3 : Ethernet(LP) (IP:192.168.1.30)

IP address: 192 . 168 . 1 . 1

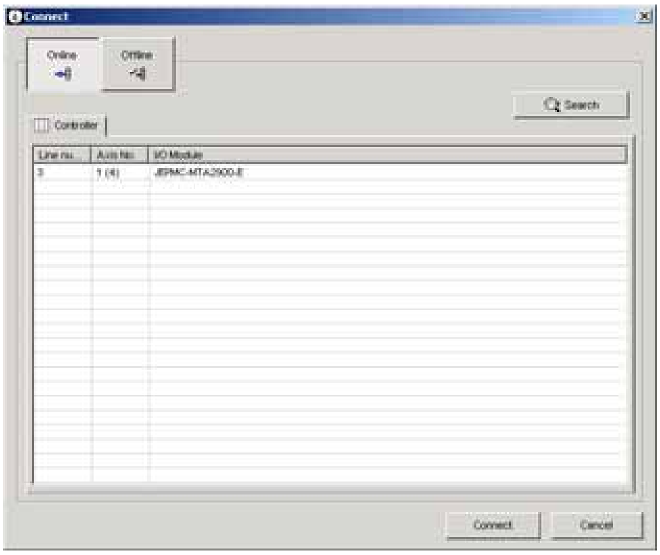
Option CPU: 0 : Main CPU (Basic CPU Module)

Search Controller

Controller	Communication Info.	Module name
MP2310	192.168.1.1 / 9999	CONTROLLE...

c) Confirm that if the IP address displayed in the **Communication port** box is the same as the IP address displayed in the **Search Controller** list. If they are the same, click the **Search** button.

The search for the connectable I/O modules via MECHATROLINK communication cable will start, and the search results will be displayed in the **Connect** window.



Line nu...	Axis No.	I/O Module
3	1 (4)	JEPMC-MTA2900-E

Note: The search function detects only those modules that can be connected to a controller through MECHATROLINK communication cable.
For SVA Modules, PO Modules, and SVR Modules, “Cannot connect via xxx” will be displayed. (xxx is a module name.)

13. Select the I/O module to be connected and then click **Online**, or just double-click the I/O module to be connected.

■ If the Connected I/O Module is Not Displayed in the Connect Window

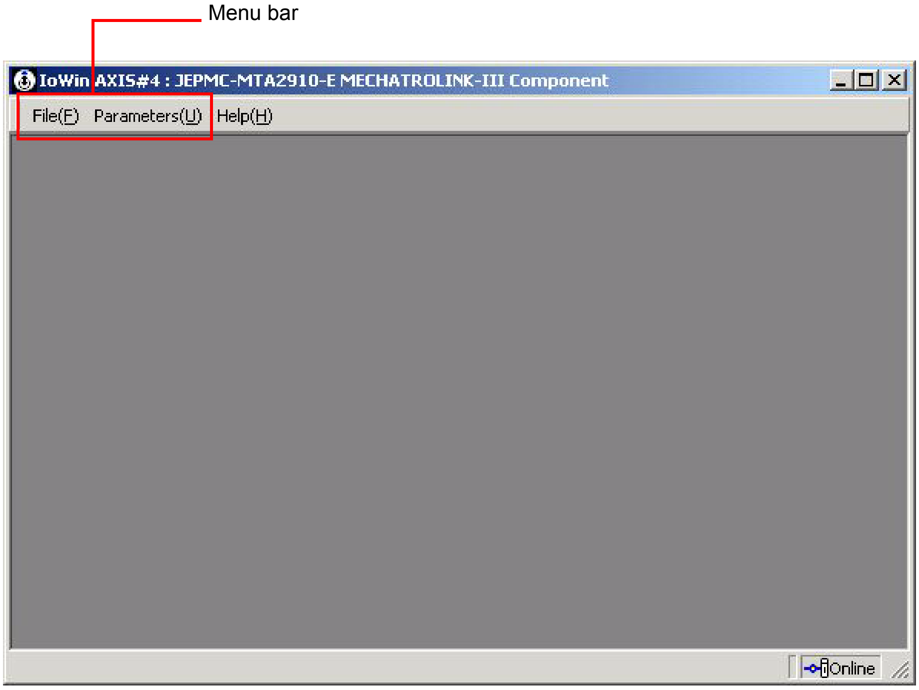
If the I/O module is not displayed in the **Connect** window though an I/O module is connected, communications might not work correctly.

Check the following items if the actually connected I/O module is not displayed.

Check Item	Corrective Actions
Is the number of retry stations set to 0?	Set the number of retry stations to 1 or more.
Does the display indicate that no I/O module is connected even though an I/O module is allocated to an axis?	Increase the number of stations. If this is not possible, take the following actions: • Delete the axis allocation. Note that the already assigned parameters will be deleted if the axis allocation is deleted. • Connect an I/O module.
Is the MECHATROLINK-III wiring correct?	Correctly wire the MECHATROLINK-III communication cables.
Is there any noise interference that may have caused a MECHATROLINK data reception error?	Take the following countermeasure against noise: • Correct the MECHATROLINK-III communication cable wiring. • Correct the FG wiring. • Attach a ferrite core to the MECHATROLINK-III communication cable.

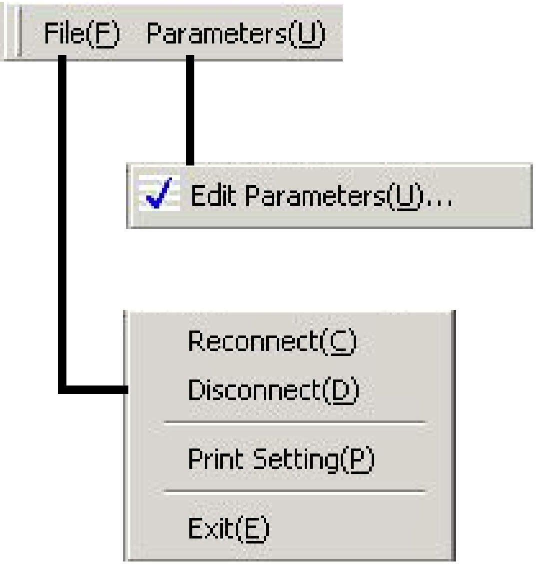
2.4 IOWin Main Window

The IOWin main window has a menu bar as shown in the following figure.



IOWin Main Window (Online Mode)

■ Menu Bar and Commands



IOWin menu bar

(1) File

Reconnect:	Switches between Online and Offline modes or between the connected I/O modules.
Disconnect:	Switches to Offline mode.
Print Setting:	Select your preferences for printing the information viewed on the screen. See *2.5.2 Printing Parameter Data* for details on the setting method.
Exit:	Quits IOWin.

(2) Parameters

Edit Parameters: Opens the Parameter Editing window. For the operation method, see *2.5.1 Editing Parameters*.

2.5 Operation

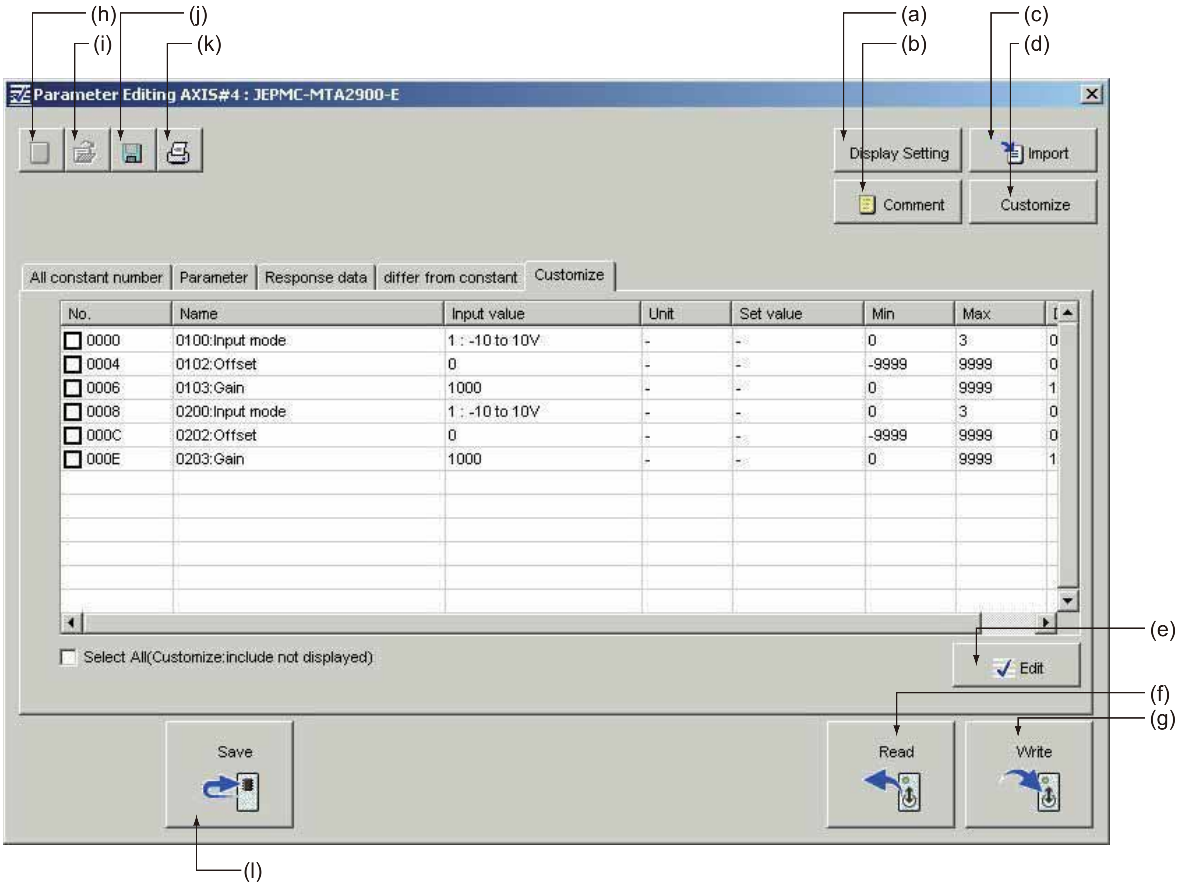
2.5.1 Editing Parameters

Parameters can be displayed or edited in the Parameter Editing window.

The windows will differ for the online and offline modes.

(1) Parameter Editing when Online

In the IOWin main window, select ***Parameters*** - ***Edit Parameters***. The **Parameter Editing** window for the online mode will appear.

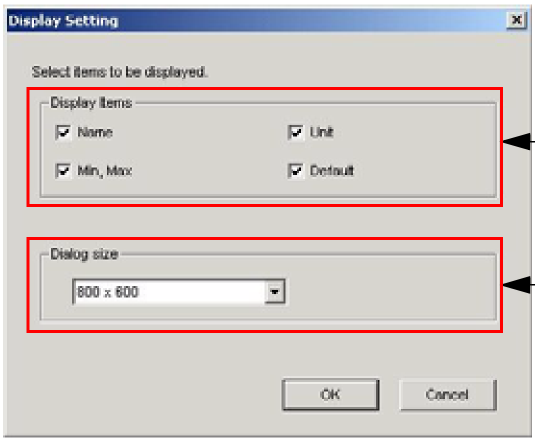


No.	Name	Input value	Unit	Set value	Min	Max	
☐ 0000	0100:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 0004	0102:Offset	0	-	-	-9999	9999	0
☐ 0006	0103:Gain	1000	-	-	0	9999	1
☐ 0008	0200:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 000C	0202:Offset	0	-	-	-9999	9999	0
☐ 000E	0203:Gain	1000	-	-	0	9999	1

Fig. 2.1 Parameter Editing Window (Online Mode)

- **Display Setting** (Button (a) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  Click **Display Setting** to open the **Display Setting** dialog box. Select the items to be displayed and the size of the **Parameter Editing** window.



Select items to be displayed.

Display Items
- ☑ Name
- ☑ Unit
- ☑ Min, Max
- ☑ Default

Dialog size: 800 x 600

- Display Items
  Select the check boxes of the items to be displayed.
- Dialog size
  Select the size of the Parameter Editing window.

Display Setting Dialog Box

Click **OK** to save any changes in the display settings and to return to the **Parameter Editing** window.

Click **Cancel** to return to the **Parameter Editing** window without changing the display settings.

- **Comment** (Button (b) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

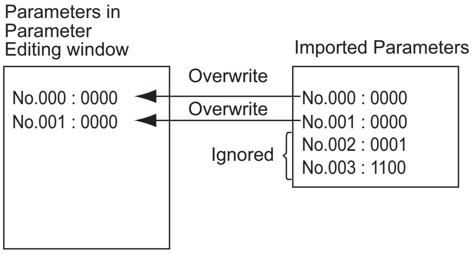
  Comments can be typed or edited in the **Comment** box. Click **Comment**, and the **Comment** box will appear.

- **Import** (Button (c) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

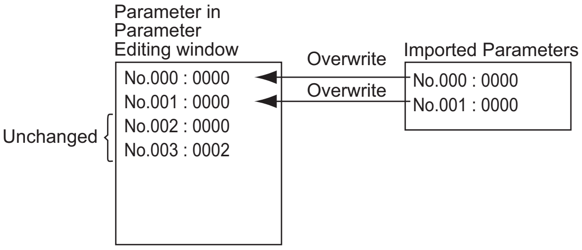
  Parameter settings can be transferred or imported from a stored file by using the Import function.

  If the imported parameters differ in number from the on-screen parameters (including parameters not currently displayed), the following processing will take place.

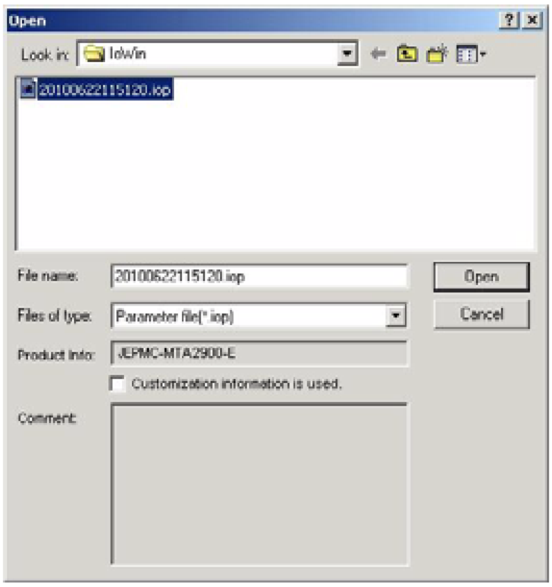
  <If the number of imported parameters is greater>



  <If the number of imported parameters is fewer>



  Click **Import**, and the **Open** box will appear.



Look in: IoWin

20100622115120.iop

File name: 20100622115120.iop

Files of type: Parameter file(*.iop)

Product Info: JEPMC-MTA2900-E

☐ Customization information is used.

Comment:

Select the file to be transferred, and click **Open**.

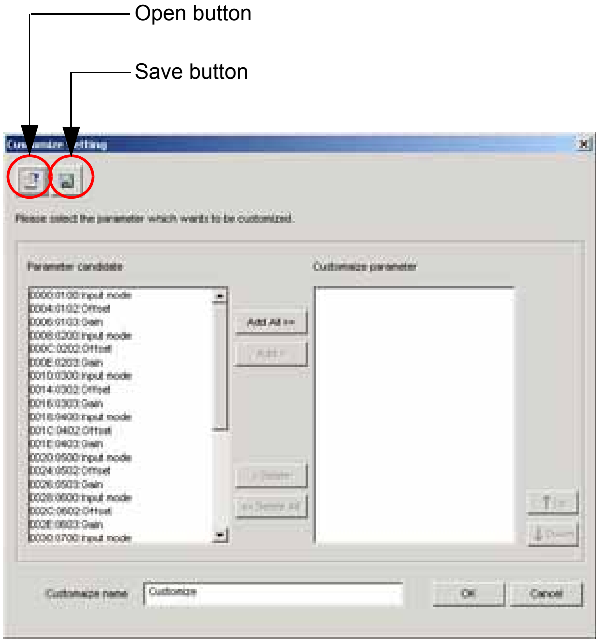
If the **Customization information is used** check box is selected, the customized information set on the **Customize** tab page in the **Parameter Editing** window will also be imported. See *• Customize* (Button (d) *in Fig. 2.1 Parameter Editing Window (Online Mode)*. For files that do not include customized information, the **Customization information is used** check box will not be available.

- **Customize** (Button (d) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  Use the following procedure to view only the parameters selected from among all parameters in the **Customize** tab page.

  1. Click **Customize** to open the **Customize Setting** window.

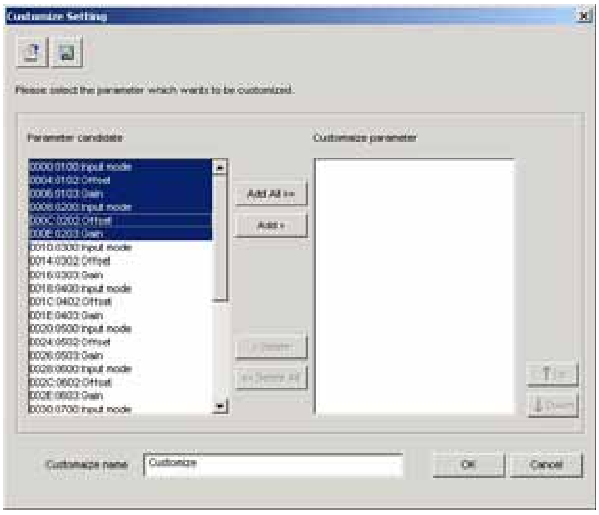
     All parameters are listed under **Parameter candidate**.



Please select the parameter which wants to be customized.

Customaize name: Customize

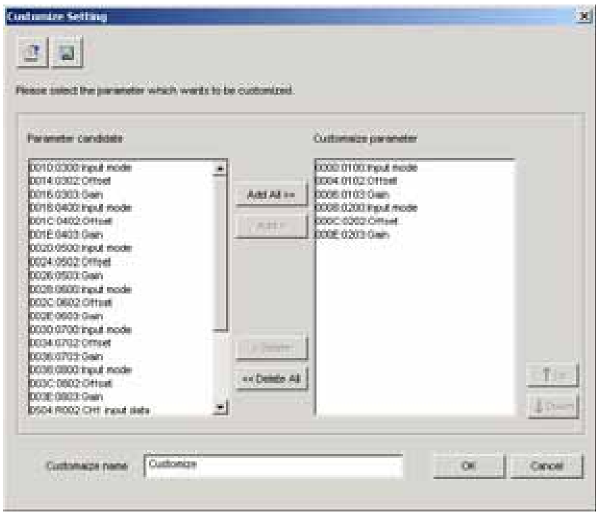
  2. In the **Parameter candidate** list, click the parameters to be customized.



Please select the parameter which wants to be customized.

Customaize name: Customize

3. Click **Add>**. The selected parameters will be moved to the **Customize parameter** list and displayed as shown below.



Parameter candidate

0010:0300:Input mode
0014:0302:Offset
0016:0303:Gain
0018:0400:Input mode
001C:0402:Offset
001E:0403:Gain
0020:0500:Input mode
0024:0502:Offset
0026:0503:Gain
0028:0600:Input mode
002C:0602:Offset
002E:0603:Gain
0030:0700:Input mode
0034:0702:Offset
0036:0703:Gain
0038:0800:Input mode
003C:0802:Offset
003E:0803:Gain
0504:R002:CH1 input data

Customize parameter

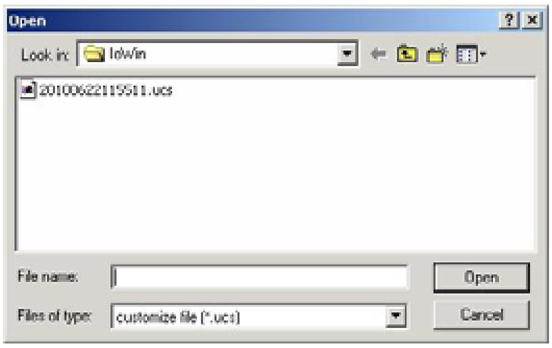
0000:0100:Input mode
0004:0102:Offset
0006:0103:Gain
0008:0200:Input mode
000C:0202:Offset
000E:0203:Gain

Customize name: Customize

Conversely, selecting parameters from the **Customize parameter** list and clicking **<Delete** will move the selected parameters to the **Parameter candidate** list.

- **Open** Button ()

Opens the **Open** box to display the customized file.



20100622115511.ucs

File name:

Files of type: customize file (*.ucs)

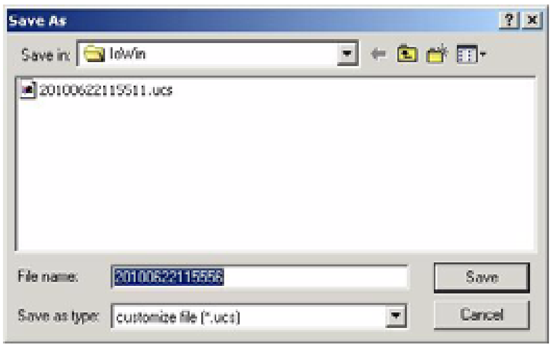
Open box opened by clicking the  (**Open**) button in the Customize Setting window.

Click **Open** to load the selected customized file.

Click **Cancel** to return to the **Customize Setting** window without loading the selected file.

- **Save** Button (💾)

Opens the **Save As** box. In the **Save As** box, select the storage location for the constants displayed in the **Customize parameters** list in the **Customize Setting** window.


Save As

Save in: IoWin

20100622115511.ucs

File name: 20100622115556

Save as type: customize file (*.ucs)

Save As box opened by clicking the 💾 (**Save**) button in the Customize Setting window.

Click **Save** to store the constants displayed in the **Customize parameter** list under the specified file name as a customized file.

Click **Cancel** to return to the **Customize Setting** window without saving the constants.

If the file name already exists or if an already existing file has been loaded and re-saved, a warning message will appear telling you that the file name already exists, and will ask if you want replace the existing file.

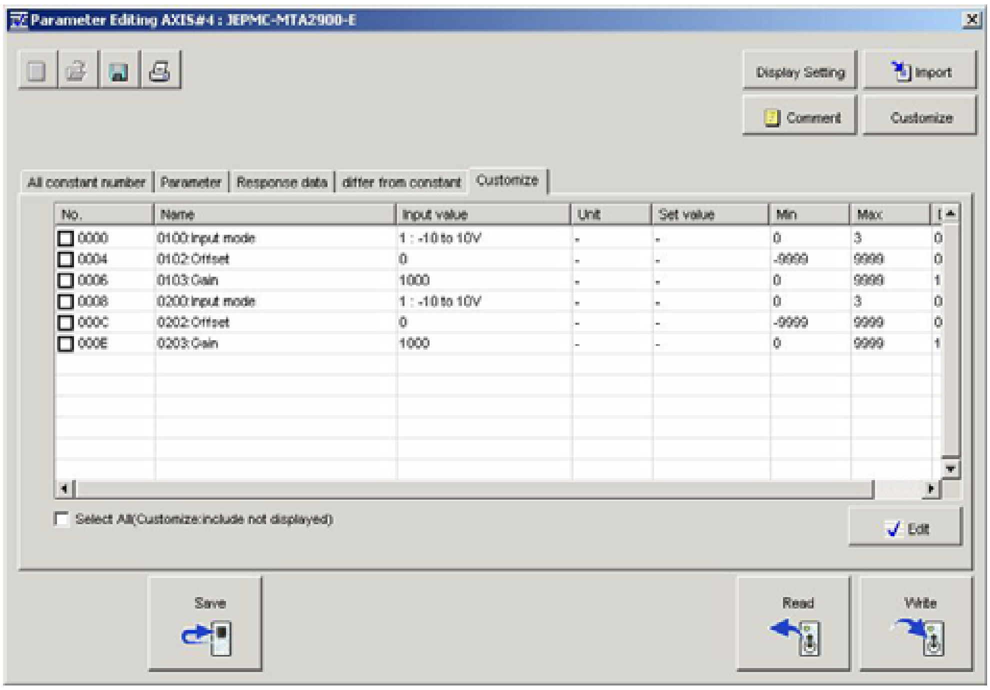

Save As

C:\IoWin\20100622115556.ucs already exists.
Do you want to replace it?

Click **Yes** to overwrite the already existing file.

Click **No** to return to the **Save As** box without saving the file.

4. When the selection of customized parameters is complete, click **OK** in the **Customize Setting** window. The **Parameter Editing** window will appear and the selected parameters will be displayed in the **Customize** tab page.

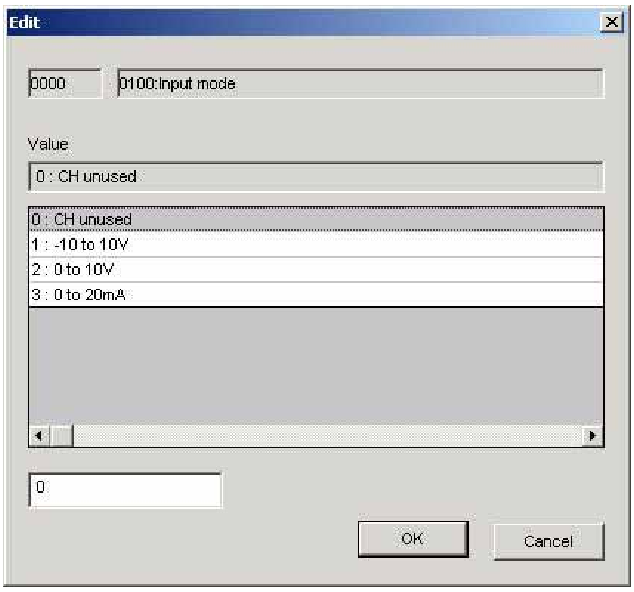


No.	Name	Input value	Unit	Set value	Min	Max	
☐ 0000	0100:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 0004	0102:Offset	0	-	-	-9999	9999	0
☐ 0006	0103:Gain	1000	-	-	0	9999	1
☐ 0008	0200:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 000C	0202:Offset	0	-	-	-9999	9999	0
☐ 000E	0203:Gain	1000	-	-	0	9999	1

☐ Select All(Customize:include not displayed)

- **Edit** (Button (e) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

Opens the **Edit** box. The selected parameter can be viewed and then changed in the **Edit** box. The **Edit** box will differ depending on the parameter selected.



0000 0100:Input mode

Value

0 : CH unused

0 : CH unused
1 : -10 to 10V
2 : 0 to 10V
3 : 0 to 20mA

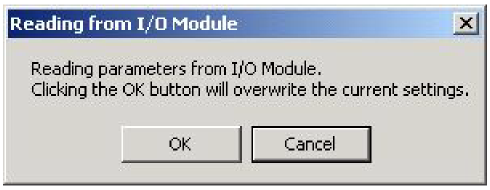
0

- **Read** (Button (f) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  The settings of the parameters with the selected check boxes can be read and then changed by overwriting them with the Read function. Read the parameters by using the following procedure.

  Note: To select all parameters, including those not displayed, select the **Select All (All constant number: include not displayed** check box.

  1. Click **Read** and a message will appear asking if you want to overwrite the parameter settings.



Reading parameters from I/O Module.
Clicking the OK button will overwrite the current settings.

  Click **Cancel** to return to the **Parameter Editing** window without reading the parameter settings.

  2. Click **OK**. Reading of the parameter settings from the I/O module will start and the settings will be overwritten.

- **Write** (Button (g) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

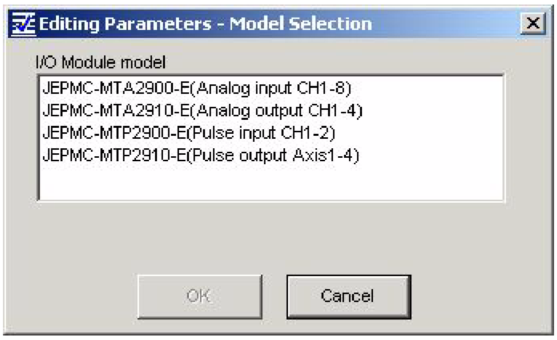
  The settings of the parameters of the selected check boxes can be saved in the I/O module.

  Note: To select all parameters, including those not displayed, select the **Select All (All constant number: include not displayed** check box.

- **New** Button (☐) (Button (h) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  A new I/O module can be selected.

  1. Click the New button (☐). The **Editing Parameters – Module Selection** box will appear.



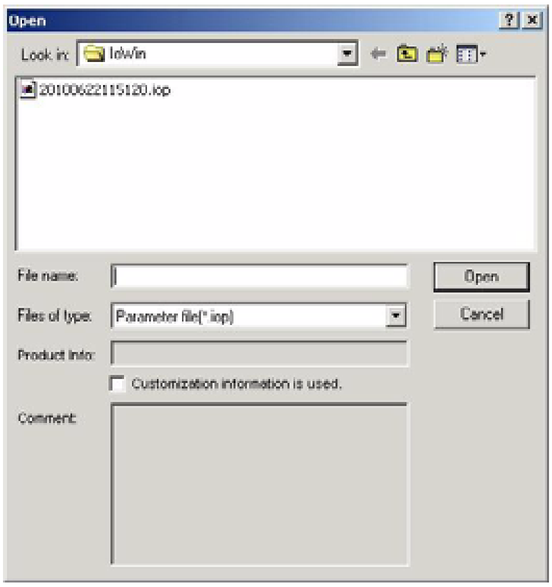
JEPMC-MTA2900-E(Analog input CH1-8)
JEPMC-MTA2910-E(Analog output CH1-4)
JEPMC-MTP2900-E(Pulse input CH1-2)
JEPMC-MTP2910-E(Pulse output Axis1-4)

  2. Select a model of I/O module.
  3. Click **OK**. The data will be imported, and the **Parameter Editing** window will appear.

- **Open** Button ( ) (Button (i) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

The parameter file can be loaded.

1. Click the **Open** button ( ), and the **Open** box will appear.



Look in: IoWin

20100622115120.iop

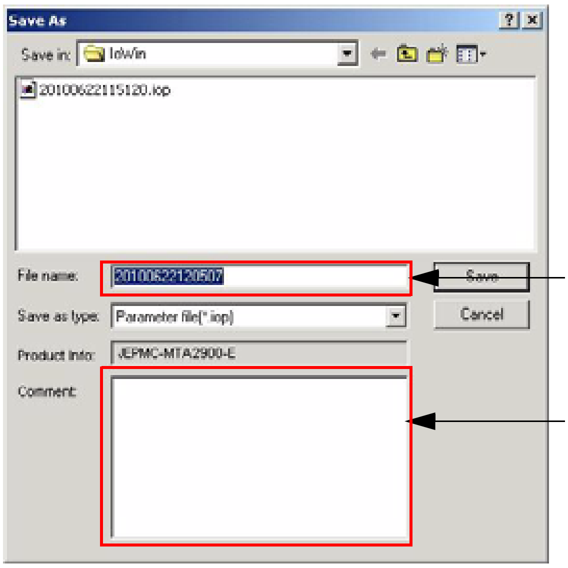
File name:

Files of type: Parameter file(*.iop)

2. Select the parameter file to be imported, and click **Open**. The selected parameter file will be imported. If the **Customization information is used** check box has been selected, the customized information set on the Customize tab page in the Parameter Editing window will also be imported. See *• Customize* (Button (d) *in Fig. 2.1 Parameter Editing Window (Online Mode)*. For files that do not include the customized information, the **Customization information is used** check box cannot be selected.

- **Save As** Button ( ) (Button (j) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

Opens the **Save As** box. Select the storage location for the parameter file displayed in the **Parameter Editing** window.



Save in: IoWin

20100622115120.iop

File name: 20100622120507

Save as type: Parameter file(*.iop)

Product Info: JEPMC-MTA2900-E

The default file name is the current time (yyyymmddhhmmss).

Up to 255 characters can be typed as a comment.

Click **Save** to save the currently set parameters under the designated file name as a parameter file.

The parameters that have been set on the **Customize** tab page will also have their customized information saved.

Click **Cancel** to return to the **Parameter Editing** window without saving the parameters.

If the file name already exists, or if an already existing file has been loaded and re-saved, a warning message will appear telling you that the file name already exists, and will ask if you want to replace the existing file.

C:\IoWin\20100622115120.iop already exists.
Do you want to replace it?

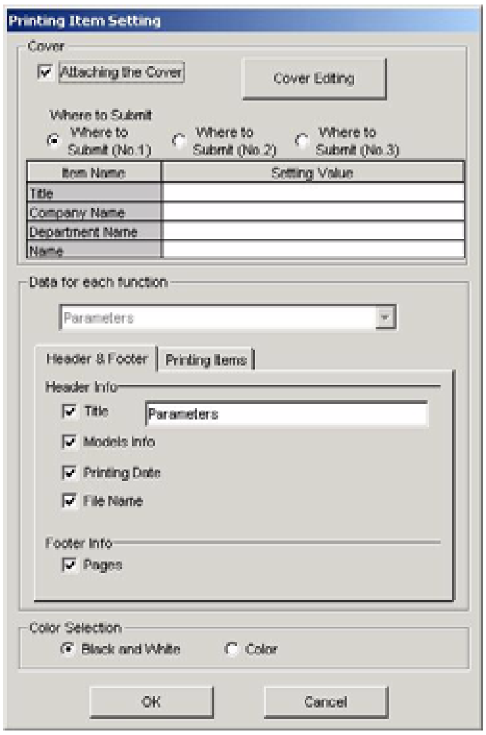
Click **Yes** to overwrite the already existing file.

Click **No** to return to the **Save As** box without saving the file.

- **Print** Button ( ) (Button (k) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  The data in the **Parameter Editing** window can be printed.

  Click the **Print** button, and the **Printing Item Setting** box will appear.



☑ Attaching the Cover

Where to Submit
● Where to Submit (No.1) ○ Where to Submit (No.2) ○ Where to Submit (No.3)

Item Name	Setting Value
Title	
Company Name	
Department Name	
Name	

Parameters

Header Info
☑ Title: Parameters
☑ Models Info
☑ Printing Date
☑ File Name

Footer Info
☑ Pages

● Black and White ○ Color

Print Item Setting Box

For details on print item settings, refer to *2.5.2 Printing Parameter Data*.

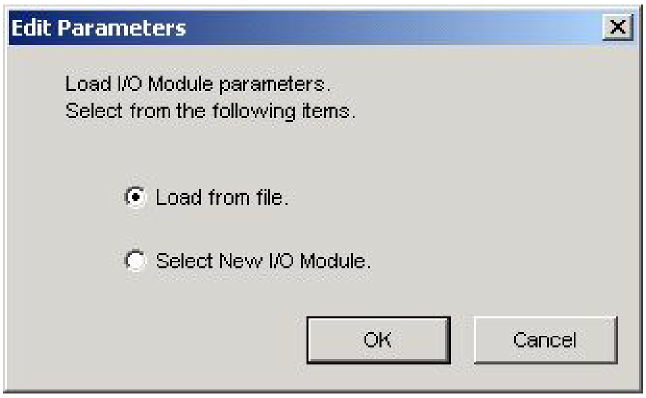
- **Save** (Button (l) in *Fig. 2.1 Parameter Editing Window (Online Mode)*)

  Parameters loaded to an I/O module can be saved in the flash ROM in the I/O module.

  Save the loaded parameters to be sure that they remain valid after restarting the power.

(2) Parameter Editing when Offline

In the IOWin main window, select ***Parameters - Edit Parameters***. The **Edit Parameters** box will appear.



Edit Parameters

Load I/O Module parameters.
Select from the following items.

● Load from file.

○ Select New I/O Module.

Select either of the followings, and then click **OK**.

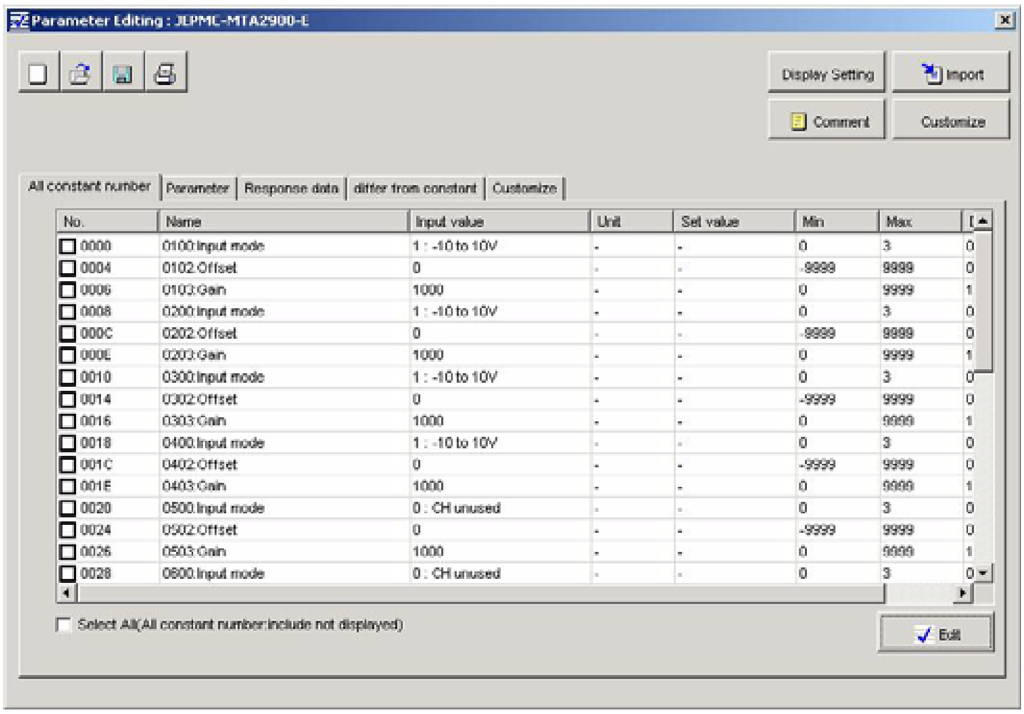
- **Load from file**: Reads in existing parameters.
- **Select New I/O Module**: Creates new settings for parameters.

<When "Load from file" is Selected>

- Refer to ･**Open** Button (Button (i) in *Fig. 2.1 Parameter Editing Window (Online Mode)*) previously described.

<When "Select New I/O Module" is Selected>

- Refer to ･**New** Button (Button (h) in *Fig. 2.1 Parameter Editing Window (Online Mode)* previously described.



Parameter Editing : JEPMC-MTA2900-E

No.	Name	Input value	Unit	Set value	Min	Max	
☐ 0000	0100:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 0004	0102:Offset	0	-	-	-9999	9999	0
☐ 0006	0103:Gain	1000	-	-	0	9999	1
☐ 0008	0200:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 000C	0202:Offset	0	-	-	-9999	9999	0
☐ 000E	0203:Gain	1000	-	-	0	9999	1
☐ 0010	0300:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 0014	0302:Offset	0	-	-	-9999	9999	0
☐ 0016	0303:Gain	1000	-	-	0	9999	1
☐ 0018	0400:Input mode	1 : -10 to 10V	-	-	0	3	0
☐ 001C	0402:Offset	0	-	-	-9999	9999	0
☐ 001E	0403:Gain	1000	-	-	0	9999	1
☐ 0020	0500:Input mode	0 : CH unused	-	-	0	3	0
☐ 0024	0502:Offset	0	-	-	-9999	9999	0
☐ 0026	0503:Gain	1000	-	-	0	9999	1
☐ 0028	0600:Input mode	0 : CH unused	-	-	0	3	0

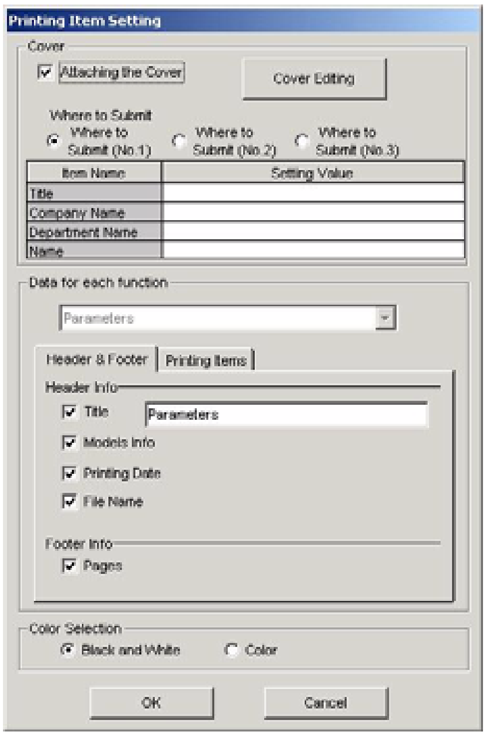
☐ Select All(All constant number:include not displayed)

Parameter Editing Window (Offline Mode)

2.5.2 Printing Parameter Data

Set the items to be printed.

In the IOWin main window, select ***File - Print Setting***. The **Printing Item Setting** box will appear.



☑ Attaching the Cover

● Where to Submit (No.1) ○ Where to Submit (No.2) ○ Where to Submit (No.3)

Parameters

☑ Title: Parameters

☑ Models Info

☑ Printing Date

☑ File Name

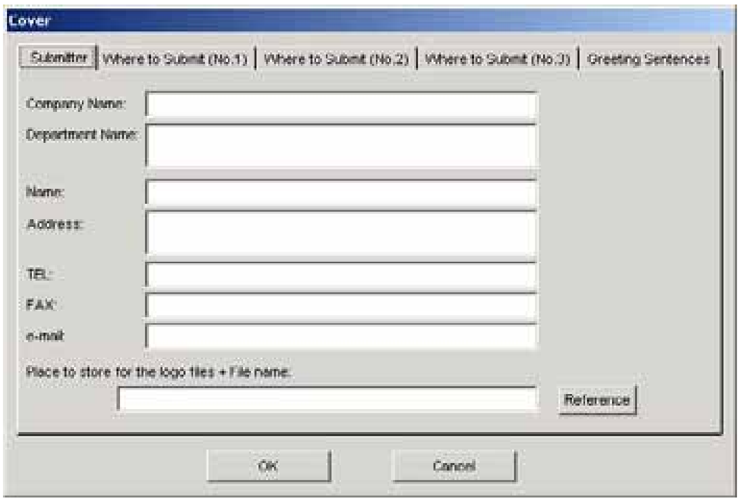
☑ Pages

● Black and White ○ Color

- Cover

  To attach a front cover, select the **Attaching the Cover** check box, and then click **Cover Editing**.

  The **Cover** box will appear.



Use the formatting options on the tabs to control the content of the cover, such as the greeting sentences and where to submit the information. After the setting is finished, click **OK**.

- Data for each function

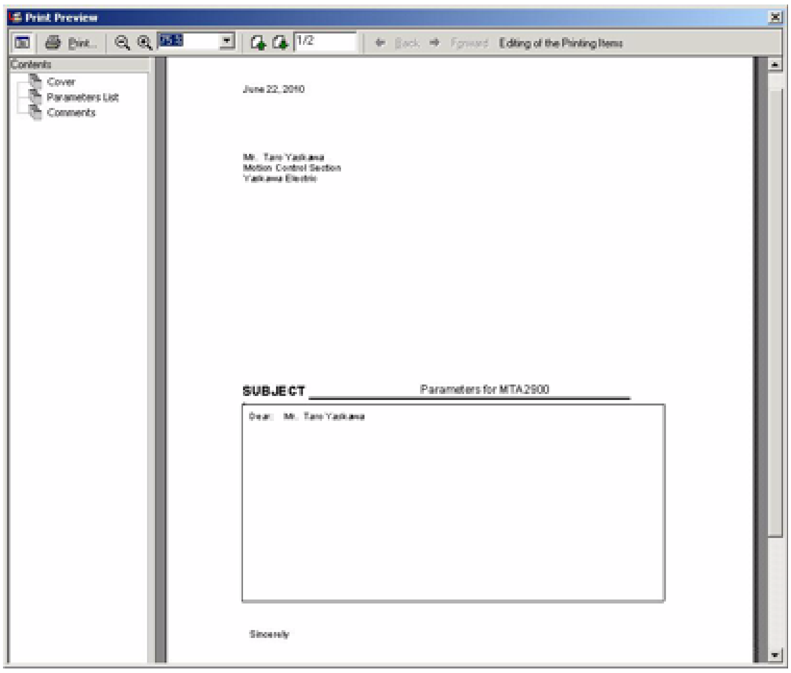
  Depending on the function, the items to be printed out differ. Select a function from the list.

  To enter your printing preferences or specifications, click the tab for which you want to enter or change operations, and enter the desired settings.

- Color Selection

  Documents can be printed in color or black and white. Select your preference.

After the settings are finished, click **OK**. The **Print Preview** box will appear.



June 22, 2010

Mr. Taro Yaskawa
Motion Control Section
Yaskawa Electric

SUBJECT Parameters for MTA2900

Dear: Mr. Taro Yaskawa

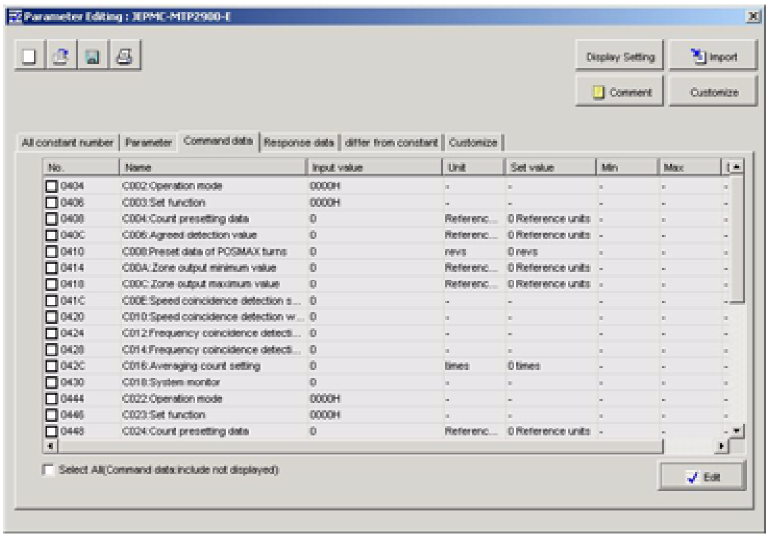
Sincerely

Click the **Print** toolbar button to start printing.

Click the **Editing of the Printing Items** toolbar button to return to the **Printing Item Setting** box to change the settings.

2.5.3 Monitoring MECHATROLINK-III Command Data and Response Data

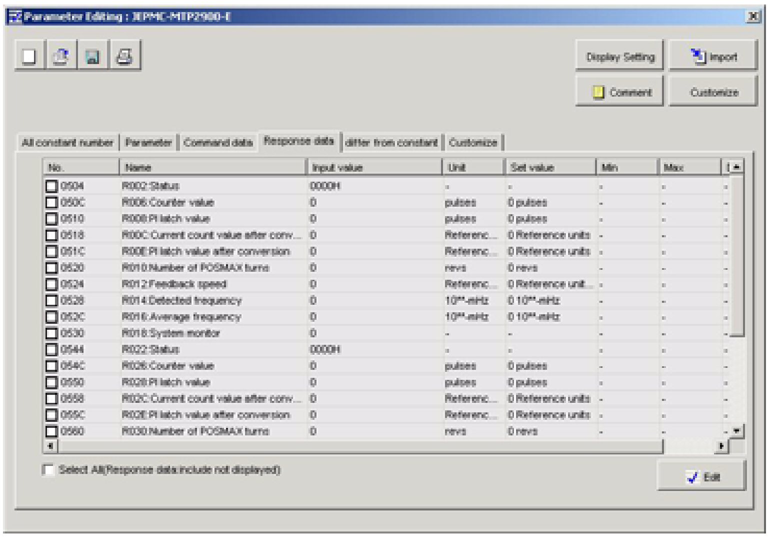
The MECHATROLINK-III command data and response data can be monitored in the **Command data** tab page and the **Response data** tab page respectively in the **Parameter Editing** window.



No.	Name	Input value	Unit	Set value	Min	Max
☐ 0404	C002:Operation mode	0000H	-	-	-	-
☐ 0406	C003:Set function	0000H	-	-	-	-
☐ 0408	C004:Count presetting data	0	Referenc...	0 Reference units	-	-
☐ 040C	C006:Agreed detection value	0	Referenc...	0 Reference units	-	-
☐ 0410	C008:Preset data of POSMAX turns	0	revs	0 revs	-	-
☐ 0414	C00A:Zone output minimum value	0	Referenc...	0 Reference units	-	-
☐ 0418	C00C:Zone output maximum value	0	Referenc...	0 Reference units	-	-
☐ 041C	C00E:Speed coincidence detection s...	0	-	-	-	-
☐ 0420	C010:Speed coincidence detection w...	0	-	-	-	-
☐ 0424	C012:Frequency coincidence detecti...	0	-	-	-	-
☐ 0428	C014:Frequency coincidence detecti...	0	-	-	-	-
☐ 042C	C016:Averaging count setting	0	times	0 times	-	-
☐ 0430	C018:System monitor	0	-	-	-	-
☐ 0444	C022:Operation mode	0000H	-	-	-	-
☐ 0446	C023:Set function	0000H	-	-	-	-
☐ 0448	C024:Count presetting data	0	Referenc...	0 Reference units	-	-

☐ Select All(Command data:include not displayed)

Command Data Tab Page



No.	Name	Input value	Unit	Set value	Min	Max
☐ 0504	R002:Status	0000H	-	-	-	-
☐ 050C	R006:Counter value	0	pulses	0 pulses	-	-
☐ 0510	R008:PI latch value	0	pulses	0 pulses	-	-
☐ 0518	R00C:Current count value after conv...	0	Referenc...	0 Reference units	-	-
☐ 051C	R00E:PI latch value after conversion	0	Referenc...	0 Reference units	-	-
☐ 0520	R010:Number of POSMAX turns	0	revs	0 revs	-	-
☐ 0524	R012:Feedback speed	0	Referenc...	0 Reference unit...	-	-
☐ 0528	R014:Detected frequency	0	10**-mHz	0 10**-mHz	-	-
☐ 052C	R016:Average frequency	0	10**-mHz	0 10**-mHz	-	-
☐ 0530	R018:System monitor	0	-	-	-	-
☐ 0544	R022:Status	0000H	-	-	-	-
☐ 054C	R026:Counter value	0	pulses	0 pulses	-	-
☐ 0550	R028:PI latch value	0	pulses	0 pulses	-	-
☐ 0558	R02C:Current count value after conv...	0	Referenc...	0 Reference units	-	-
☐ 055C	R02E:PI latch value after conversion	0	Referenc...	0 Reference units	-	-
☐ 0560	R030:Number of POSMAX turns	0	revs	0 revs	-	-

☐ Select All(Responce data:include not displayed)

Response Data Tab Page

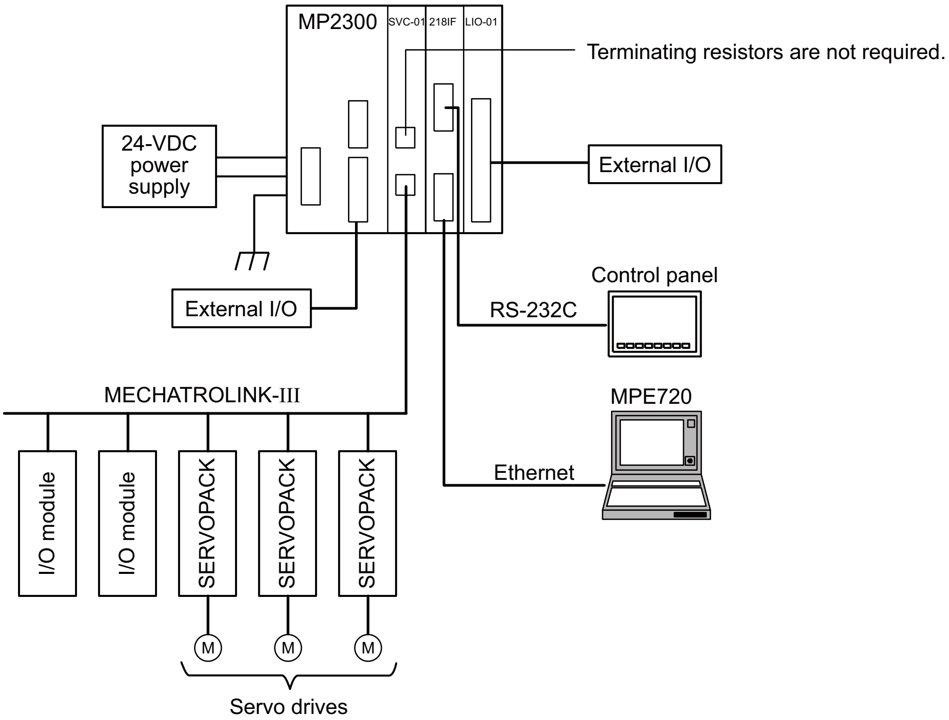
3

MP2000 Series Machine Controllers

This chapter describes the MECHATROLINK-III compatible Yaskawa MP2000 Series Machine Controllers.

3.1 System Configuration Example

The following diagram shows a system configuration example.



Note: Use the specified cables and connectors. Refer to *1.1.5 (3) Connection Cables* to select appropriate cables and connectors to connect each device.

IMPORTANT

To connect MECHATROLINK-III compatible I/O modules to an MP2000 series Machine Controller, an SVC-01 Module must be mounted on the Machine Controller.

The SVC-01 Module controls MECHATROLINK-III supported servo drives and exchanges data with the connected I/O modules.

3.2 Applicable Machine Controllers

The following table lists the MP2000 series Machine Controllers that can be connected with I/O modules via an SVC-01 Module.

Name		Model	Max. Number of SVC-01 Modules that Can Be Connected	Applicable CPU Version	Applicable MPE720 Version	Remarks
MP2310		JEPMC-MP2310	3 modules	Ver. 2.70 or later	Ver. 5.50 Ver. 6.20 or later	–
MP2300S		JEPMC-MP2300S	1 module			–
MP2300		JEPMC-MP2300	2 modules			–
MP2200	100/200-VAC Input Base Unit[*1]	JEPMC-BU2200	16 modules			The max. number of SVC-01 Modules is the total number that can be connected when using four racks (maximum number of racks).[*2]
	24-VDC Input Base Unit [*1]	JEPMC-BU2210				
MP2100M		JAPMC-MC2140	14 modules			To install an SVC-01 Module, use the following procedure. 1. Install an MP2100 MEX I/F board (Model: JAPMC-EX2100) in a personal computer. 2. Mount an SVC-01 Module on an expansion rack (MP2200 base unit). 3. Mount an inter-rack connection module EXIOIF (Model: JAPMC-EX2200) on the expansion rack. 4. Connect the expansion rack to an MP2100M controller. 5. Connect the MP2100M to the personal computer. Note: The maximum number of SVC-01 Modules is the total number that can be used with three racks (maximum number of racks).
MP2500ME		JEPMC-MP254E			Ver. 6.20 or later	To install an SVC-01 Module, use the following procedure. 1. Mount an SVC-01 Module on an expansion rack (MP2200 base unit). 2. Mount an inter-rack connection module EXIOIF (Model: JAPMC-EX2200) on the expansion rack. 3. Connect the expansion rack to an MP2500ME controller. Note: The maximum number of SVC-01 Modules is the total number that can be used with three racks (maximum number of racks).

(cont'd)

Name	Model	Max. Number of SVC-01 Modules that Can Be Connected	Applicable CPU Version	Applicable MPE720 Version	Remarks
MP2500B-OP	JEPMC-MP250U	14 modules	Ver. 2.70 or later	Ver. 6.20 or later	To install an SVC-01 Module, use the following procedure. The procedures differ if connecting one module or several modules. ■ For one module Mount an SVC-01 Module on MP2500B-OP or an MP2500MB-OP controller directly. ■ For several modules 1. Mount an inter-rack connection module EXIOIF (Model: JAPMC-EX2200) on an MP2500B-OP or an MP2500MB-OP controller. 2. Mount an SVC-01 Module on an expansion rack (MP2200 base unit). 3. Mount an inter-rack connection module EXIOIF (Model: JAPMC-EX2200) on the expansion rack. 4. Connect the expansion rack to the MP2500B-OP or the MP2500MB-OP controller. Note: The maximum number of SVC-01 Modules is the total number that can be used with three racks (maximum number of racks).
MP2500MB-OP	JEPMC-MP254U				

* 1. Requires a CPU Module, CPU-01 or CPU-02:
CPU-01: Model JAPMC-CP2200
CPU-02: Model JAPMC-CP2210 (with one CF card slot and one USB port)

* 2. Inter-rack connection module EXIOIF (Model: JAPMC-EX2200) is required between racks.

Note: SVC-01 Modules cannot be mounted on the following MP2000 series Machine Controllers:
MP2100, MP2400, MP2500, MP2500M, MP2500B, MP2500MB

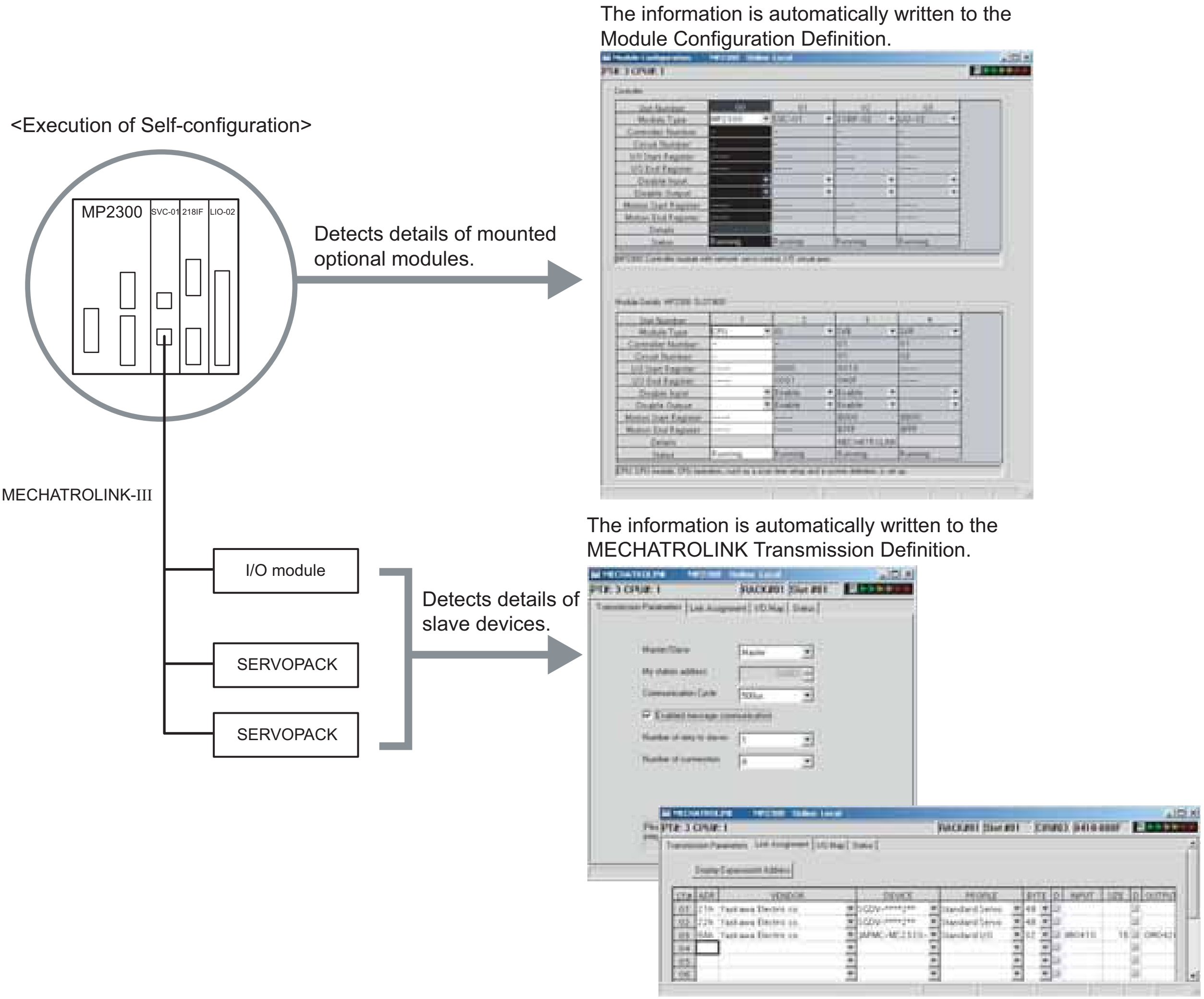
3.3 Self-configuration and Created Definition Files

This section describes the procedures for self-configuration and the definition files that will be created by self-configuration.

3.3.1 Self-configuration Overview

When the self-configuration function is implemented, the Machine Controller recognizes the mounted optional modules, and automatically creates the Module Configuration Definition, and MECHATROLINK Transmission Definition files. The self-configuration function greatly reduces the system startup time.

The following figure shows how the self-configuration function works.



Note: 1. Refer to *3.3.4 (1) Module Configuration Definition* for details on Module Configuration Definition, and *3.3.4 (2) MECHATROLINK Transmission Definition* for details on MECHATROLINK Transmission Definition.

2. The station from which a communication error or no response is returned, because of a duplicated station address or cable disconnection, is recognized as an unconnected station.

The self-configuration of devices connected in a MECHATROLINK-III network by SVC-01 Module is carried out by the following procedures.

(1) Self-configuration

The SVC-01 Module searches for slave stations in the entire range of addresses (03h to EFH) connected in the network. The SVC-01 Module acquires the device information from the slave stations that have been found, and then determines the transmission parameters to be used.

If the slave devices support multiple communication profiles, the SVC-01 Module makes connections in the primary profile. If the primary profile is not compatible with the SVC-01 Module, an attempt is made to establish connections in the secondary profile.

(2) Automatic Setting of Communication Parameters

The SVC-01 Module automatically sets the communication parameters in accordance with the number of found slave stations and the corresponding communication information read from each slave station. The transmission cycle is set to match the largest slave station with the smallest transmission cycle.

(3) Automatic Link Allocations

The SVC-01 Module determines the link allocations based on the device definition information acquired from each slave station. If 17 or more servo stations have been connected in the network, 17th or later station is not allocated. Similarly, if 22 or more I/O stations have been connected, 22nd or later station is not allocated.

Note also that if a slave station is a device that only supports communication profiles that are not compatible with SVC-01 Module, no allocation is made for that station.

(4) Recognized Modules

If the slave devices support a profile that is compatible with SVC-01 Module, link allocation is carried out in the manner shown below in accordance with self-configuration.

Device	Communication Specifications			
	Corresponding Profile	Number of Transmission Bytes	Minimum Transmission Cycle	Maximum Transmission Cycle
SGDV-****2**	Standard Servo	48	125 μs	4 ms
JAPMC-MC2320-E	Standard I/O	16, 32, 48, 64	250 μs	32 ms
JEPMC-MTA2900-E	Standard I/O	32	125 μs	8 ms
JEPMC-MTA2910-E	Standard I/O	16	125 μs	8 ms
JEPMC-MTP2900-E	Standard I/O	64 (64×2)	125 μs	8 ms
JEPMC-MTP2910-E	Standard I/O	64 (64×2)	125 μs	8 ms
WildCard Device	Standard Servo	48	Depends on the device.	Depends on the device.
	Standard I/O	16, 32, 48, 64	Depends on the device.	Depends on the device.

3.3.2 How to Execute Self-configuration

There are two ways to execute self-configuration.

(1) Turning ON the Power After Setting the DIP switch “CNFG”

Set the DIP switch “CNFG” on the Machine Controller to ON, and then turn ON the power to execute self-configuration. The setting of the DIP switch “INIT” causes some differences in the results of self-configuration.

CNFG	INIT	Result
ON	ON	• Module Configuration Definition will be updated. • All the detected axes (slave devices) will be allocated to the MECHATROLINK Transmission Definition.
ON	OFF	• Module Configuration Definition will be updated. • The axes that have already been allocated to the MECHATROLINK Transmission Definition will remain unchanged. Only the axes that are newly detected by self-configuration will be newly allocated. • The column showing the deleted axis will appear blank in the MECHATROLINK Transmission Definition window.

After execution of self-configuration, be sure to save the results of self-configuration to the flash memory of the Machine Controller.

Note: For MP2100M, MP2500ME, MP2500B-OP, and MP2500MB-OP Machine Controllers, the DIP switch is not commonly used for self-configuration. Use an MPE720 as described below to execute self-configuration.

(2) Using an MPE720

Start the Engineering Manager of MPE720 and open the Module Configuration window. Select ***Order - Self Configure All Modules*** from the main menu of the Module Configuration window, or select a module for which self-configuration is to be executed in the Module Configuration window and then select ***Module Self-configuration***.

Note: Refer to *3.3.4 (1) (a) How to Open the Module Configuration Window* for information on how to open the Module Configuration window.

The results of configuration will be as follows.

Menu	Result
Self Configure All Modules (Self-configuration for all modules)	• Module Configuration Definitions will be updated. • The axes that have already been allocated to the MECHATROLINK Transmission Definition will remain unchanged. Only the axes that are newly detected by self-configuration will be newly allocated. • The column showing the deleted axis will appear blank in the MECHATROLINK Transmission Definition window.
Module Self-configuration (Self-configuration for individual module)	• The slave devices (slave axes) of the selected module will be detected. • The axes that have already been allocated to the MECHATROLINK Transmission Definition will remain unchanged. Only the axes that are newly detected by self-configuration will be newly allocated. • The column showing the deleted axis will appear blank in the MECHATROLINK Transmission Definition window.

3.3.3 System Startup Using Self-configuration

System startup time can be reduced by using self-configuration.

This section describes system startup using self-configuration, in the following three circumstances.

- Starting the system for the first time
- Adding an electronic device (e.g., servo drive or optional module)
- Replacing electronic devices

(1) Starting the System for the First Time

Use the following procedure to start up a new system.

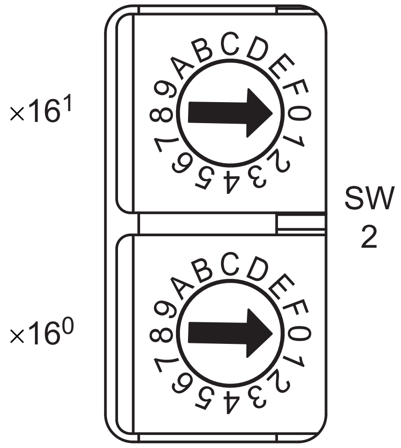
1. Wire and connect electronic devices.

   Correctly wire and connect all electronic devices to be used.

2. Make switch settings for MECHATROLINK slaves.

   Set the station address on the rotary switch on each MECHATROLINK slaves.

   <Example of I/O module Settings JEPMC-MTP2910-E>



   Note: Refer to each slave's manual for details on the setting.

3. Start up MECHATROLINK slaves.

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

4. Complete the settings on each optional module.

   Set the required items, such as communication specifications and station address, using the switches on each optional module mounted on the Machine Controller.

5. Execute self-configuration.

   Make sure that all the MECHATROLINK slave devices have started, and then execute self-configuration.

   With self-configuration, the Machine Controller recognizes the connected MECHATROLINK slave devices and optional modules, and assigns I/O registers. The motion parameters will automatically be set to enable the minimum standard motions.

   Note: For information on how to execute self-configuration, refer to the relevant Machine Controller manual.

6. Make parameter settings to match the device.

   Start IOWin to set parameters for each module, and save them as required.

7. Save ladder programs, and restart the Machine Controller.

   After saving the ladder programs to the Machine Controller, set all the DIP switches on the Machine Controller to OFF. Then turn the power to the Machine Controller OFF and then ON again.

This completes the system startup procedure.

IMPORTANT

- After changing the application by editing ladder programs or changing parameter settings, always save the changes to the flash memory. If the Machine Controller's power is turned OFF without having saved the changes in the application to the flash memory, the changed data in the machine controller will be lost. If so, the changes are still in the PC’s memory. To save the data, transfer the changed data in the PC’s memory to the Machine Controller and save it to the flash memory.
- Yaskawa recommends that you back up the applications at appropriate times. The application can be backed up by following procedure:
  MPE720 Ver 6.□□: Select ***Online - Read from Controller***.
  MPE720 Ver 5.□□: Logon online to the Machine Controller and then select ***Transfer - All Files - From Controller to MPE720***.

(2) System Startup when Adding Electronic Devices

Use the following procedure to start the system when adding servo drives, optional modules, and other electronic devices.

1. Back up applications.

   Back up the application before adding electronic devices.

2. Turn OFF the power to the Machine Controller.

   Log off from the Machine Controller or discontinue communications, then turn OFF the Machine Controller power.

3. Start the electronic device to be added.

   Make the DIP and rotary switch settings for the device to be added.

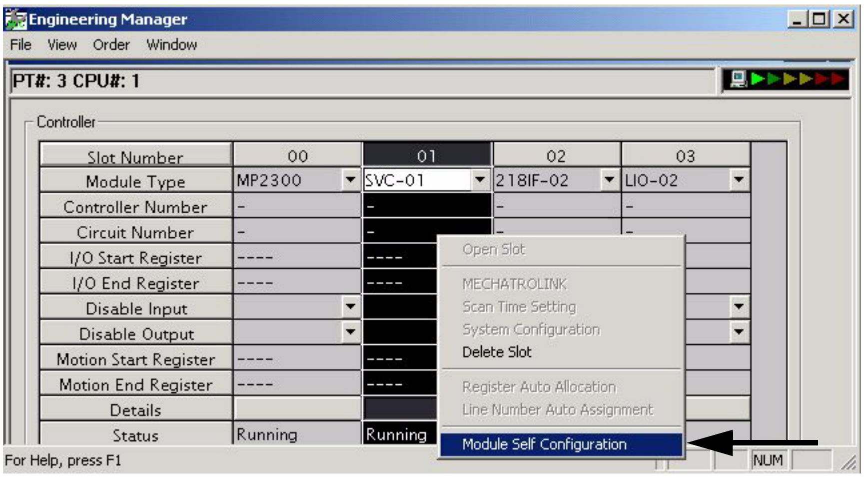
   For MECHATROLINK slaves, make the switch settings, and turn ON the power to the slave. Confirm that the device starts correctly and then turn OFF the power.

4. Connect the electronic device.

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

5. Execute self-configuration.

   Turn ON the power to the Machine Controller, log on to the Machine Controller online using MPE720, then select ***Order - Module Self-configuration*** to execute self-configuration for the added optional module or the servo drive connected to the SVC-01 Module.



PT#: 3 CPU#: 1

Slot Number	00	01	02	03
Module Type	MP2300	SVC-01	218IF-02	LIO-02
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		

Note: 1. For details on module self-configuration, refer to *3.3.2 (2) Using an MPE720*.
2. When the “MP2□□□” module is selected and **Module Self-configuration** is executed, all modules are self-configured.
3. When executing the Module Self-configuration command, existing definitions for servo drives will not be refreshed and existing parameters will be retained. However, servo drives must be started up normally before self-configuration.

IMPORTANT

- If I/O addresses are changed for an existing application using MPE720 after the initial self-configuration has been executed, the I/O addresses are updated when self-configuration is subsequently executed.

Refer to steps 6 and 7 under *3.3.3 (1) Starting the System for the First Time* for details of the rest of this procedure (steps 6 and 7).

6. Make parameter settings to match the device.
7. Save ladder programs and restart the Machine Controller.

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

(3) System Startup when Replacing Electronic Devices

Use the following procedure to start up the system when replacing servo drives, optional modules, and other electronic devices due to malfunctions and other causes.

1. Back up applications.

   Back up the application with MPE720 before replacing electronic devices.

2. Turn OFF the power to the Machine Controller.

   Log off from the Machine Controller or discontinue communications, then turn OFF the Machine Controller power.

3. Start the electronic device to be added.

   Make the DIP and rotary switch settings required for the device to be added.
   For MECHATROLINK slaves, make the switch settings, and turn ON the power to the slave. Confirm that the device starts correctly and then turn OFF the power.

4. Replace the electronic device.

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

5. Turn ON the power to the Machine Controller.

   Turn ON (OFF to ON) the power to the Machine Controller to validate the parameters.

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

3.3.4 Self-configuration and Definition Windows

Each definition file contains the following information.

- Module Configuration Definition

  Information on all the optional modules connected to the Machine Controller

  Refer to *3.3.4 (1) Module Configuration Definition* for details.

- MECHATROLINK Transmission Definition

  Information of allocations related to MECHATROLINK transmission (master and slaves)

  Refer to *3.3.4 (2) MECHATROLINK Transmission Definition* for details.

(1) Module Configuration Definition

(a) How to Open the Module Configuration Window

Open the Module Configuration window by the following procedure.

<Personal Computer with MPE720 Version 6 Installed>

1. Start the MPE720 installed in a personal computer that is connected to a Machine Controller, and then open the target project file.

   Note: Refer to *Engineering Tool for MP2000 Series Machine Controller MPE720 Version 6 User's Manual* (manual number: SIEP C880700 30) for information on how to start the MPE720.

2. Click ***Setup - Module configuration*** from the launcher, or **Module Configuration** from the Start menu.

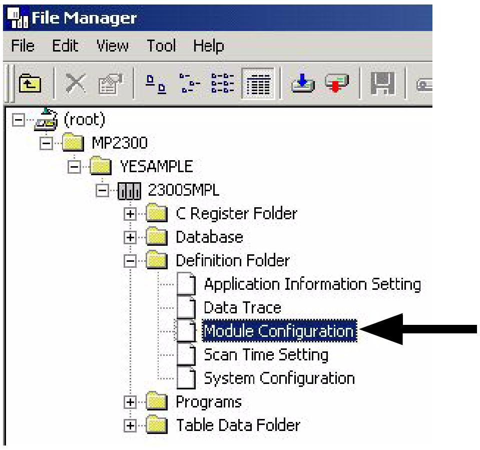
The Module Configuration window (see the next page) will appear.

<Personal Computer with MPE720 Version 5 Installed>

1. Start the MPE720 installed in a personal computer that is connected to a Machine Controller. Log on online to the application for the target Machine Controller in the **File Manager** window.

   Note: Refer to *Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual* (manual number: SIEP C880700 05) for information on how to start the MPE720 and how to log on to the Machine Controller online.

2. Double-click **Module Configuration** in the **Definition Folder**.

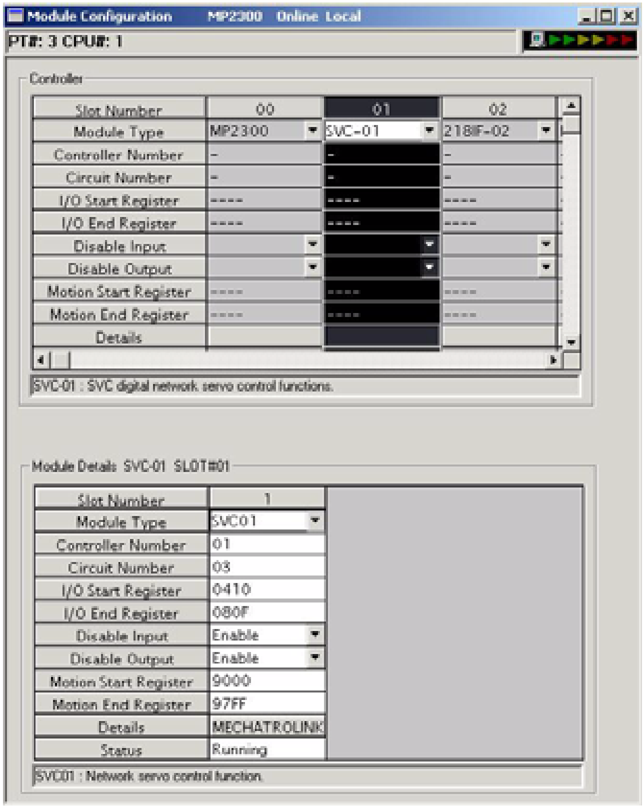


The Module Configuration window will appear (see the next page).

(b) Module Configuration Window

The **Module Configuration** window differs slightly depending on the Machine Controller model.

<MP2100, MP2300, MP2300S, and MP2310>



Module Configuration MP2300 Online Local

PT#: 3 CPU#: 1

Controller

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

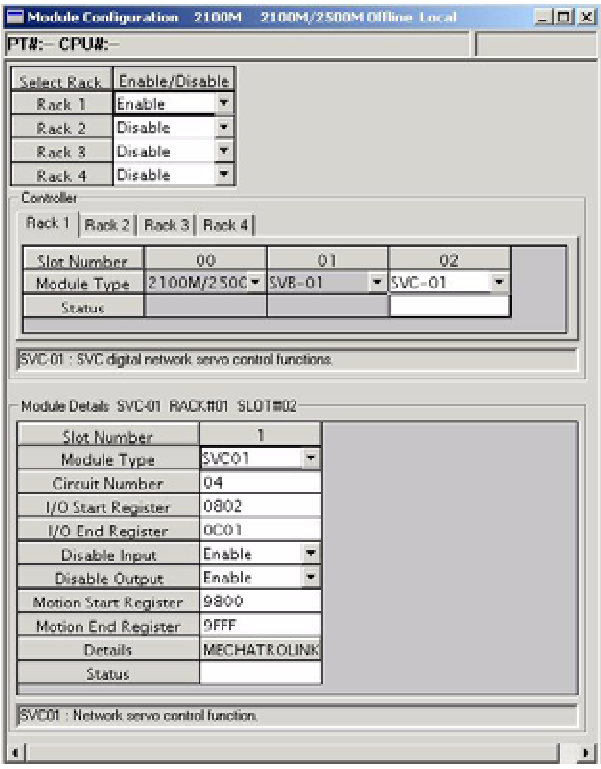
SVC-01 : SVC digital network servo control functions.

Module Details SVC-01 SLOT#01

Slot Number	1
Module Type	SVC01
Controller Number	01
Circuit Number	03
I/O Start Register	0410
I/O End Register	080F
Disable Input	Enable
Disable Output	Enable
Motion Start Register	9000
Motion End Register	97FF
Details	MECHATROLINK
Status	Running

SVC01 : Network servo control function.

<MP2100M, MP2200, MP2500ME, MP2500B-OP, and MP2500MB-OP>



Module Configuration 2100M 2100M/2500M Offline Local

PT#:– CPU#:–

Select Rack	Enable/Disable
Rack 1	Enable
Rack 2	Disable
Rack 3	Disable
Rack 4	Disable

Controller

Slot Number	00	01	02
Module Type	2100M/250C	SVB-01	SVC-01
Status			

SVC-01 : SVC digital network servo control functions.

Module Details SVC-01 RACK#01 SLOT#02

Slot Number	1
Module Type	SVC01
Circuit Number	04
I/O Start Register	0802
I/O End Register	0C01
Disable Input	Enable
Disable Output	Enable
Motion Start Register	9800
Motion End Register	9FFF
Details	MECHATROLINK
Status	

SVC01 : Network servo control function.

After executing self-configuration, all the optional modules connected to the Machine Controller are displayed in the **Controller** field. Click an optional module in the **Controller** field and its details are displayed in the **Module Details** field.

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

Item	Description	Modification
Select Rack (Only for MP2100M/MP2200/ MP2500ME/ MP2500B-OP/MP2500MB-OP)	Specifies whether the expansion rack (JEPMC-BU2200 and JEPMC-BU2210) is used or not. Note: **Rack 1** is reserved for the CPU Module and cannot be set to **Disable**.	Possible
Slot Number	Slot number	Not possible
Module Type	Module detected in the slot	Possible
Controller Number (Only for MP2100/MP2300/ MP2310/MP2300S)	Fixed to 01	Not possible
Circuit Number	Module circuit number	Possible
I/O Start Register*	The initial I/O register number of the I/O Module to be connected to the MECHATROLINK (Setting range: 0000 to 7FFFh, max. 400h words per SVC-01 Module)	Possible
I/O End Register*	The last I/O register number of the I/O Module to be connected to the MECHATROLINK (Setting range: 0000 to 7FFFh, max. 400h words per SVC-01 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

* **I/O Start Register** and **I/O End Register** must be set even though the I/O Module is not connected to the MECHATROLINK network.

Note: 1. "Possible" in the Modification column 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.

2. When changing the setting, be careful not to set the register numbers overlapped with another module.

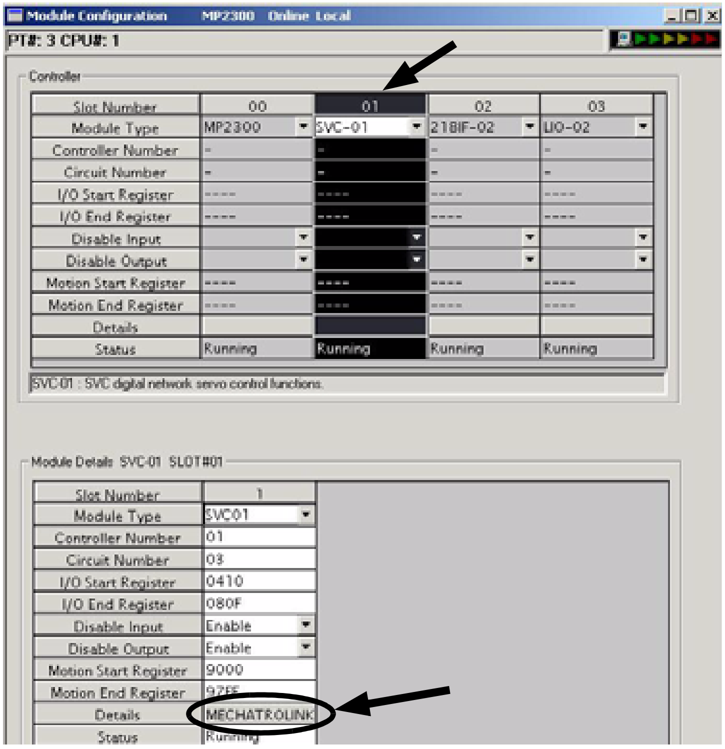
(2) MECHATROLINK Transmission Definition

(a) How to open the MECHATROLINK Transmission Definition Window from the Module Configuration Definition Window

In the Module Configuration window, select the **SVC-01** Module in the **Controller** field and double-click the **MECHATROLINK** cell in the **Details** field. The MECHATROLINK Transmission Definition window will appear.

Note: If several SVC-01 Modules are mounted, select the SVC-01 Module to be checked or set in the **Controller** field.

<MP2100, MP2300, MP2300S, and MP2310>



Module Configuration MP2300 Online Local

PT#: 3 CPU#: 1

Controller

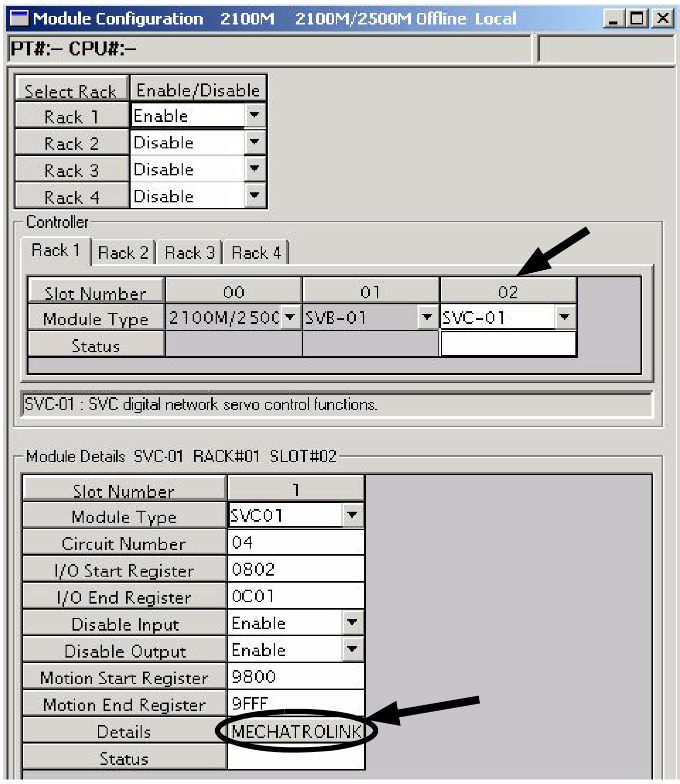
Slot Number	00	01	02	03
Module Type	MP2300	SVC-01	218IF-02	LIO-02
Controller Number	-	-	-	-
Circuit Number	-	-	-	-
I/O Start Register	----	----	----	----
I/O End Register	----	----	----	----
Disable Input				
Disable Output				
Motion Start Register	----	----	----	----
Motion End Register	----	----	----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

SVC-01 : SVC digital network servo control functions.

Module Details SVC-01 SLOT#01

Slot Number	1
Module Type	SVC01
Controller Number	01
Circuit Number	03
I/O Start Register	0410
I/O End Register	080F
Disable Input	Enable
Disable Output	Enable
Motion Start Register	9000
Motion End Register	97FF
Details	MECHATROLINK
Status	Running

<MP2100M, MP2200, MP2500ME, MP2500B-OP, and MP2500MB-OP>



Module Configuration 2100M 2100M/2500M Offline Local

PT#:– CPU#:–

Select Rack	Enable/Disable
Rack 1	Enable
Rack 2	Disable
Rack 3	Disable
Rack 4	Disable

Controller

Slot Number	00	01	02
Module Type	2100M/250C	SVB-01	SVC-01
Status			

SVC-01 : SVC digital network servo control functions.

Module Details SVC-01 RACK#01 SLOT#02

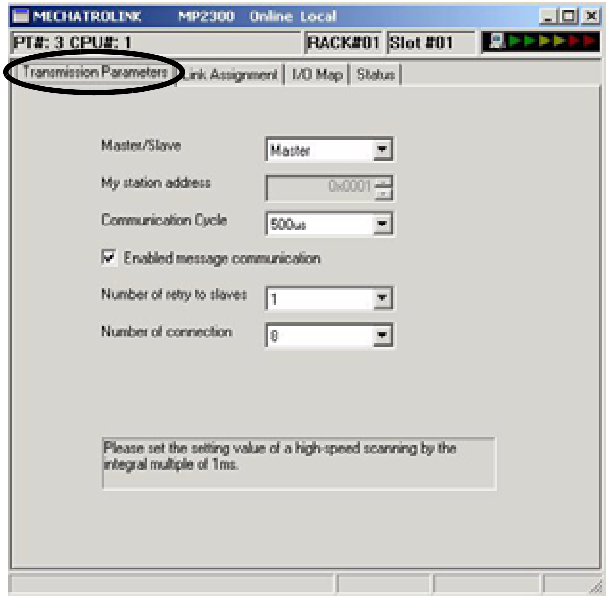
Slot Number	1
Module Type	SVC01
Circuit Number	04
I/O Start Register	0802
I/O End Register	0C01
Disable Input	Enable
Disable Output	Enable
Motion Start Register	9800
Motion End Register	9FFF
Details	MECHATROLINK
Status	

(b) The MECHATROLINK Transmission Definition Window

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

- Transmission Parameters Tab

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



Master/Slave: Master

My station address: 0x0001

Communication Cycle: 500us

☑ Enabled message communication

Number of retry to slaves: 1

Number of connection: 8

Please set the setting value of a high-speed scanning by the integral multiple of 1ms.

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

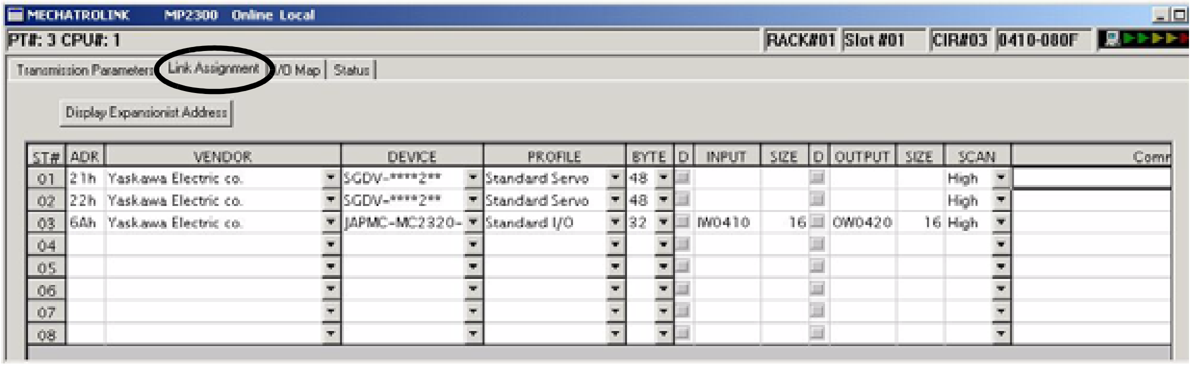
Item	Description	Options and Precautions on Settings
Master/Slave	Displays whether the selected SVC-01 Module is used as a master station or slave station.	Select “Master”.
My station address (Local station address)	Displays the local station address set by using the rotary switches.	For master station, fixed to 01h. For slave stations, set a number in the range 03h to EFh.
Communication Cycle	Displays the transmission cycle.	This can only be set for the master station. Select from among 125 µs/250 µs/500 µs/1 ms.
Enabled message communication	If the checkbox is selected, it indicates that the message communication function is enabled.	This can only be set for the master station. This function is linked with the retry count. When the retry count is “0”, selecting the check box causes the retry count to change to “1”. Note that if a value higher than 1 has been set for the retry count, this checkbox is automatically selected.
Number of retry to slaves	Displays the maximum number of retries executed within one transmission cycle.	This can only be set for the master station. For the setting range, refer to • *Range of Retry Count Setting* below.
Number of connection	Displays the number of slave stations that are connected.	This can only be set for the master station. Any required connected station within the selectable range can be set. When the transmission cycle is 125 µs:1 to 4 stations When the transmission cycle is 250 µs:1 to 8 stations When the transmission cycle is 500 µs:1 to 15 stations When the transmission cycle is 1 ms:1 to 21 stations
Message Field	Displays the precautions on high-speed scan time setting.	This is only valid for the master station. When the transmission cycle is 125 µs/250 µs, this becomes blank.

- Range of Retry Count Setting

Communication Cycle	Number of Slave Stations	Range
125 μs	1 to 4	0 to (5 - number of slave stations)
250 μs	1 to 8	0 to (9 - number of slave stations)
500 μs	1 to 15	0 to (15 - number of slave stations)
1 ms	1 to 21	0 to (23 - number of slave stations)

- Link Assignment Tab

The data of the slave devices (MECHATROLINK connected devices such as servo drive and distributed I/O) are displayed on the **Link Assignment** tab.



ST#	ADR	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPUT	SIZE	SCAN	Comr
01	21h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	48	☐			☐			High	
02	22h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	48	☐			☐			High	
03	6Ah	Yaskawa Electric co.	JAPMC-MC2320-	Standard I/O	32	☐	IW0410	16	☐	OW0420	16	High	
04						☐			☐				
05						☐			☐				
06						☐			☐				
07						☐			☐				
08						☐			☐				

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

Item	Description	Options and Precautions on Settings
ST #	The station number. A number of lines corresponding to the number of slave stations set on the parameter setting screen is displayed.	The station number set here must be the same as the number set using rotary switches.
ADR	Sets the station address of a slave station. When the local station is set as a slave station, the address specified on the parameter setting screen is displayed.	Setting range: 03h to EFh
ExADR	This is displayed on clicking the **Display Expansionist Address** button, and hidden on clicking the **Hide Extended Address** button. When multi-station modules where a number of stations are grouped together as a single node are used, the individual extended addresses are set in this field.	Setting range: 03h to EFh
VENDOR	Displays the vendor name of the device.	Select the vendor from the pull-down list. If “WildCard Device” has been selected for “DEVICE”, the display is in gray.
DEVICE	Selects the slave model. When the local station is used as a slave station, it is only possible to select “JAPMC-MC2320-E”, “JEPMC-MTA2900-E”, “JEPMC-MTA2910-E”, “JEPMC-MTP2900-E”, or “JEPMC-MTP2910-E” (local station).	Selectable options: SGDV-****2** JAPMC-MC2320-E JEPMC-MTA2900-E JEPMC-MTA2910-E JEPMC-MTP2900-E JEPMC-MTP2910-E WildCard Device Note: Refer to *3.3.1 (4) Recognized Modules* for details on the communication specifications.

(cont'd)

Item	Description	Options and Precautions on Settings
PROFILE	Selects the profile to be used from the pull-down list.	Selectable options: Standard Servo Standard I/O
BYTE	Sets the number of transmission bytes.	The selectable options vary depending on the profile.
INPUT	Sets the leading register number of the input area. When "Standard Servo" is set for "PROFILE", this is invalid.	Set within the module's I/O register range.
OUTPUT	Sets the leading register number of the output area. When "Standard Servo" is set for "PROFILE", this is invalid.	Set within the module's I/O register range.
D	I/O register's enable/disable status ☐ : Enabled ☑ : Disabled	Click the button to change the status.
SIZE	Sets the input/output size in word units. When "Standard Servo" is set for "PROFILE", this is invalid.	Setting range: 0 to 32
SCAN	Sets a scan in which input/output service is performed. When "Standard Servo" is set for "PROFILE", this is fixed as "High".	Select either "High" or "Low".
Station name (Comment)	Enter a comment of your choice.	Enter a comment of up to 32 characters.

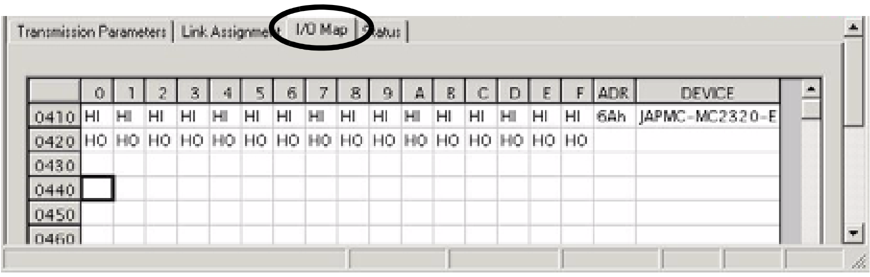
- Deleting a Station Assignment

  To delete, click any cell in the row of the station, and select ***Edit - Assignment Delete*** from the main menu.

  Note: Be careful when deleting a station assignment. The deletion is irreversible.

- I/O Map Tab

  The status allocated to I/O registers is displayed.



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ADR	DEVICE
0410	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	6Ah	JAPMC-MC2320-E
0420	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO	HO		
0430																		
0440																		
0450																		
0460																		

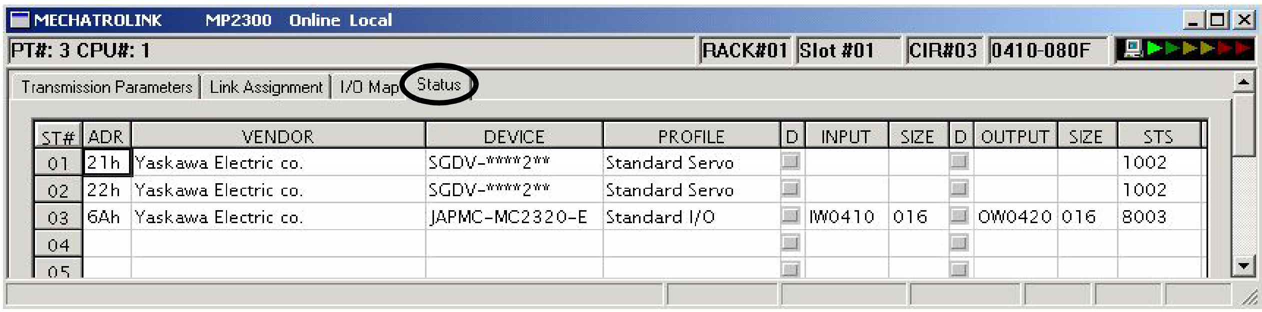
<Displayed Meaning>

HI: High-speed scan input
HO: High-speed scan output
LI: Low-speed scan input
LO: Low-speed scan output

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

- Status Tab

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



MECHATROLINK MP2300 Online Local

PT#: 3 CPU#: 1 RACK#01 Slot #01 CIR#03 0410-080F

Transmission Parameters | Link Assignment | I/O Map | Status

ST#	ADR	VENDOR	DEVICE	PROFILE	D	INPUT	SIZE	D	OUTPUT	SIZE	STS
01	21h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	☐			☐			1002
02	22h	Yaskawa Electric co.	SGDV-****2**	Standard Servo	☐			☐			1002
03	6Ah	Yaskawa Electric co.	JAPMC-MC2320-E	Standard I/O	☐	IW0410	016	☐	OW0420	016	8003
04					☐			☐			
05					☐			☐			

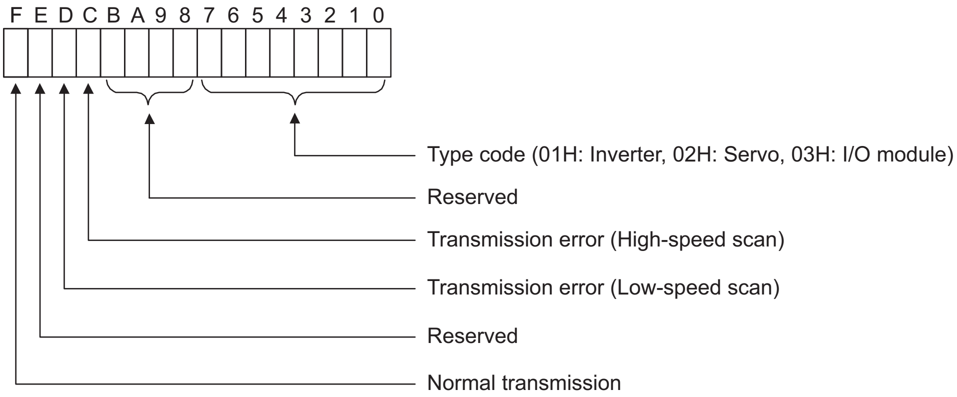
The items shown on the **Status** tab are the same as those on the **Link Assignment** tab except for **STS**.

- STS

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

  In offline mode, nothing is displayed.

  The meaning of each bit is shown below.



3.4 I/O Register Configuration

This section shows the I/O register configuration of each I/O module.

(1) JEPMC-MTD2310-E (64-point I/O Module)

	Command Data		Response Data
OW□□□□	(Reserved by system)	IW□□□□	(Reserved by system)
OW□□□□+1	(Reserved by system)	IW□□□□+1	(Reserved by system)
OW□□□□+2	Output (OUT) 1 to 16 data	IW□□□□+2	Input (IN) 1 to 16 data
OW□□□□+3	Output (OUT) 17 to 32 data	IW□□□□+3	Input (IN) 17 to 32 data
OW□□□□+4	Output (OUT) 33 to 48 data	IW□□□□+4	Input (IN) 33 to 48 data
OW□□□□+5	Output (OUT) 49 to 64 data	IW□□□□+5	Input (IN) 49 to 64 data
OW□□□□+6	Not used	IW□□□□+6	Not used
OW□□□□+7	Not used	IW□□□□+7	Not used

(2) JEPMC-MTA2900-E (Analog Input Module)

	Command Data		Response Data
OW□□□□	(Reserved by system)	IW□□□□	(Reserved by system)
OW□□□□+1	(Reserved by system)	IW□□□□+1	(Reserved by system)
OW□□□□+2	Not used	IW□□□□+2	CH1 analog input value
OW□□□□+3	Not used	IW□□□□+3	CH2 analog input value
OW□□□□+4	Not used	IW□□□□+4	CH3 analog input value
OW□□□□+5	Not used	IW□□□□+5	CH4 analog input value
OW□□□□+6	Not used	IW□□□□+6	CH5 analog input value
OW□□□□+7	Not used	IW□□□□+7	CH6 analog input value
OW□□□□+8	Not used	IW□□□□+8	CH7 analog input value
OW□□□□+9	Not used	IW□□□□+9	CH8 analog input value
OW□□□□+10	Not used	IW□□□□+10	Not used
⋮	Not used	⋮	Not used
OW□□□□+15	Not used	IW□□□□+15	Not used

(3) JEPMC-MTA2910-E (Analog Output Module)

	Command Data		Response Data
OW□□□□	(Reserved by system)	IW□□□□	(Reserved by system)
OW□□□□+1	(Reserved by system)	IW□□□□+1	(Reserved by system)
OW□□□□+2	CH1 analog output set value	IW□□□□+2	Not used
OW□□□□+3	CH2 analog output set value	IW□□□□+3	Not used
OW□□□□+4	CH3 analog output set value	IW□□□□+4	Not used
OW□□□□+5	CH4 analog output set value	IW□□□□+5	Not used
OW□□□□+6	Not used	IW□□□□+6	Not used
OW□□□□+7	Not used	IW□□□□+7	Not used

(4) JEPMC-MTP2900-E (Pulse Input Module)

	Command Data
OW□□□□	(Reserved by system)
OW□□□□+1	(Reserved by system)
OW□□□□+2	Command setting
OW□□□□+3	Set function
OW□□□□+4	Count presetting data
OW□□□□+5	
OW□□□□+6	Agree detection value
OW□□□□+7	
OW□□□□+8	Preset data of POSMAX turns
OW□□□□+9	
OW□□□□+10	Zone output minimum value
OW□□□□+11	
OW□□□□+12	Zone output maximum value
OW□□□□+13	
OW□□□□+14	Speed coincidence detection setting
OW□□□□+15	
OW□□□□+16	Speed coincidence detection width
OW□□□□+17	
OW□□□□+18	Frequency coincidence detection setting
OW□□□□+19	
OW□□□□+20	Frequency coincidence detection width
OW□□□□+21	
OW□□□□+22	Averaging count setting
OW□□□□+23	
OW□□□□+24	System monitor
OW□□□□+25	
OW□□□□+26	Not used
⋮	Not used
OW□□□□+31	Not used

	Response Data
IW□□□□	(Reserved by system)
IW□□□□+1	(Reserved by system)
IW□□□□+2	Status
IW□□□□+3	Reserved (0)
IW□□□□+4	
IW□□□□+5	
IW□□□□+6	Counter value
IW□□□□+7	
IW□□□□+8	PI latch value/ Interval value
IW□□□□+9	
IW□□□□+10	Reserved (0)
IW□□□□+11	
IW□□□□+12	Current count value after conversion
IW□□□□+13	
IW□□□□+14	PI latch value after conversion/Interval value after conversion
IW□□□□+15	
IW□□□□+16	Number of POSMAX turns
IW□□□□+17	
IW□□□□+18	Feedback speed
IW□□□□+19	
IW□□□□+20	Detected frequency
IW□□□□+21	
IW□□□□+22	Average frequency
IW□□□□+23	
IW□□□□+24	System monitor
IW□□□□+25	
IW□□□□+26	Not used
⋮	Not used
IW□□□□+31	Not used

(5) JEPMC-MTP2910-E (Pulse Output Module)

	Command Data		Response Data
OW□□□□	(Reserved by system)	IW□□□□	(Reserved by system)
OW□□□□+1	(Reserved by system)	IW□□□□+1	(Reserved by system)
OW□□□□+2	Run command setting	IW□□□□+2	Run status
OW□□□□+3	Monitor selection	IW□□□□+3	Monitor selection
OW□□□□+4	Function setting 3	IW□□□□+4	Warning
OW□□□□+5	Reserved (0)	IW□□□□+5	Alarm
OW□□□□+6	Motion command	IW□□□□+6	Motion command response code
OW□□□□+7	Motion command control flag	IW□□□□+7	Motion command status
OW□□□□+8	Reserved (0)	IW□□□□+8	Reserved (0)
OW□□□□+9	Override	IW□□□□+9	Reserved (0)
OW□□□□+10	Bias speed	IW□□□□+10	Position management status
OW□□□□+11	General-purpose DO	IW□□□□+11	General-purpose DI
OW□□□□+12	Speed reference setting	IW□□□□+12	Monitor 1
OW□□□□+13		IW□□□□+13	
OW□□□□+14	Position reference setting	IW□□□□+14	Monitor 2
OW□□□□+15		IW□□□□+15	
OW□□□□+16	Run command setting	IW□□□□+16	Run status
OW□□□□+17	Monitor selection	IW□□□□+17	Monitor selection
OW□□□□+18	Function setting 3	IW□□□□+18	Warning
OW□□□□+19	Reserved (0)	IW□□□□+19	Alarm
OW□□□□+20	Motion command	IW□□□□+20	Motion command response code
OW□□□□+21	Motion command control flag	IW□□□□+21	Motion command status
OW□□□□+22	Reserved (0)	IW□□□□+22	Reserved (0)
OW□□□□+23	Override	IW□□□□+23	Reserved (0)
OW□□□□+24	Bias speed	IW□□□□+24	Position management status
OW□□□□+25	General-purpose DO	IW□□□□+25	General-purpose DI
OW□□□□+26	Speed reference setting	IW□□□□+26	Monitor 1
OW□□□□+27		IW□□□□+27	
OW□□□□+28	Frequency reference setting	IW□□□□+28	Monitor 2
OW□□□□+29		IW□□□□+29	
OW□□□□+30	Not used	IW□□□□+30	Not used
OW□□□□+31	Not used	IW□□□□+31	Not used

4

64-point I/O Module (JEPMC-MTD2310-E)

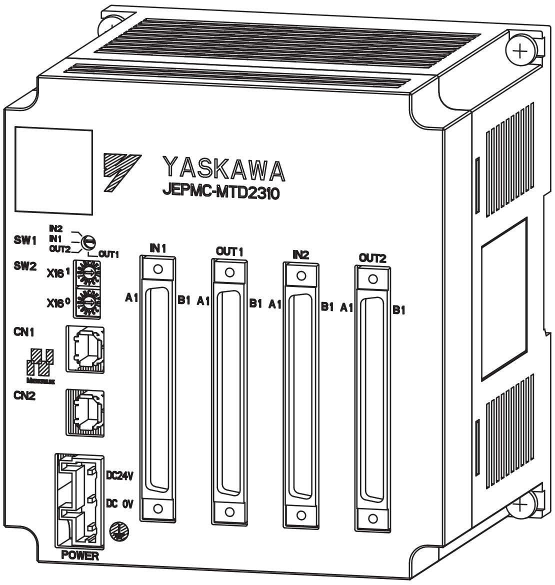
This chapter provides an overview and a description of the specifications, the connections, and the settings of the 64-point I/O Module model JEPMC-MTD2310-E.

4.1 Overview

The 64-point I/O Module, model: JEPMC-MTD2310-E (hereinafter referred to as MTD2310 Module), is a 64-point I/O module equipped with 64 point inputs (sink/source) and 64 point outputs (sink).

4.2 External Appearance and Configuration

4.2.1 External Appearance



4.2.2 I/O and Status Indication

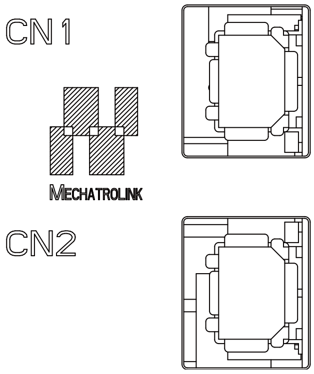
The following table shows the LEDs that indicate the operating condition and errors of the MTD2310 Module.

R	ACTIVE		F
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	29
6	14	22	30
7	15	23	31
8	16	24	32

Indicator Name	Indicator Color	Meaning of Indicator	
R	Yellow	OFF	Module abnormal
		ON	Module normal
ACTIVE	Yellow	OFF	CONNECT not established
		ON	CONNECT established
F	Red	OFF	Normal status
		ON	Fuse blown error
		Flashing	Alarm occurrence • Communication setting error: A.E41 • Communication error (reception error): A.E60 • Communication error (FCS error): A.E62 • Communication error (synchronous frame not received): A.E63
		Series of 2 flashes	Module failure (system ROM error)
		Series of 3 flashes	Module failure (system RAM error)
		Series of 4 flashes	Transmission cycle setting error, or communication LSI error
		Series of 5 flashes	Station address setting error
		Series of 6 flashes	Module failure (WDT error)
		Series of 7 flashes	Module failure (NMI error)
1 to 32	Yellow	Input signal/output signal monitor (The content displayed changes in accordance with the position of the input/output display selection switch.)	

4.2.3 MECHATROLINK-III Connectors

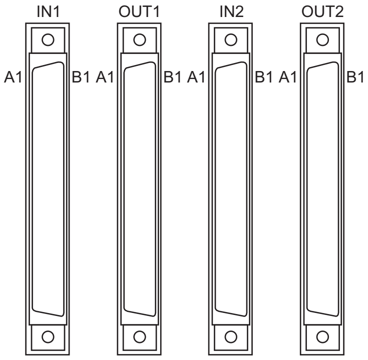
Connect the MECHATROLINK-III cable.



4.2.4 I/O Connectors

Connect an MTD2310 module and external I/O signals with I/O cables.

The number of signal points is 64 for input and 64 for output.

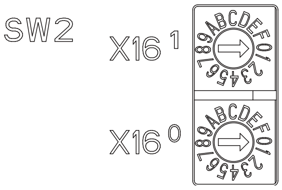


4.2.5 Station Number Selection Switch

Set the MECHATROLINK-III station number.

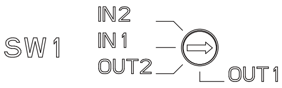
The setting range is 3 to EF (hexadecimal).

When multiple modules are connected, make sure there is no duplication of station numbers.



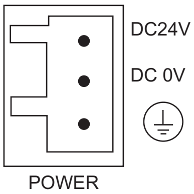
4.2.6 I/O Indication Selector Switch

Select the I/O signal monitor display in 32-point units.



IN1	Inputs 1 to 32
IN2	Inputs 33 to 64
OUT1	Outputs 1 to 32
OUT2	Outputs 33 to 64

4.2.7 External Wiring Terminals



Terminal Name	Function
DC 24 V	+24 VDC
DC 0 V	0 VDC
FG	Protective grounding terminal

4.3 Specifications

4.3.1 General Specifications

The general specifications for the MTD2310 Module are shown below.

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% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B3501)
	Corrosive Gas	There must be no flammable or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 • 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 B3502 Peak acceleration of 147 m/s^2 (15 G) twice for 11 ms each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group1, ClassA)
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling
Compliant Standards (Certification process is under way to obtain the certificate.)		UL, CSA, CE

4.3.2 Performance Specifications

(1) Hardware Specifications

The hardware specifications of the MTD2310 Module are shown below.

Item	Specifications
Name	64-point I/O module
Abbreviated Name	MTD2310
Model	JEPMC-MTD2310-E
Input Voltage	24 VDC (±20%)
Current Consumption	0.5 A

(2) Input Circuit

The specifications of the input circuit are given below.

Item	Specifications
Number of Input Points	64 points (32 points × 2)
Input Method	Combined sink/source
Insulation Method	By photocoupler
Input Voltage	24 VDC (20.4 to 28.8 VDC)
Input Current	5 mA/point
ON Voltage/Current	9 V or greater/1.6 mA or greater
OFF Voltage/Current	7 V max./1.3 mA max.
ON Time/OFF Time	ON = 2 ms, OFF = 3 ms
Number of Common Terminals	Common terminals for each 16 points (1 to 16, 17 to 32, 33 to 48, 49 to 64)

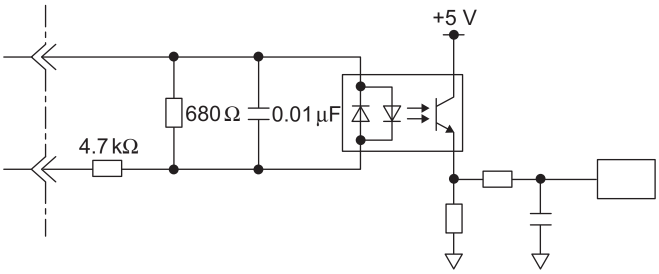


Fig. 4.1 Input Circuit

(3) Output Circuit

The specifications of the output circuit are given below.

Item	Specification
Number of Output Points	64 points (32 points × 2)
Output Method	Transistor/open collector/sink output
Insulation Method	By photocoupler
Output Voltage	24 VDC (20.4 to 28.8 VDC)
Output Current	50 mA/point
Leakage Current when OFF	0.1 mA max.
ON Time/OFF Time	ON = 2 ms max., OFF = 4 ms max.
Number of Common Terminals	Common terminals for each 16 points (1 to 16, 17 to 32, 33 to 48, 49 to 64)
Fuse	For each common terminal there is a fuse for protection against fire on shorting of outputs
Error Detection	Fuse blow detection

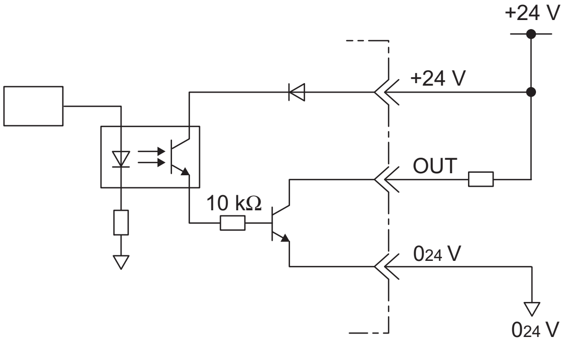


Fig. 4.2 Output Circuit

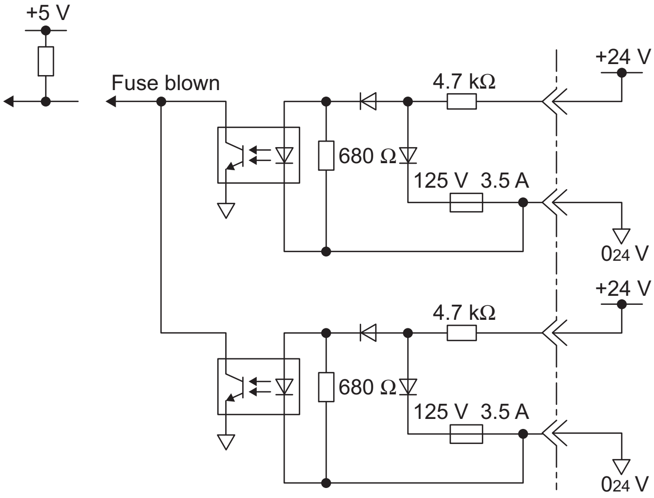


Fig. 4.3 Fuse Blow Detection Circuit

4.3.3 MECHATROLINK-III Communication Specifications

The general specifications of MECHATROLINK-III communications are given below.

Item	Specifications	
Communications Protocol	MECHATROLINK-III	
Classification	Slave	
Station Address Setting Range	03 to EF (hexadecimal)	
Transmission Speed	100 Mbps	
Supported Transmission Cycles	0.125 ms, 0.25 ms, 0.5 ms, 0.75 ms, 1 ms to 8 ms (granularity: 0.5 ms)	
Number of Bytes per Station for Cyclic Communications	16 bytes	
Supported Communication Methods	Cyclic communications, event-driven communications, message communications	
Supported Profile	Standard I/O profile	
Supported Commands	Cyclic communications	NOP, ID_RD, ALM_RD, ALM_CLR, CONNECT, DISCONNECT, DATA_RWA
	Event-drive communications	NOP, ID_RD, CONNECT, DISCONNECT
	Message communications	Read memory content, Write memory content, Read maximum message size

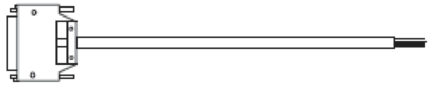
4.4 External I/O Signals and Connection Examples

4.4.1 Specifications of Connection Cables and Connectors

(1) Connectors

Name	Number of Pins	Connector			
		Module	Manufacturer	Cable	Manufacturer
I/O Connector	40	900413-1	Tyco Electronics AMP K.K.	FCN-360C-040-E (cover) FCN-361J-040-AU	Fujitsu Component Limited

(2) Standard Cable Models and Appearance

Name	Model	Length	Appearance (JEPMC-W5410-□□)
Cable for MTD2310 Module	JEPMC-W5410-05	0.5 m	
	JEPMC-W5410-10	1 m	
	JEPMC-W5410-30	3 m	

(3) Standard Cable Wiring Chart

The wiring chart for the loose wires of the JEPMC-W5410-□□ standard cable is shown below.

Fujitsu Component 40-pin	Wire Color	Dot Color	Dot Mark
A1	Blue	Red	-
B1	Blue	Black	-
A2	Pink	Red	-
B2	Pink	Black	-
A3	Green	Red	-
B3	Green	Black	-
A4	Orange	Red	-
B4	Orange	Black	-
A5	Gray	Red	-
B5	Gray	Black	-
A6	Blue	Red	- -
B6	Blue	Black	- -
A7	Pink	Red	- -
B7	Pink	Black	- -
A8	Green	Red	- -
B8	Green	Black	- -
A9	Orange	Red	- -
B9	Orange	Black	- -
A10	Gray	Red	- -
B10	Gray	Black	- -

Fujitsu Component 40-pin	Wire Color	Dot Color	Dot Mark
A11	Blue	Red	- - -
B11	Blue	Black	- - -
A12	Pink	Red	- - -
B12	Pink	Black	- - -
A13	Green	Red	- - -
B13	Green	Black	- - -
A14	Orange	Red	- - -
B14	Orange	Black	- - -
A15	Gray	Red	- - -
B15	Gray	Black	- - -
A16	Blue	Red	- - - -
B16	Blue	Black	- - - -
A17	Pink	Red	- - - -
B17	Pink	Black	- - - -
A18	Green	Red	- - - -
B18	Green	Black	- - - -
A19	Orange	Red	- - - -
B19	Orange	Black	- - - -
A20	Gray	Red	- - - -
B20	Gray	Black	- - - -

4.4.2 Connector Pin Layouts

(1) Input Signal Connector IN1

The pin layout of the IN1 connector is shown below.

No.	Signal Name	Function	No.	Signal Name	Function
A1	(NC)	–	B1	(NC)	–
A2	+24V_2	24 V power supply 2	B2	+24V_2	24 V power supply 2
A3	IN32	Input 32	B3	IN31	Input 31
A4	IN30	Input 30	B4	IN29	Input 29
A5	IN28	Input 28	B5	IN27	Input 27
A6	IN26	Input 26	B6	IN25	Input 25
A7	IN24	Input 24	B7	IN23	Input 23
A8	IN22	Input 22	B8	IN21	Input 21
A9	IN20	Input 20	B9	IN19	Input 19
A10	IN18	Input 18	B10	IN17	Input 17
A11	IN16	Input 16	B11	IN15	Input 15
A12	IN14	Input 14	B12	IN13	Input 13
A13	IN12	Input 12	B13	IN11	Input 11
A14	IN10	Input 10	B14	IN09	Input 9
A15	IN08	Input 8	B15	IN07	Input 7
A16	IN06	Input 6	B16	IN05	Input 5
A17	IN04	Input 4	B17	IN03	Input 3
A18	IN02	Input 2	B18	IN01	Input 1
A19	(NC)	–	B19	(NC)	–
A20	+24V_1	24 V power supply 1	B20	+24V_1	24 V power supply 1

Note: +24V_1 is the common terminal for IN01 to IN16.
+24V_2 is the common terminal for IN17 to IN32.

(2) Input Signal Connector IN2

The pin layout of the IN2 connector is shown below.

No.	Signal Name	Function	No.	Signal Name	Function
A1	(NC)	–	B1	(NC)	–
A2	+24V_4	24 V power supply 4	B2	+24V_4	24 V power supply 4
A3	IN64	Input 64	B3	IN63	Input 63
A4	IN62	Input 62	B4	IN61	Input 61
A5	IN60	Input 60	B5	IN59	Input 59
A6	IN58	Input 58	B6	IN57	Input 57
A7	IN56	Input 56	B7	IN55	Input 55
A8	IN54	Input 54	B8	IN53	Input 53
A9	IN52	Input 52	B9	IN51	Input 51
A10	IN50	Input 50	B10	IN49	Input 49
A11	IN48	Input 48	B11	IN47	Input 47
A12	IN46	Input 46	B12	IN45	Input 45
A13	IN44	Input 44	B13	IN43	Input 43
A14	IN42	Input 42	B14	IN41	Input 41
A15	IN40	Input 40	B15	IN39	Input 39
A16	IN38	Input 38	B16	IN37	Input 37
A17	IN36	Input 36	B17	IN35	Input 35
A18	IN34	Input 34	B18	IN33	Input 33
A19	(NC)	–	B19	(NC)	–
A20	+24V_3	24 V power supply 3	B20	+24V_3	24 V power supply 3

Note: +24V_3 is the common terminal for IN33 to IN48.
+24V_4 is the common terminal for IN49 to IN64.

(3) Output Signal Connector OUT1

The pin layout of the OUT1 connector is shown below.

No.	Signal Name	Remarks	No.	Signal Name	Remarks
A1	024V_6	Common ground 6	B1	024V_6	Common ground 6
A2	+24V_6	24 V power supply 6	B2	+24V_6	24 V power supply 6
A3	OUT32	Output 32	B3	OUT31	Output 31
A4	OUT30	Output 30	B4	OUT29	Output 29
A5	OUT28	Output 28	B5	OUT27	Output 27
A6	OUT26	Output 26	B6	OUT25	Output 25
A7	OUT24	Output 24	B7	OUT23	Output 23
A8	OUT22	Output 22	B8	OUT21	Output 21
A9	OUT20	Output 20	B9	OUT19	Output 19
A10	OUT18	Output 18	B10	OUT17	Output 17
A11	OUT16	Output 16	B11	OUT15	Output 15
A12	OUT14	Output 14	B12	OUT13	Output 13
A13	OUT12	Output 12	B13	OUT11	Output 11
A14	OUT10	Output 10	B14	OUT09	Output 9
A15	OUT08	Output 8	B15	OUT07	Output 7
A16	OUT06	Output 6	B16	OUT05	Output 5
A17	OUT04	Output 4	B17	OUT03	Output 3
A18	OUT02	Output 2	B18	OUT01	Output 1
A19	024V_5	Common ground 5	B19	024V_5	Common ground 5
A20	+24V_5	24 V power supply 5	B20	+24V_5	24 V power supply 5

Note: +24V_5 and 024V_5 are the common terminals for OUT01 to OUT16.
+24V_6 and 024V_6 are the common terminals for OUT17 to OUT32.

(4) Output Signal Connector OUT2

The pin layout of the OUT2 connector is shown below.

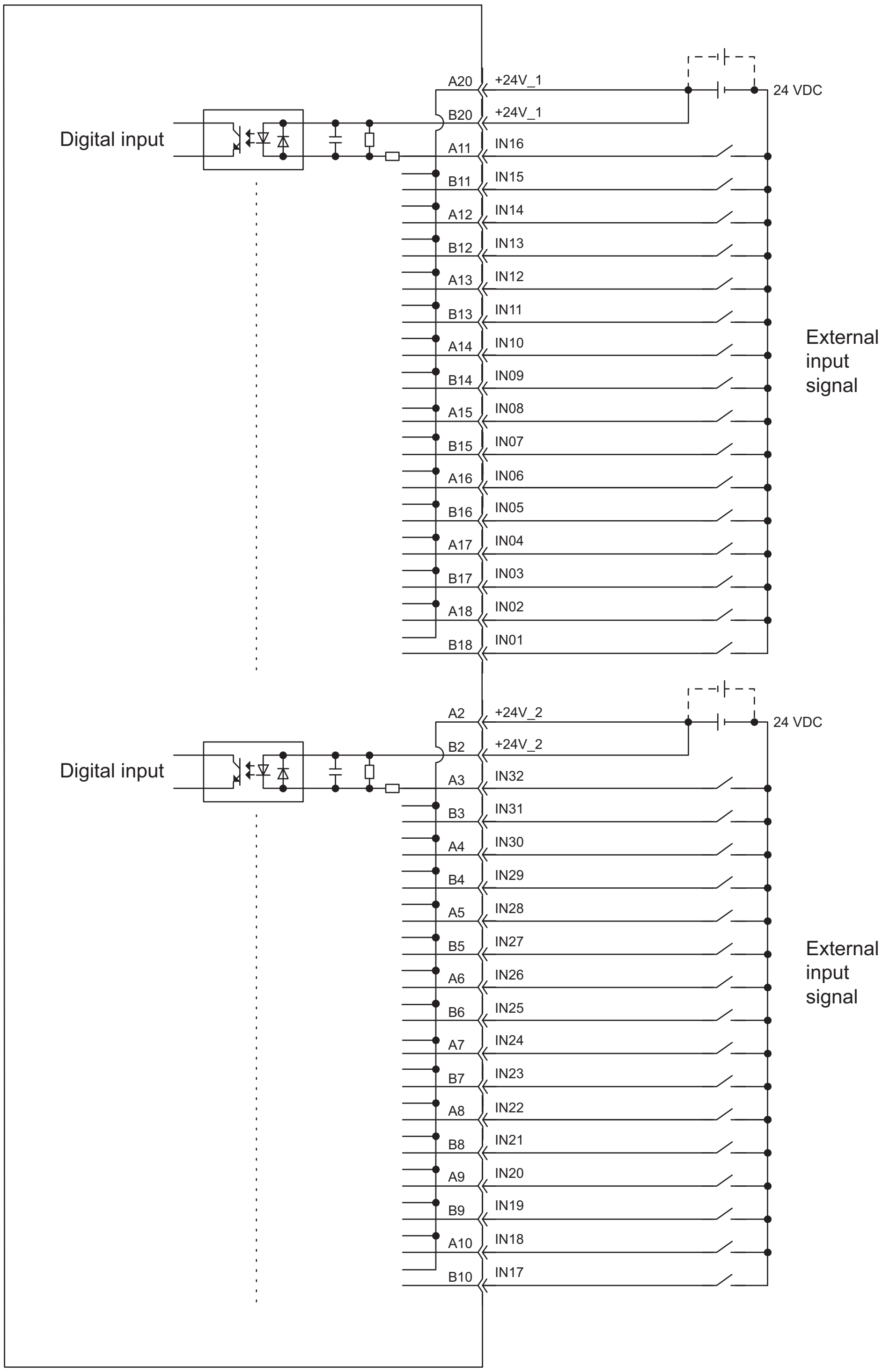
No.	Signal Name	Remarks	No.	Signal Name	Remarks
A1	024V_8	Common ground 8	B1	024V_8	Common ground 8
A2	+24V_8	24 V power supply 8	B2	+24V_8	24 V power supply 8
A3	OUT64	Output 64	B3	OUT63	Output 63
A4	OUT62	Output 62	B4	OUT61	Output 61
A5	OUT60	Output 60	B5	OUT59	Output 59
A6	OUT58	Output 58	B6	OUT57	Output 57
A7	OUT56	Output 56	B7	OUT55	Output 55
A8	OUT54	Output 54	B8	OUT53	Output 53
A9	OUT52	Output 52	B9	OUT51	Output 51
A10	OUT50	Output 50	B10	OUT49	Output 49
A11	OUT48	Output 48	B11	OUT47	Output 47
A12	OUT46	Output 46	B12	OUT45	Output 45
A13	OUT44	Output 44	B13	OUT43	Output 43
A14	OUT42	Output 42	B14	OUT41	Output 41
A15	OUT40	Output 40	B15	OUT39	Output 39
A16	OUT38	Output 38	B16	OUT37	Output 37
A17	OUT36	Output 36	B17	OUT35	Output 35
A18	OUT34	Output 34	B18	OUT33	Output 33
A19	024V_7	Common ground 7	B19	024V_7	Common ground 7
A20	+24V_7	24 V power supply 7	B20	+24V_7	24 V power supply 7

Note: +24V_7 and 024V_7 are the common terminals for OUT33 to OUT48.
+24V_8 and 024V_8 are the common terminals for OUT49 to OUT64.

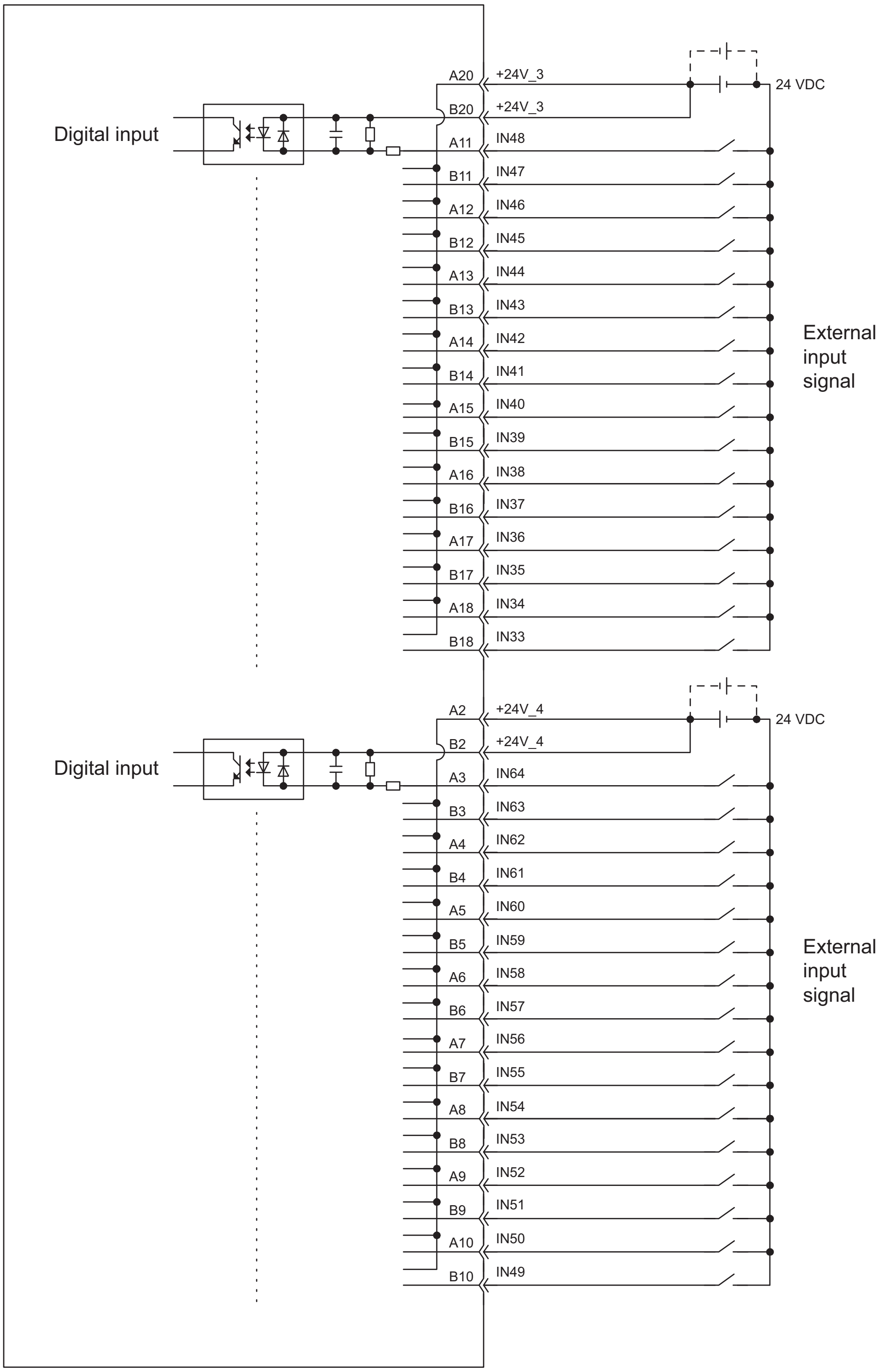
4.4.3 Connection Example

The connection examples of the input/output connectors are shown below.

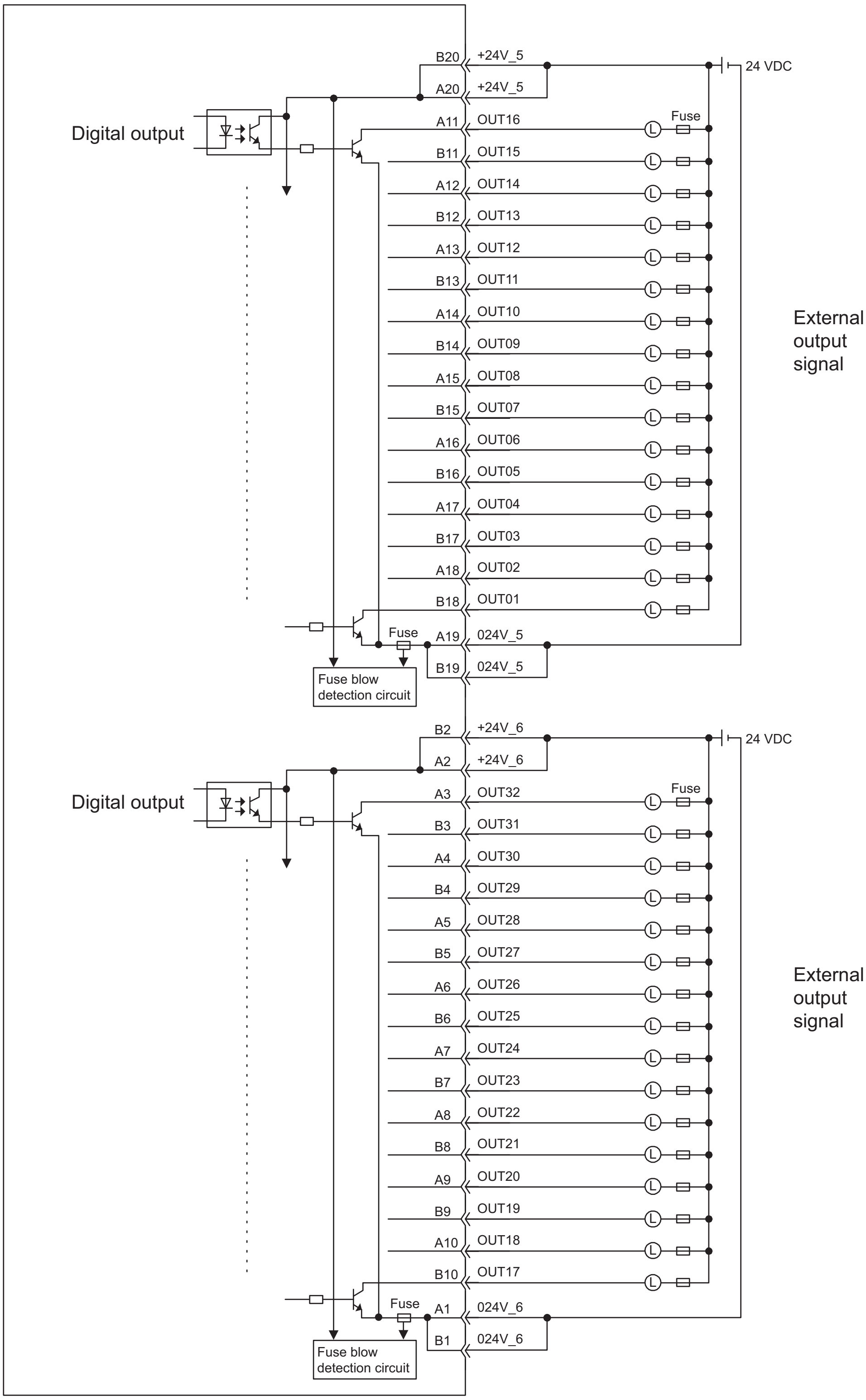
(1) Connection Example of an Input Signal Connector (IN1)



(2) Connection Example of the Input Signal Connector (IN2)

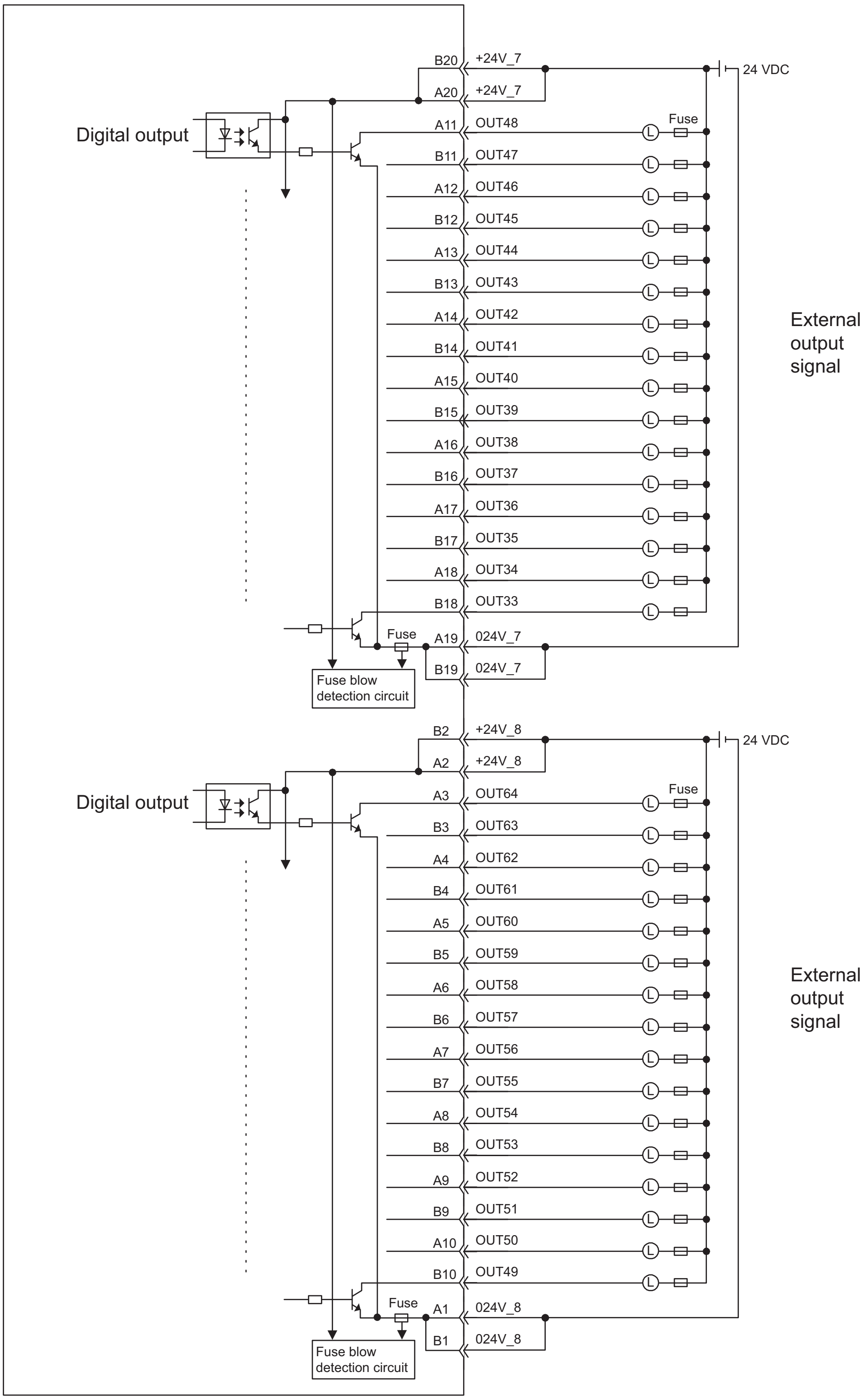


(3) Connection Example of an Output Signal Connector (OUT1)



Note: Connect a fuse appropriate for the load specifications in series with the load, to prevent any accident caused by overload or to protect the output elements.
Failure to connect a fuse may result in fire, damage to equipment, or damage to the output circuits if there is a load short-circuit or overload.

(4) Connection Example of the Output Signal Connector (OUT2)



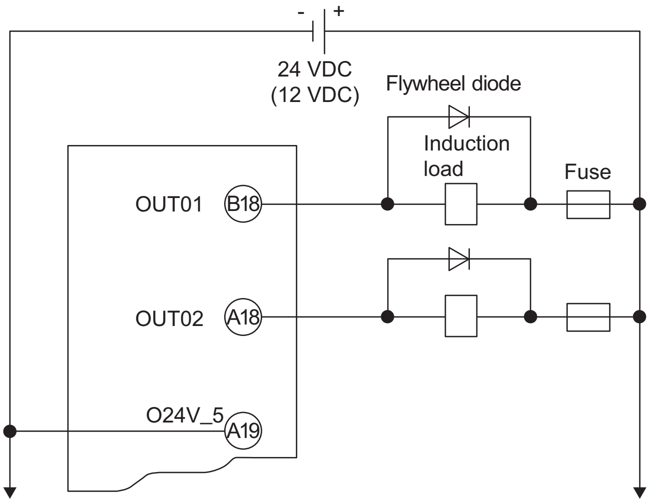
Note: Connect a fuse appropriate for the load specifications in series with the load, to prevent any accident caused by overload or to protect the output elements.
Failure to connect a fuse may result in fire, damage to equipment, or damage to the output circuits if there is a load short-circuit or overload.

(5) Wiring Precautions

(a) Output Fuse

The external output circuit is not equipped with a built-in fuse. Connect a fuse appropriate for the load specifications in series with the load, to prevent any accident caused by overload or to protect the output elements.

Failure to connect a fuse may result in fire, damage to equipment, or damage to the output circuits if there is a load short-circuit or overload.

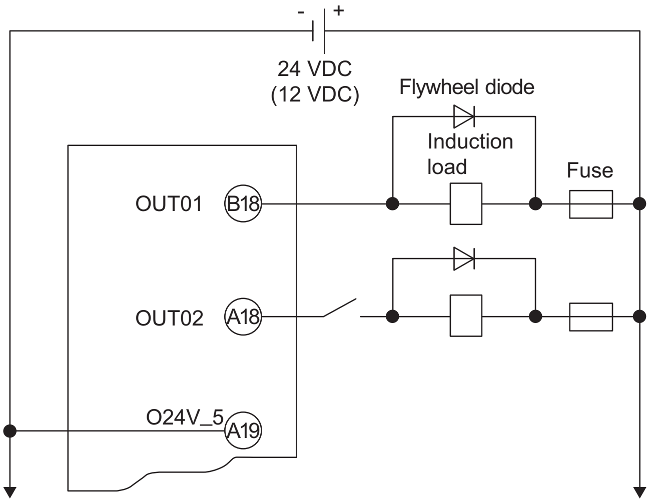


(b) Connection of induction load

When an induction load is connected to the external output circuit as shown below, connect a flywheel diode in parallel to the induction load to reduce surge voltage. When an induction load of the external output circuit is connected to the contact, connect the flywheel diode in parallel to the induction load to reduce surge voltage.
Failure to connect a flywheel diode may result in damage to the external output circuit.

The type of the flywheel diode must be changed according to the load specifications; however, the following is recommended for general purposes.

- H14E Series (manufactured by HITACHI) or equivalent

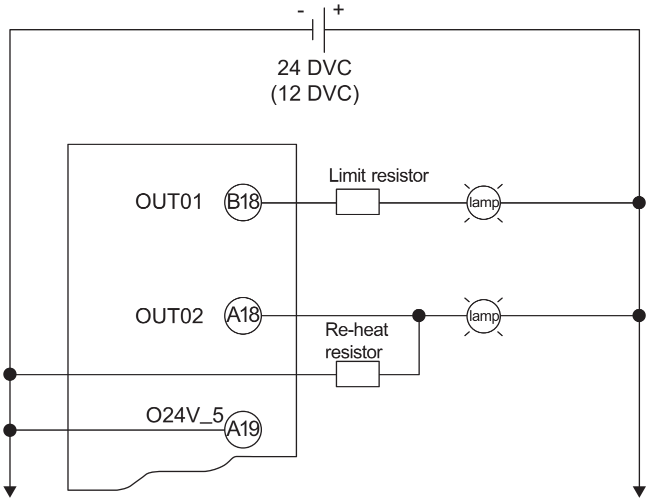


(c) Load with Large Inrush Current

When a load having large inrush current such as incandescent lamps is connected, use the following method to reduce inrush current less than the maximum load current of the external output circuit.

Failure to observe the conditions for the maximum load current may result in damage to the output elements.

- Let a dark current of approx. 30% of rated current flow in the incandescent lamp.
- Attach a current limit resistor in series with the incandescent lamp.



4.5 Operation Details

Note: Refer to *Appendix B* for MECHATROLINK communication specifications.

4.5.1 Command Data

Command Format

Byte	Command
0	CMD
1	WDC
2	CMD_CTRL
3	
4	OUT_DATA
5	
6	
7	
8	
9	
10	
11	
12	Reserved (0)
13	
14	
15	

(1) Command Data List

The command data for the MTD2310 Module are listed below.

Command Byte Number	Name	Contents
0	CMD	Command code
1	WDC	Watchdog data
2 and 3	CMD_CTRL	Command control
4 to 11	OUT_DATA	Output data
12 to 15	Reserved (0)	Reserved by system

(2) Command Data Details

(a) CMD

Command code (Byte 0)		Setting Range	Setting Unit
		20 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous)		

(b) WDC

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Not to be used		

(c) CMD_CTRL

Command control (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Command control for standard I/O profile command Bit 3: ALM_CLR (Clear communication alarm/warning) is disabled when set to 0, and clears alarm when set to 1		

(d) OUT_DATA

Output data (Bytes 4 to 11)		Setting Range	Setting Unit
		–	–
Description	Output data		

4.5.2 Response Data

Response Format

Byte	Response
0	RCMD
1	RWDT
2	CMD_STAT
3	
4	IN_DATA
5	
6	
7	
8	
9	
10	
11	
12	Reserved (0)
13	
14	
15	

(1) Response Data List

The response data for the MTD2310 Module are listed below.

Response Byte Number	Name	Description
0	RCMD	Command code
1	RWDT	Watchdog data
2, 3	CMD_STAT	Command status
4 to 11	IN_DATA	Input data
12 to 15	Reserved (0)	Reserved by system

(2) Response Data Details

(a) RCMD

Command code (Byte 0)		Setting Range	Setting Unit
		20 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous)		

(b) RWDT

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Not to be used		

(c) CMD_STAT

Command status (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Standard I/O Profile Command Status Bit 0: D_ALM 0: Normal status, 1: Device in alarm status Bit 1: D_WAR 0: Normal status, 1: Device in warning status Bit 2: CMDRDY 0: Command reception disabled, 1: Command reception enabled Bit 3: ALM_CLR_CMP 0: ALM_CLR command execution not completed, 1: ALM_CLR command execution completed Bit 8 to B: CMD_ALM Any value other than 0: Command error status Bit C to F: COMM_ALM Any value other then 0: Communication error status		

(d) IN_DATA

Input data (Bytes 4 to 11)		Setting Range	Setting Unit
		–	–
Description	Input data		

4.6 MECHATROLINK-III Communications Related Information

4.6.1 ID_CODE

The MTD2310 Module returns values in conformity with MECHATROLINK-III communication specifications, using ID_CODE.

ID_CODE Table

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
01	Vendor ID Code	Vendor-specific ID code	4	Supported	00000000 (Yaskawa Electric Corporation)
02	Device Code	Product-specific code	4	Supported	02400001
03	Device Version	Product version information	4	Supported	00000100
04	Device Definition (MDI) File version	Information of the device definition file (MDI) version the product supports	4	Supported	00001000
05	Extended Address Setting	Number of extended addresses the product supports	4	Supported	00000001
06	Serial No.	Product serial number	32	Unsupported	–
10	Profile Type 1	Profile type 1 the product supports	4	Supported	00000030 (Standard I/O profile)
11	Profile Version 1	Profile version 1 the product supports	4	Supported	00000100
12	Profile Type 2	Profile type 2 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 2)
13	Profile Version 2	Profile version 2 the product supports	4	Supported	00000000
14	Profile Type 3	Profile type 3 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 3)
15	Profile Version 3	Profile version 3 the product supports	4	Supported	00000000
16	Minimum Value of Transmission Cycle	The minimum transmission cycle the product supports	4	Supported	000061A8
17	Maximum Value of Transmission Cycle	The maximum transmission cycle the product supports	4	Supported	000C3500
18	Granularity of Transmission Cycle	The transmission cycle granularity levels the product supports	4	Supported	00000003
19	Minimum Value of Communication Cycle	The minimum communication cycle the product supports	4	Supported	000061A8
1A	Maximum Value of Communication Cycle	The maximum communication cycle the product supports	4	Supported	0061A800
1B	Number of Transmission Bytes	Number of transmission bytes for the product	4	Supported	00000002
1C	Number of Transmission Bytes (Current Setting)	Currently set number of transmission bytes for the product	4	Supported	00000002
1D	Profile Type (Current Selection)	Profile type selected by CONNECT command	4	Supported	00000030
20	Supported Communication Mode	Communication mode the product supports	4	Supported	00000007

ID_CODE Table (cont'd)

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
21	MAC Address	MAC address	4	Unsupported	–
30	List of Supported Main Commands	List of the main commands the product supports	32	Supported	0000C079 00000001 00000000 00000000 00000000 00000000 00000000 00000000
38	List of Supported Sub Commands	Not used with a standard I/O profile	32	Unsupported	–
40	List of Common Parameters	Not used with a standard I/O profile	32	Unsupported	–
80	Main Device Name	Main device name	32	Supported	4D50454A 544D2D43 31333244 00452D30 00000000 00000000 00000000 00000000
90	Sub Device 1 Name	Sub device 1 name	32	Unsupported	–
98	Sub Device 1 Version	Sub device 1 version	4	Unsupported	–
A0	Sub Device 2 Name	Sub device 2 name	32	Unsupported	–
A8	Sub Device 2 Version	Sub device 2 version	4	Unsupported	–
B0	Sub Device 3 Name	Sub device 3 name	32	Unsupported	–
B8	Sub Device 3 Version	Sub device 3 version	4	Unsupported	–

4.6.2 Virtual Memory

Data are stored in the virtual memory addresses as shown below.

Device Information Area

Address	Contents
0000 0000 to 0000 0003	Not specified
0000 0004 to 0000 0007	Vendor ID code
0000 0008 to 0000 000B	Device code
0000 000C to 0000 000F	Device version
0000 0010 to 0000 0013	Device definition (MDI) file version
0000 0014 to 0000 0017	Extended address setting
0000 0018 to 0000 0037	Serial No.
0000 0038 to 0000 003F	Not specified
0000 0040 to 0000 0043	Profile type 1
0000 0044 to 0000 0047	Profile version 1
0000 0048 to 0000 004B	Profile type 2
0000 004C to 0000 004F	Profile version 2
0000 0050 to 0000 0053	Profile type 3
0000 0054 to 0000 0057	Profile version 3
0000 0058 to 0000 005B	Minimum value of transmission cycle
0000 005C to 0000 005F	Maximum value of transmission cycle
0000 0060 to 0000 0063	Granularity of transmission cycle
0000 0064 to 0000 0067	Minimum value of communication cycle
0000 0068 to 0000 006B	Maximum value of communication cycle
0000 006C to 0000 006F	Number of transmission bytes
0000 0070 to 0000 0073	Number of transmission bytes (current setting)
0000 0074 to 0000 0077	Profile type (current selection)
0000 0078 to 0000 007F	Not specified
0000 0080 to 0000 0083	Supported communication mode
0000 0084 to 0000 008B	MAC address
0000 008C to 0000 00BF	Not specified
0000 00C0 to 0000 00DF	List of supported main commands
0000 00E0 to 0000 00FF	List of supported subcommands
0000 0100 to 0000 011F	List of supported common parameters
0000 0120 to 0000 01FF	Not specified
0000 0200 to 0000 021F	Main device name
0000 0220 to 0000 023F	Not specified
0000 0240 to 0000 025F	Sub device 1 name
0000 0260 to 0000 0263	Sub device 1 version
0000 0264 to 0000 027F	Not specified
0000 0280 to 0000 029F	Sub device 2 name
0000 02A0 to 0000 02A3	Sub device 2 version
0000 02A4 to 0000 02BF	Not specified
0000 02C0 to 0000 02DF	Sub device 3 name
0000 02E0 to 0000 02E3	Sub device 3 version
0000 02E4 to 0000 0FFF	Not specified
0000 1000 to 0000 FFFF	Not specified

4.7 Alarm/Warning Code List

The list of alarms and warnings that are generated by the MECHATROLINK communication function is as follows.

4.7.1 Alarm List

Category	Alarm Code	COMM_ ALM	Alarm Details	Countermeasures	Alarm Clearance
Communication Setting Error	A.E41 (Communication data size setting error)	0	Occurs when communication data was not received.	Review the controller's communication settings.	Not possible
Communication Establishment Error	A.E40 (Transmission cycle setting error)	B	Occurs when an unsupported transmission cycle is set on reception of a CONNECT command.	Review the controller's transmission cycle setting.	Not possible
	A.E60 (Reception error)	9	Result of noise or other causes after communications are established when two consecutive reception errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E62 (FCS error)	8	Result of noise or other causes after communications are established when two consecutive FCS errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E63 (Synchronous frame not received)	A	Result of noise or other causes after communications are established when two consecutive failures to receive a synchronous frame occur.	Replace the module.	Possible
System Error	A.B6A (Communication LSI initialization error)	0	Occurs when initialization of the communication LSI has failed.	Replace the module.	Not possible
	A.BF0 (Blown fuse error)	0	Occurs when a fuse has blown.	Replace the module.	Not possible

4.7.2 Warning List

(1) Communication Error (COMM_ALM)

Category	Warning Code	COMM_ALM	Warning Details	Countermeasures	Alarm Clearance
Communication Alarm	A.960 (Communication error alarm)	2	Result of noise or other causes after communications are established when a reception error occurs.	Review the communication wiring and take countermeasures against noise.	Possible
Communication Establishment Error	A.962 (FCS error alarm)	1	Result of noise or other causes after communications are established when an FCS error occurs.		
	A.963 (Synchronous frame not received alarm)	3	Result of noise or other causes after communications are established when a synchronous frame is not received.		

(2) Command Error (CMD_ALM)

Category	Warning Code	CMD_ALM	Warning Details	Countermeasures	Alarm Clearance
Data Setting Warning	A.94A (ID number alarm)	9	Occurs when the ID number specified by ID_RD command is out of the valid ID number range.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	Automatically cleared
	A.94B (Invalid data)	9	Occurs when data of a command other than ID_RD is out of the valid data range.		
Command Warning	A.95B (Unsupported command)	8	Occurs when an unsupported command is received.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	
	A.95F (Undefined command)	8	Occurs at reception of a command other than those supported by MECHATROLINK-III specifications.		
	A.97A (Phase error)	C	Occurs at reception of a command that cannot be processed in the current phase.	Review the controller's command issue sequence.	

5

Analog Input Module (JEPMC-MTA2900-E)

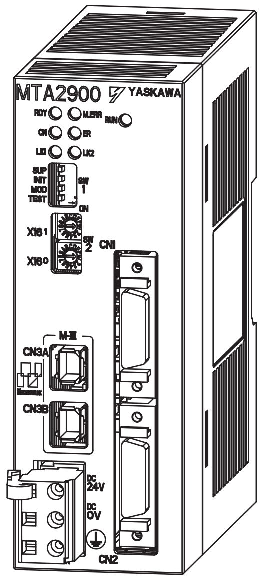
This chapter provides an overview and a description of the specifications, the connections, and the settings of the Analog Input Module model JEPMC-MTA2900-E.

5.1 Overview

The Analog Input Module JEPMC-MTA2900-E (hereinafter referred to as the MTA2900 Module) has eight channels for analog input. Three ranges of analog-input are available: Voltage -10 to +10 V, Voltage 0 to +10 V, and Current 0 to 20 mA.

5.2 External Appearance and Configuration

5.2.1 External Appearance



5.2.2 I/O and Status Indication

(1) LED Indicator

RUN ○

Indicator Name	Indicator Color	Status when lit	Status when unlit
RUN	Green	Normal operation (The channels are allocated while executing the DATA_RW□ command)	Operation being stopped

(2) Bus Coupler Status Indicator

Indicator Code	Indicator Name	Indicator Color	Status when ON	Remarks
D1	RDY	Green	The microprocessor for control is operating normally.	CPU_I/O
	M_ERR	Red	Lights up or flashes at occurrence of failure.	CPU_I/O
D2	CN	Green	MECHATROLINK-III connection is established.	CPU_I/O
	ER	Red	Lights up of flashes at occurrence of MECHATROLINK-III communication error.	CPU_I/O
D3	LK1	Green	Linked to MECHATROLINK connector CN1	PHY port2
	LK2	Green	Linked to MECHATROLINK connector CN2	PHY port1

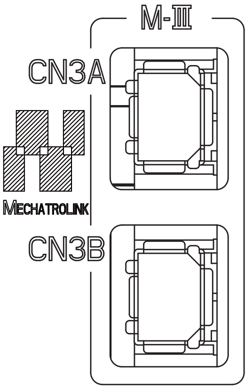
(3) Status Indication Details

Classification	LED Indicator Status						Indication	Meaning
	RDY	M_ERR	CN	ER	LK1	LK2		
Normal Status	○	●	–	–	–	–	Hardware reset status	If this state remains unchanged 10 seconds after power-on, there is a hardware failure.
	○	○	–	–	–	–	Initialization in progress	
	●	○	–	–	–	–	Normally executing	Normal
Error Status	○	●	–	–	–	–	Occurrence of serious failure	An error was detected by the watchdog timer.
	○	★	–	–	–	–	The number of flashes indicates the type of hardware error: 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error 6: Communication ASIC diagnosis error	An error was detected during self-diagnosis.
	●	★	–	–	–	–	The number of flashes indicates the type of software error. 2: Transmission cycle setting error 3: Station address setting error 4: Watchdog timeout	An error was detected in the software.
Alarm	●	★	–	–	–	–	I/O error	An I/O error was detected.
MECHATROLINK Communications	●	○	–	–	●	–	LINK1 busy	Communication with LINK1 enabled
	●	○	–	–	–	●	LINK 2 busy	Communication with LINK 2 enabled
	●	○	●	–	–	–	Connection established	Connection to the master device is established.
	●	○	–	●	–	–	Occurrence of communication error	–

Note: ○: Unlit, ●: Lit, ★: Flashes, –: Not specified

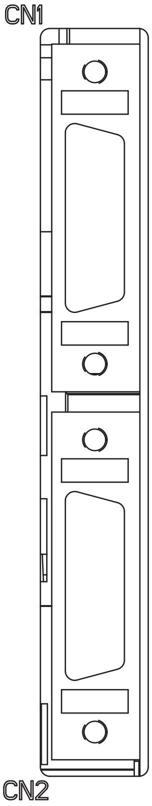
5.2.3 MECHATROLINK-III Connectors

Connect the MECHATROLINK-III cable.



5.2.4 I/O Connectors

Connect an MTA2900 Module and external I/O signals with I/O cables.

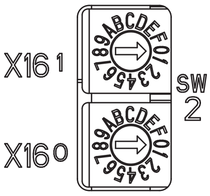


5.2.5 Station Number Selection Switch

Set the MECHATROLINK-III station number.

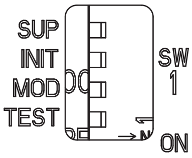
The setting range is 3 to EF (hexadecimal).

When multiple modules are connected, make sure there is no duplication of station numbers.

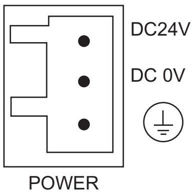


5.2.6 Operation Switch

Select the CPU operating conditions when the power is turned on.



5.2.7 External Wiring Terminals



Terminal Name	Function
DC 24 V	+24 VDC
DC 0 V	0 VDC
FG	Protective grounding terminal

5.3 Mounting an MTA2900 Module

5.3.1 Method

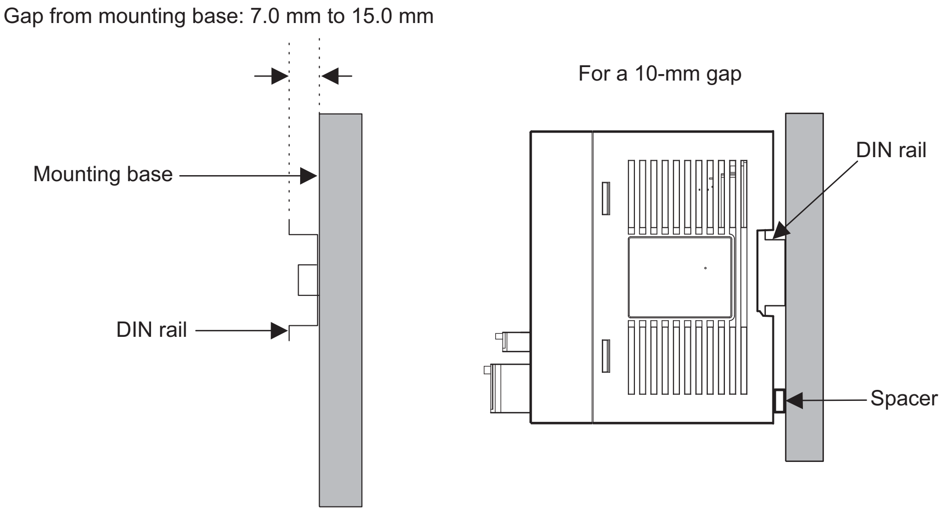
There are two methods for mounting an MTA2900 Module.

- Using DIN rail (standard)
- Using screws

(1) DIN Rail Mounting

(a) DIN Rails and Spacer

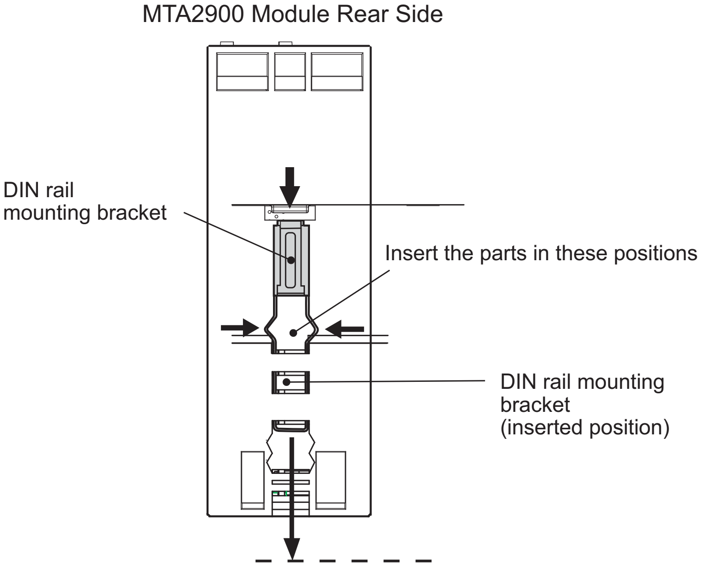
Several types of DIN rails are available: with 7-mm to 15-mm gap from the mounting base as shown in the following diagram. If mounting an MTA2900 Module using DIN rail with 10 mm gap, install a spacer on the rear of the MTA2900 Module near the bottom to protect the MTA2900 Module from vibration and shock.



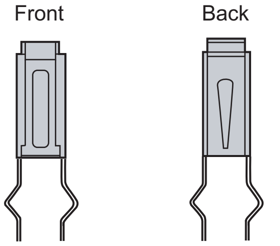
(b) Procedure for Mounting to DIN Rail

Use the following procedure to attach the DIN rail mounting parts to the MTA2900 Module and then mount the MTA2900 Module to the DIN rail.

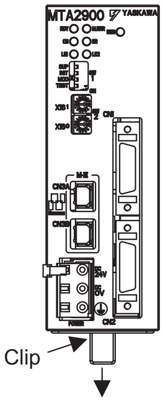
1. Insert the DIN rails to the dotted line in the two slots on the rear of the MTA2900 Module as shown in the following figure.



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

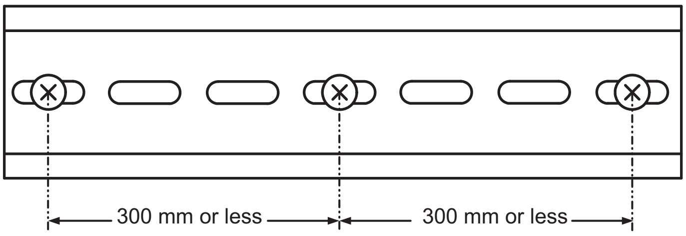


2. Pull the DIN rail mounting clips down to release them.



■ Fixing a DIN Rail

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



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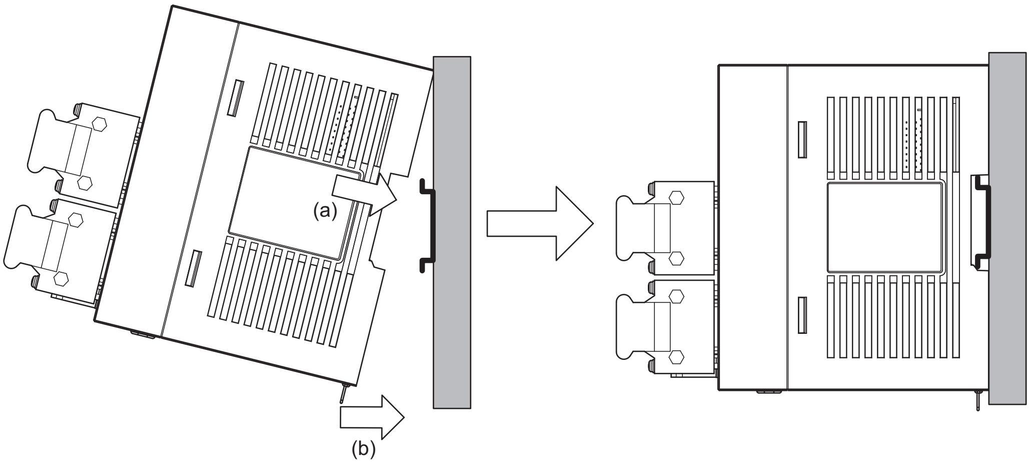
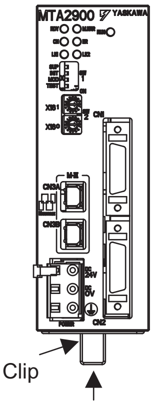
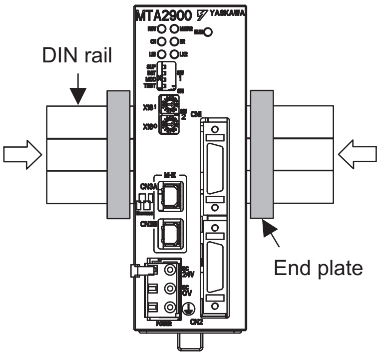
3. Hook the MTA2900 Module to the top of the DIN rail (a), and then push the MTA2900 Module towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MTA2900 Module to secure it to the DIN rail.

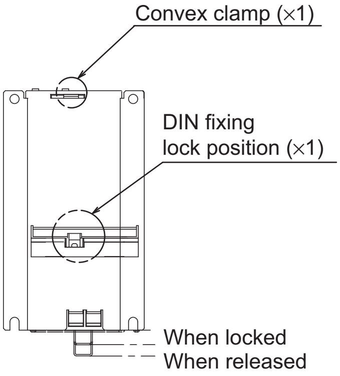


This completes the installation procedure.

(2) Screwed Method

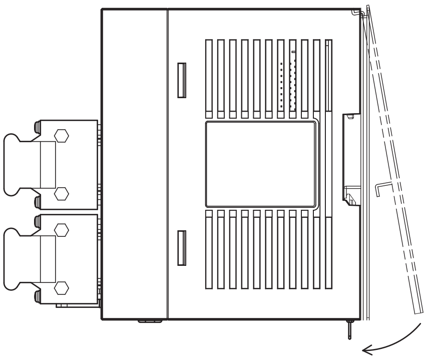
Use a panel mounting clamp model JEPMC-OP2400-E (optional) by the following procedure to mount an MTA2900 Module on the panel.

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

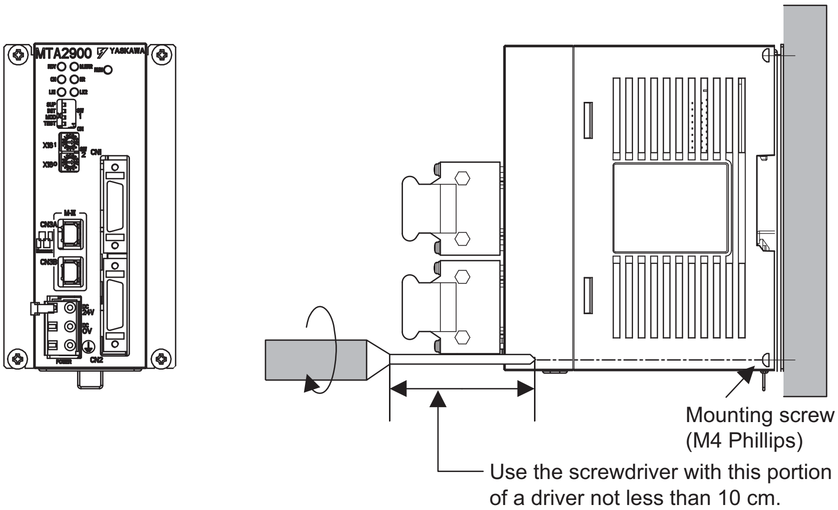


Panel mounting clamp

2. Insert one convex portion at the top of the panel mounting clamp into the hole of the MTA2900 Module case.



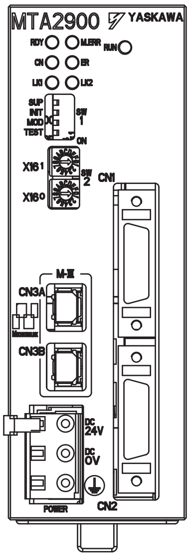
3. Push the clamp as indicated by an arrow above onto the MTA2900 Module case and use the DIN fixing lock to fix MTA2900 Module.
4. Push the MTA2900 Module mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.



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

5.3.2 Mount Direction

Be sure to mount the MTA2900 Module from the front using a DIN rail or panel mounting clamp.

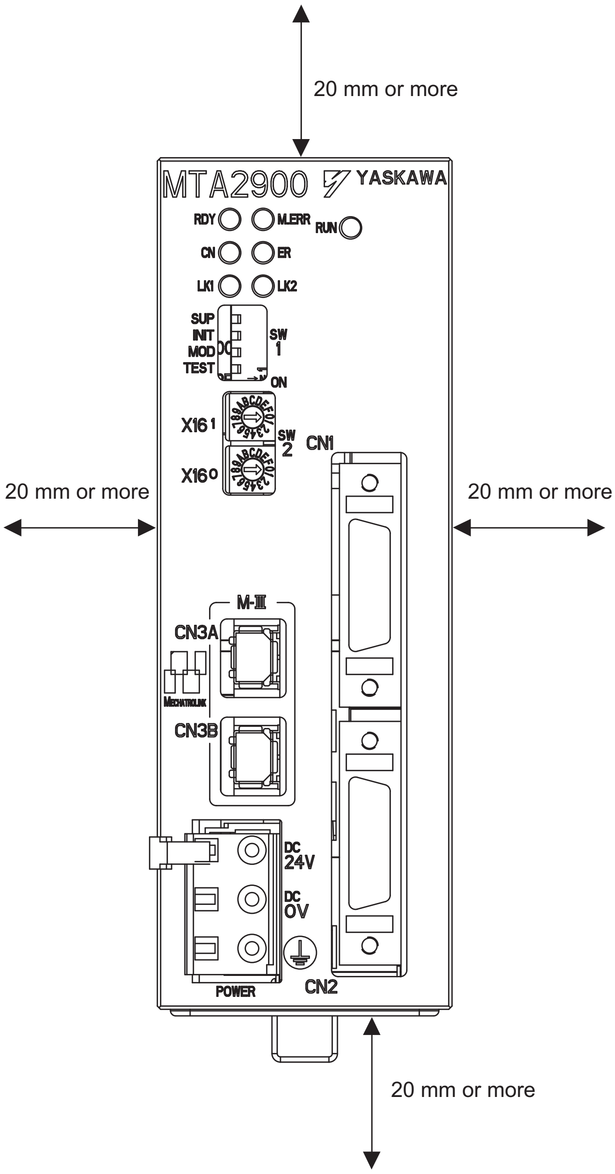


View from front, when attached

5.3.3 Space Required for Mounting an MTA2900 Module

Install MTA2900 Module so that enough space is left around it as shown in the following figure:

- Mount condition
  - Vertical and horizontal directions: 20 mm or more



5.4 Specifications

5.4.1 General Specifications

The general specifications of MTA2900 Module are shown below.

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%RH (with no condensation)
	Ambient Storage Humidity	5% to 95%RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B 3501)
	Corrosive Gas	There must be no flammable 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)
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling
	Mounting Direction	See *5.3 Mounting an MTA2900 Module*.
Compliant Standards (Certification process is under way to obtain the certificate.)		UL, CSA, and CE

5.4.2 Performance Specifications

(1) Hardware Specifications

The hardware specifications of the MTA2900 Module are shown below.

Item			Specifications		
Name			Analog input module		
Abbreviated Name			MTA2900		
Model			JEPMC-MTA2900-E		
Power Supply Section (POWER-CN)	Input Voltage		24 VDC (±20%)		
	Current Consumption		0.5 A max.		
Communication Interfaces (CN3A/CN3B)	Communication Standards		MECHATROLINK-III		
Analog Input Section (CN1/CN2)	Number of Channels		8 (4 channels per connector × 2)		
	Setting of the channels used		1 to 8 channels (optional)		
	Insulation		Between channels: Non-insulated		
	Analog Input Range		-10 to +10 V	0 to +10 V	0 to 20 mA
	Max. Rated Input		±15 V		±30 mA
	Input Impedance		20 kΩ		250 Ω
	Resolution		16 bits (-31276 to +31276)	15 bits (0 to +31276)	
	Absolute Accuracy *1		100 mV max.		0.3 mV max.
	Accuracy	25°C *2	±0.1% (±10 mA)		±0.1% (±0.02 mA)
		0 to 55°C	±0.3% (±30 mA)		±0.3% (±0.06 mA)
	Input Conversion Time *3		1.4 ms max.		

* 1. Indicates the values if the offset and gain are not adjusted.

* 2. Indicates the values if the offset and gain are adjusted.

* 3. Input conversion time = Delay caused by input filter (1 ms max.) + (50 µs × Number of channels used)
Delay time caused by the input filter peaks at 1 ms between –10 V and + 10 V.

Note: Use a 24-VDC power supply and external input power supply with double or reinforced insulation.

(2) Switch Specifications

The specifications of the switches provided on the MTA2900 Module are as follows.

(a) SW1

The SW1 switch sets the CPU operation mode at power-on.

Note: The SW1 setting is read at power-on. If the setting is changed after power-on, the descriptions in the table below will not be applicable.

Device Code	Name	Setting	Operation	Default	Remarks
S1-4	SUP	ON	SYSTEM load	OFF	ON: The MTA2900 Module will start running in a mode where the firmware version can be upgraded.
		OFF	Normal run		
S1-3	INIT	ON	Parameter initialization	OFF	• S1-2 set to OFF and S1-3 set to ON: The parameters will be initialized to the factory defaults at startup. However, the settings written in the nonvolatile memory will be kept unchanged. • Both S1-2 and S1-3 set to ON: Both the parameters and nonvolatile memory will be initialized to the factory defaults.
		OFF	Normal run		
S1-2	MODE	ON	Function selection	OFF	Used in combination with S1-3 setting to initialize the nonvolatile memory.
		OFF			
S1-1	TEST	ON	Reserved by system	OFF	Used for final adjustment before shipment.
		OFF			

(b) SW2

The SW2 switch sets the station address of MTA2900 Module as a slave device of the MECHATROLINK-III network.

Device Code	Name	Setting Range	Operation	Initial Setting	Remarks
S2	$x16^1$	0 to F	Station address (Upper digit)	0	F cannot be used.
S3	$x16^0$	0 to F	Station address (Lower digit)	3	–

(3) Input Characteristics

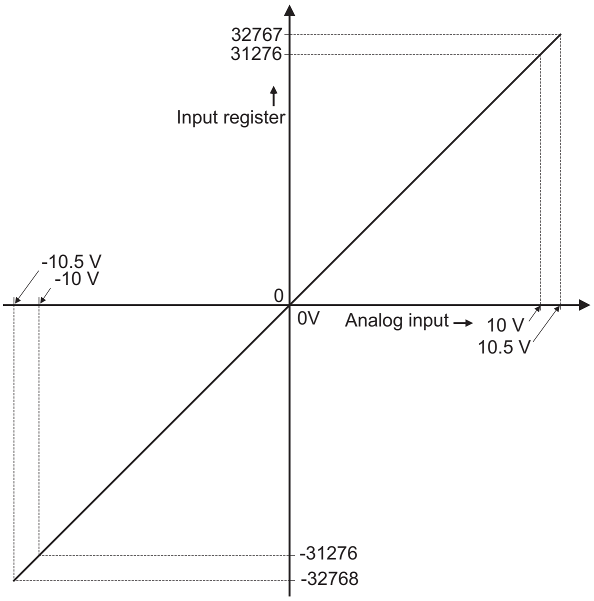
The input characteristics table corresponding to the analog input value, voltage and current mode are as follows, shown along with the input characteristic drawings.

(a) Input Characteristics and Corresponding Modes

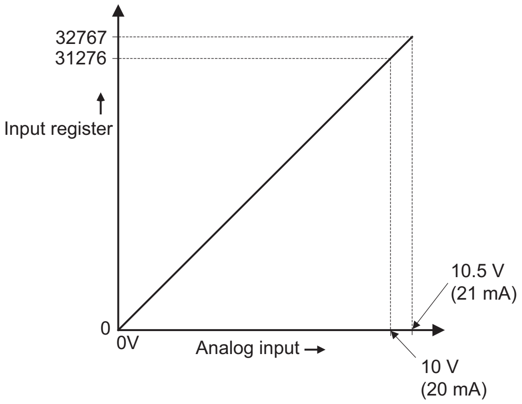
Analog input value	Voltage mode 1	Voltage mode 2	Current mode
	-10 V to +10 V	0 to +10 V	0 to 20 mA
-10.5 V	-32768	–	–
-10.0 V	-31276	–	–
-5.0 V	-15638	–	–
0.0 V (0.0 mA)	0	0	0
+5.0 V (10 mA)	15638	15638	15638
+10.0 V (20 mA)	31276	31276	31276
+10.5 V (21 mA)	32767	32767	32767

Note: If the voltage exceeds +10.0 V, the linearity is not guaranteed.

(b) Voltage Mode 1 (-10 V to +10 V)



(c) Voltage Mode 2 (0 V to +10 V) and Current Mode (0 to 20 mA)



5.4.3 MECHATROLINK-III Communication Specifications

The general specifications of MECHATROLINK-III communications are given below.

Item	Specifications	
Communications Protocol	MECHATROLINK-III	
Classification	Slave	
Station Address Setting Range	03 to EF (hexadecimal)	
Transmission Speed	100 Mbps	
Supported Transmission Cycles	0.125 ms[*1], 0.25 ms, 0.5 ms, 1 ms to 8 ms (granularity: 0.5 ms)	
Number of Bytes per Station for Cyclic Communications	32 bytes	
Supported Communication Methods	Cyclic communications, event-driven communications, message communications	
Supported Profile	Standard I/O profile	
Supported Commands	Cyclic communications	NOP, PRM_RD, PRM_WR[*2], ID_RD, CONFIG, ALM_RD, ALM_CLR, SYNC_SET, CONNECT, DISCONNECT, PPRM_RD, PPRM_WR[*2], MEM_RD, MEM_WR[*2], DATA_RWA, DATA_RWS
	Event-driven communications	NOP, ID_RD, ALM_RD, CONNECT, DISCONNECT, MEM_RD
	Message communications	Read memory content, Write memory content, Read memory content: non contiguous, Write memory content: non contiguous, Read maximum message size

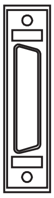
[*1] Set the communication cycle to 250 µs or more when the transmission cycle is set to 125 µs.

[*2] The value written by PRM_WR, PPRM_WR, MEM_WR commands, or tool (IOWin) to the volatile or nonvolatile memory will be validated immediately.

5.5 External I/O Signals and Connection Example

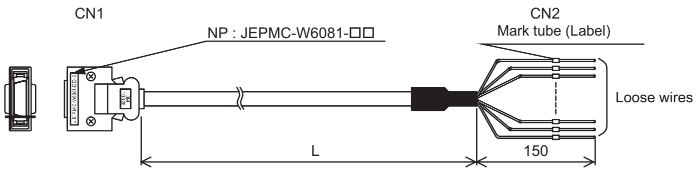
5.5.1 Specifications of Connection Cables and Connectors

(1) Connectors



Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
Analog Input Connectors	CN1/CN2	26	10226-52A3PL	• Connector • 10126-3000VE • Shell 10326-52F0-008 (One-touch- lock type)	Sumitomo 3M Limited

(2) Standard Cable Models and Appearance

Name	Model	Length	Appearance (JEPMC-W6081-□□)
Cable for MTA2900 Module	JEPMC-W6081-05	0.5 m	
	JEPMC-W6081-10	1 m	
	JEPMC-W6081-30	3 m	

(3) Standard Cable Wiring Chart

The wiring chart of the loose wires of the JEPMC-W6081-☐☐ standard cable is shown below.

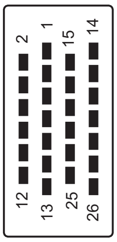
CN1 26-pin Terminal No.	Wire Color	Dot Color	Dot Mark	CN2 Mark Tube (Label)
1	Gray	Red	– – –	V1
2	Gray	Black	– – –	G1V
	Orange	Black	– – –	G1A
3	Orange	Red	– – –	A1
14	Yellow	Red	–	DP1
16	Yellow	Black	–	DN1
4	Pink	Red	– –	V2
5	Pink	Black	– –	G2V
	Yellow	Black	– –	G2A
6	Yellow	Red	– –	A2
17	White	Red	–	DP2
19	White	Black	–	DN2
7	White	Red	– –	V3
8	White	Black	– –	G3V
	Gray	Black	– –	G3A
9	Gray	Red	– –	A3
20	Gray	Red	–	DP3
22	Gray	Black	–	DN3
10	Orange	Red	– –	V4
11	Orange	Black	– –	G4V
	Pink	Black	–	G4A
12	Pink	Red	–	A4
23	Orange	Red	–	DP4
25	Orange	Black	–	DN4
FG	Braided shielded twisted-pair wire			–

5.5.2 Connector Pin Layouts

The pin layouts and each terminal function of the CN1 and CN2 connectors of the MTA2900 Modules are described below.

(1) Connector CN1

(a) Pin Layout at Connection Side



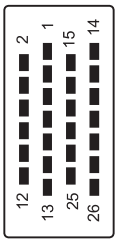
2	G1	1	V1	15	(G1)	14	MDP1
4	V2	3	A1	17	MDP2	16	MDN1
6	A2	5	G2	19	MDN2	18	(G2)
8	G3	7	V3	21	(G3)	20	MDP3
10	V4	9	A3	23	MDP4	22	MDN3
12	A4	11	G4	25	MDN4	24	(G4)
		13	(NC)			26	(NC)

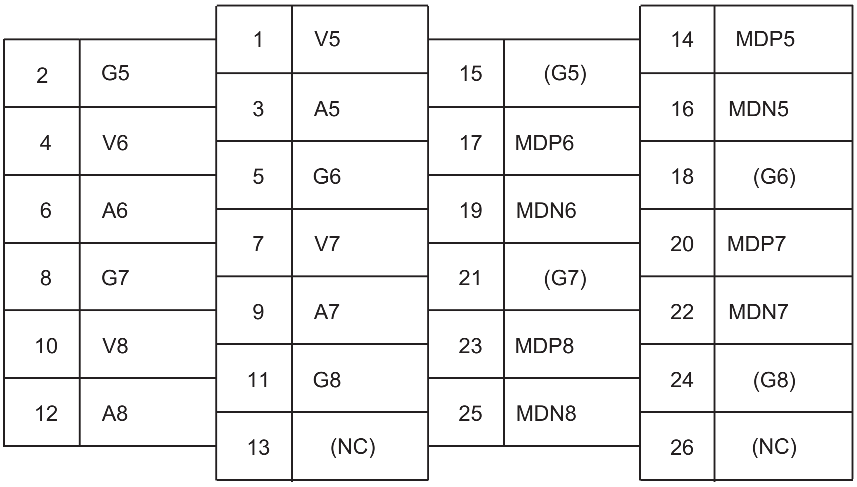
(b) Terminal Functions

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

(2) Connector CN2

(a) Pin Layout at Connection Side



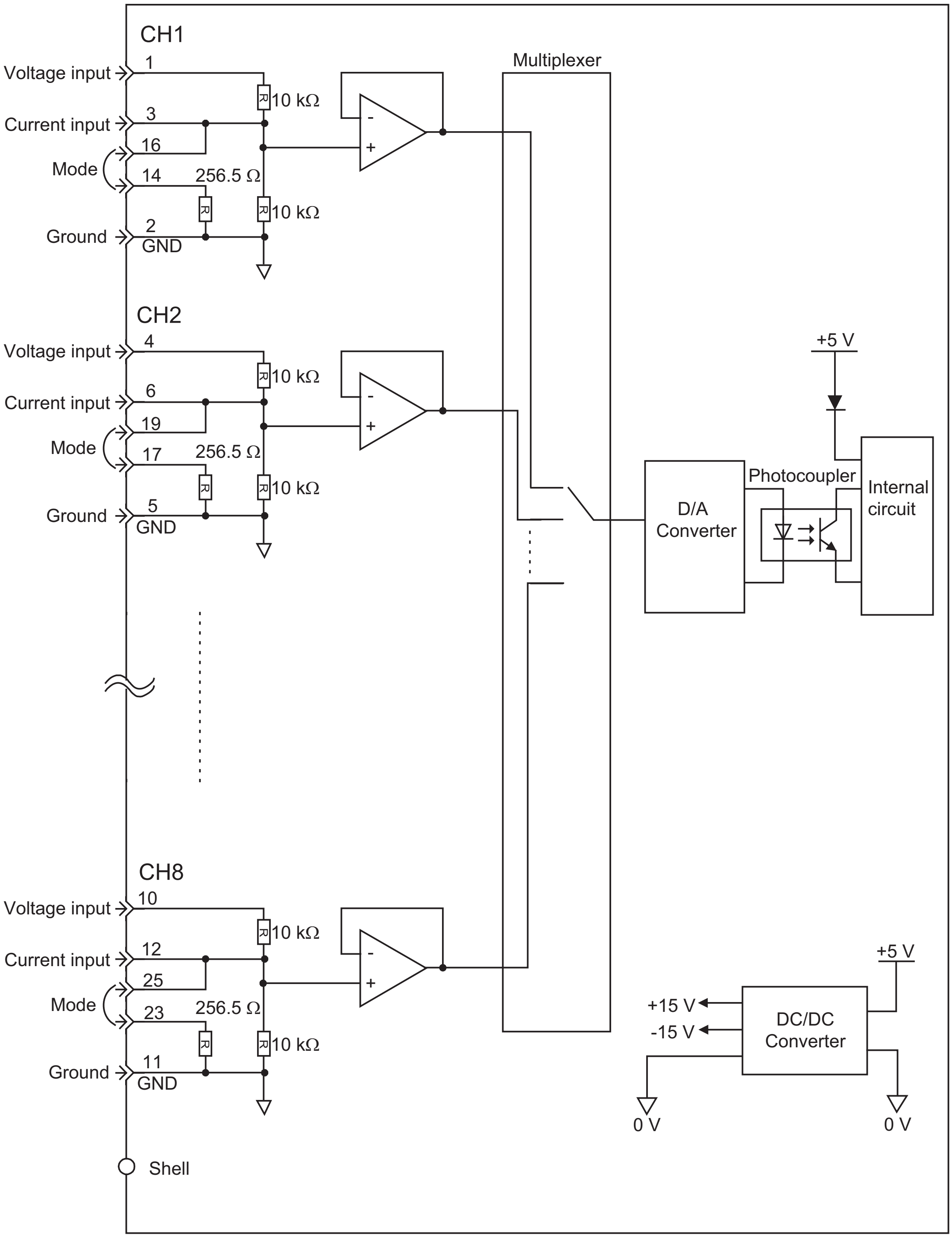


(b) Terminal Specifications

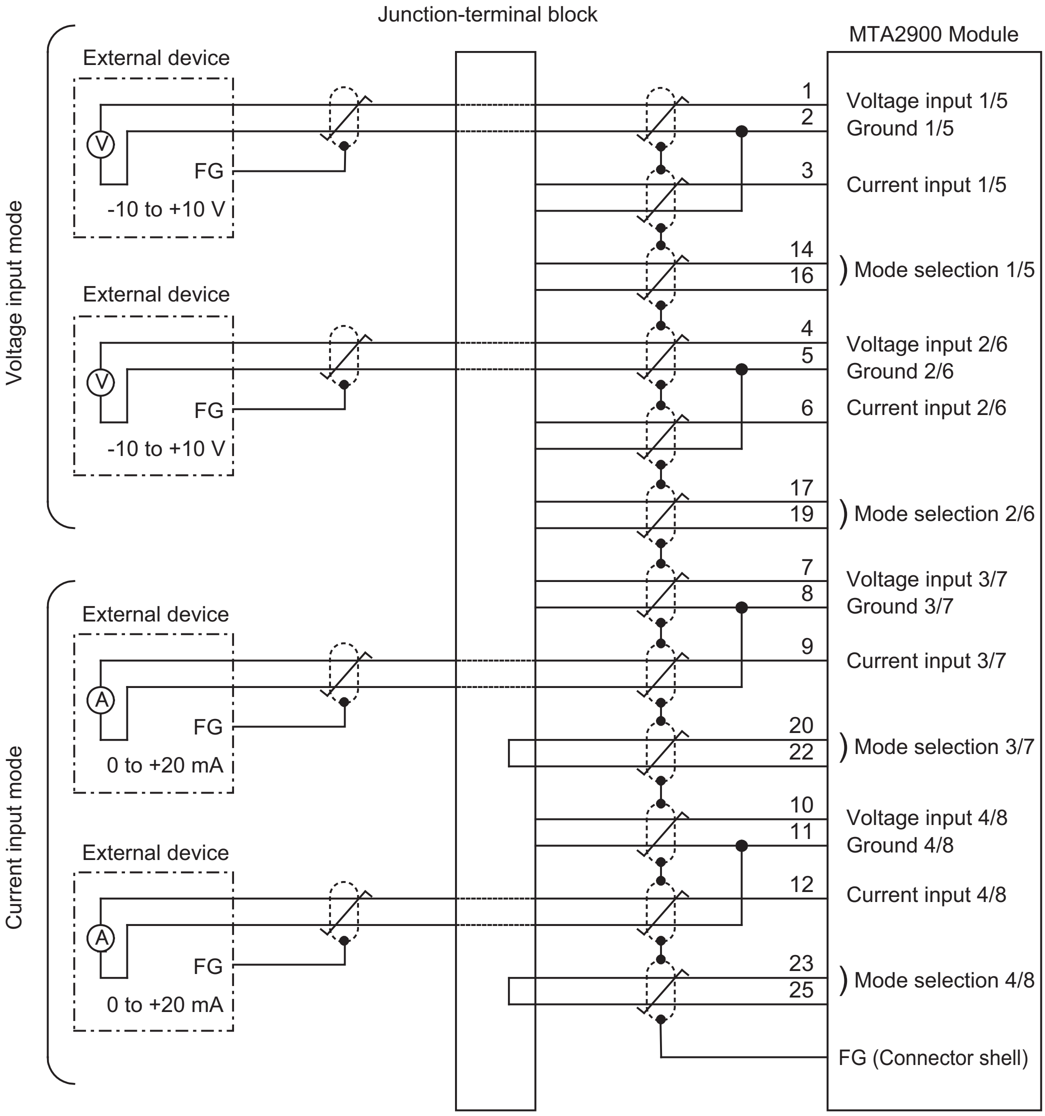
No.	Signal Name	Function	No.	Signal Name	Function
1	V5	Voltage input 5	14	MDP5	Mode selection terminal 5
2	G5	Ground 5	15	(G5)	(Ground 5)
3	A5	Current input 5	16	MDN5	Mode selection terminal 5
4	V6	Voltage input 6	17	MDP6	Mode selection terminal 6
5	G6	Ground 6	18	(G6)	(Ground 6)
6	A6	Current input 6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

5.5.3 Circuit Configuration and Connection Example

(1) MTA2900 Module Circuit Configuration



(2) MTA2900 Module Connection Example (CN1/CN2)



Note: 1. Use a standard cable (JEPMC-W6081-□□) to connect the MTA2900 Module to an external device.
Use the junction-terminal block, because the distances between each external device and the module will vary.
2. Ground the cable shield between the external devices and the junction-terminal block on the external-device side.

- Using with Voltage Input Mode 1 and 2

Open each mode-selection terminal, terminals 1 to 8, and do not connect to the current-input terminals 1 to 8.

- Using with Current Input Mode

Short-circuit each mode-selection terminal, terminals 1 to 8, and do not connect to the voltage-input terminals 1 to 8.

5.6 Parameter Settings

5.6.1 Parameter List

The parameters required to set for the MTA2900 Module are listed below.

These parameters can be set using the IOWin. For details, refer to *2.5.1 Editing Parameters*.

Parameter No. (Hexadecimal) n = channel No.	Data Size (Number of bytes)	Parameter Name	Description
0n00	2	Input mode	Specifies the input mode in which the channel is used.
0n02	2	Offset	Specifies the offset value.
0n03	2	Gain	Specifies the gain value.

5.6.2 Parameter Details

(1) Input Mode Setting

Input mode		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n00 n = channel no.	2	0 to 3	–	0
Description	Specifies the input mode for the channel specified by channel no. 0: Channel not used (default) - No input from the channel 1: Voltage mode 1 - Analog input range: –10 to + 10 V 2: Voltage mode 2 - Analog input range: 0 to +10 V 3: Current mode - Analog input range: 0 to 20 mA					

(2) Offset

Offset		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n02 n = channel no.	2	-9999 to +9999	–	0
Description	Specifies the offset value for the channel specified by channel no. For details, refer to *5.6.3 (2) Setting the Offset/Gain*.					

(3) Gain

Gain		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n03 n = channel no.	2	0 to +9999	–	1000
Description	Specifies the gain value for the channel specified by channel no. For details, refer to *5.6.3 (2) Setting the Offset/Gain*.					

5.6.3 MTA2900 Module Settings

This section describes the items to be set in parameters after connecting the MTA2900 Module.

(1) Setting the Input Mode

The MTA2900 Module has three input modes:

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

The input mode for each channel must be selected both on the hardware (connection) and in the software (parameter). Both settings must match.

For information on the hardware setting, refer to *5.5.3 (2) MTA2900 Module Connection Example (CN1/CN2)*.

(2) Setting the Offset/Gain

The offset/gain settings do not usually require adjustment. The MTA2900 Module is adjusted before shipment so that the input register value appropriate for the specified voltage (current) range is input. If more precise adjustments are required, use the following procedure to adjust the offset/gain:

1. Send a DATA_RWA command (asynchronous) or DATA_RWS command (synchronous) from the host controller to the MTA2900 Module.
2. Change the voltage of the external device connected to the channel for which offset/gain value to be adjusted, to 0 V, 5 V, and 10 V (when the input mode is set to Voltage Mode 2 (analog input range: 0 to +10 V)). Check the analog input value in the response data for the DATA_RWA or DATA_RWS command.
3. Set (adjust) the offset/gain parameter of the channel using the PPRM_WR command.
4. Repeat steps 1 to 3 for all channels to be used.

Note: 1. For the analog input value for channel #n, the offset and gain adopted data value (A/D conversion value) received from the MTA2900 Module is stored.
Analog input value of channel #n = A/D conversion value × gain + offset
2. The default values of offset and gain are as follows:
Offset: 0000
Gain: 1.000
Therefore, if offset/gain adjustment is not conducted, the analog input value of channel #n will be equal to A/D conversion value.

(3) Initializing Parameters to Default Values

- Initializing parameters to default values
  Set INIT of SW1 to ON, and then restart the power.
- Initializing parameters written in nonvolatile memory to default values
  Set MODE and INIT of SW1 to ON, and then recycle the power.

Note: After initialization, reset INIT of SW1 to OFF. If INIT of SW1 is left ON, the parameters will be initialized every time the power is restarted.

5.7 Operation Details

Note: Refer to *Appendix B* for MECHATROLINK communication specifications.

5.7.1 Command Data

Command Format

Byte	Command
0	CMD
1	WDC
2	CMD_CTRL
3	
4	Reserved (0)
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	

(1) Command Data List

The command data for the MTA2900 are listed below.

Command Byte Number	Name	Contents
0	CMD	Command code
1	WDC	Watchdog data
2 and 3	CMD_CTRL	Command control
4 to 31	Reserved (0)	Reserved by system

(2) Command Data Details

(a) CMD

<table>
<tr><td colspan="2" rowspan="2">Command code
(Byte 0)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>20, 21 (Hexadecimal)</td><td>–</td></tr>
<tr><td>Description</td><td colspan="3">Command code of standard I/O profile command
DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous)
DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)</td></tr>
</table>

(b) WDC

<table>
<tr><td colspan="2" rowspan="2">Watchdog
(Byte 1)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td>Description</td><td colspan="3">Watchdog data of standard I/O profile command
Used to establish synchronous communication and for detection of out-of-sync state.</td></tr>
</table>

(c) CMD_CTRL

<table>
<tr><td colspan="2" rowspan="2">Command control
(Bytes 2 and 3)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td>Description</td><td colspan="3">Control for standard I/O profile command
Bit 3: ALM_CLR (Clear communication alarm/warning) is disabled when set to 0, and clears alarm when set to 1</td></tr>
</table>

(d) Reserved

<table>
<tr><td colspan="2" rowspan="2">Reserved
(Bytes 4 to 31)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td>Description</td><td colspan="3">Not to be used.</td></tr>
</table>

5.7.2 Response Data

Response Format

Byte	Response
0	RCMD
1	RWDT
2	CMD_STAT
3	
4	Channel #1 Analog input value
5	
6	Channel #2 Analog input value
7	
8	Channel #3 Analog input value
9	
10	Channel #4 Analog input value
11	
12	Channel #5 Analog input value
13	
14	Channel #6 Analog input value
15	
16	Channel #7 Analog input value
17	
18	Channel #8 Analog input value
19	
20	Reserved (0)
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	

(1) Response Data List

The response data for the MTA2900 Module are listed below.

Response Byte Number	Name	Description
0	RCMD	Command code
1	RWDT	Watchdog data
2, 3	CMD_STAT	Command status
4, 5	Channel #1 Analog input value	Analog input value of channel #1
6, 7	Channel #2 Analog input value	Analog input value of channel #2
8, 9	Channel #3 Analog input value	Analog input value of channel #3
10, 11	Channel #4 Analog input value	Analog input value of channel #4
12, 13	Channel #5 Analog input value	Analog input value of channel #5
14, 15	Channel #6 Analog input value	Analog input value of channel #6
16, 17	Channel #7 Analog input value	Analog input value of channel #7
18, 19	Channel #8 Analog input value	Analog input value of channel #8
20 to 31	Reserved (0)	Reserved by system

(2) Response Data Details

(a) RCMD

Command code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) RWDT

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used for synchronous communication establishment and detection of out of sync state.		

(c) CMD_STAT

Command status (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Standard I/O Profile Command Status Bit 0: D_ALM 0: Normal status, 1: Device in alarm status Bit 1: D_WAR 0: Normal status, 1: Device in warning status Bit 2: CMDRDY 0: Command reception disabled, 1: Command reception enabled Bit 3: ALM_CLR_CMP 0: ALM_CLR command execution not completed, 1: ALM_CLR command execution completed Bit 8 to B: CMD_ALM Any value other than 0: Command error status Bit C to F: COMM_ALM Any value other then 0: Communication error status		

(d) Channel #1 to #8 Analog Input Value

		Setting Range	Setting Unit
Channel #n analog input value (Byte 4 to 11)		Voltage mode 1: -31276 to + 31276 Voltage mode 2: 0 to 31276 Current mode: 0 to 31276	–
Description	Used to monitor analog input value after A/D conversion.		

5.7.3 Command Data/Response Data Processing Timing

The latest analog input value at reception of the command is set in the response data.

5.8 MECHATROLINK-III Communications Related Information

5.8.1 ID_CODE

The MTD2310 Module returns values in conformity with MECHATROLINK-III communication specifications, using ID_CODE.

ID_CODE Table

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
01	Vendor ID Code	Vendor-specific ID code	4	Supported	00000000 (Yaskawa Electric Corporation)
02	Device Code	Product-specific code	4	Supported	02400002
03	Device Version	Product version information	4	Supported	00000100
04	Device Definition (MDI) File version	Information of the device definition file (MDI) version the product supports	4	Supported	00001000
05	Extended Address Setting	Number of extended addresses the product supports	4	Supported	00000002
06	Serial No.	Product serial number	32	Unsupported	–
10	Profile Type 1	Profile type 1 the product supports	4	Supported	00000030 (Standard I/O profile)
11	Profile Version 1	Profile version 1 the product supports	4	Supported	00000100
12	Profile Type 2	Profile type 2 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 2)
13	Profile Version 2	Profile version 2 the product supports	4	Supported	00000000
14	Profile Type 3	Profile type 3 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 3)
15	Profile Version 3	Profile version 3 the product supports	4	Supported	00000000
16	Minimum Value of Transmission Cycle	The minimum transmission cycle the product supports	4	Supported	000030D4
17	Maximum Value of Transmission Cycle	The maximum transmission cycle the product supports	4	Supported	000C3500
18	Granularity of Transmission Cycle	The transmission cycle granularity levels the product supports	4	Supported	00000002
19	Minimum Value of Communication Cycle	The minimum communication cycle the product supports	4	Supported	000061A8
1A	Maximum Value of Communication Cycle	The maximum communication cycle the product supports	4	Supported	0061A800
1B	Number of Transmission Bytes	Number of transmission bytes for the product	4	Supported	00000010
1C	Number of Transmission Bytes (Current Setting)	Currently set number of transmission bytes for the product	4	Supported	00000010
1D	Profile Type (Current Selection)	Profile type selected by CONNECT command	4	Supported	00000030
20	Supported Communication Mode	Communication mode the product supports	4	Supported	00000007

ID_CODE Table (cont'd)

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
21	MAC Address	MAC address	4	Unsupported	–
30	List of Supported Main Commands	List of the main commands the product supports	32	Supported	6000E07F 00000003 00000000 00000000 00000000 00000000 00000000 00000000
38	List of Supported Sub Commands	Not used with a standard I/O profile	32	Unsupported	–
40	List of Common Parameters	Not used with a standard I/O profile	32	Unsupported	–
80	Main Device Name	Main device name	32	Supported	4D50454A 544D2D43 30393250 00452D30 00000000 00000000 00000000 00000000
90	Sub Device 1 Name	Sub device 1 name	32	Unsupported	–
98	Sub Device 1 Version	Sub device 1 version	4	Unsupported	–
A0	Sub Device 2 Name	Sub device 2 name	32	Unsupported	–
A8	Sub Device 2 Version	Sub device 2 version	4	Unsupported	–
B0	Sub Device 3 Name	Sub device 3 name	32	Unsupported	–
B8	Sub Device 3 Version	Sub device 3 version	4	Unsupported	–

5.8.2 Virtual Memory

Data are stored in the virtual memory addresses as shown below.

(1) Device Information Area

Address	Contents
0000 0000 to 0000 0003	Not specified
0000 0004 to 0000 0007	Vendor ID code
0000 0008 to 0000 000B	Device code
0000 000C to 0000 000F	Device version
0000 0010 to 0000 0013	Device definition (MDI) file version
0000 0014 to 0000 0017	Extended address setting
0000 0018 to 0000 0037	Serial No.
0000 0038 to 0000 003F	Not specified
0000 0040 to 0000 0043	Profile type 1
0000 0044 to 0000 0047	Profile version 1
0000 0048 to 0000 004B	Profile type 2
0000 004C to 0000 004F	Profile version 2
0000 0050 to 0000 0053	Profile type 3
0000 0054 to 0000 0057	Profile version 3
0000 0058 to 0000 005B	Minimum value of transmission cycle
0000 005C to 0000 005F	Maximum value of transmission cycle
0000 0060 to 0000 0063	Granularity of transmission cycle
0000 0064 to 0000 0067	Minimum value of communication cycle
0000 0068 to 0000 006B	Maximum value of communication cycle
0000 006C to 0000 006F	Number of transmission bytes
0000 0070 to 0000 0073	Number of transmission bytes (current setting)
0000 0074 to 0000 0077	Profile type (current selection)
0000 0078 to 0000 007F	Not specified

Address	Contents
0000 0080 to 0000 0083	Supported communication mode
0000 0084 to 0000 008B	MAC address
0000 008C to 0000 00BF	Not specified
0000 00C0 to 0000 00DF	List of supported main commands
0000 00E0 to 0000 00FF	List of supported subcommands
0000 0100 to 0000 011F	List of supported common parameters
0000 0120 to 0000 01FF	Not specified
0000 0200 to 0000 021F	Main device name
0000 0220 to 0000 023F	Not specified
0000 0240 to 0000 025F	Sub device 1 name
0000 0260 to 0000 0263	Sub device 1 version
0000 0264 to 0000 027F	Not specified
0000 0280 to 0000 029F	Sub device 2 name
0000 02A0 to 0000 02A3	Sub device 2 version
0000 02A4 to 0000 02BF	Not specified
0000 02C0 to 0000 02DF	Sub device 3 name
0000 02E0 to 0000 02E3	Sub device 3 version
0000 02E4 to 0000 0FFF	Not specified
0000 1000 to 0000 FFFF	Not specified

(2) Vendor Parameter Area

Address	Param-eter No.	Contents
8000 0000 to 8000 0001	0100	Input mode setting (CH1)
8000 0002 to 8000 0003	–	Reserved (0)
8000 0004 to 8000 0005	0102	Offset (CH1)
8000 0006 to 8000 0007	0103	Gain (CH1)
8000 0008 to 8000 0009	0200	Input mode setting (CH2)
8000 000A to 8000 000B	–	Reserved (0)
8000 000C to 8000 000D	0202	Offset (CH2)
8000 000E to 8000 000F	0203	Gain (CH2)
8000 0010 to 8000 0011	0300	Input mode setting (CH3)
8000 0012 to 8000 0013	–	Reserved (0)
8000 0014 to 8000 0015	0302	Offset (CH3)
8000 0016 to 8000 0017	0303	Gain (CH3)
8000 0018 to 8000 0019	0400	Input mode setting (CH4)
8000 001A to 8000 001B	–	Reserved (0)
8000 001C to 8000 001D	0402	Offset (CH4)
8000 001E to 8000 001F	0403	Gain (CH4)

Address	Param-eter No.	Contents
8000 0020 to 8000 0021	0500	Input mode setting (CH5)
8000 0022 to 8000 0023	–	Reserved (0)
8000 0024 to 8000 0025	0502	Offset (CH5)
8000 0026 to 8000 0027	0503	Gain (CH5)
8000 0028 to 8000 0029	0600	Input mode setting (CH6)
8000 002A to 8000 002B	–	Reserved (0)
8000 002C to 8000 002D	0602	Offset (CH6)
8000 002E to 8000 002F	0603	Gain (CH6)
8000 0030 to 8000 0031	0700	Input mode setting (CH7)
8000 0032 to 8000 0033	–	Reserved (0)
8000 0034 to 8000 0035	0702	Offset (CH7)
8000 0036 to 8000 0037	0703	Gain (CH7)
8000 0038 to 8000 0039	0800	Input mode setting (CH8)
8000 003A to 8000 003B	–	Reserved (0)
8000 003C to 8000 003D	0802	Offset (CH8)
8000 003E to 8000 003F	0803	Gain (CH8

5.9 Alarm/Warning Code List

The list of alarms and warnings that are generated by the MECHATROLINK communication function is as follows.

5.9.1 Alarm List

Category	Alarm Code	COMM_ ALM	Alarm Details	Countermeasures	Alarm Clearance
Communication Setting Error	A.E41 (Communication data size setting error)	0	Occurs when communication data was not received.	Review the controller's communication settings.	Not possible
Communication Establishment Error	A.E40 (Transmission cycle setting error)	B	Occurs when an unsupported transmission cycle is set on reception of a CONNECT command.	Review the controller's transmission cycle setting.	Not possible
	A.E60 (Reception error)	9	Result of noise or other causes after communications are established when two consecutive reception errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E62 (FCS error)	8	Result of noise or other causes after communications are established when two consecutive FCS errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E63 (Synchronous frame not received)	A	Result of noise or other causes after communications are established when two consecutive failures to receive a synchronous frame occur.	Replace the module.	Possible
System Error	A.B6A (Communication LSI initialization error)	0	Occurs when initialization of the communication LSI has failed.	Replace the module.	Not possible

5.9.2 Warning List

(1) Communication Error (COMM_ALM)

Category	Warning Code	COMM_ ALM	Warning Details	Countermeasures	Alarm Clearance
Communication Alarm	A.960 (Communication error alarm)	2	Result of noise or other causes after communications are established when a reception error occurs.	Review the communication wiring and take countermeasures against noise.	Possible
Communication Establishment Error	A.962 (FCS error alarm)	1	Result of noise or other causes after communications are established when an FCS error occurs.		
	A.963 (Synchronous frame not received alarm)	3	Result of noise or other causes after communications are established when a synchronous frame is not received.		

(2) Command Error (CMD_ALM)

Category	Warning Code	CMD_ ALM	Warning Details	Countermeasures	Alarm Clearance
Data Setting Warning	A.94A (ID number alarm)	9	Occurs when the ID number specified by ID_RD command is out of the valid ID number range.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	Automatically cleared
	A.94B (Invalid data)	9	Occurs when data of a command other than ID_RD is out of the valid data range.		
Command Warning	A.95B (Unsupported command)	8	Occurs when an unsupported command is received.	Review the content of the command data issued by the controller.	
	A.95F (Undefined command)	8	Occurs at reception of a command other than those supported by MECHATROLINK-III specifications.		
	A.97A (Phase error)	C	Occurs at reception of a command that cannot be processed in the current phase.	Review the controller's command issue sequence.	

6

Analog Output Module (JEPMC-MTA2910-E)

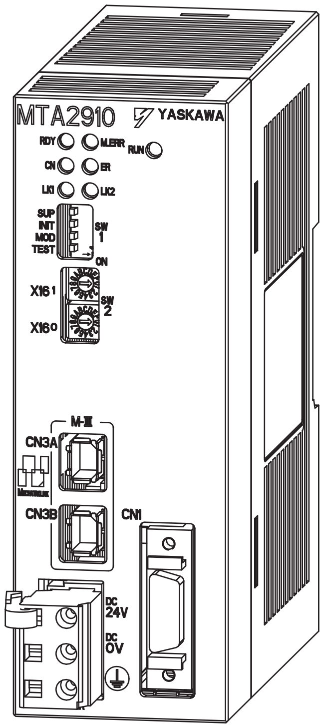
This chapter provides an overview and a description of the specifications, the connections, and the settings of the Analog Output Module model JEPMC-MTA2910-E.

6.1 Overview

The Analog Output Module, model: JEPMC-MTA2910-E (hereinafter referred to as the MTA2910 Module), has four channels. Two ranges of analog output are available: -10 to +10 V, 0 to +10 V.

6.2 External Appearance and Configuration

6.2.1 External Appearance



6.2.2 I/O and Status Display

(1) LED Indicator

RUN ○

Indicator Name	Indicator Color	Status when lit	Status when unlit
RUN	Green	Normal operation (while executing the DATA_RW□ command)	Operation being stopped

(2) Bus Coupler Status Indicator

Indicator Code	Indicator Name	Indicator Color	Status when ON	Remarks
D1	RDY	Green	The microprocessor for control is operating normally.	CPU_I/O
	M_ERR	Red	Lights up or flashes at occurrence of failure.	CPU_I/O
D2	CN	Green	MECHATROLINK-III connection is established.	CPU_I/O
	ER	Red	Lights up of flashes at occurrence of MECHATROLINK-III communication error.	CPU_I/O
D3	LK1	Green	Linked to MECHATROLINK connector CN1	PHY port2
	LK2	Green	Linked to MECHATROLINK connector CN2	PHY port1

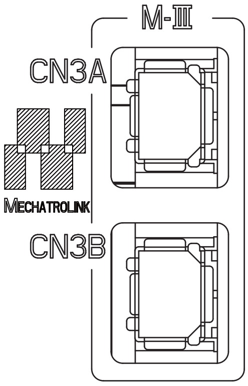
(3) Status Indication Details

Classification	LED Indicator Status						Indication	Meaning
	RDY	M_ERR	CN	ER	LK1	LK2		
Normal Status	○	●	–	–	–	–	Hardware reset status	If this state remains unchanged 10 seconds after power-on, there is a hardware failure.
	○	○	–	–	–	–	Initialization in progress	
	●	○	–	–	–	–	Normally executing	Normal
Error Status	○	●	–	–	–	–	Occurrence of serious failure	An error was detected by the watchdog timer.
	○	★	–	–	–	–	The number of flashes indicates the type of hardware error: 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error 6: Communication ASIC diagnosis error	An error was detected during self-diagnosis.
	●	★	–	–	–	–	The number of flashes indicates the type of software error. 2: Transmission cycle setting error 3: Station address setting error 4: Watchdog timeout	An error was detected in the software.
Alarm	●	★	–	–	–	–	I/O error	An I/O error was detected.
MECHATROLINK Communications	●	○	–	–	●	–	LINK1 busy	Communication with LINK1 enabled
	●	○	–	–	–	●	LINK 2 busy	Communication with LINK 2 enabled
	●	○	●	–	–	–	Connection established	Connection to the master device is established.
	●	○	–	●	–	–	Occurrence of communication error	–

Note: ○: Unlit, ●: Lit, ★: Flashes, –: Not specified

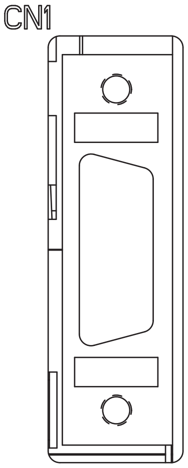
6.2.3 MECHATROLINK-III Connectors

Connect the MECHATROLINK-III cable.



6.2.4 I/O Connectors

Connect an MTA2910 module and external I/O signals with I/O cables.

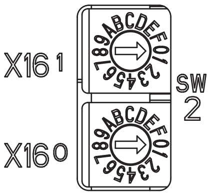


6.2.5 Station Number Selection Switch

Set the MECHATROLINK-III station number.

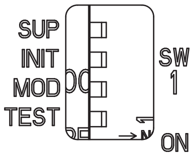
The setting range is 3 to EF (hexadecimal).

When multiple modules are connected, make sure there is no duplication of station numbers.

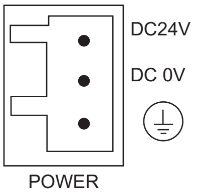


6.2.6 Operation Switch

Select the CPU operating condition when the power is turned on.



6.2.7 External Wiring Terminals



Terminal Name	Function
DC 24 V	+24 VDC
DC 0 V	0 VDC
FG	Protective grounding terminal

6.3 Mounting an MTA2910 Module

6.3.1 Method

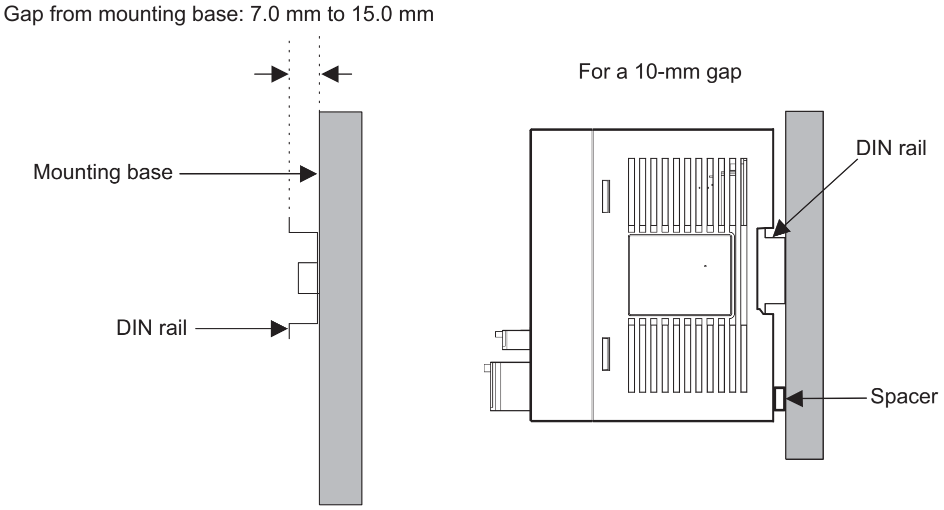
There are two methods for mounting an MTA2910 Module.

- Using DIN rail (standard)
- Using screws

(1) DIN Rail Mounting

(a) DIN Rails and Spacer

Several types of DIN rails are available: with 7-mm to 15-mm gap from the mounting base as shown in the following diagram. If mounting an MTA2910 Module using DIN rail with 10 mm gap, install a spacer on the rear of the MTA2910 Module near the bottom to protect the MTA2910 Module from vibration and shock.

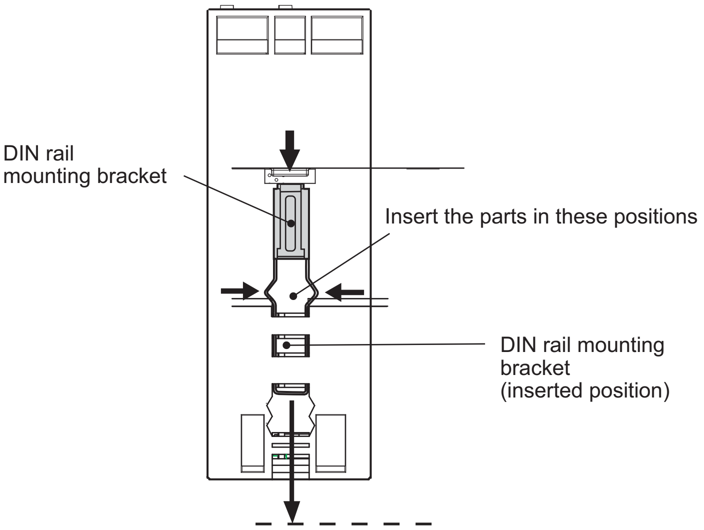


(b) Procedure for Mounting to DIN Rail

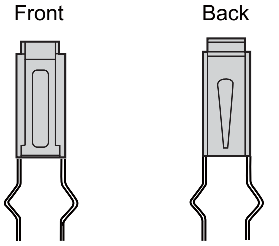
Use the following procedure to attach the DIN rail mounting parts to the MTA2910 Module and then mount the MTA2910 Module to the DIN rail.

1. Insert the DIN rails to the dotted line in the two slots on the rear of the MTA2910 Module as shown in the following figure.

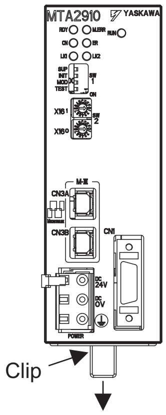
MTA2910 Module Rear Side



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

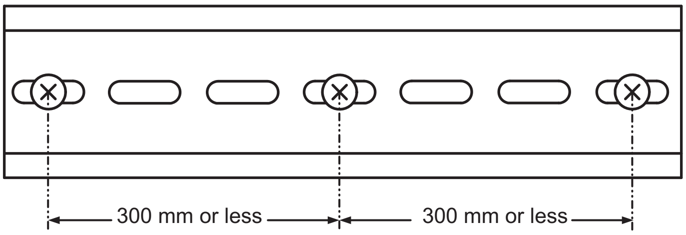


2. Pull the DIN rail mounting clips down to release them.

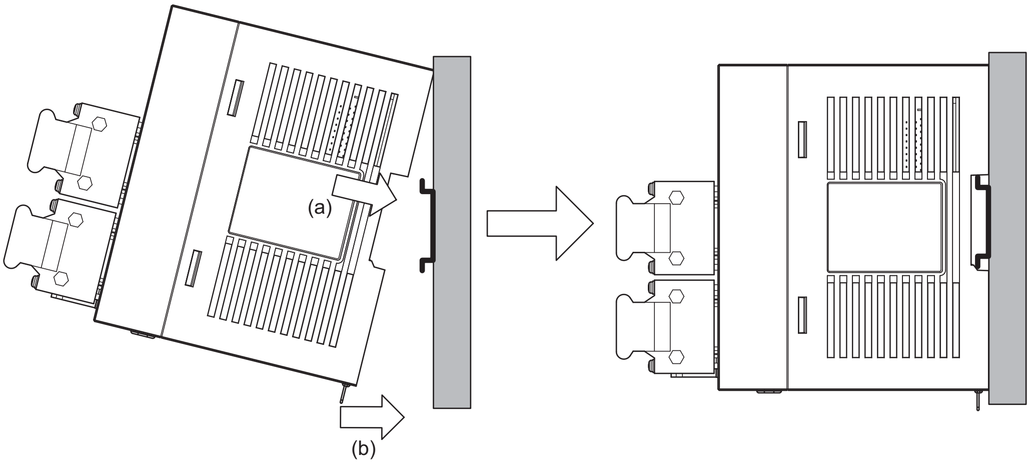


■ Fixing a DIN Rail

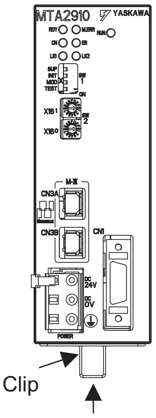
Make sure to fix a DIN rail at 300 mm or less pitch as shown in the figure below.



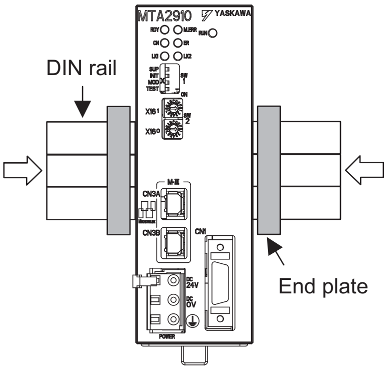
3. Hook the MTA2910 Module to the top of the DIN rail (a), and then push the MTA2910 Module towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MTA2910 Module to secure it to the DIN rail.

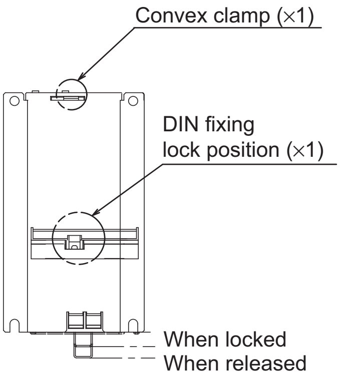


This completes the installation procedure.

(2) Screwed Method

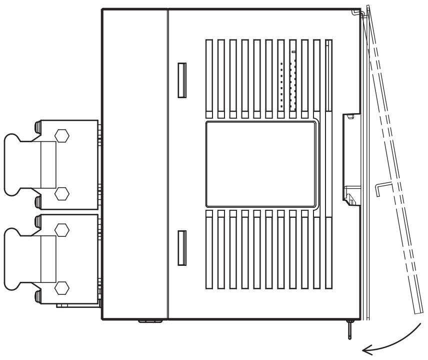
Use a panel mounting clamp model JEPMC-OP2400-E (optional) by the following procedure to mount an MTA2910 Module on the panel.

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

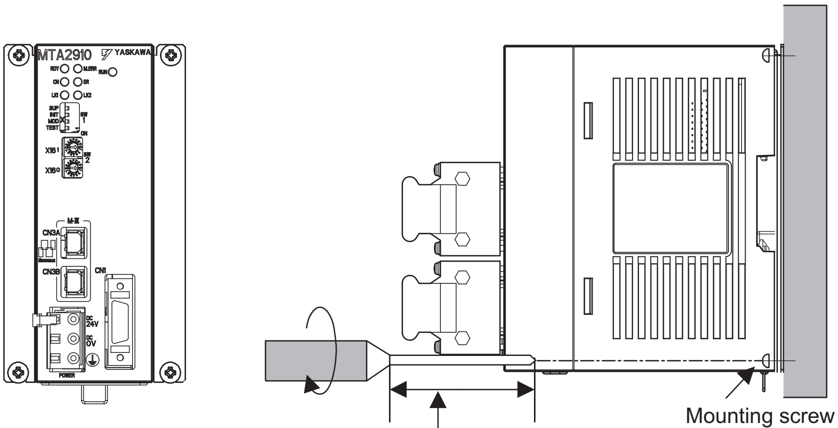


Panel mounting clamp

2. Insert one convex portion at the top of the panel mounting clamp into the hole of the MTA2910 Module case.



3. Push the clamp as indicated by an arrow above onto the MTA2910 Module case and use the DIN fixing lock to fix MTA2910 Module.
4. Push the MTA2910 Module mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.



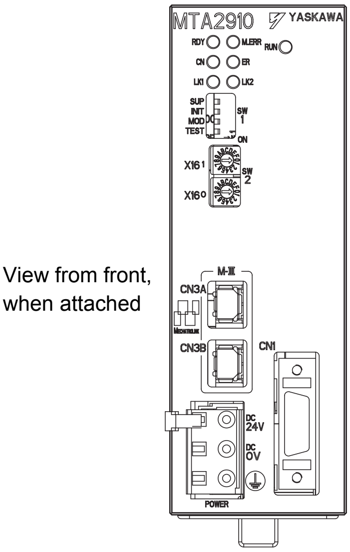
Mounting screw (M4 Phillips)

Use the screwdriver with this portion of a driver not less than 10 cm.

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

6.3.2 Mount Direction

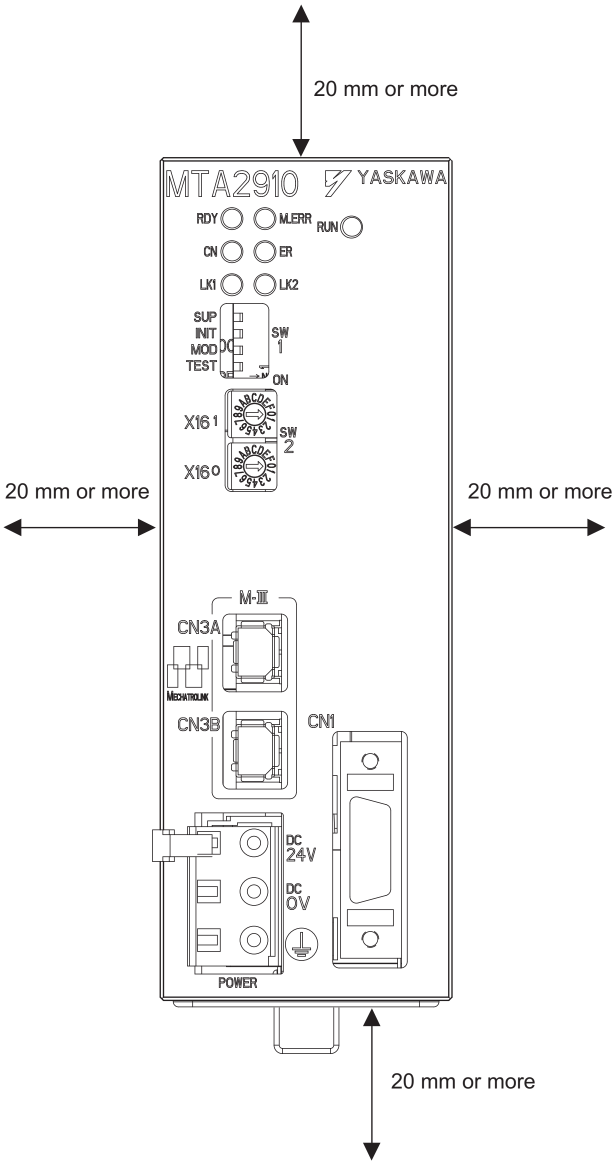
Be sure to mount the MTA2910 Module from the front using a DIN rail or panel mounting clamp and.



6.3.3 Space Required for Mounting an MTA2910 Module

Install MTA2910 Module so that enough space is left around it as shown in the following figure:

- Mount condition
  - Vertical and horizontal directions: 20 mm or more



6.4 Specifications

6.4.1 General Specifications

The general specifications for MTA2910 Module are shown below.

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% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B3501)
	Corrosive Gas	There must be no flammable or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 • 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 B3502 Peak acceleration of 147 m/s^2 (15 G) twice for 11 ms each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group1, ClassA)
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling
	Mounting Direction	Refer to *6.3 Mounting an MTA2910 Module*.
Compliant Standards (Certification process is under way to obtain the certificate.)		UL, CSA, CE

6.4.2 Performance Specifications

(1) Hardware Specifications

The hardware specifications of MTA2910 Module are shown below.

Item			Specifications	
Name			Analog output module	
Abbreviated Name			MTA2910	
Model No.			JEPMC-MTA2910-E	
Power Supply Section (POWER-CN)	Input Voltage		24 VDC (±20%)	
	Current Consumption		0.5 A max.	
Communication Interface (CN3A/CN3B)	Communication Specifications		MECHATROLINK-III	
Analog Output (CN1)	Number of Channels		4	
	Setting of the Channels Used		1 to 4 channels (optional)	
	Insulation		Between channels: Non-insulated	
	Analog Output Range		–10 to +10 V	0 to 10V
	Resolution		16 bits (–31276 to +31276)	16 bits (0 to +31276)
	Accuracy	25°C	± 0.1% (± 10 mV)	
		0 to 55°C	± 0.3% (± 30 mV)	
	Max. Allowable Load Current		± 5 mA	
	Output Delay Time		1.2 ms[*]	

[*] : After change with a full scale of –10 V to + 10 V

Note: Use a 24-VDC power supply and external input power supply with double or reinforced insulation.

(2) Switch Specifications

The specifications of the switches provided on the MTA2910 Module are as follows.

(a) SW1

The SW1 switch sets the CPU operation mode at power-on.

Note: The SW1 setting is read at power-on. If the setting is changed after power-on, the descriptions in the table below will not be applicable.

Device Code	Name	Setting	Operation	Default	Remarks
S1-4	SUP	ON	SYSTEM load	OFF	ON: The MTA2910 Module will start running in a mode where the firmware version can be upgraded.
		OFF	Normal run		
S1-3	INIT	ON	Parameter initialization	OFF	• S1-2 set to OFF and S1-3 set to ON: The parameters will be initialized to the factory defaults at startup. However, the settings written in the nonvolatile memory will be kept unchanged. • Both S1-2 and S1-3 set to ON: Both the parameters and nonvolatile memory will be initialized to the factory defaults.
		OFF	Normal run		
S1-2	MODE	ON	Function selection	OFF	Used in combination with S1-3 setting to initialize the nonvolatile memory.
		OFF			
S1-1	TEST	ON	Reserved by system	OFF	Used for final adjustment before shipment.
		OFF			

(b) SW2

The SW2 switch sets the station address of MTA2910 Module as a slave device of the MECHATROLINK-III network.

Device Code	Name	Setting Range	Operation	Initial Setting	Remarks
S2	$\times 16^1$	0 to F	Station address (Upper digit)	0	F cannot be used.
S3	$\times 16^0$	0 to F	Station address (Lower digit)	3	–

(3) Output Characteristics

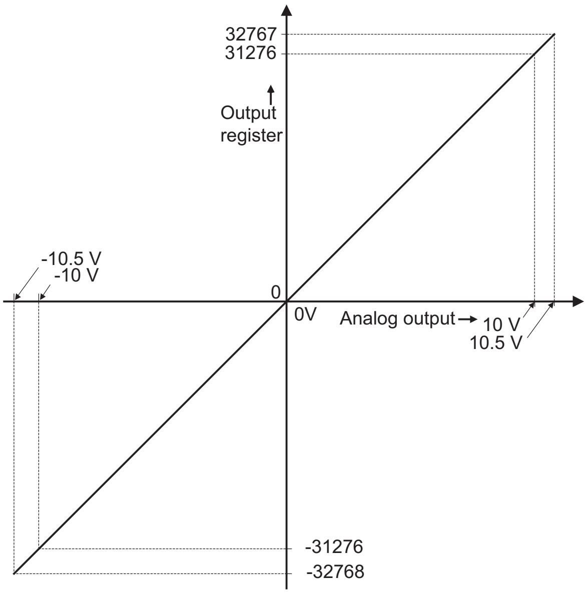
This section explains the output characteristics table corresponding to the analog output value and voltage and current mode, and output characteristic drawings.

(a) Output Characteristics Corresponding Table

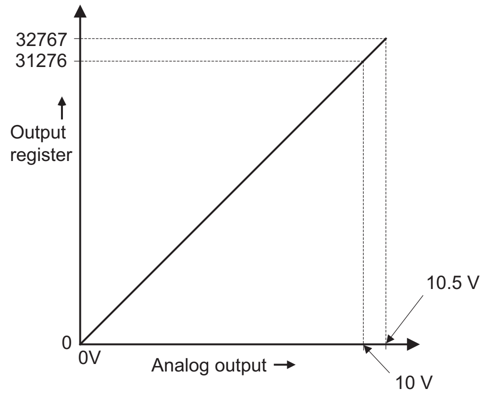
Analog output value	Output Register	
	Output range 1 (-10 V to +10 V)	Output range 2 (0 to +10 V)
-10.5 V	-32768	–
-10.0 V	-31276	–
-5.0 V	-15638	–
0.0 V	0	0
+5.0 V	15638	15638
+10.0 V	31276	31276
+10.5 V	32767	32767

Note: If the mode exceeds +10.0 V, the linearity is not guaranteed.

(b) Output Characteristics Drawing for Output Range 1 (-10 V to +10 V)



(c) Output Characteristics Drawing for Output Range 2 (-10 V to +10 V)



6.4.3 MECHATROLINK-III Communication Specifications

The general specifications of MECHATROLINK-III communications are given below.

Item	Specifications	
Communications Protocol	MECHATROLINK-III	
Classification	Slave	
Station Address Setting Range	03 to EF (hexadecimal)	
Transmission Speed	100 Mbps	
Supported Transmission Cycles	0.125 ms[*1], 0.25 ms, 0.5 ms, 1 ms to 8 ms (granularity: 0.5 ms)	
Number of Bytes per Station for Cyclic Communications	16 bytes	
Supported Communication Methods	Cyclic communications, event-driven communications, message communications	
Supported Profile	Standard I/O profile	
Supported Commands	Cyclic communications	NOP, PRM_RD, PRM_WR[*2], ID_RD, CONFIG, ALM_RD, ALM_CLR, SYNC_SET, CONNECT, DISCONNECT, PPRM_RD, PPRM_WR[*2], MEM_RD, MEM_WR[*2], DATA_RWA, DATA_RWS
	Event-driven communications	NOP, ID_RD, ALM_RD, CONNECT, DISCONNECT, MEM_RD
	Message communications	Read memory content, Write memory content, Read memory content: non contiguous, Write memory content: non contiguous, Read maximum message size

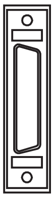
[*1] Set the communication cycle to 250 μs or more when the transmission cycle is set to 125 μs.

[*2] The value written by PRM_WR, PPRM_WR, MEM_WR commands, or tool (IOWin) to the volatile or nonvolatile memory will be validated immediately.

6.5 External I/O Signals and Connection Examples

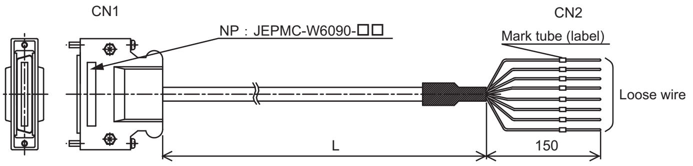
6.5.1 Specifications of Connection Cables and Connectors

(1) Connectors



Description	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
Analog Output Connector	CN1	20	10220-52A3PL	• Connector 10120-3000VE • Shell 10320-52A0-008 (Screw lock type) 10320-52F0-008 (One-touch-lock type)	Sumitomo 3M Limited

(2) Standard Cable Models and Appearance

Description	Model	Length	Appearance (JEPMC-W6090-□□)
Cable for AO-01Module	JEPMC-W6090-05	0.5 m	
	JEPMC-W6090-10	1 m	
	JEPMC-W6090-30	3 m	

(3) Standard Cable Wiring Chart

The wiring chart of the loose wire of the JEPMC-W6090-□□ standard cable is shown below.

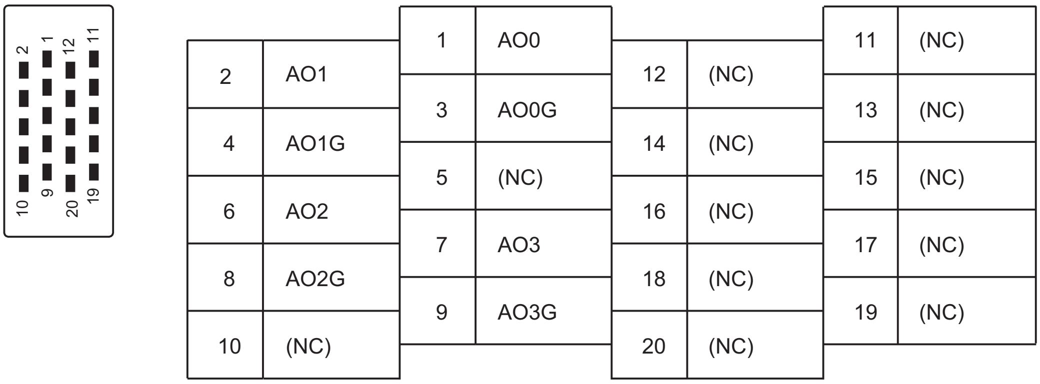
CN1 20-pin Terminal No.	Wire Color	Dot Color	Dot Mark	CN2 Mark Tube (Label)
1	Orange	Red	–	AO0
3	Orange	Black	–	AO0G
2	Gray	Red	–	AO1
4	Gray	Black	–	AO1G
6	White	Red	–	AO2
8	White	Black	–	AO2G
7	Yellow	Red	–	AO3
9	Yellow	Black	–	AO3G
10 to 20	Twisted-pair wire			

6.5.2 Connector Pin Layouts

The pin layout and each terminal function of the CN1 connector of MTA2910 Modules are described below.

(1) Connector CN1

Pin Arrangement at Connection Side



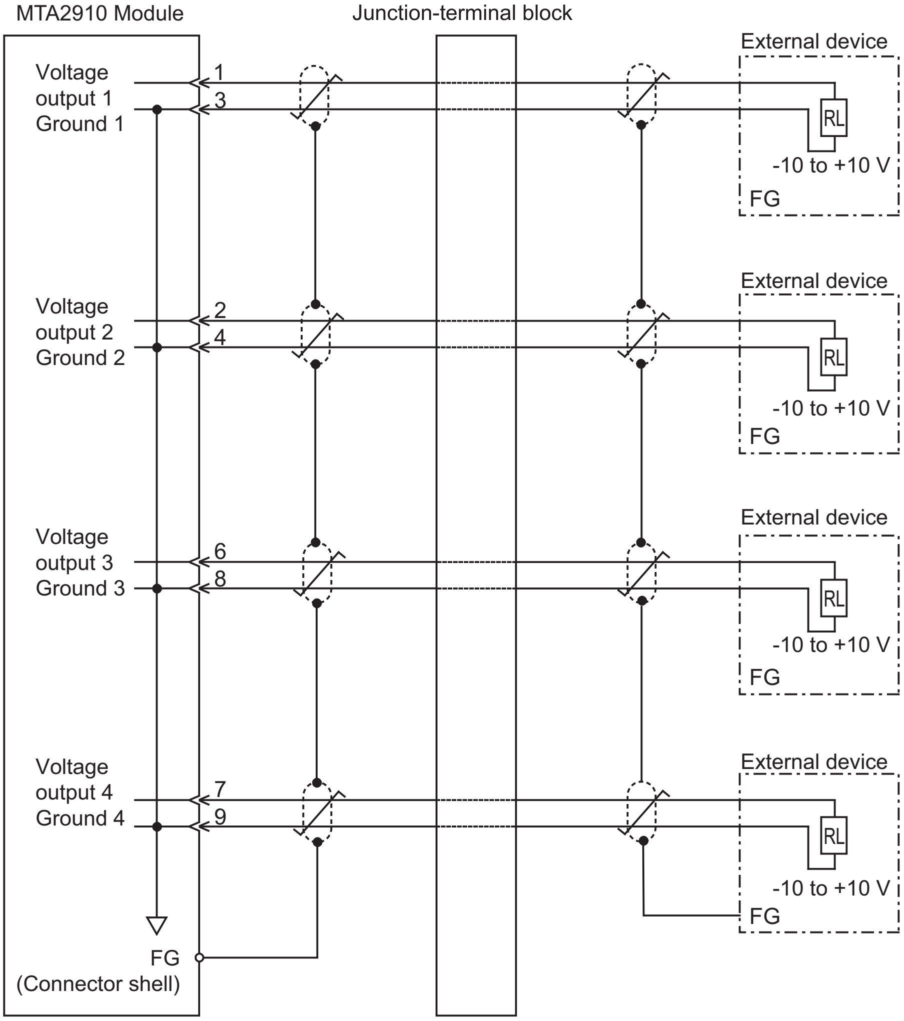
		1	AO0			11	(NC)
2	AO1			12	(NC)		
		3	AO0G			13	(NC)
4	AO1G			14	(NC)		
		5	(NC)			15	(NC)
6	AO2			16	(NC)		
		7	AO3			17	(NC)
8	AO2G			18	(NC)		
		9	AO3G			19	(NC)
10	(NC)			20	(NC)		

(2) Terminal Functions

No.	Signal Name	Function	No.	Signal Name	Function
1	AO0	Analog output 0	11	(NC)	–
2	AO1	Analog output 1	12	(NC)	–
3	AO0G	Ground 0	13	(NC)	–
4	AO1G	Ground 1	14	(NC)	–
5	(NC)	–	15	(NC)	–
6	AO2	Analog output 2	16	(NC)	–
7	AO3	Analog output 3	17	(NC)	–
8	AO2G	Ground 2	18	(NC)	–
9	AO3G	Ground 3	19	(NC)	–
10	(NC)	–	20	(NC)	–

6.5.3 Connection Example

The connection examples of the MTA2910 Module are shown below.



Note: 1. Use the MTA2910 Module standard cable (JEPMC-W6090-□□) to connect the MTA2910 Module and an external device. Use the junction terminal block because the distances between each external device and the module vary.

2. Ground the cable shield between the external devices and the junction terminal block by the external device side.

6.6 Parameter Settings

6.6.1 Parameter List

The parameters required to set for MTA2910 Module are listed below.

These parameters can be set using the IOWin. For details, refer to *2.5.1 Editing Parameters*.

Parameter No. (Hexadecimal) n = channel No.	Data Size (Number of bytes)	Parameter Name	Description
0n00	2	Output mode	Specifies the output mode in which the channel is used.
0n02	2	Offset	Specifies the offset value.
0n03	2	Gain	Specifies the gain value

6.6.2 Parameter Details

(1) Output Mode Setting

Output mode		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n00 n = channel No.	2	0 to 2	–	0
Description	Specifies the output mode for the channel specified by channel no. 0: Channel not used (default) - No output from the channel 1: Voltage mode 1 – Analog output range: –10 to +10 V 2: Voltage mode 2 – Analog output range: 0 to 10 V					

(2) Offset

Offset		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n02 n = channel no.	2	-9999 to +9999	–	0
Description	Specifies the offset value for the channel specified by channel No. For details, refer to *6.6.3 (2) Setting the Offset/Gain*.					

(3) Gain

Gain		Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
		0n03 n = channel no.	2	0 to +9999	–	1000
Description	Specifies the gain value for the channel specified by channel No. For details, refer to *6.6.3 (2) Setting the Offset/Gain.*					

6.6.3 MTA2910 Module Settings

This section describes the items to be set in parameters after connecting the MTA2910 Module.

(1) Setting the Output Mode

The MTA2910 Module has two output modes:

- Voltage Mode 1 (Output range: −10 to +10 V)
- Voltage Mode 2 (Output range: 0 to +10 V)

The output mode must be individually set for all channels to be used.

(2) Setting the Offset/Gain

The offset/gain settings do not usually have to be adjusted. The MTA2910 Module has been adjusted before shipment so that the output register value appropriate for the specified voltage range is output. If more precise adjustments are required, use the following procedure to adjust the offset/gain.

1. Send a DATA_RWA command (asynchronous) or DATA_RWS command (synchronous) from the host controller to the MTA2910 Module.
2. Set the analog output value in the command data of the channel for which the offset value is to be adjusted, to 0 (0 V), and measure the output voltage (AO1).
3. Calculate the offset of the output voltage by using the following equation, and set the calculated offset value of the channel by using a PPRM_WR command.
   Offset value = AO1 × (−3127.6) (round off below decimal point)
4. Send a DATA_RWA command (asynchronous) or DATA_RWS command (synchronous) from the host controller to the MTA2910 Module.
5. Set the analog output value in the command data of the channel for which the gain value is to be adjusted, to 31276 (10 V), and measure the output voltage (AO2).
6. Calculate the gain of the output voltage using the following equation, and set the calculated gain value of the channel by using a PPRM_WR command.
   a) If AO2 < 10 V
      Gain value = 10.0 ÷ AO2 (round off to the lower decimal point)
   b) If AO2 > 10 V
      Gradually reduce the analog output value in the command data from 31276 until the output voltage reaches approximately 10 V. The value of the analog output value that results in an output voltage of approximately 10 V is REG1.
      Gain value = REG1 ÷ 31276.0 (round off below decimal point)

   Note: The default values of offset and gain are as follows:
   Offset: 0000
   Gain: 1.000

(3) Initializing Parameters to Default Values

- Initializing parameters to default values
  Set INIT of SW1 to ON, and then recycle the power.
- Initializing parameters written in nonvolatile memory to default values
  Set MODE and INIT of SW1 to ON, and then recycle the power.

Note: After initialization, reset INIT of SW1 to OFF. If INIT of SW1 is left ON, the parameters will be initialized every time the power is recycled.

6.7 Operation Details

Note: Refer to *Appendix B* for MECHATROLINK communication specifications.

6.7.1 Command Data

Command Format

Byte	Command
0	CMD
1	WDC
2	CMD_CTRL
3	
4	Channel #1 Analog output value
5	
6	Channel #2 Analog output value
7	
8	Channel #3 Analog output value
9	
10	Channel #4 Analog output value
11	
12	Reserved (0)
13	
14	
15	

(1) Command Data List

The command data for the MTA2910 are listed below.

Command Byte Number	Name	Contents
0	CMD	Command code
1	WDC	Watchdog data
2 and 3	CMD_CTRL	Command control
4 and 5	Channel #1 Analog output value	Analog output value of channel #1
6 and 7	Channel #2 Analog output value	Analog output value of channel #2
8 and 9	Channel #3 Analog output value	Analog output value of channel #3
10 and 11	Channel #4 Analog output value	Analog output value of channel #4
12 to 15	Reserved (0)	Reserved by system

(2) Command Data Details

(a) CMD

Command code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) WDC

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used to establish synchronous communication and for detection of out-of-sync state.		

(c) CMD_CTRL

Command control (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Control for standard I/O profile command Bit 3: ALM_CLR (Clear communication alarm/warning) is disabled when set to 0, and clears alarm when set to 1		

(d) Channel #1 to #4 Analog Output Value

Channel #n analog output value (Byte 4 to 11)		Setting Range	Setting Unit
		Voltage mode 1: -31276 to + 31276 Voltage mode 2: 0 to 31276	–
Description	Used to monitor analog input value after D/A conversion.		

6.7.2 Response Data

Response Format

Byte	Response
0	RCMD
1	RWDT
2	CMD_STAT
3	
4	IN_DATA
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

(1) Response Data List

The response data from MTA2910 Module are listed below.

Response Byte Number	Name	Description
0	RCMD	Command code
1	RWDT	Watchdog data
2, 3	CMD_STAT	Command status
4 to 15	Reserved (0)	Reserved by system

(2) Response Data Details

(a) RCMD

Command code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) RWDT

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used to establish synchronous communication and for detection of out-of-sync state.		

(c) CMD_STAT

Command status (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Standard I/O Profile Command Status Bit 0: D_ALM 0: Normal status, 1: Device in alarm status Bit 1: D_WAR 0: Normal status, 1: Device in warning status Bit 2: CMDRDY 0: Command reception disabled, 1: Command reception enabled Bit 3: ALM_CLR_CMP 0: ALM_CLR command execution not completed, 1: ALM_CLR command execution completed Bit 8 to B: CMD_ALM Any value other than 0: Command error status Bit C to F: COMM_ALM Any value other then 0: Communication error status		

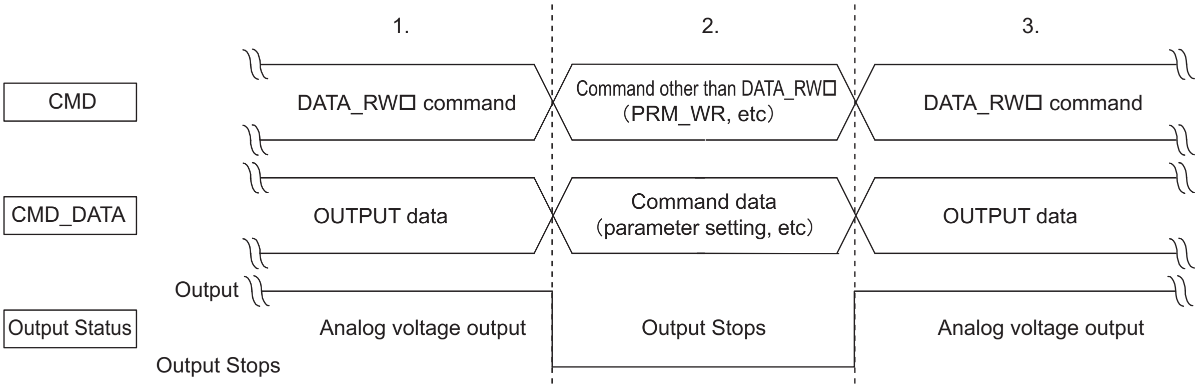
(d) Reserved

Reserved (Bytes 4 to 15)		Setting Range	Setting Unit
		–	–
Description	No to be used		

6.7.3 Command Data/Response Data Processing Timing

The MTA2910 Module outputs the analog voltage specified in the command data after the command is received. The maximum delay time is 24 μs.

- Output when switching commands



Section 1: The OUTPUT data (digital value) is converted to analog voltage in accordance with the parameter setting and then output.

Section 2: The analog voltage will stop being output if any command other than DATA_RW☐ are issued.

Section 3: If the parameter is changed by a read parameter command (such as PRM_WR, PPRM_WR, or MEM_WR) in section 2, the OUTPUT data will be converted to analog voltage in accordance with the changed parameter setting.

6.8 MECHATROLINK-III Communications Related Information

6.8.1 ID_CODE

The MTD2310 Module returns values in conformity with MECHATROLINK-III communication specifications, using ID_CODE.

ID_CODE Table

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
01	Vendor ID Code	Vendor-specific ID code	4	Supported	00000000 (Yaskawa Electric Corporation)
02	Device Code	Product-specific code	4	Supported	02400003
03	Device Version	Product version information	4	Supported	00000100
04	Device Definition (MDI) File version	Information of the device definition file (MDI) version the product supports	4	Supported	00001000
05	Extended Address Setting	Number of extended addresses the product supports	4	Supported	00000002
06	Serial No.	Product serial number	32	Unsupported	–
10	Profile Type 1	Profile type 1 the product supports	4	Supported	00000030 (Standard I/O profile)
11	Profile Version 1	Profile version 1 the product supports	4	Supported	00000100
12	Profile Type 2	Profile type 2 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 2)
13	Profile Version 2	Profile version 2 the product supports	4	Supported	00000000
14	Profile Type 3	Profile type 3 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 3)
15	Profile Version 3	Profile version 3 the product supports	4	Supported	00000000
16	Minimum Value of Transmission Cycle	The minimum transmission cycle the product supports	4	Supported	000030D4
17	Maximum Value of Transmission Cycle	The maximum transmission cycle the product supports	4	Supported	000C3500
18	Granularity of Transmission Cycle	The transmission cycle granularity levels the product supports	4	Supported	00000002
19	Minimum Value of Communication Cycle	The minimum communication cycle the product supports	4	Supported	000061A8
1A	Maximum Value of Communication Cycle	The maximum communication cycle the product supports	4	Supported	0061A800
1B	Number of Transmission Bytes	Number of transmission bytes for the product	4	Supported	00000010
1C	Number of Transmission Bytes (Current Setting)	Currently set number of transmission bytes for the product	4	Supported	00000010
1D	Profile Type (Current Selection)	Profile type selected by CONNECT command	4	Supported	00000030
20	Supported Communication Mode	Communication mode the product supports	4	Supported	00000007

ID_CODE Table (cont'd)

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
21	MAC Address	MAC address	4	Unsupported	–
30	List of Supported Main Commands	List of the main commands the product supports	32	Supported	6000E07F 00000003 00000000 00000000 00000000 00000000 00000000 00000000
38	List of Supported Sub Commands	Not used with a standard I/O profile	32	Unsupported	–
40	List of Common Parameters	Not used with a standard I/O profile	32	Unsupported	–
80	Main Device Name	Main device name	32	Supported	4D50454A 544D2D43 31393250 00452D30 00000000 00000000 00000000 00000000
90	Sub Device 1 Name	Sub device 1 name	32	Unsupported	–
98	Sub Device 1 Version	Sub device 1 version	4	Unsupported	–
A0	Sub Device 2 Name	Sub device 2 name	32	Unsupported	–
A8	Sub Device 2 Version	Sub device 2 version	4	Unsupported	–
B0	Sub Device 3 Name	Sub device 3 name	32	Unsupported	–
B8	Sub Device 3 Version	Sub device 3 version	4	Unsupported	–

6.8.2 Virtual Memory

Data are stored in the virtual memory addresses as shown below.

(1) Device Information Area

Address	Contents
0000 0000 to 0000 0003	Not specified
0000 0004 to 0000 0007	Vendor ID code
0000 0008 to 0000 000B	Device code
0000 000C to 0000 000F	Device version
0000 0010 to 0000 0013	Device definition (MDI) file version
0000 0014 to 0000 0017	Extended address setting
0000 0018 to 0000 0037	Serial No.
0000 0038 to 0000 003F	Not specified
0000 0040 to 0000 0043	Profile type 1
0000 0044 to 0000 0047	Profile version 1
0000 0048 to 0000 004B	Profile type 2
0000 004C to 0000 004F	Profile version 2
0000 0050 to 0000 0053	Profile type 3
0000 0054 to 0000 0057	Profile version 3
0000 0058 to 0000 005B	Minimum value of transmission cycle
0000 005C to 0000 005F	Maximum value of transmission cycle
0000 0060 to 0000 0063	Granularity of transmission cycle
0000 0064 to 0000 0067	Minimum value of communication cycle
0000 0068 to 0000 006B	Maximum value of communication cycle
0000 006C to 0000 006F	Number of transmission bytes
0000 0070 to 0000 0073	Number of transmission bytes (current setting)
0000 0074 to 0000 0077	Profile type (current selection)
0000 0078 to 0000 007F	Not specified

Address	Contents
0000 0080 to 0000 0083	Supported communication mode
0000 0084 to 0000 008B	MAC address
0000 008C to 0000 00BF	Not specified
0000 00C0 to 0000 00DF	List of supported main commands
0000 00E0 to 0000 00FF	List of supported subcommands
0000 0100 to 0000 011F	List of supported common parameters
0000 0120 to 0000 01FF	Not specified
0000 0200 to 0000 021F	Main device name
0000 0220 to 0000 023F	Not specified
0000 0240 to 0000 025F	Sub device 1 name
0000 0260 to 0000 0263	Sub device 1 version
0000 0264 to 0000 027F	Not specified
0000 0280 to 0000 029F	Sub device 2 name
0000 02A0 to 0000 02A3	Sub device 2 version
0000 02A4 to 0000 02BF	Not specified
0000 02C0 to 0000 02DF	Sub device 3 name
0000 02E0 to 0000 02E3	Sub device 3 version
0000 02E4 to 0000 0FFF	Not specified
0000 1000 to 0000 FFFF	Not specified

(2) Vendor Parameter Area

Address	Param-eter No.	Contents
8000 0000 to 8000 0001	0100	Output mode setting (CH1)
8000 0002 to 8000 0003	–	Reserved (0)
8000 0004 to 8000 0005	0102	Offset (CH1)
8000 0006 to 8000 0007	0103	Gain (CH1)
8000 0008 to 8000 0009	0200	Output mode setting (CH2)
8000 000A to 8000 000B	–	Reserved (0)
8000 000C to 8000 000D	0202	Offset (CH2)
8000 000E to 8000 000F	0203	Gain (CH2)
8000 0010 to 8000 0011	0300	Output mode setting (CH3)
8000 0012 to 8000 0013	–	Reserved (0)
8000 0014 to 8000 0015	0302	Offset (CH3)
8000 0016 to 8000 0017	0303	Gain (CH3)
8000 0018 to 8000 0019	0400	Output mode setting (CH4)
8000 001A to 8000 001B	–	Reserved (0)
8000 001C to 8000 001D	0402	Offset (CH4)
8000 001E to 8000 001F	0403	Gain (CH4)

6.9 Alarm/Warning Code List

The list of alarms and warnings that are generated by the MECHATROLINK communication function is as follows.

6.9.1 Alarm List

Category	Alarm Code	COMM_ALM	Alarm Details	Countermeasures	Alarm Clearance
Communication Setting Error	A.E41 (Communication data size setting error)	0	Occurs when communication data was not received.	Review the controller's communication settings.	Not possible
Communication Establishment Error	A.E40 (Transmission cycle setting error)	B	Occurs when an unsupported transmission cycle is set on reception of a CONNECT command.	Review the controller's transmission cycle setting.	Not possible
	A.E60 (Reception error)	9	Result of noise or other causes after communications are established when two consecutive reception errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E62 (FCS error)	8	Result of noise or other causes after communications are established when two consecutive FCS errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E63 (Synchronous frame not received)	A	Result of noise or other causes after communications are established when two consecutive failures to receive a synchronous frame occur.	Replace the module.	Possible
System Error	A.B6A (Communication LSI initialization error)	0	Occurs when initialization of the communication LSI has failed.	Replace the module.	Not possible

6.9.2 Warning List

(1) Communication Error (COMM_ALM)

Category	Warning Code	COMM_ ALM	Warning Details	Countermeasures	Alarm Clearance
Communication Alarm	A.960 (Communication error alarm)	2	Result of noise or other causes after communications are established when a reception error occurs.	Review the communication wiring and take countermeasures against noise.	Possible
Communication Establishment Error	A.962 (FCS error alarm)	1	Result of noise or other causes after communications are established when an FCS error occurs.		
	A.963 (Synchronous frame not received alarm)	3	Result of noise or other causes after communications are established when a synchronous frame is not received.		

(2) Command Error (CMD_ALM)

Category	Warning Code	CMD_ ALM	Warning Details	Countermeasures	Alarm Clearance
Data Setting Warning	A.94A (ID number alarm)	9	Occurs when the ID number specified by ID_RD command is out of the valid ID number range.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	Automatically cleared
	A.94B (Invalid data)	9	Occurs when data of a command other than ID_RD is out of the valid data range.		
Command Warning	A.95B (Unsupported command)	8	Occurs when an unsupported command is received.	Review the content of the command data issued by the controller.	
	A.95F (Undefined command)	8	Occurs at reception of a command other than those supported by MECHATROLINK-III specifications.		
	A.97A (Phase error)	C	Occurs at reception of a command that cannot be processed in the current phase.	Review the controller's command issue sequence.	

7

Pulse Input Module (JEPMC-MTP2900-E)

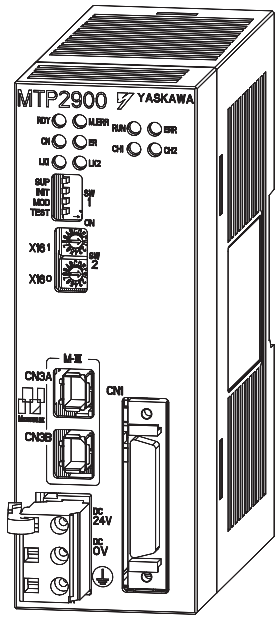
This chapter provides an overview, the specifications, the connections, and the settings of the Pulse Input Module model JEPMC-MTP2900-E.

7.1 Overview

The Pulse Input Module JEPMC-MTP2900-E (hereinafter referred to as the MTP2900 Module) is equipped with a 32-bit counter and two channels to count pulses output from a pulse generator such as rotary encoder.

7.2 External Appearance and Configuration

7.2.1 External Appearance



7.2.2 I/O and Status Indication

The LED lamp status or the combination of LED lamp status indicates the MTP2900 Module status.

(1) Status Indication 1

(a) LED Indicators

Indicator Name	Indicator Color	Status when ON
RDY	Green	The microprocessor for control is operating normally.
M_ERR	Red	Lights up or flashes at occurrence of failure.
CN	Green	MECHATROLINK-III connection is established.
ER	Red	Lights up or flashes at occurrence of MECHATROLINK-III communication error
LK1	Green	Linked to MECHATROLINK connector CN1
LK2	Green	Linked to MECHATROLINK connector CN2

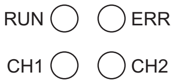
(b) Status Indication Details

Classification	LED Indicator Status						Indication	Meaning
	RDY	M_ERR	CN	ER	LK1	LK2		
Normal Status	○	●	–	–	–	–	Hardware reset status	If this state remains unchanged 10 seconds after power-on, there is a hardware failure.
	○	○	–	–	–	–	Initialization in progress	
	●	○	–	–	–	–	Normally executing	Normal
Error Status	○	●	–	–	–	–	Occurrence of serious failure	An error was detected the by watchdog timer.
	○	★	–	–	–	–	The number of flashes indicates the type of hardware error: 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error 6: Communication ASIC diagnostic error	An error was detected during self-diagnosis.
	●	★	–	–	–	–	The number of flashes indicates the type of software error. 2: Transmission cycle setting error 3: Station address setting error 4: Watchdog timeout	An error was detected in the software.
Alarm	●	★	–	–	–	–	I/O error	An I/O error was detected.
MECHA-TROLINK-III Communications	●	○	–	–	●	–	LINK1 busy	Communication with LINK1 enabled
	●	○	–	–	–	●	LINK 2 busy	Communication with LINK 2 enabled
	●	○	○	–	–	–	Connection not established	Connection to the master device is not established.
	●	○	★	–	–	–	Both CH1 and CH2 are set to be used, but the connection is established only for CH1.	The connection to the master device is established.
			☆				Both CH1 and CH2 are set to be used, but the connection is established only for CH2.	
			●				Only CH1 is set to be used, and the connection is established for CH1.	
							Only CH2 is set to be used, and the connection is established for CH2.	
							Both CH1 and CH2 are set to be used, and the connection is established for CH1 and CH2.	
	●	○	–	●			Occurrence of communication error	A communication error occurred at CH1 or CH2.

Note: ○: Unlit, ●: Lit, ★: Flashes, ☆: Series of two flashes, –: Not specified

(2) Status Indication 2

(a) LED Indicators



Indicator Name	Indicator Color	Status when ON	Status when OFF
RUN	Green	Normally operating	Being stopped
ERR	Red	Malfunction occurs	Normally operating
CH1	Green	CH1 counter count value increments or decrements	No pulse input
CH2	Green	CH2 counter count value increments or decrements	No pulse input

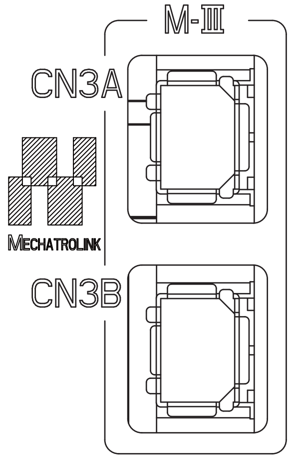
(b) Status Indication Details

Classification	LED Indicator Status				Indication	Meaning
	RUN	ERR	CH1	CH2		
Initial Status	○	●	○	○	At power-on	The power to the MTP2900 Module has just been turned on. If the ERR lamp goes out when the initialization process starts. If the ERR lamp does not go out, the MTP2900 Module is faulty. Replace the module.
Normal Status	○	○	○	○	No definition	The MTP2900 Module has not yet been registered in the module definition. Always register the module in the Module Definition window before using it.
	★	○	–	–	CPU stopped state	The CPU in the Machine Controller is being stopped. Execute CPU RUN. The LED indicators will indicate the normally operating status.
	●	○	–	–	Normally operating	The MTP2900 Module is counting pulses normally.
Error Status	★	★	–	–	The number of flashes indicates the type of hardware error: 1: - 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU diagnostic error 6: Shared memory diagnostic error 7: Counter ASIC diagnostic error	MTP2900 Module hardware failure. Replace the module.
	○	★	–	–	The number of flashes indicates the type of software error. 1: - 2: Watchdog timeout 3: Address error (read-out) exception 4: Address error (write-in) exception 6: General illegal instruction exception 7: Slot illegal instruction exception	MTP2900 Module software failure. Replace the module.

Note: ○: Unlit, ●: Lit, ★: Flashes, ☆: Series of two flashes, -: Not specified

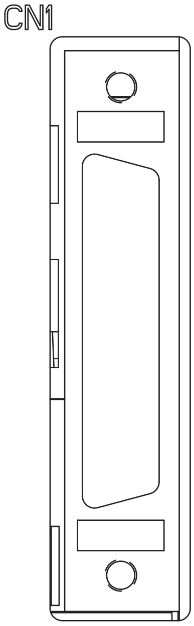
7.2.3 MECHATROLINK-III Connectors

Connect the MECHATROLINK-III cable.



7.2.4 I/O Connectors

Connect an MTP2900 module and external I/O signals with I/O cables.

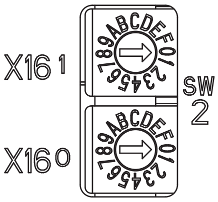


7.2.5 Station Number Selection Switch

Set the MECHATROLINK-III station number.

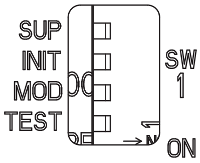
The setting range is 3 to EF (hexadecimal).

When multiple modules are connected, make sure there is no duplication of station numbers.

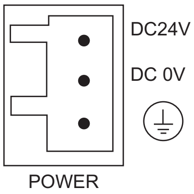


7.2.6 Operation Switch

Select the CPU operating condition when the power is turned on.



7.2.7 External Wiring Terminals



Terminal Name	Function
DC 24 V	+24 VDC
DC 0 V	0 VDC
FG	Protective grounding terminal

7.3 Mounting an MTP2900 Module

7.3.1 Method

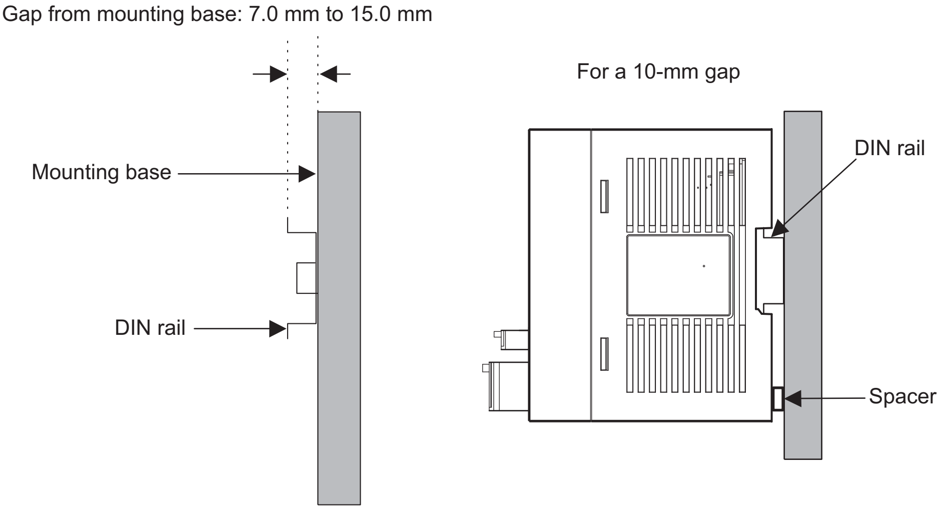
There are two methods for mounting an MTP2900 Module.

- Using DIN rail (standard)
- Using screws

(1) DIN Rail Mounting

(a) DIN Rails and Spacer

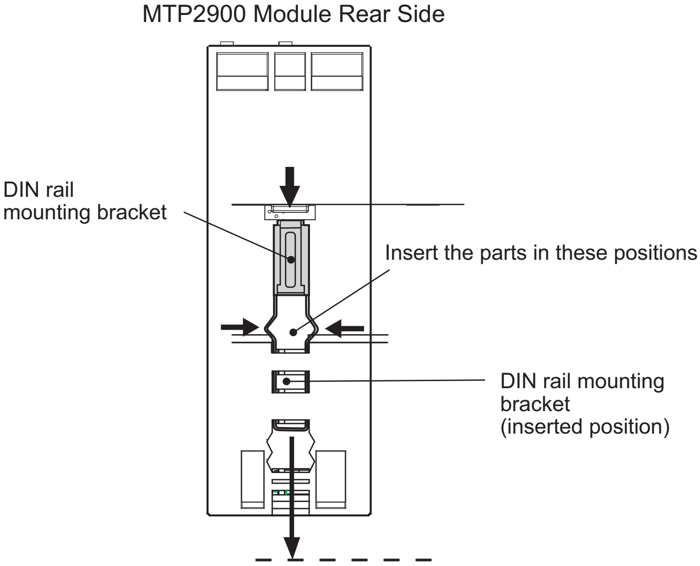
Several types of DIN rails are available: with 7-mm to 15-mm gap from the mounting base as shown in the following diagram. If mounting an MTP2900 Module using DIN rail with 10 mm gap, install a spacer on the rear of the MTP2900 Module near the bottom to protect the MTP2900 Module from vibration and shock.



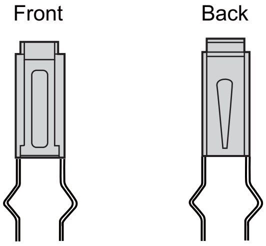
(b) Procedure for Mounting to DIN Rail

Use the following procedure to attach the DIN rail mounting parts to the MTP2900 Module and then mount the MTP2900 Module to the DIN rail.

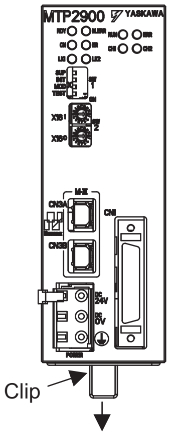
1. Insert the DIN rails to the dotted line in the two slots on the rear of the MTP2900 Module as shown in the following figure.



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

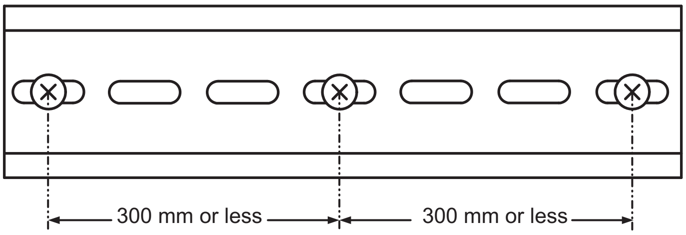


2. Pull the DIN rail mounting clips down to release them.



■ Fixing a DIN Rail

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



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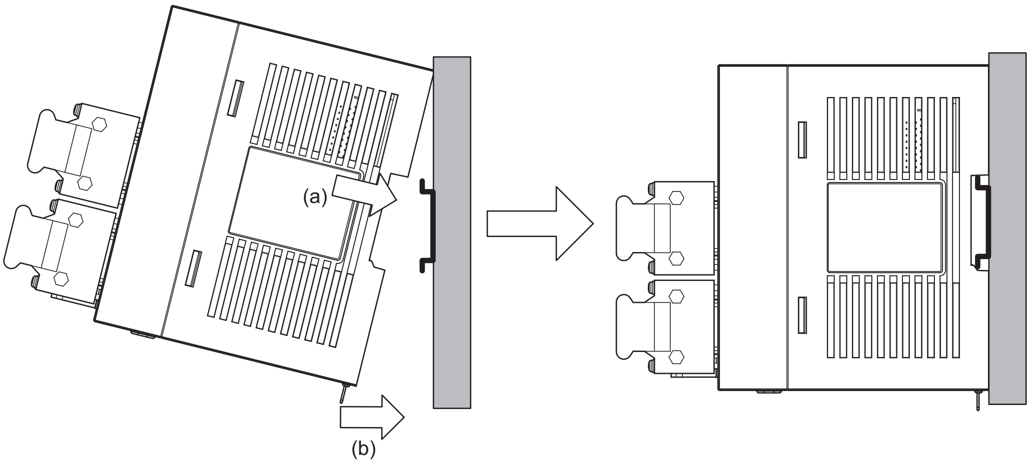
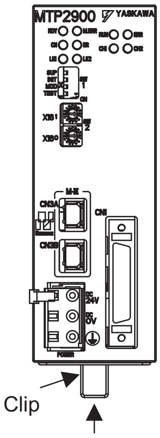
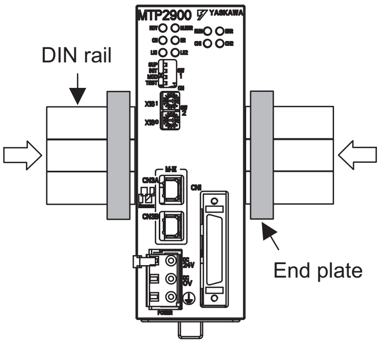
3. Hook the MTP2900 Module to the top of the DIN rail (a), and then push the MTP2900 Module towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MTP2900 Module to secure it to the DIN rail.

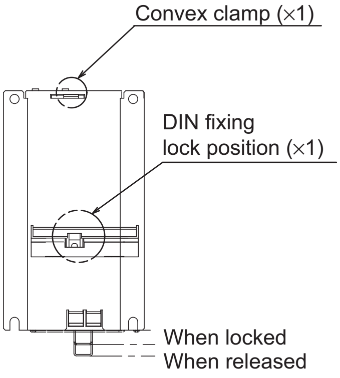


This completes the installation procedure.

(2) Screwed Method

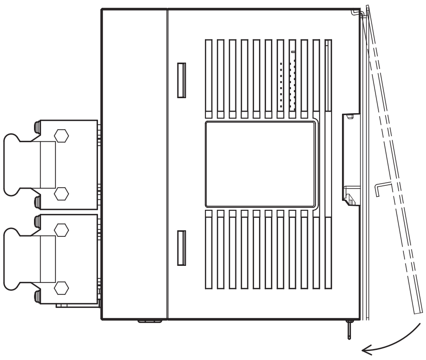
Use a panel mounting clamp model JEPMC-OP2400-E (optional) by the following procedure to mount an MTP2900 Module on the panel.

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

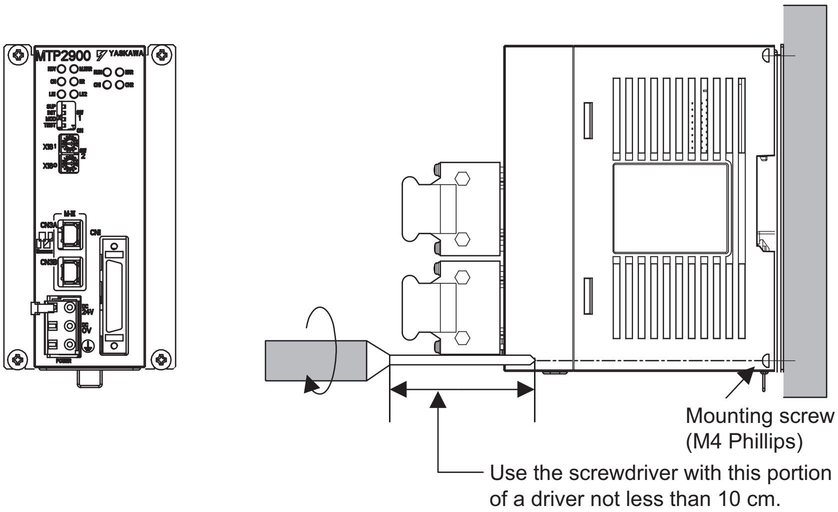


Panel mounting clamp

2. Insert one convex portion at the top of the panel mounting clamp into the hole of the MTP2900 Module case.



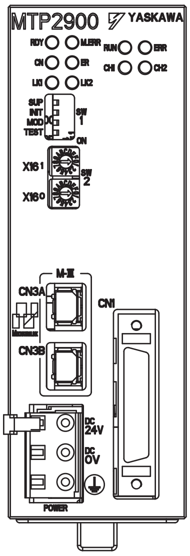
3. Push the clamp as indicated by an arrow above onto the MTP2900 Module case and use the DIN fixing lock to fix MTP2900 Module.
4. Push the MTP2900 Module mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.



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

7.3.2 Mount Direction

Be sure to mount the MTP2900 Module from the front using a DIN rail or panel mounting clamp.

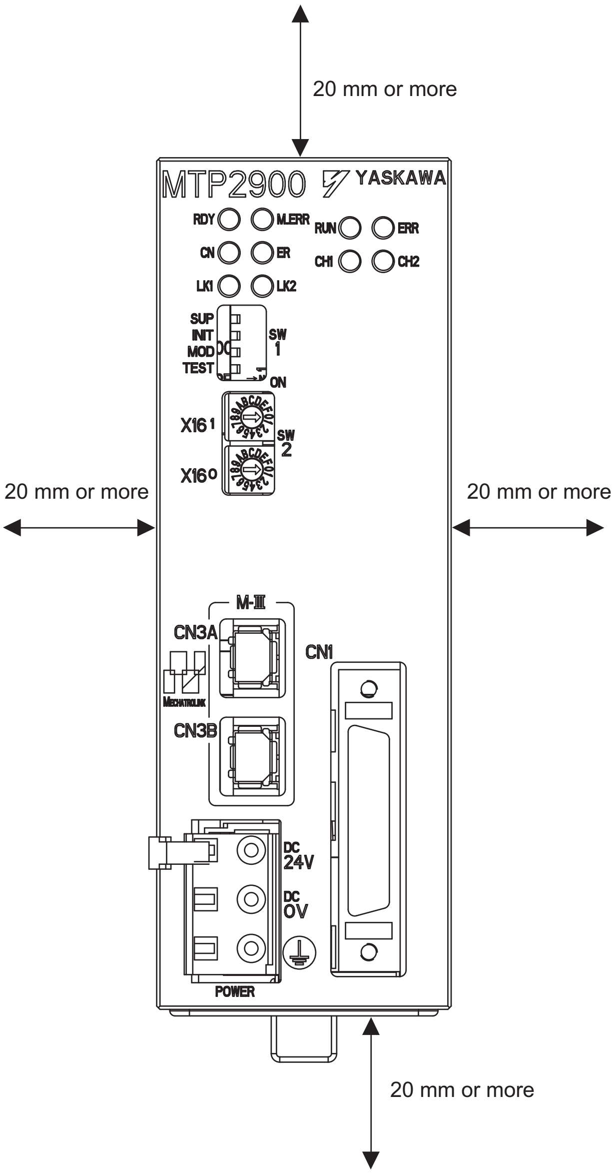


View from front, when attached

7.3.3 Space Required for Mounting an MTP2900 Module

Install MTP2900 Module so that enough space is left around it as shown in the following figure:

- Mount condition
    - Vertical and horizontal directions: 20 mm or more



7.4 Specifications

7.4.1 General Specifications

The general specifications for MTP2900 Module are shown below.

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% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B3501)
	Corrosive Gas	There must be no flammable or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 • 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 B3502 Peak acceleration of 147 m/s^2 (15 G) twice for 11 ms each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group1, ClassA)
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling
	Mounting Direction	Refer to *7.3 Mounting an MTP2900 Module*.
Compliant Standards (Certification process is under way to obtain the certificate.)		UL, CSA, CE

7.4.2 Performance Specifications

(1) Hardware Specifications

The hardware specifications of the MTP2900 Module are shown below.

Item		Specifications
Name		Pulse input module
Abbreviated Name		MTP2900
Model		JEPMC-MTP2900-E
Power Supply Section (POWER-CN)	Input Voltage	24 VDC (±20%)
	Current Consumption	0.5 A max.
Communication Interface (CN3A/CN3B)	Communication Specifications	MECHATROLINK-III
I/O Section (CN1)	Input Circuits (Can be selected by setting the parameters.)	5-V differential: Max. frequency 4 MHz (RS422, non-isolated) 12 V: Max. frequency 120 kHz (Current source input, photocoupler I/F)
	Pulse Counting Methods (Can be selected by setting the parameters.)	Sign (×1 and ×2) Up/Down (×1 and ×2) A/B (×1, ×2, and ×4)
	Counter Mode (Can be selected by setting the parameters.)	Reversible counter mode Interval counter mode Frequency measurement mode
	Coincidence Output	2-point 24-VDC ±20%, 50 mA current sink output, photocoupler I/F Response time: 1 ms max. when OFF → ON, 1ms max. when ON → OFF
	DC Output * (Can be selected by setting the parameters.)	2-point 24-VDC ±20%, 50 mA current sink output, photocoupler I/F Response time: 1 ms max. when OFF → ON, 1ms max when ON → OFF • Zone output • Speed coincidence • Frequency coincidence
	PI Latch Input	DI: 2-point 24-VDC ±20%, source output, photocoupler interface Response time: 30 µs max. when OFF → ON, 600 µs max.when ON → OFF Phase-C: In 5-V differential input mode, the minimum ON pulse width is 125 ns. In 12/24 V input mode, the minimum ON pulse width is 4.2 µs. Latch input response time: 95 to 125 ns (response delay for pulse-A or B input)

* Note that the DO output may turn ON for 3 to 4 ms at the moment the power supply turns OFF.

Note: Use a 24-VDC power supply and external input power supply with double or reinforced insulation.

(2) Switch Specifications

The specifications of the switches provided on the MTA2900 Module are as follows.

(a) SW1

The SW1 switch sets the CPU operation mode at power-on.

Note: The SW1 setting is read at power-on. If the setting is changed after power-on, the descriptions in the table below will not be applicable.

Device Code	Name	Setting	Operation	Initial Setting	Remarks
S1-4	SUP	ON	SYSTEM load	OFF	ON: The MTP2900 Module will start running in a mode where the firmware version can be upgraded.
		OFF	Normal run		
S1-3	INIT	ON	Parameter initialization	OFF	• S1-2 set to OFF and S1-3 set to ON: The parameters will be initialized to the factory defaults at startup. However, the settings written in the nonvolatile memory will be kept unchanged. • Both S1-2 and S1-3 set to ON: Both the parameters and nonvolatile memory will be initialized to the factory defaults.
		OFF	Normal run		
S1-2	MODE	ON	Function selection	OFF	Used in combination with S1-3 setting to initialize the nonvolatile memory.
		OFF			
S1-1	TEST	ON	Reserved by system	OFF	Used for final adjustment before shipment
		OFF			

(b) SW2

The SW2 switch sets the station address of MTP2900 Module as a slave device of the MECHATROLINK-III network.

Name	Setting Range	Operation	Initial Setting	Remarks
$\times 16^1$	0 to F	Station address (Upper digit)	0	F cannot be used.
$\times 16^0$	0 to F	Station address (Lower digit)	3	–

Note: To use both CH1 and CH2, set the sub-addresses “00h” and “01h” in addition to the station address. Example: If the station address is set to 03h (S2 = 0h, S3 = 3h), the station address designation from the master device should be 0003h for CH1, and 0103h for CH2.

(3) Pulse Counting Methods

The MTP2900 Module supports three pulse counting methods:

- Sign
- UP/DOWN
- A/B

This section describes the details on each pulse counting method.

(a) Sign Method

The count is incremented and decremented based on the polarity:

Polarity: Positive logic

When the pulse B input is at Low, the count is incremented by the pulse A input. (Positive in the frequency measurement*)

When the pulse B input is at High, the count is decremented by the pulse A input. (Negative in the frequency measurement)

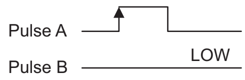
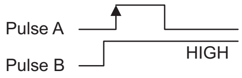
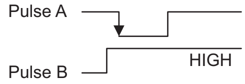
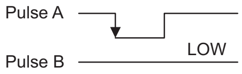
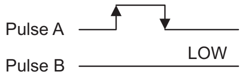
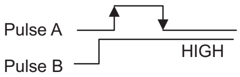
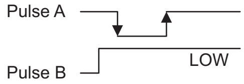
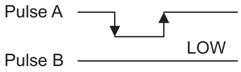
Polarity: Negative logic

When the pulse B input is at High, the count is incremented by the pulse A input. (Positive in the frequency measurement).

When the pulse B input is at Low, the count is decremented by the pulse A input. (Negative in the frequency measurement)

* For information on the frequency measurement, refer to *7.4.2 (4) (c) Frequency Measurement Counter*.

The following table shows the pulse counting operations with different multiplications and polarities.

Pulse Counting Method	Polarity	UP Count (Forward)	DOWN Count (Reverse)
Sign (×1)	Positive logic		
	Negative logic		
Sign (×2)	Positive logic		
	Negative logic		

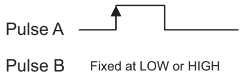
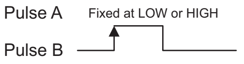
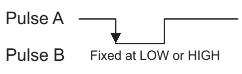
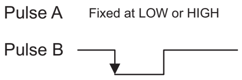
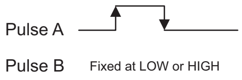
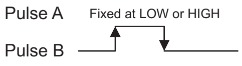
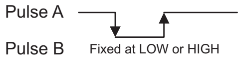
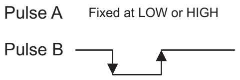
(b) UP/DOWN Method

The count is incremented are decremented in the following way regardless of the polarity.

The count is incremented by the pulse A input. (Positive in the frequency measurement)

The count is decremented by the pulse B input. (Negative in the frequency measurement)

The following table shows the pulse counting operations with different multiplications and polarities.

Pulse Counting Mode	Polarity	UP Count (Forward)	DOWN Count (Reverse)
UP/DOWN (×1)	Positive logic		
	Negative logic		
UP/DOWN (×2)	Positive logic		
UP/DOWN (×2)	Negative logic		

Note: ±0 when the pulses A and B are input at a time.

(c) Pulse A/B Method

The count is incremented and decremented based on the polarity as explained below.

Polarity: Positive logic

The count is incremented when the phase of the pulse A input is advanced from the pulse B. (Positive in the frequency measurement)

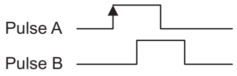
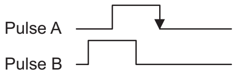
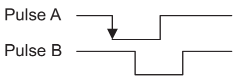
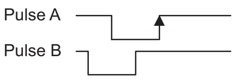
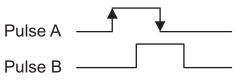
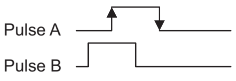
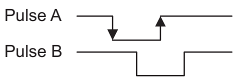
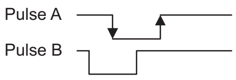
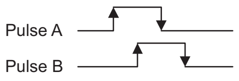
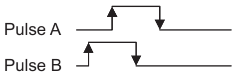
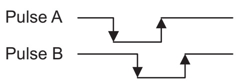
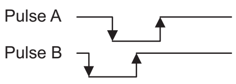
The count is decremented when the phase of the pulse A input is lagged behind the pulse B. (Negative in the frequency measurement)

Polarity: Negative logic

The count is incremented when the phase of the pulse A input is advanced from the pulse B 0. (Positive in the frequency measurement)

The count is decremented when the phase of the pulse A input is lagged behind the pulse B 0. (Negative in the frequency measurement)

The following table shows the pulse counting operations with difference multiplications and polarities.

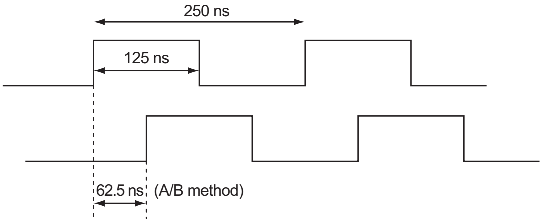
Pulse Counting Mode	Polarity	UP Count (Forward)	DOWN Count (Reverse)
A/B (×1)	Positive logic		
	Negative logic		
A/B (×2)	Positive logic		
	Negative logic		
A/B (×4)	Positive logic		
	Negative logic		

IMPORTANT

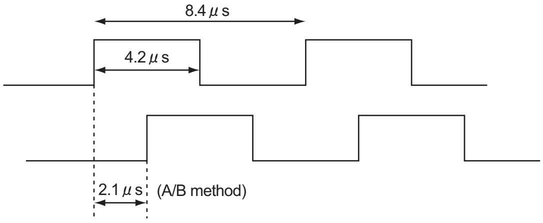
■ Minimum Width of Pulse Counting

Fill the following pulse width with the loose wire side of the standard cable (JEPMC-W2063-☐☐-E).

- Input 5-V Differential Input



- Input 12 V



(4) Counter Modes

The MTP2900 Module has three counter modes. The counter mode can be selected by setting the parameter (refer to *7.6 Parameter Settings*.).

- Reversible counter
- Interval counter
- Frequency measurement

This section outlines each counter mode.

Note: Type of command data and response data are shown in bold uppercase. Parameter names are shown in italics.

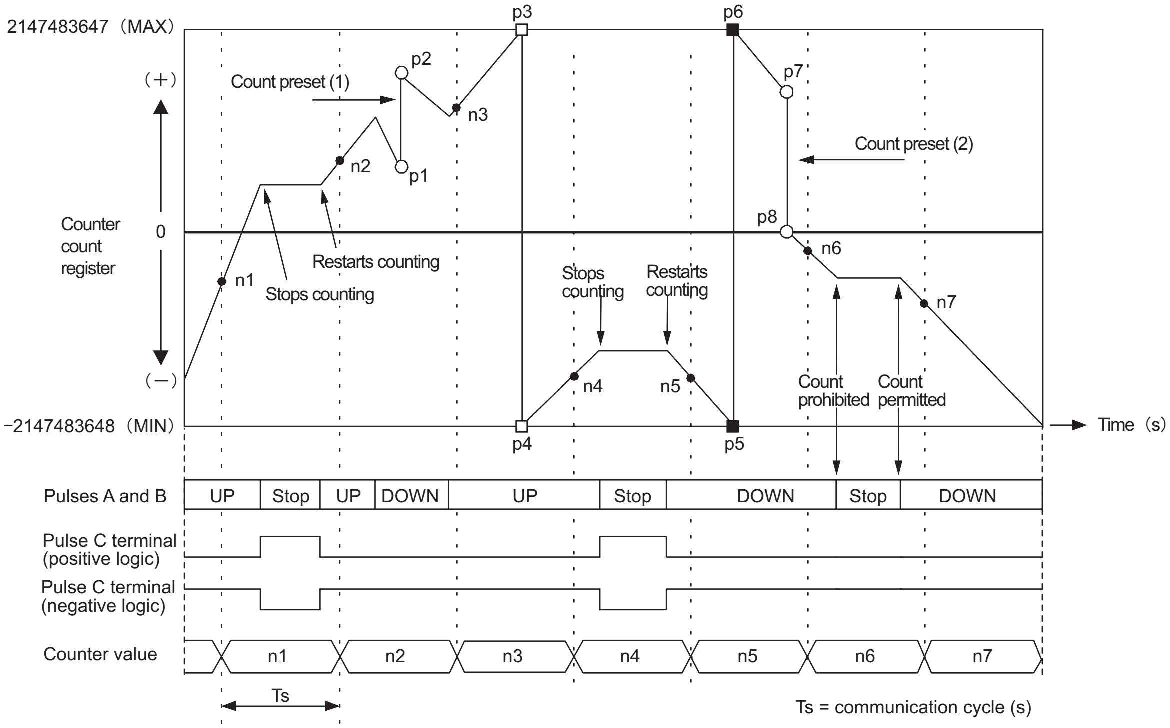
(a) Reversible Counter

The count is incremented and decremented based on the pulse A and pulse B inputs.

The Count Disable and Count Preset functions are enabled by setting the parameters *. Also the counting can be prohibited while pulse C is being input by setting the ***Mask of Calculation by C-pulse*** (Parameter No.0n0C).

* Refer to *7.7.1 (1) Command Data List*.

The diagram below illustrates an example of the reversible counter operation when the ***Mask of Calculation by C-pluse*** is enabled by setting parameter No.0n0C to 0.



<Explanation>

Counter value

Stores sequentially the **Count Value** every communication cycle (n1 to n7 in the above diagram).

Count preset (1) and (2)

When the Calculating preset bit (bit 1: **Command Setting**) is set to 1 at the positions p1 and p7 as shown in the above diagram, the count values are forcibly reset to the preset values p2 and p8.

Overflow and Underflow

When the count value increments to the value MAX (p3), it is automatically reset to the value MIN (p4)
When the count value decrements to the value MIN (p5), it is automatically reset to the value MAX (p6).

Count disable/Count permit

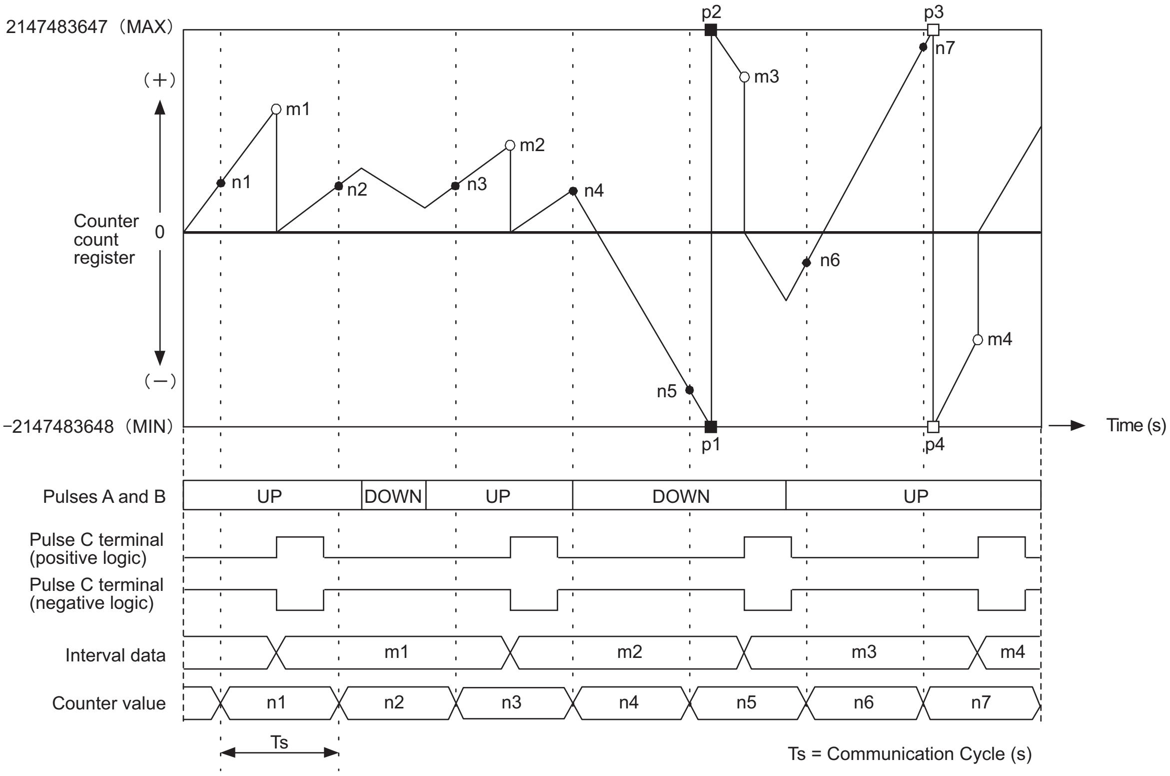
When the ***Mask of Calculation by C-pulse*** is enabled by setting parameter No.0n0C to 0, counting will stop while pulse C is being input. Also, setting the Count disable bit (bit 0: **Command Setting**) to 1 will cause counting to stop until the command is cancelled regardless of whether or not pulse C is input.

(b) Interval Counter

The count is incremented and decremented based on the pulse A and B inputs, and the count value is stored in the **Counter Value** every communication cycle.

The count value is latched and the counter is reset when pulse C is input (Interval Latch). The latched data is stored in **Interval Value** every communication cycle.

The diagram below illustrates an example of the interval counter operation.



<Explanation>

Counter value

Stores sequentially the **Count Value** (n1 to n7 in the above diagram) every communication cycle.

Interval data

The count value (m1 to m4 in the above diagram) is latched and reset at the rising edge of pulse C.

The latched data is stored in the **Interval Value**.

Overflow and Underflow

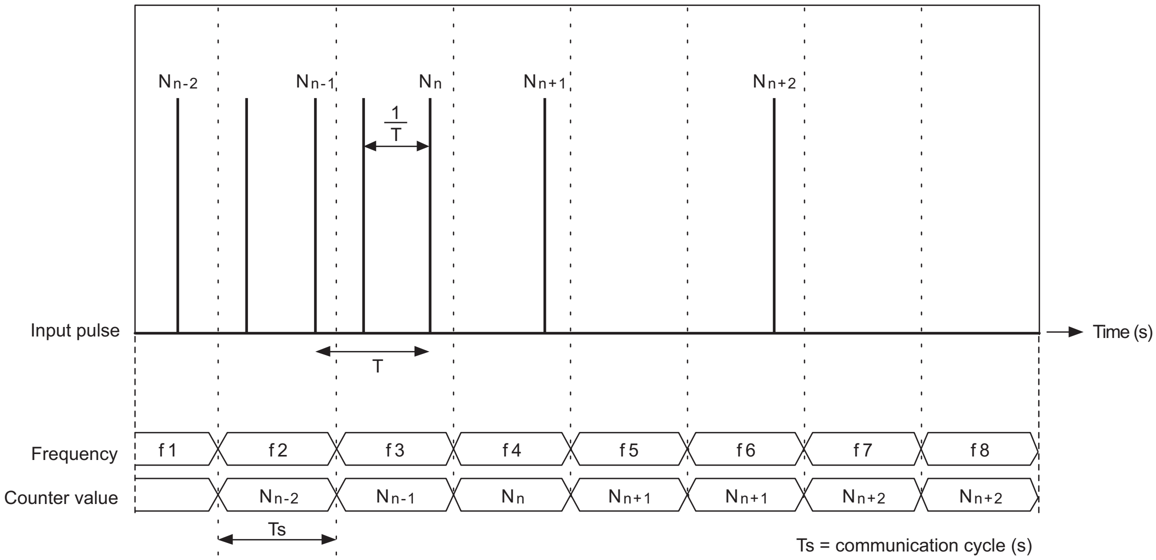
When the count value decrements to the value MIN (p1), it is automatically reset to the value MAX (p2).

When the count value increments to the value MAX (p3), it is automatically reset to the value MIN (p4).

(c) Frequency Measurement Counter

The frequency is calculated from the input pulse A and B trains and stored in the **Counter Value**.

The diagram below illustrates an example of the frequency measurement counter operation.



<Principle of Frequency Measurement>

The frequency is calculated using the following equation.

$$f = \frac{N_n - N_{n-1}}{T} \times \text{MULT}$$

f : Frequency

N_n, N_{n-1} : Current counter count value of input pulse of every control cycle

T : Time between input pulses (The measurement time minimum unit: 4 MHz = 0.25 µs)

MULT : Parameter No. 0n0B (***Frequency Calculation Selection***)

The above equation is applicable when more than one pulse is input within a measurement cycle. If no pulse is input within a measurement cycle, the frequency estimated from the previously calculated value is set as the result (f5 in the above diagram), and the true value (f6 in the above diagram) is calculated in the following measurement cycle when pulses are input.

(5) Counter Functions

(a) Outline of Counter Function

The counter functions are used to write the status and the count value in the response data according to the counter operation method specified by the parameter settings and the command data.

The following table outlines the MTP2900 Module counter functions. The counter functions that can be used differ depending on the counter mode.

Function Name		Details	Counter Mode*		
			Reversible	Interval	Frequency Measurement
A/B pulse counting mode		Sets the pulses A and B counting method.	✓	✓	✓
PI latch		Latches the count value at the phase-C signal of DI signal input.	✓		
Coincidence output		Outputs a DO signal when the count value agrees with the preset value, and writes the status in the **Status**.	✓	✓	✓
Mask of calculation by C-pulse		Stops counting while the phase-C pulse is being input.	✓		
Count disable		Stops counting during the time specified in the output data.	✓	✓	
Count preset		Resets the count value to the preset value.	✓		
Electronic gear		Converts the count value into reference units.	✓	✓	
Ring counter		Controls cyclicly the count value in the range between 0 to the set value.	✓		
Multi-purpose outputs	Zone output	Outputs a DO signal when the count value is in the zone specified by the upper limit and lower limit, and writes the status in the **Status**.	✓		
	Speed coincidence	Outputs a DO signal when the feedback speed is in the range specified by the detection value and width, and writes the status in the **Status**.	✓		
	Frequency coincidence	Outputs a DO signal when the detected frequency is in the range specified by the detection value and width, and writes the status in the **Status**.		✓	

* In the counter mode marked with ✓, the counter function can be used.

For more information on the above counter functions, refer to *7.6 Parameter Settings* and *7.7.1 Command Data*.

(b) Counter Function Details

This section describes the details on the parameter and command/response data setting items.

Note: The counter function is valid in the counter mode indicated with ○○ while it is not valid in the counter mode indicated with ○○ .

- A/B Pulses Counting Mode **Reversible** **Interval** **Frequency Measurement**

The pulses A and B counting method can be selected by setting the following parameters.

Parameter No.	Name	Details	Default Value
0n04	A/B pulse signal polarity	Set the polarity of phase-A and -B pulse signals: 0: Positive logic, 1: Negative logic	0: Positive logic
0n06	Pulse counting mode selection*	Select the pulse counting method: 0: Sign (× 1) 1: Sign (× 2) 2: Up/Down (× 1) 3: Up/Down (× 2) 4: Pulses A/B (× 1) 5: Pulses A/B (× 2) 6: Pulses A/B (× 4)	6: A/B (× 4)

* For details on the pulse counting methods, refer to *7.4.2 (3) Pulse Counting Methods*.

- Mask of Calculation by C-Pulse **Reversible** Interval Frequency Measurement

Used to stop counting while pulse C is being input. This ***Mask of Calculation by C-pulse*** is enabled by setting parameter No.0n0C to 0. However, this function is invalid while the **PI Latch Detect Demand** using pulse C is ON.

While the pulse counting is being stopped, counting the following values is stopped: Number of Incremental Pulses (PDV), Counter Value (PFB), After Convert Increment Pulse (PDVG), and Current Count Value After Conversion (PFBG)

Note: An operation example of the Mask of Calculation by C-Pulse is given in *7.4.2 (4) (a) Reversible Counter*.

- Count Disable **Reversible** **Interval** Frequency Measurement

Used to stop counting while the count disable bit (bit 0: **Command Setting**) is 1.

This function can be used independently from the Mask of calculation by C-Pulse.

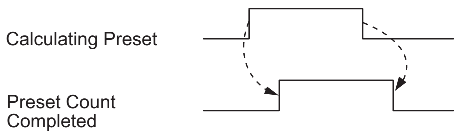
While the pulse counting is being stopped, counting the following values is stopped: Number of Incremental Pulses (PDV), Counter Value (PFB), After Convert Increment Pulse (PDVG), and Current Count Value After Conversion (PFBG)

Note: An operation example of the Count Disable function is given in *7.4.2 (4) (a) Reversible Counter*.

- Calculating Preset **Reversible** Interval Frequency Measurement

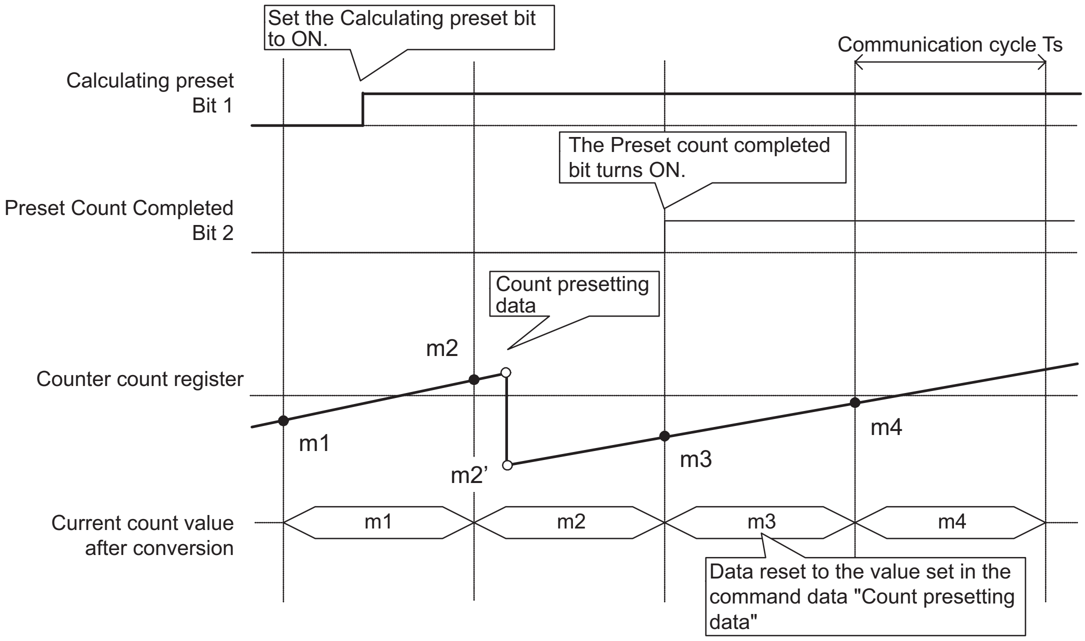
Used to reset the counter forcibly to the value specified in the **Count Presetting Data**.

The value of the counter is reset to the preset value when the signal of the Calculating preset bit (bit 1: **Command Setting**) is input (detection at the signal rising edge). When the value is reset to the preset value, the Preset count completed bit (bit 2: **Status**) turns ON.



Note: 1. An operation example of the Calculating Preset function is given in *7.4.2 (4) (a) Reversible Counter*.
2. When using the ring counter function, set the command data “Count presetting data” to a value between 0 and the value “POSMAX-1”.

The timing of the Preset Count Completed bit of MTP2900 Module is shown below.



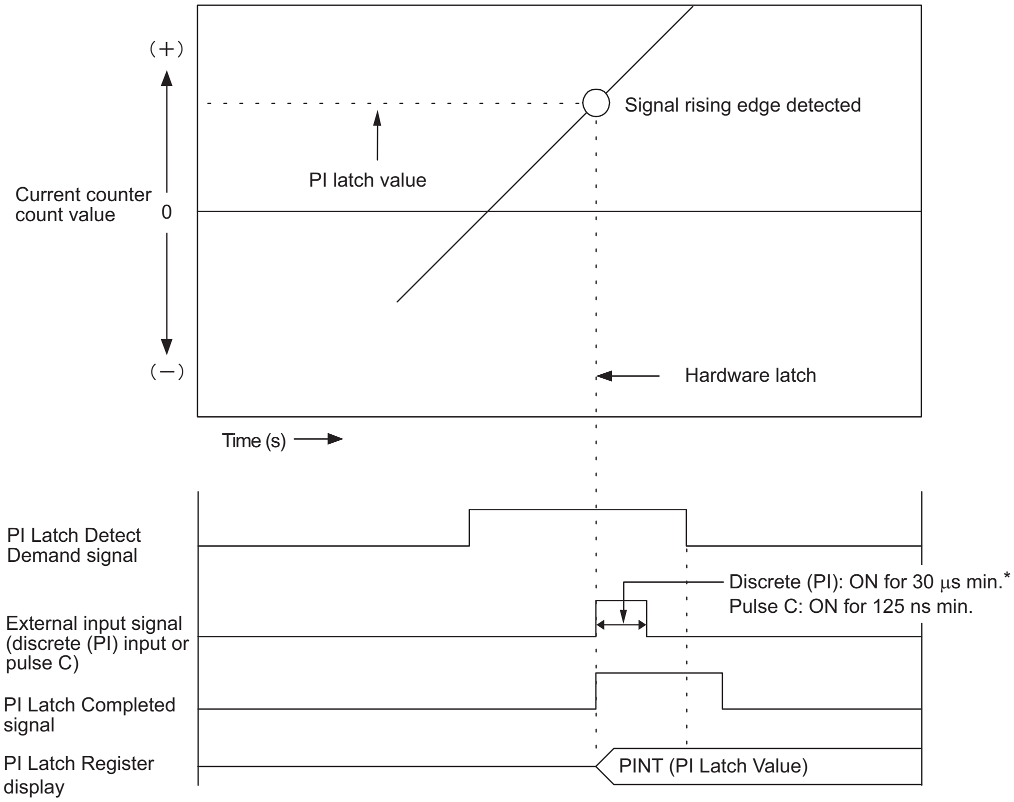
- PI Latch **Reversible** **Interval** **Frequency Measurement**

Used to store (latch) the counter count value at the moment an external signal is input (at the rising edge detecting point) in the **PI Latch Value**.

Either a discrete input (PI input) or pulse C can be selected for the external signal to be used.

The following graph shows the PI latch process: Execution of the **PI Latch Detect Demand**, detection of the external input signal rising edge, storage of PI latch data in the **PI Latch Value**.

When the electronic gear function is enabled (when the parameter No. 0n0F (***Reference Unit Selection***) is set to a unit other than 0 (pulse)), the latch data converted into the set reference unit is written in the **PI Latch Value after Conversion/Interval Data after Conversion**.



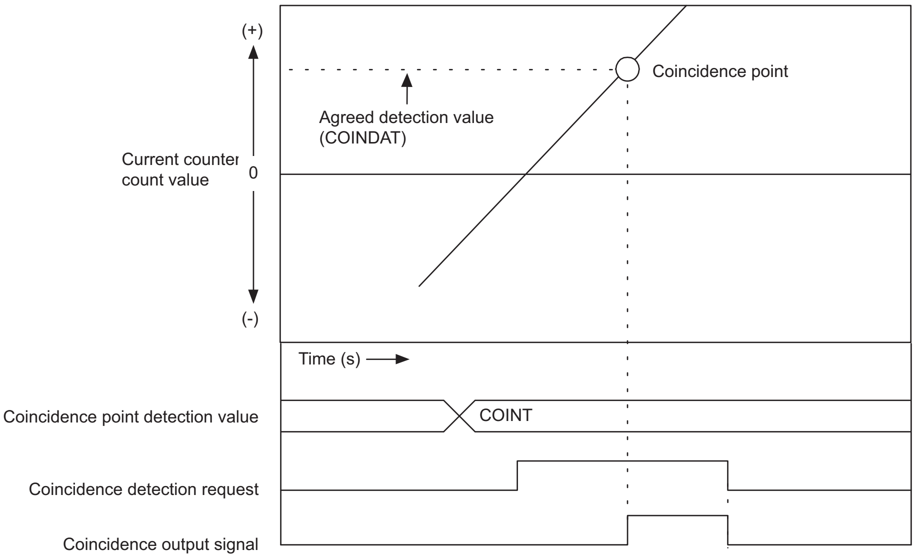
* At least 600 µs must elapse before accepting the ON signal after the signal turns OFF from ON.

• Coincidence Output **Reversible** **Interval** **Frequency Measurement**

Used to output the coincidence output signal when the counter count value becomes the value predefined in the **Agreed Detection Value**.

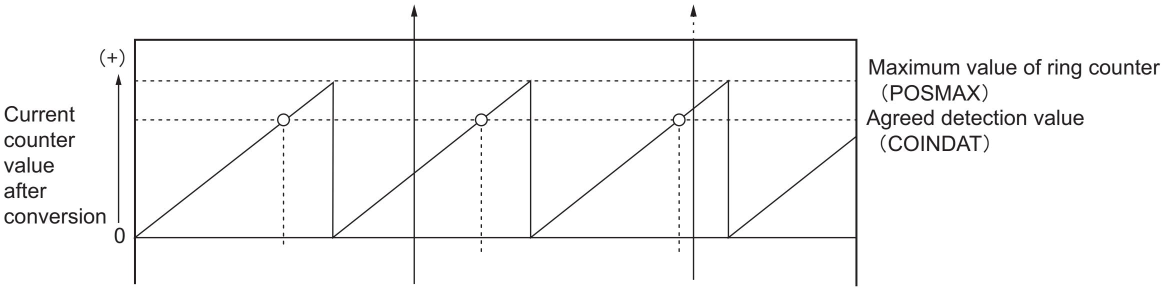
The coincidence detection (bit 3: **Command Setting**) is enabled when the ***Coincidence Detection Function Use Selection***) is used by setting the parameter No.0n09 to 1.

The following diagram illustrates the process from the reception of the coincidence detection request signal until the detection of coincidence point.



Note: Use the Coincidence detection bit (bit 5: **Status**) to monitor the coincidence detection signal output.

■ Precautions When Using the Ring Counter



When the ***Ring-counter Function Selection*** is used by setting the parameter No.0n0E to 1, the coincidence detection value exists every communication cycle as shown in the diagram above. For the coincidence detection processing when the ring counter function is enabled, the coincidence detection set value closest to the current counter count value after conversion is obtained and set every communication cycle. Therefore, if a pulse that exceeds one cycle is input within 1 communication cycle, the coincidence detection may not be executed.

Note: For details on the ring counter function, refer to *7.4.2 (5) • Ring Counter Function*.

■ Precautions When Using the Electronic Gear Function

Errors in the result of unit conversion from/to reference unit from/to pulse may cause the following differences in the coincidence detection operation.

Note: For details on the electronic gear function, refer to *7.4.2 (5) (b) • Electronic Gear Function*.

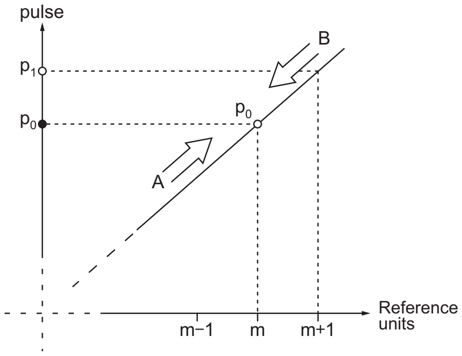
- When 1 reference unit = n pulses ($n > 1$)

  The value p_0 converted from the coincidence detection set value m (reference unit) into pulses is the coincidence detected value.

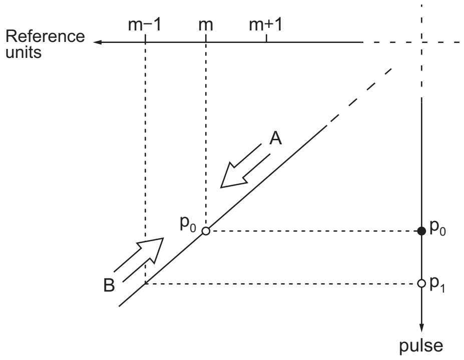
  The counter value whose value after conversion is equal to m is p_0 or more but less than p_1. When the pulse to increment the count (in the direction indicated with the arrow A) is input, the MTP2900 Module executes coincidence detection at the timing the counter value = m.

  When the pulse to decrement the count (in the direction indicated with the arrow B) is input, the current counter value after conversion is equal to m when the counter value = $p_1 - 1$ ($p_1 + 1$ if $p_0 < 0$). However, the MTP2900 Module does not execute the coincidence detection at this timing, but executes at the timing the counter value = p_0.

<When p_0 is a positive value>



<When p_0 is a negative value>



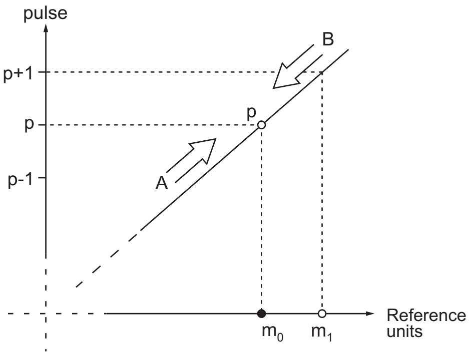
- When 1 pulse = n reference units ($n > 1$)

  The value p converted from the agreed detection value m_0 (reference units) into pulses is the coincidence detected value.

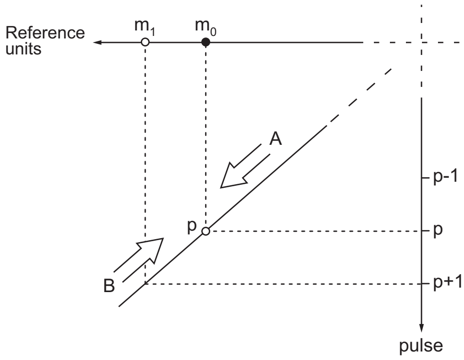
  The current counter value after conversion converted from the counter value p is m_0 or more but less than m_1. When the pulse to increment the count (in the direction indicated with the arrow A) is input, the MTP2900 Module executes coincidence detection at the timing the current count value = m_0.

  When the pulse to decrement the count (in the direction indicated with the arrow B) is input, the MTP2900 Module executes coincidence detection at the timing the current counter value after conversion = $m_1 - 1$ ($m_1 + 1$ if $m_0 < 0$) before the current counter value after conversion becomes m_0.

<When m_0 is a positive value>



<When m_0 is a negative value>

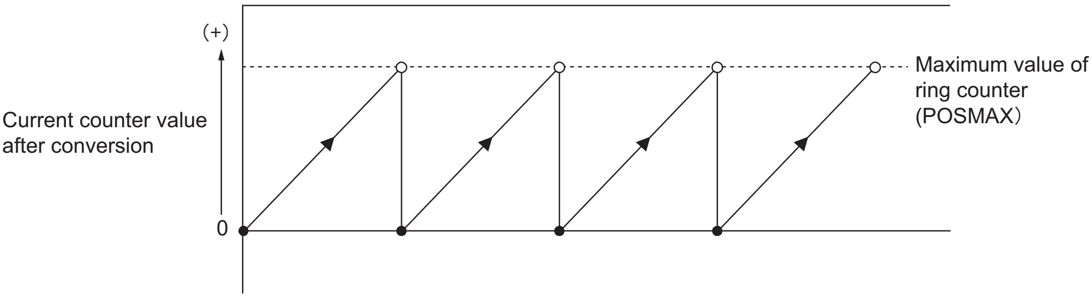


• Ring Counter Function **Reversible** Interval Frequency Measurement

Used to cyclicly control the counter count value to be written in the **Counter Value** within the range between 0 and the maximum ring counter value (POSMAX). Set the maximum ring counter value in the ***Maximum Value of Ring Counter*** (parameter No.0n16).

When ***Ring-counter Function Selection*** is used by setting parameter No. 0n0E to 1, the value of the **Number of POSMAX Turns** increments by 1 (for forward rotation) or decrements by 1 (for reverse rotation) every time the count value exceeds the ring counter reset position.

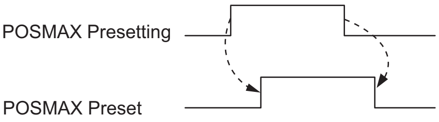
This function can be used for the machine configuration to be reset cyclicly without using a special application program.



• Number of POSMAX Turns Preset **Reversible** Interval Frequency Measurement

Used to forcibly reset the value of the **Number of POSMAX Turns** to the value specified in the **Preset Data of POSMAX Turns**.

The Number of POSMAX Turns is reset when the signal of the POSMAX presetting bit (bit 4: **Command Setting**) is input (the rising edge detection). When the value is reset, the POSMAX preset bit (bit C: **Status**) turns ON.



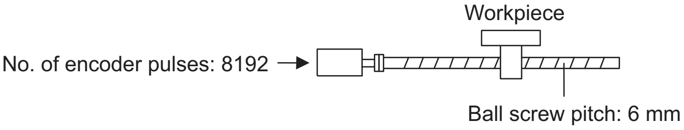
• Electronic Gear Function **Reversible** **Interval** Frequency Measurement

Used when a unit (mm, deg, or inch) other than pulse is set to the ***Reference Unit Selection*** (parameter No.0n0F).

- Outline

  The Electronic Gear function is used to set per pulse input to the MTP2900 Module to any reference unit value.

  To calculate the number of required pulses for the system shown below, the operations when using the electronic gear and when not using the electronic gear differ as explained below.



<When the Electronic Gear is Not Used>

If 13653 pulses are input, the number of revolutions is

13653 ÷ 8192 = 1.666 (revolutions)

1 revolution moves the workpiece 6mm, therefore the travel amount by 1666 revolutions is

6 (mm/revolution) × 1.666 (revolutions) = 9.999 (mm)

Therefore, the workpiece moves for 9.999 mm by inputting 13653 pulses. This equation must be calculated at the host controller.

<When the Electronic Gear is Used>

Mechanical conditions such as the moving amount per machine rotation, encoder gear ratio, and machine gear ratio are predefined and the minimum reference unit is set to 1 μm.

To move the workpiece 10 mm,

10 (mm) ÷ 1 (μm) = 10000 reference units

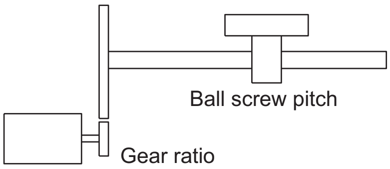
Input 10000 reference units.

- Settings

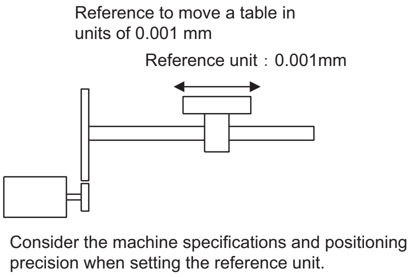
  Use the following procedure to make the settings.

1. Confirm the machine specifications.

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



2. Confirm the number of encoder pulses displayed in the **Counter Value**, and set this value to the ***Number of Pulses per Motor Rotation*** (parameter No.0n18).
3. Set the reference unit (the smallest unit for the reference data to move the load) according to the settings of the ***Reference Unit Selection*** (parameter No.0n0F) and ***Number of Digits below Decimal Point*** (parameter No.0n10).



Note:When reference unit is 1µm, inputting 50,000 reference pulses moves the workpiece by 50000 × 1µm = 50 mm.

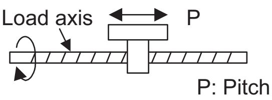
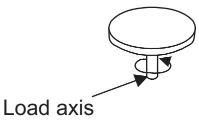
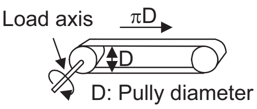
4. Find the load travel distance per load axis rotation using the reference unit, and set to the ***Travel Distance per Machine Rotation*** (parameter No.0n12).

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

<Calculation Example>

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

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

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

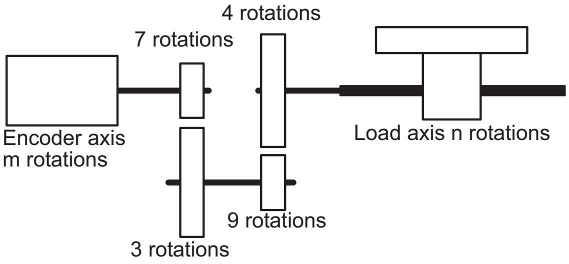
5. Set the ***Encoder Gear Ratio*** and the ***Machine Gear Ratio*** in the parameters No. 0n14 and No. 0n15.

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

   No.0n14: ***Encoder Gear Ratio*** = m (rotations)
   No.0n15: ***Machine Gear Ratio*** = n (rotations)
   (Setting range: 1 to 65,535 (rotations))

   <Setting Example>

   - For the configuration shown in the diagram



Gear ratio = n / m = (3 / 7) × (4 / 9) = 4 / 21

Therefore, set the following values.

No.0n14: ***Encoder Gear Ratio*** = 4 (rotations)
No.0n15: ***Machine Gear Ratio*** = 21 (rotations)

- Multi-purpose Output Function

Used to externally output the multi-purpose output signal when the specified condition is satisfied and the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect).

The output condition can be selected by setting the Multi-purpose output bits (bits 4 to 7: **Set Function**) according to the selected counter mode.

This section describes each output conditions.

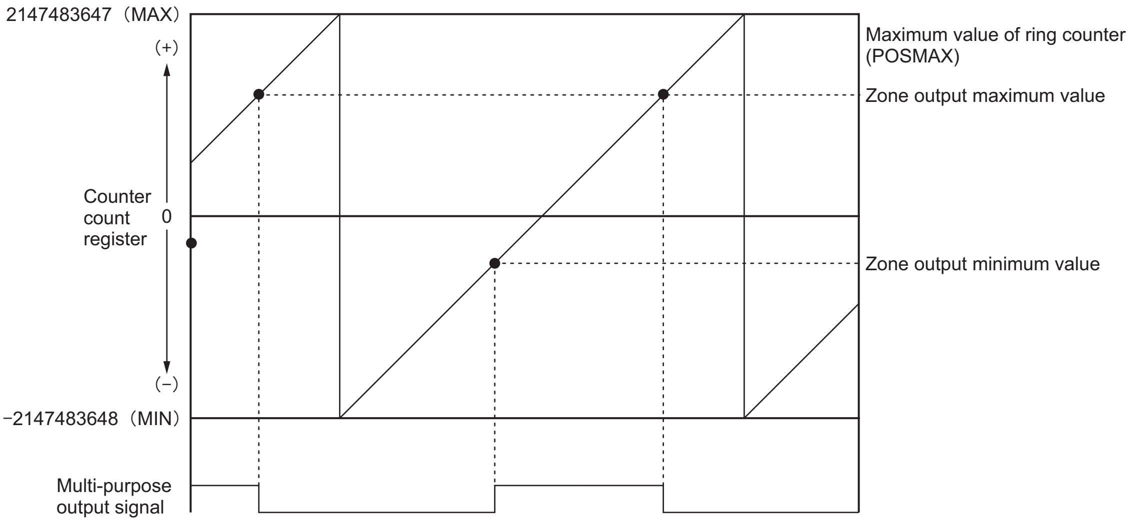
- Zone Output **Reversible** **Interval** **Frequency Measurement**

  The multi-purpose output signal is output at the rising edge of the multi-purpose output detection request signal when the Multi-purpose output bit (bit 5: **Set Function**) is set to 1 (Zone output) and the counter value is in the range between the value of the **Zone Output Minimum Value** and **Zone Output Maximum Value**.

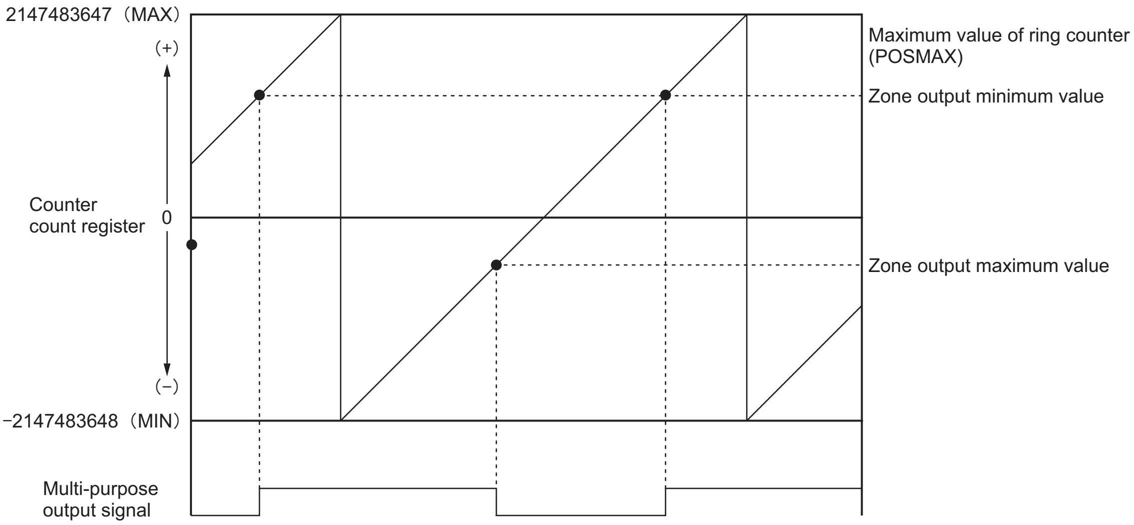
  As the counter value is detected by software processing, there will be a delay of maximum 500 µs.

  Operation examples of the Zone Output is illustrated below.

  - **When Zone Output Minimum Value < Zone Output Maximum Value**



- **When Zone Output Minimum Value > Zone Output Maximum Value**

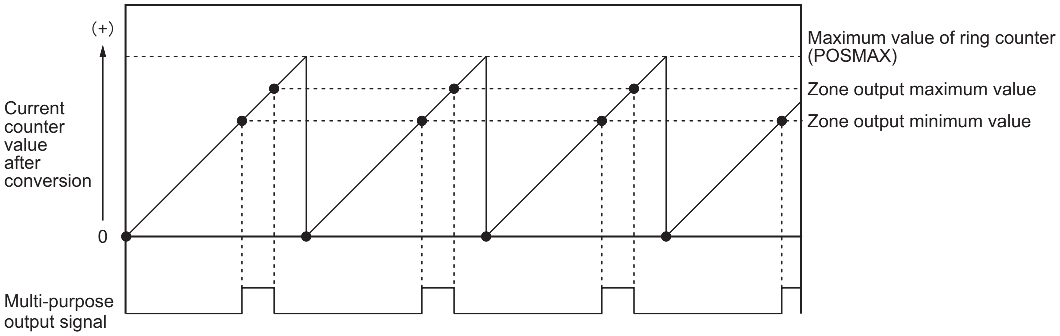


- **When Zone Output Minimum Value = Zone Output Maximum Value**
  The multi-purpose output signal is output when the **Count Value** and the **Zone Output Minimum Value** (= the zone output maximum value) match.

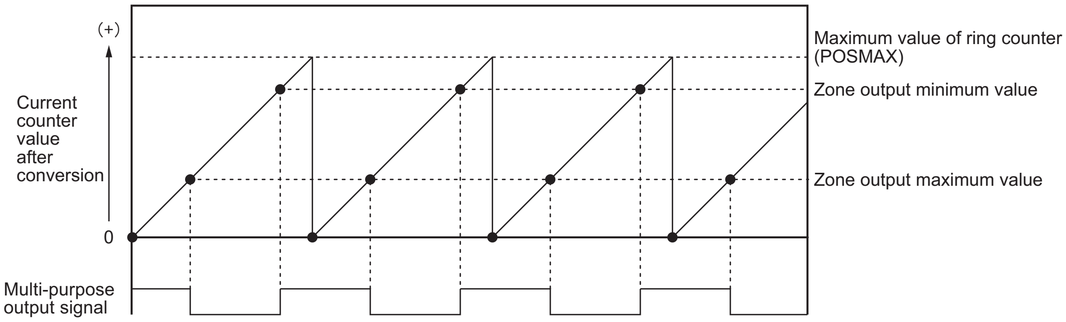
■ Operation When Using the Ring Counter

The zone output operation will be as shown below when the ***Ring-counter Function Selection*** is used by setting the parameter No.0n0E to 1.

- **When Zone Output Minimum Value < Zone Output Maximum Value**



- **When Zone Output Minimum Value > Zone Output Maximum Value**



Note: For information on the ring counter function, refer to *7.4.2 (5) (b) • Ring Counter Function*.

- Speed Coincidence Output **Reversible** **Interval** **Frequency Measurement**

  The multi-purpose output signal is output at the rising edge of the multi-purpose output detection request signal when the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 2 (Speed coincidence) and the feedback speed calculated from the difference between counter values of each control cycle is within the range specified in **Speed Coincidence Detection Width** whose center point is the value set in the **Speed Coincidence Detection Setting**.

  The software processing for detecting the counter count value cause a delay for 500 µs maximum.

- Frequency Coincidence Output **Reversible** **Interval** **Frequency Measurement**

  The multi-purpose output signal is output at the rising edge of the multi-purpose output detection request signal when the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 3 (Frequency coincidence) and the frequency measured by the frequency measurement counter is within the range specified in the **Frequency Coincidence Detection Width** whose center point is the value set in the **Frequency Coincidence Detection Setting**.

  The software processing for detecting the counter count value cause a delay for 500 µs maximum.

7.4.3 MECHATROLINK-III Communication Specifications

The general specifications of MECHATROLINK-III communications are given below.

Item	Specifications	
Communications Protocol	MECHATROLINK-III	
Classification	Slave[*1]	
Station Address Setting Range	03 to EF (hexadecimal)	
Transmission Speed	100 Mbps	
Supported Transmission Cycles	0.125 ms[*2], 0.25 ms, 0.5 ms, 1 ms to 8 ms (granularity: 0.5 ms)	
Number of Bytes per Station for Cyclic Communications	16 bytes	
Supported Communication Methods	Cyclic communications, event-driven communications, message communications	
Supported Profile	Standard I/O profile	
Supported Commands	Cyclic communications	NOP, PRM_RD, PRM_WR[*3], ID_RD, CONFIG, ALM_RD, ALM_CLR, SYNC_SET[*1], CONNECT[*1], DISCONNECT, PPRM_RD, PPRM_WR[*3], MEM_RD, MEM_WR[*3], DATA_RWA, DATA_RWS
	Event-driven communications	NOP, ID_RD, CONNECT[*1], DISCONNECT, MEM_RD
	Message communications	Read memory content, Write memory content, Read memory content: non contiguous, Write memory content: non contiguous, Read maximum message size

* 1. Setting the parameter No. 0n00 (***Channel Selection***) to 1 (Use) for both channels CH1 and CH2 makes the MTP2900 Module a multi-slave device that uses the command and response areas for 2 lines. When the parameter No.0n00 is set to 1 for both channels CH1 and CH2, set the same value in COM_TIM (communication cycle) in the CONNECT command for 2 lines. The MTP2900 Module starts synchronous communications by the first received CONNECT or SET_SYC command.

* 2. Set the communication cycle to 250 µs or more when the transmission cycle is set to 125 µs.

* 3. The parameters written by the PPM_WR, PPRM_WR, MEM_WR commands, or tool (IOWin) to the volatile or nonvolatile memory will be validated after the CONFIG command is executed.

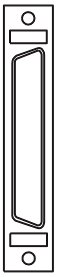
IMPORTANT

The pulse output control cycle is 0.5 ms. When the communication cycle is set to 0.25 ms, the response data will be refreshed every 0.5 ms.

7.5 External I/O Signals and Connection Examples

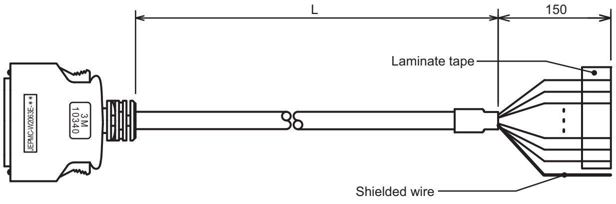
7.5.1 Specifications of Connection Cables and Connectors

(1) Connectors



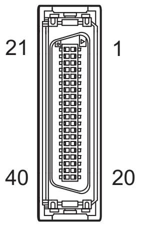
Name	Connector Name	No. of Pins	Connector Model		
			Module	Cable	Manufacturer
External I/O Connector	CN1	40	10240-52A3PL	• Connector 10140-6000EL • Shell 10340-3210-006 (One-touch- lock type)	Sumitomo 3M Limited

(2) Standard Cable Models and Appearance

Name	Model	Length	Appearance (JEPMC-W2063-☐☐-E)
Cable for MTP2900 Module	JEPMC-W2063-A5-E	0.5 m	
	JEPMC-W2063-01-E	1 m	
	JEPMC-W2063-03-E	3 m	

(3) Standard Cable Wiring Chart

The wiring chart of the loose wire of the JEPMC-W2063-☐☐-E standard cable is shown below.



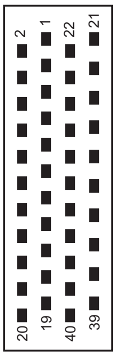
Terminal No.	Dot Mark	Wire Color	Dot Mark	Terminal No.
1	-	Orange	Continuous– – – –	21
2	-	Gray	Continuous– – – –	22
3	-	White	Continuous– – – –	23
4	-	Yellow	Continuous– – – –	24
5	-	Pink	Continuous– – – –	25
6	- -	Orange	–	26
7	- -	Gray	–	27
8	- -	White	–	28
9	- -	Yellow	–	29
10	- -	Pink	–	30
11	- - -	Orange	– –	31
12	- - -	Gray	– –	32
13	- - -	White	– –	33
14	- - -	Yellow	– –	34
15	- - -	Pink	– –	35
16	- - - -	Orange	– – –	36
17	- - - -	Gray	– – –	37
18	- - - -	White	– – –	38
19	- - - -	Yellow	– – –	39
20	- - - -	Pink	– – –	40
			Shielded wire	Shell

7.5.2 Connector Pin Layouts

The pin layout and each terminal function of the CN1 connector of the MTP2900 Modules are described below.

(1) Connector CN1

(a) Pin Layout at Connection Side



2	+5PB1	1	+5PA1	22	-5PB1	21	-5PA1
4	SG	3	+5PC1	24	SG	23	-5PC1
6	+5PB2	5	+5PA2	26	-5PB2	25	-5PA2
8	(NC)	7	+5PC2	28	(NC)	27	-5PC2
10	12VB1	9	12VA1	30	12PB1	29	12PA1
12	(NC)	11	12/24VC1	32	24PC1	31	12PC1
14	12VB2	13	12VA2	34	12PB2	33	12PA2
16	(NC)	15	12/24VC2	36	24PC2	35	12PC2
18	OUT1	17	COIN1	38	OUT2	37	COIN2
20	PIL1	19	0V (24V)	40	PIL2	39	24V

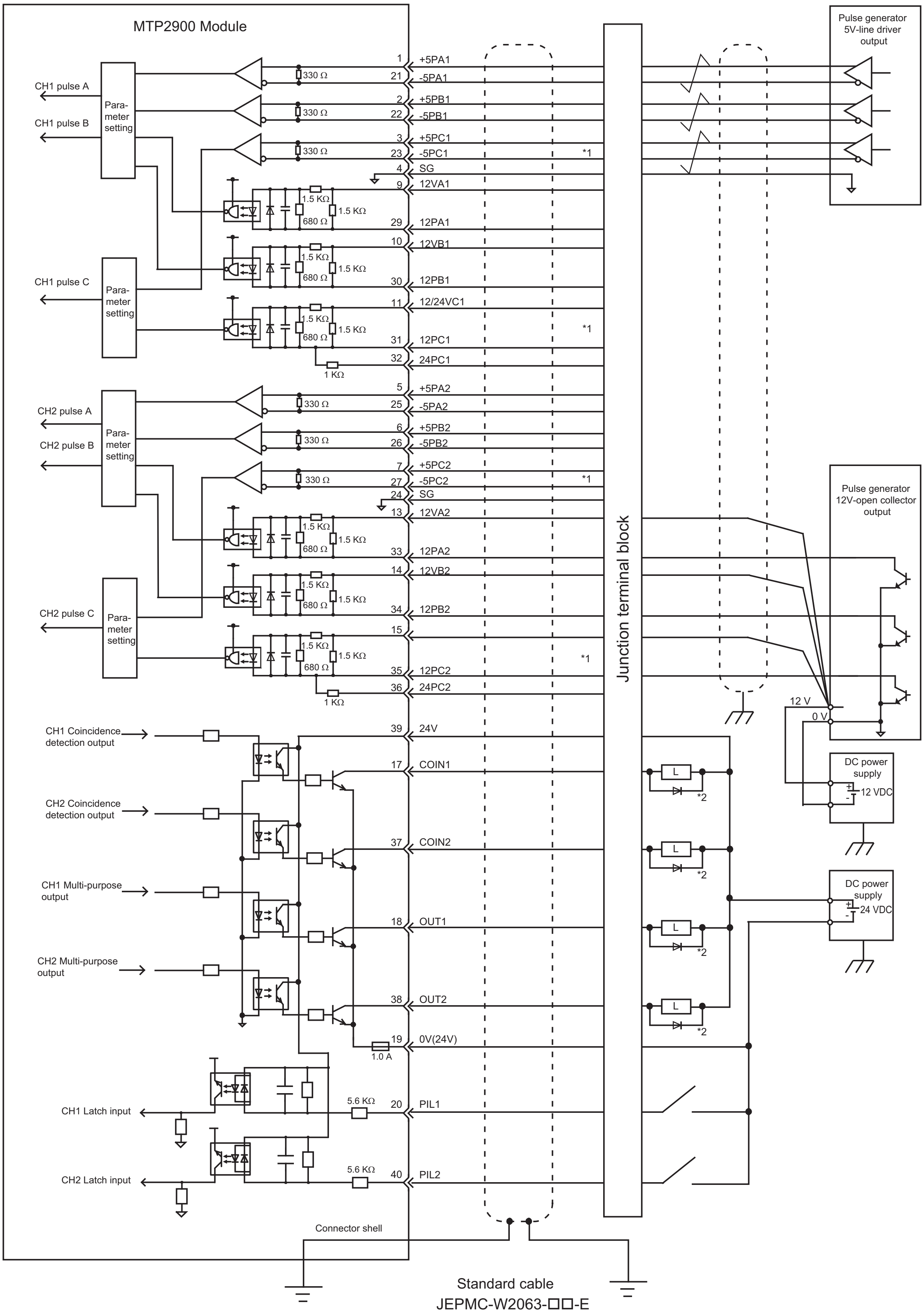
(b) Terminal Functions

No.	Signal Name	I/O	Function	No.	Signal Name	I/O	Function
1	+5PA1	I	5V differential A1 pulse input (+)	21	-5PA1	I	5V differential A1 pulse input (–)
2	+5PB1	I	5V differential B1 pulse input (+)	22	-5PB1	I	5V differential B1 pulse input (–)
3	+5PC1	I	5V differential C1 pulse input (+)	23	-5PC1	I	5V differential C1 pulse input (–)
4	SG	–	Ground (for pulse input)	24	SG	–	Ground (for pulse input)
5	+5PA2	I	5V differential A2 pulse input (+)	25	-5PA2	I	5V differential A2 pulse input (–)
6	+5PB2	I	5V differential B2 pulse input (+)	26	-5PB2	I	5V differential B2 pulse input (–)
7	+5PC2	I	5V differential C2 pulse input (+)	27	-5PC2	I	5V differential C2 pulse input (–)
8	(NC)	–	–	28	(NC)	–	–
9	12VA1	P	Power supply 12V A1 input	29	12PA1	I	12V A1 pulse input
10	12VB1	P	Power supply 12V B1 input	30	12PB1	I	12V B1 pulse input
11	12/24VC1	P	Power supply 12/24V C1 input	31	12PC1	I	12V C1 pulse input
12	(NC)	–	–	32	24PC1	I	24V C1 pulse input
13	12VA2	P	Power supply 12V A2 input	33	12PA2	I	12V A2 pulse input
14	12VB2	P	Power supply 12V B2 input	34	12PB2	I	12V B2 pulse input
15	12/24VC2	P	Power supply 12/24V C2 input	35	12PC2	I	12V C2 pulse input
16	(NC)	–	–	36	24PC2	I	24V C2 pulse input
17	COIN1	O	Coincidence detection output 1	37	COIN2	O	Coincidence detection output 2
18	OUT1	O	Multi-purpose output 1	38	OUT2	O	Multi-purpose output 2
19	0V (24V)	–	Ground (24V) 8	39	24V	P	24V power supply input
20	PIL1	I	Latch input 1	40	PIL2	I	Latch input 2

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

7.5.3 Connection Example

The following diagram shows the connection example of the MTP2900 Module.



* 1. If not connecting the phase C with modules, set the ***Mask of Calculation by C-Pulse*** to Disabled by setting the parameter No.0n0c to 1.

* 2. When connecting an induction load, connect a flywheel diode in parallel with the induction load.

7.6 Parameter Settings

7.6.1 Parameter List

The parameters required to set for the MTP2900 Module are listed below.

These parameters can be set using the IOWin. For details, refer to *2.5.1 Editing Parameters*.

Parameter No. (Hexadecimal) n = Channel No.	Data Size (Number of bytes)	Parameter Name	Parameter Valid Counter Mode *1			Description
			Reversible	Interval	Frequency Measurement	
0n00	2	Channel selection	✓	✓	✓	Specifies whether or not to use the channel.
0n02	2	A/B pulse signal form selection	✓	✓	✓	Specifies the phase-A and phase-B pulse signal form.
0n03	2	C-pulse signal type	✓	✓	✓	Specifies the phase-C pulse signal form.
0n04	2	A/B pulse signal polarity	✓	✓	✓	Specifies the phase-A and phase-B pulse signal polarity.
0n05	2	C-pulse signal polarity selection	✓	✓	✓	Specifies the phase-C pulse signal polarity.
0n06	2	Pulse counting mode selection	✓	✓	✓	Specifies the pulse counting method.
0n07	2	Counter mode selection	✓	✓	✓	Specifies the counter mode.
0n09	2	Coincidence detection function use selection	✓	✓	✓	Specifies whether not to use the coincidence detection function.
0n0B	2	Frequency calculation selection			✓	Specifies the number of digits of the detected frequency when the ***Counter Mode Selection*** is set to Frequency Measurement by setting the parameter No.0n07 to 2.
0n0C	2	Mask of calculation by C-pulse	✓			Specifies whether to prohibit or permit counting while pulse C is being input.
0n0E	2	Ring-counter function selection	✓			Specifies whether or not to use the ring counter function.
0n0F	2	Reference unit selection *2	✓	✓	✓	Specifies the reference unit.
0n10	2	Number of digits below decimal point	✓	✓	✓	Specifies the number of digits below the decimal point for the minimum reference unit.
0n12	4	Travel distance per machine rotation (scale pitch)	✓	✓		Sets the load movement amount per load axis rotation.
0n14	2	Encoder gear ratio	✓	✓		Specifies the value m when the load axis rotates n times while the encoder axis rotates m times.
0n15	2	Machine gear ratio	✓	✓		Specifies the value n when the load axis rotates n times while the encoder axis rotates m times.
0n16	4	Maximum value of ring counter (POSMAX)	✓			When ***Ring Counter Function Selection*** is used by setting the parameter No.0n0E to 1, specifies the position to be reset every turn.
0n18	2	Number of pulses per motor rotation (Number of pulses per linear scale pitch)	✓	✓	✓	Specifies the number of input pulses per encoder rotation.
0n1A	2	Feedback speed moving average time constant	✓	✓	✓	Specifies the moving average filter time constant to be used to calculate the feedback speed.

[1] Parameters are valid in the counter mode marked with ✓.

[2] When the ***Reference Unit Selection*** is set to pulse by setting the parameter No.0n0F to 0, the settings of the

parameter No. 0n12 to 0n16 are disregarded.

7.6.2 Parameter Details

(1) Channel Selection

Channel selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n00 n = channel No.	2	0 or 1	–	0: Not use
Description	Specify whether to use or not to use the channel. 0: Not use (default) 1: Use				

(2) A/B Pulse Signal Form Selection

A/B pulse signal form Selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n02 n = channel No.	2	0 or 1	–	0: +5 V differential input
Description	Specify the phase-A and phase-B pulse signal form. 0: + 5 V differential input (default) 1: 12 V collector input				

(3) C-pulse Signal Type

C-pulse signal type	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n03 n = channel No.	2	0 to 2	–	0: +5 V differential input
Description	Specify the phase-C pulse signal form. 0: +5 V differential input (default) 1: 12 V collector input 2: +24 V input				

(4) A/B Pulse Signal Polarity

A/B pulse signal polarity	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n04 n = channel No.	2	0 or 1	–	0: Positive logic
Description	Specify the phase-A and phase-B pulse signal polarity. 0: Positive logic (default) 1: Negative logic				

(5) C-pulse Signal Polarity Selection

C-pulse signal polarity selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n05 n = channel No.	2	0 or 1	–	0: Positive logic
Description	Specify the phase-C pulse signal polarity. 0: Positive logic (default) 1: Negative logic				

(6) Pulse Counting Mode Selection

Pulse counting mode selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n06 n = channel No.	2	0 to 6	–	6: Phase-A/-B pulses (×4)
Description	Specify the pulse counting mode. 0: Sign (×1) 1: Sign (×2) 2: Up/Down (×1) 3: Up/Down (×2) 4: Phase-A/-B pulses (×1) 5: Phase-A/-B pulses (×2) 6: Phase-A/-B pulses (×4) (default)				

(7) Counter Mode Selection

Counter mode selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n07 n = channel No.	2	0 to 2	–	0: Reversible counter
Description	Specify the counter mode. 0: Reversible counter (default) 1: Interval counter 2: Frequency measurement				

(8) Coincidence Detection Function Use Selection

Coincidence detection function use selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n09 n = channel No.	2	0 or 1	–	0: Not use
Description	Specify the phase-A and phase-B pulse signal polarity. 0: Not use (default) 1: Use				

(9) Frequency Calculation Selection

Frequency calculation selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n0B n = channel No.	2	0 to 3	–	0: ×1
Description	Specify the number of digits of the detected frequency when the ***Counter Mode Selection*** is set to Frequency Measurement by setting the parameter No.0n07 to 2. The actually detected frequency multiplied by the value specified here will be written as the detected frequency. 0: × 1 (default) 1: × 10 2: × 100 3: × 1000				

(10) Mask of Calculation by C-pulse

Mask of calculation by C-pulse	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n0C n = channel No.	2	0 or 1	–	1: Disabled
Description	Specify whether to prohibit or permit counting while pulse C is being input. 0: Enabled (prohibits counting) 1: Disabled (permits counting) (default)				

(11) Ring-counter Function Selection

Ring-counter function selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n0E n = channel No.	2	0 or 1	–	0: Not use
Description	Specify whether to use or not to use the ring-counter function. 0: Not use (default) 1: Use				

(12) Reference Unit Selection

Reference unit selection	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n0F n = channel No.	2	0 to 3	-	0: Pulse
Description	Specify the reference unit. When the unit other than pulse is selected, the electronic gear function can be used. When pulse is selected, the electronic gear function cannot be used. 0: Pulse (default) 1: mm 2: deg 3: inch				

(13) Number of Digits Below Decimal Point

Number of digits below decimal point	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n10 n = channel No.	2	0 to 5	digit	3
Description	Specify the number of digits below decimal point for the minimum reference unit in the range between 0 to 5 <Example> If the minimum reference unit is 1 μm (10^{-3} mm), set the Reference Unit Selection to mm, and Number of Digits Below Decimal Point to 3.				

(14) Travel Distance per Machine Rotation (Scale Pitch)

Travel distance per machine rotation (scale pitch)	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n12 n = channel No.	4	1 to 2^{31}–1	reference unit	10000
Description	Set the load moving amount per load axis rotation in the range between 1 and 2147483647.				

(15) Encoder Gear Ratio

Encoder gear ratio	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n14 n = channel No.	2	1 to 65535	rev	1
Description	Set the value m in the range between 1 and 65535 when the load axis rotates n times while the encoder axis rotates m times.				

(16) Machine Gear Ratio

Machine gear ratio	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n15 n = channel No.	2	1 to 65535	rev	1
Description	Set the value n in the range between 1 and 65535 when the load axis rotates n times while the encoder axis rotates m times.				

(17) Maximum Value of Ring Counter (POSMAX)

Maximum value of ring counter (POSMAX)	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n16 n = channel No.	4	1 to $2^{31}-1$	reference unit	360000
Description	When the ***Ring-counter Function Selection*** is used by setting the parameter No.0n0E to 1, sets the position to be reset every turn in the range between 1 and 2147483647 (reference units).				

(18) Number of Pulses per Motor Rotation (Number of Pulses per Linear Scale Pitch)

Number of pulses per motor rotation (Number of pulses per linear scale pitch)	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n18 n = channel No.	2	1 to $2^{31}-1$	Pulse/rev	16384 (before multiplication)
Description	Set the number of input pulses per encoder rotation in the range between 1 and 2147483647 (pulses/rev.).				

(19) Feedback Speed Moving Average Filter Time Constant

Feedback speed moving average filter time constant	Parameter No. (Hexadecimal)	Data Size (Number of bytes)	Setting Range	Setting Unit	Default
	0n1A n = channel No.	2	0 to 32	–	10
Description	Set the moving average filter time constant to be used to calculate the feedback speed in the range between 0 and 32.				

7.7 Operation Details

Note: Refer to *Appendix B* for MECHATROLINK communication specifications.

7.7.1 Command Data

Command Format

Byte	Command Data	Byte	Command Data
0	CMD	32	Speed coincidence detection width
1	WDC	33	
2	CMD_CTRL	34	
3		35	
4	Command setting	36	Frequency coincidence detection setting
5		37	
6	Set function	38	
7		39	
8	Count presetting data	40	Frequency coincidence detection width
9		41	
10		42	
11		43	
12	Agreed detection value	44	Averaging count setting
13		45	
14		46	
15		47	
16	Preset data of POSMAX turns	48	System monitor
17		49	
18		50	
19		51	
20	Zone output minimum value	52	Reserved (0)
21		53	
22		54	
23		55	
24	Zone output maximum value	56	
25		57	
26		58	
27		59	
28	Speed coincidence detection setting	60	
29		61	
30		62	
31		63	

(1) Command Data List

The command data to MTP2900 Module are listed below.

Command Byte No.	Name	Data Valid Counter Mode *			Contents
		Reversible	Interval	Frequency Measurement	
0	CMD	✓	✓	✓	Command code
1	WDC	✓	✓	✓	Watchdog data
2 and 3	CMD_CTRL	✓	✓	✓	Command control
4 and 5	Command setting	See *7.7.1 (2) (d) Command Setting*			Operation mode
6 and 7	Set function	See *7.7.1 (2) (e) Set Function*			Sets the details on the functions.
8 to 11	Count presetting data	✓			Resets the current counter count value to the value specified here.
12 to 15	Agreed detection value	✓	✓	✓	Outputs a coincidence detection signal when the current counter count value reaches the value specified here.
16 to 19	Preset data of POSMAX turns	✓			Resets the number of POSMAX turns to the value specified here.
20 to 23	Zone output minimum value	✓			Zone output lower limit
24 to 27	Zone output maximum value	✓			Zone output upper limit
28 to 31	Speed coincidence detection setting	✓			The speed to be detected
32 to 35	Speed coincidence detection width	✓			Speed detection width
36 to 39	Frequency coincidence detection setting			✓	The frequency to be detected
40 to 43	Frequency coincidence detection width			✓	Frequency detection width
44 to 47	Averaging count setting			✓	The number of times of detections to calculate the frequency value to be written in the response data
48 to 51	System monitor	✓	✓	✓	For system analysis
52 to 63	Reserved (0)	–	–	–	Reserved by system

* Data are valid in the counter mode marked with ✓.

(2) Command Data Details

(a) CMD

Command Code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) WDC

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used to establish synchronous communication and for detection of out-of-sync state.		

(c) CMD_CTRL

Command Control (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Control for standard I/O profile command Bit 3: ALM_CLR (Clear communication alarm/warning) is disabled when set to 0, and clears alarm when set to 1		

(d) Command Setting

Command setting (Bytes 4 and 5)			Setting Range	Setting Unit	Counter Mode		
			–	–	Reversible	Interval	Frequency Measurement
Description	Bit 0	Count disable Specify whether to prohibit or permit counting. 0: Permit (default) 1: Prohibit			Valid	Valid	Invalid
	Bit 1	Calculating preset Specify whether to reset or not to reset the count value to the preset value 0: Not reset (default) 1: Reset			Valid	Invalid	Invalid
	Bit 2	PI latch detect demand Specify whether to store or not to store the count value when an external signal is input. 0: Not store (default) 1: Store			Valid	Valid	Invalid
	Bit 3	Coincidence detection Specify whether to output or not to output the coincidence detection signal when the counter count value and the coincidence detection set value match. 0: Not output (default) 1: Output			Valid	Valid	Valid
	Bit 4	POSMAX presetting Specify whether to reset or not to reset the number of POSMAX turns to the preset value. 0: Not reset (default) 1: Reset			Valid	Invalid	Invalid
	Bit 5	Multi-purpose output Specify whether to detect or not to detect the multi-purpose output (zone output/speed coincidence/frequency coincidence). 0: Not detect (default) 1: Detect			Valid	Invalid	Valid

(e) Set Function

Set function (Bytes 6 and 7)			Setting Range	Setting Unit	Counter Mode		
			–	–	Reversible	Interval	Frequency Measurement
Description	PI latch detection signal Set the external signal to be used for PI latch.						
	Bits 0 to 3	0: PI (discrete input)			Valid	Invalid	Invalid
		2: Pulse C			Valid	–	Invalid
	Multi-purpose output When the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect), specify the output detection method.						
	Bits 4 to 7	0: Invalid			Valid	Valid	Valid
		1: Zone output			Valid	Invalid	Invalid
		2: Speed coincidence			Valid	Invalid	Invalid
		3: Frequency coincidence			Invalid	Invalid	Valid

(f) Count Presetting Data

Count presetting data (Bytes 8 to 11)	Setting Range	Setting Unit
	-2^{31} to $2^{31} -1$	reference unit
Description	Set a value to which the current counter count value is reset when the Calculating preset bit (bit 1: **Command Setting**) is set to 1 (Reset).	

(g) Agreed Detection Value

Agreed detection value (Bytes 12 to 15)	Setting Range	Setting Unit
	-2^{31} to $2^{31} -1$	reference unit
Description	Set the value of the **Counter Value** to output the coincidence detection signal when the Coincidence detection bit (bit 3: **Command Setting**) is set to 1 (Output).	

(h) Preset Data of POSMAX Turns

Preset data of POSMAX turns (Bytes 16 to 19)	Setting Range	Setting Unit
	-2^{31} to $2^{31} -1$	turn
Description	Set the value to which the number of POSMAX turns is reset when the POSMAX presetting bit (bit 4: **Command Setting**) is set to 1 (Reset).	

(i) Zone Output Minimum Value

Zone output minimum value (Bytes 20 to 23)	Setting Range	Setting Unit
	-2^{31} to $2^{31} -1$	reference unit
Description	Set the zone lower limit when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 1 (Zone output).	

(j) Zone Output Maximum Value

Zone output maximum value (Bytes 24 to 27)	Setting Range	Setting Unit
	-2^{31} to $2^{31} -1$	reference unit
Description	Set the zone upper limit when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 1 (Zone output).	

(k) Speed Coincidence Detection Setting

Speed coincidence detection setting (Bytes 28 to 31)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	Set the detection speed when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 2 (Speed coincidence).		

(l) Speed Coincidence Detection Width

Speed coincidence detection width (Bytes 32 to 35)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	Set the speed detection width when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 2 (Speed coincidence).		

(m) Frequency Coincidence Detection Setting

Frequency coincidence detection setting (Bytes 36 to 39)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	Set the detection frequency when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 3 (Frequency coincidence).		

(n) Frequency Coincidence Detection Width

Frequency coincidence detection width (Bytes 40 to 43)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	Set the frequency detection width when the Multi-purpose output bit (bit 5: **Command Setting**) is set to 1 (Detect) and the Multi-purpose output bits (bits 4 to 7: **Set Function**) is set to 3 (Frequency coincidence).		

(o) Averaging Count Setting

Averaging count setting (Bytes 44 to 47)		Setting Range	Setting Unit
		0 to 255	–
Description	Set the number of times of frequency detection to calculate the frequency to be written in the **Average Frequency**.		

(p) System Monitor

System monitor (Bytes 48 to 51)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	–
Description	For system analysis		

7.7.2 Response Data

Response Format

Byte	Response Data	Byte	Response Data
0	RCMD	32	Number of POSMAX turns
1	RWDT	33	
2	CMD_STAT	34	
3		35	
4	Status	36	Feedback speed
5		37	
6	Reserved (0)	38	
7		39	
8		40	Detected frequency
9		41	
10		42	
11		43	
12	Counter value	44	Average frequency
13		45	
14		46	
15		47	
16	PI latch value /Interval value	48	System monitor
17		49	
18		50	
19		51	
20	Reserved (0)	52	Reserved (0)
21		53	
22		54	
23		55	
24	Current count value after conversion	56	
25		57	
26		58	
27		59	
28	PI latch value after conversion /Interval value after conversion	60	
29		61	
30		62	
31		63	

(1) Response Data List

The response data from the MTP2900 Module are listed below.

Command Byte No.	Name	Data Valid Counter Mode *			Contents
		Reversible	Interval	Frequency Measurement	
0	RCMD	✓	✓	✓	Command code
1	RWDT	✓	✓	✓	Watchdog data
2 and 3	CMD_STAT	✓	✓	✓	Command control
4 and 5	Status	✓	✓	✓	Operation status
6 to 11	Reserved (0)	–	–	–	Reserved by system
12 to 15	Counter value	✓	✓	✓	Pulse count value
16 to 19	PI latch value/Interval value	✓	✓		Counter count value at the moment an external signal is input
20 to 23	Reserved (0)	–	–	–	Reserved by system
24 to 27	Current count value after conversion	✓	✓	✓	The current counter count value converted into reference units
28 to 31	PI latch value after conversion/Interval value after conversion	✓	✓		The value of PI latch data/interval data converted into reference units.
32 to 35	Number of POSMAX turns	✓			The number of turns up to the present
36 to 39	Feedback speed	✓	✓		Feedback speed
40 to 43	Detected frequency			✓	The frequency detected at the moment an external signal is input
44 to 47	Average frequency			✓	The average of the detected frequency values
48 to 51	System monitor	✓	✓	✓	For system analysis
52 to 63	Reserved (0)	–	–	–	Reserved by system

* Data are valid in the counter mode marked with ✓.

(2) Response Data Details

(a) RCMD

Command Code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) RWDT

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used for synchronous communication establishment and detection of out of sync state.		

(c) CMD_STAT

Command Status (Bytes 2 and 3)	Setting Range	Setting Unit
	–	–
Description	Standard I/O Profile Command Status Bit 0: D_ALM - 0: Normal status, 1: Device in alarm status Bit 1: D_WAR - 0: Normal status, 1: Device in warning status Bit 2: CMDRDY - 0: Command reception disabled, 1: Command reception enabled Bit 3: ALM_CLR_CMP - 0: ALM_CLR command execution not completed, 1: ALM_CLR command execution completed Bit 8 to B: CMD_ALM - Any value other than 0: Command error status Bit C to F: COMM_ALM - Any value other then 0: Communication error status	

(d) Status

Status (Bytes 4 and 5)		Setting Range	Setting Unit
		–	–
Description	Bit 0	Error setting the data 1 (ON): Data setting error	
	Bit 1	Parameter Error 1 (ON): Parameter setting error	
	Bit 2	Preset count completed 1 (ON): Count value reset completed	
	Bit 3	PI latch completed 1 (ON): PI latch completed	
	Bit 4	A/B pulse 0 1 (ON): Feedback pulse is ±1 or less	
	Bit 5	Coincidence detection 1 (ON): Coincidence detection signal ON	
	Bit 6	A-pulse status monitor 1 (ON): High	
	Bit 7	B-pulse status monitor 1 (ON): High	
	Bit 8	C-pulse status monitor 1 (ON): High	
	Bit 9	Parameter write 1 (ON): Writing a parameter	
	Bit A	Reserved Fixed to 0 (OFF)	
	Bit C	POSMAX preset 1 (ON): Completed	
	Bit D	Multipurpose signal 1 (ON): Multipurpose signal ON	
	Bit F	Module ready 1 (ON): Counter processing being executed	

(e) Counter Value

Counter value (Bytes 12 to 15)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	pulse
Description	Indicates the pulse count value for each communication cycle.	

(f) PI Latch Value/Interval Value

PI latch value/Interval value (Bytes 16 to 19)	Setting Range	Setting Unit
	-2^{31} to $2^{31}-1$	pulse
Description	Indicates the counter count value at the moment an external signal is input.	

(g) Current Count Value After Conversion

Current count value after Conversion (Bytes 24 to 27)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	reference unit
Description	Indicates the current counter count value converted into reference units. When the ***Reference Unit Selection*** is set to pulse by setting the parameter No.0n0F to 0, the converted value is the same as the current counter count value.		

(h) PI Latch Value After Conversion/Interval Value After Conversion

PI latch value after conversion/Interval value after conversion (Bytes 28 to 31)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	reference unit
Description	Indicates the PI latch value/interval value converted into reference units. When the ***Reference Unit Selection*** is set to pulse by setting the parameter No.0n0F to 0, the converted value is the same as the PI latch value.		

(i) Number of POSMAX Turns

Number of POSMAX turns (Bytes 32 to 35)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	turn
Description	Indicates the number of turns up to the present when the ***Ring-counter Function Selection*** is used by setting the parameter No.0n0E to 1.		

(j) Feedback Speed

Feedback speed (Bytes 36 to 39)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	reference unit
Description	When the electronic gear function is not used (the ***Reference Unit Selection*** is set to pulse by setting the parameter No.0n0F to 0), pulse/s is used as the unit.		

(k) Detected Frequency

Detected frequency (Bytes 40 to 43)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	10 mHz
Description	Indicates the frequency detected at the moment an external signal is input. "m" indicates the value set in the ***Frequency Calculation Selection*** (parameter No.0n0B).		

(l) Average Frequency

Average frequency (Bytes 44 to 47)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	10 mHz
Description	Indicates the average of the detected frequency values of the number of times specified in the **Averaging Count Setting**. "m" indicates the value set in the ***Frequency Calculation Selection*** (parameter No.0n0B).		

(m) System Monitor

System monitor (Bytes 48 to 51)		Setting Range	Setting Unit
		–	–
Description	For system analysis		

7.7.3 Command Data/Response Data Processing Timing

The maximum refreshing delay time for the pulse input data of every communication cycle is "Communication cycle time + Transmission cycle time."

If the communication cycle time is equal to the transmission cycle time, the maximum refreshing delay time is "Communication cycle time × 2."

7.8 MECHATROLINK-III Communications Related Information

7.8.1 ID_CODE

The MTP2900 Module returns values in conformity with MECHATROLINK-III communication specifications, using ID_CODE.

ID_CODE Table

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
01	Vendor ID Code	Vendor-specific ID code	4	Supported	00000000 (Yaskawa Electric Corporation)
02	Device Code	Product-specific code	4	Supported	02400004
03	Device Version	Product version information	4	Supported	00000100
04	Device Definition (MDI) File version	Information of the device definition file (MDI) version the product supports	4	Supported	00001000
05	Extended Address Setting	Number of extended addresses the product supports	4	Supported	00000002
06	Serial No.	Product serial number	32	Unsupported	–
10	Profile Type 1	Profile type 1 the product supports	4	Supported	00000030 (Standard I/O profile)
11	Profile Version 1	Profile version 1 the product supports	4	Supported	00000100
12	Profile Type 2	Profile type 2 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 2)
13	Profile Version 2	Profile version 2 the product supports	4	Supported	00000000
14	Profile Type 3	Profile type 3 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 3)
15	Profile Version 3	Profile version 3 the product supports	4	Supported	00000000
16	Minimum Value of Transmission Cycle	The minimum transmission cycle the product supports	4	Supported	000030D4
17	Maximum Value of Transmission Cycle	The maximum transmission cycle the product supports	4	Supported	000C3500
18	Granularity of Transmission Cycle	The transmission cycle granularity levels the product supports	4	Supported	00000002
19	Minimum Value of Communication Cycle	The minimum communication cycle the product supports	4	Supported	000061A8
1A	Maximum Value of Communication Cycle	The maximum communication cycle the product supports	4	Supported	0061A800
1B	Number of Transmission Bytes	Number of transmission bytes for the product	4	Supported	00000010
1C	Number of Transmission Bytes (Current Setting)	Currently set number of transmission bytes for the product	4	Supported	00000010
1D	Profile Type (Current Selection)	Profile type selected by CONNECT command	4	Supported	00000030
20	Supported Communication Mode	Communication mode the product supports	4	Supported	00000007

ID_CODE Table (cont'd)

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
21	MAC Address	MAC address	4	Unsupported	–
30	List of Supported Main Commands	List of the main commands the product supports	32	Supported	6000E07F 00000003 00000000 00000000 00000000 00000000 00000000 00000000
38	List of Supported Sub Commands	Not used with a standard I/O profile	32	Unsupported	–
40	List of Common Parameters	Not used with a standard I/O profile	32	Unsupported	–
80	Main Device Name	Main device name	32	Supported	4D50454A 544D2D43 30393250 00452D30 00000000 00000000 00000000 00000000
90	Sub Device 1 Name	Sub device 1 name	32	Unsupported	–
98	Sub Device 1 Version	Sub device 1 version	4	Unsupported	–
A0	Sub Device 2 Name	Sub device 2 name	32	Unsupported	–
A8	Sub Device 2 Version	Sub device 2 version	4	Unsupported	–
B0	Sub Device 3 Name	Sub device 3 name	32	Unsupported	–
B8	Sub Device 3 Version	Sub device 3 version	4	Unsupported	–

7.8.2 Virtual Memory

Data are stored in the virtual memory addresses as shown below.

(1) Device Information Area

Address	Contents
0000 0000 to 0000 0003	Not specified
0000 0004 to 0000 0007	Vendor ID code
0000 0008 to 0000 000B	Device code
0000 000C to 0000 000F	Device version
0000 0010 to 0000 0013	Device definition (MDI) file version
0000 0014 to 0000 0017	Extended address setting
0000 0018 to 0000 0037	Serial No.
0000 0038 to 0000 003F	Not specified
0000 0040 to 0000 0043	Profile type 1
0000 0044 to 0000 0047	Profile version 1
0000 0048 to 0000 004B	Profile type 2
0000 004C to 0000 004F	Profile version 2
0000 0050 to 0000 0053	Profile type 3
0000 0054 to 0000 0057	Profile version 3
0000 0058 to 0000 005B	Minimum value of transmission cycle
0000 005C to 0000 005F	Maximum value of transmission cycle
0000 0060 to 0000 0063	Granularity of transmission cycle
0000 0064 to 0000 0067	Minimum value of communication cycle
0000 0068 to 0000 006B	Maximum value of communication cycle
0000 006C to 0000 006F	Number of transmission bytes
0000 0070 to 0000 0073	Number of transmission bytes (current setting)
0000 0074 to 0000 0077	Profile type (current selection)
0000 0078 to 0000 007F	Not specified
0000 0080 to 0000 0083	Supported communication mode
0000 0084 to 0000 008B	MAC address
0000 008C to 0000 00BF	Not specified
0000 00C0 to 0000 00DF	List of supported main commands
0000 00E0 to 0000 00FF	List of supported subcommands
0000 0100 to 0000 011F	List of supported common parameters
0000 0120 to 0000 01FF	Not specified
0000 0200 to 0000 021F	Main device name
0000 0220 to 0000 023F	Not specified
0000 0240 to 0000 025F	Sub device 1 name
0000 0260 to 0000 0263	Sub device 1 version
0000 0264 to 0000 027F	Not specified
0000 0280 to 0000 029F	Sub device 2 name
0000 02A0 to 0000 02A3	Sub device 2 version
0000 02A4 to 0000 02BF	Not specified
0000 02C0 to 0000 02DF	Sub device 3 name
0000 02E0 to 0000 02E3	Sub device 3 version
0000 02E4 to 0000 0FFF	Not specified
0000 1000 to 0000 FFFF	Not specified

(2) Vendor Parameter Area (CH1)

Address	Parameter No.	Contents (CH1)
8000 0000 to 8000 0001	0100	Channel selection
8000 0004 to 8000 0005	0102	A/B pulse signal form selection
8000 0006 to 8000 0007	0103	C-pulse signal type
8000 0008 to 8000 0009	0104	A/B pulse signal polarity
8000 000A to 8000 000B	0105	C-pulse signal polarity
8000 000C to 8000 000D	0106	Pulse counting mode selection
8000 000E to 8000 000F	0107	Counter mode selection
8000 0012 to 8000 0013	0109	Coincidence detection function use selection
8000 0016 to 8000 0017	010B	Frequency calculation selection
8000 0018 to 8000 0019	010C	Mask of calculation by C-pulse
8000 001C to 8000 001D	010E	Ring-counter function selection
8000 001E to 8000 001F	010F	Reference unit selection
8000 0020 to 8000 0021	0110	Number of digits below decimal point
8000 0024 to 8000 0027	0112	Travel distance per machine rotation (scale pitch)
8000 0028 to 8000 0029	0114	Encoder gear ratio
8000 002A to 8000 002B	0115	Machine gear ratio
8000 002C to 8000 002F	0116	Maximum value of ring counter (POSMAX)
8000 0030 to 8000 0033	0118	Number of pulses per motor rotation (number of pulses per linear scale pitch)
8000 0034 to 8000 0035	011A	Feedback speed moving average time constant

(3) Vendor Parameter Area (CH2)

Address	Parameter No.	Contents (CH2)
8000 0040 to 8000 0041	0200	Channel selection
8000 0044 to 8000 0045	0202	A/B pulse signal form selection
8000 0046 to 8000 0047	0203	C-pulse signal type
8000 0048 to 8000 0049	0204	A/B pulse signal polarity
8000 004A to 8000 004B	0205	C-pulse signal polarity
8000 004C to 8000 004D	0206	Pulse counting mode selection
8000 004E to 8000 004F	0207	Counter mode selection
8000 0052 to 8000 0053	0209	Coincidence detection function use selection
8000 0056 to 8000 0057	020B	Frequency calculation selection
8000 0058 to 8000 0059	020C	Mask of calculation by C-pulse
8000 005C to 8000 005D	020E	Ring-counter function selection
8000 005E to 8000 005F	020F	Reference unit selection
8000 0060 to 8000 0061	0210	Number of digits below decimal point
8000 0064 to 8000 0067	0212	Travel distance per machine rotation (scale pitch)
8000 0068 to 8000 0069	0214	Encoder gear ratio
8000 006A to 8000 006B	0215	Machine gear ratio
8000 006C to 8000 006F	0216	Maximum value of ring counter (POSMAX)
8000 0070 to 8000 0073	0218	Number of pulses per motor rotation (number of pulses per linear scale pitch)
8000 0074 to 8000 0075	021A	Feedback speed moving average time constant

7.9 Alarm/Warning Code List

The list of alarms and warnings that are generated by the MECHATROLINK communication function is as follows.

7.9.1 Alarm List

Category	Alarm Code	COMM_ ALM	Alarm Details	Countermeasures	Alarm Clearance
Communication Setting Error	A.E41 (Communication data size setting error)	0	Occurs when communication data was not received.	Review the controller's communication settings.	Not possible
Communication Establishment Error	A.E40 (Transmission cycle setting error)	B	Occurs when an unsupported transmission cycle is set on reception of a CONNECT command.	Review the controller's transmission cycle setting.	Not possible
	A.E60 (Reception error)	9	Result of noise or other causes after communications are established when two consecutive reception errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET	Possible
	A.E62 (FCS error)	8	Result of noise or other causes after communications are established when two consecutive FCS errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E63 (Synchronous frame not received)	A	Result of noise of other causes after communications are established when two consecutive failures to receive a synchronous frame occur.	Replace the module.	Possible
System Error	A.B6A (Communication LSI initialization error)	0	Occurs when initialization of the communication LSI has failed.	Replace the module.	Not possible

7.9.2 Warning List

(1) Communication Error (COMM_ALM)

Category	Warning Code	COMM_ ALM	Warning Details	Countermeasures	Alarm Clearance
Communication Alarm	A.960 (Communication error alarm)	2	Result of noise or other causes after communications are established when a reception error occurs.	Review the communication wiring and take countermeasures against noise.	Possible
Communication Establishment Error	A.962 (FCS error alarm)	1	Result of noise or other causes after communications are established when an FCS error occurs.		
	A.963 (Synchronous frame not received alarm)	3	Result of noise or other causes after communications are established when a synchronous frame is not received.		

(2) Command Error (CMD_ALM)

Category	Warning Code	CMD_ ALM	Warning Details	Countermeasures	Alarm Clearance
Data Setting Warning	A.94A (ID number alarm)	9	Occurs when the ID number specified by ID_RD command is out of the valid ID number range.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	Automatically cleared
	A.94B (Invalid data)	9	Occurs when data of a command other than ID_RD is out of the valid data range.		
Command Warning	A.95B (Unsupported command)	8	Occurs when an unsupported command is received.	Review the content of the command data issued by the controller.	
	A.95F (Undefined command)	8	Occurs at reception of a command other than those supported by MECHATROLINK-III specifications.		
	A.97A (Phase error)	C	Occurs at reception of a command that cannot be processed in the current phase.	Review the controller's command issue sequence.	

8

Pulse Output Module (JEPMC-MTP2910-E)

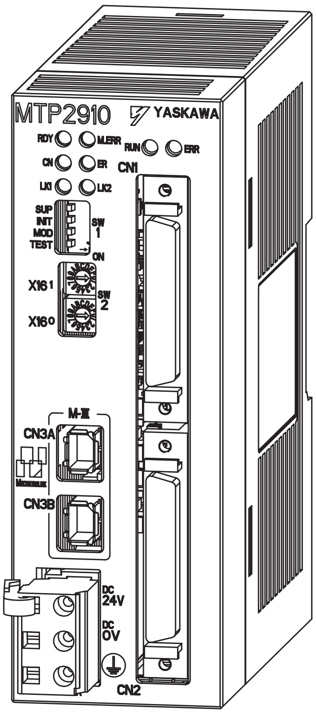
This chapter provides an overview, the specifications, the connections, and the settings of the Pulse Output Module model JEPMC-MTP2910-E.

8.1 Overview

The Pulse Output Module JEPMC-MTP2910-E (hereinafter referred to as the MTP2910 Module) is a motion module with pulse output, and has interfaces for implementing control on four axes. It can be used when connecting stepping motors and SERVOPACKs in a network.

8.2 External Appearance and Configuration

8.2.1 External Appearance



8.2.2 I/O and Status Indication

The LED lamp status or the combination of LED lamp status indicates the MTP2910 Module status.

(1) Status Indication 1

(a) LED Indicators

Indicator Name	Indicator Color	Status when ON
RDY	Green	The microprocessor for control is operating normally.
M_ERR	Red	Lights up or flashes at occurrence of failure.
CN	Green	MECHATROLINK-III connection is established.
ER	Red	Lights up or flashes at occurrence of MECHATROLINK-III communication error.
LK1	Green	Linked to MECHATROLINK connector CN1.
LK2	Green	Linked to MECHATROLINK connector CN2.

(b) Status Indication Details

Classification	LED Indicator Status						Indication	Meaning
	RDY	M_ERR	CN	ER	LK1	LK2		
Normal Status	○	●	–	–	–	–	Hardware reset status	If this state remains unchanged 10 seconds after power-on, there is a hardware failure.
	○	○	–	–	–	–	Initialization in progress	
	●	○	–	–	–	–	Normally executing	Normal
Error Status	○	●	–	–	–	–	Occurrence of serious failure	An error was detected by the watchdog timer.
	○	★	–	–	–	–	The number of flashes indicates the type of hardware error: 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error 6: Communication ASIC diagnostic error	An error was detected during self-diagnosis.
	●	★	–	–	–	–	The number of flashes indicates the type of software error. 2: Transmission cycle setting error 3: Station address setting error 4: Watchdog timeout	An error was detected in the software.
Alarm	●	★	–	–	–	–	I/O error	An I/O error was detected.
MECHATROLINK-III Communications	●	○	–	–	●	–	LINK1 busy	Communication with LINK1 enabled
	●	○	–	–	–	●	LINK 2 busy	Communication with LINK 2 enabled
	●	○	○	–	–	–	Connection not established	Connection to the master device is not established.
	●	○	★	–	–	–	Axis 1 or 2 and Axis 3 or 4 are set to be used, but the connection is established only for Axis 1 or 2 to be used.	The connection to the master device is established.
			☆				Axis 1 or 2 and Axis 3 or 4 are set to be used, but the connection is established only for Axis 3 or 4 to be used.	
			●				Axis 1 or 2 is set to be used, and the connection is established for Axis 1 or 2 to be used.	
							Axis 3 or 4 is set to be used, and the connection is established for Axis 3 or 4 to be used.	
							Axis 1 or 2 and Axis 3 or 4 are set to be used, and the connection is established for both axes to be used.	
	●	○	–	●	–	–	Occurrence of communication error	A communication error occurred at Axis 1, 2, 3, or 4.

Note: ○: Unlit, ●: Lit, ★: Flashes, ☆: Series of two flashes, –: Not specified.

(2) Status Indication 2

(a) LED Indicators

RUN ○ ○ ERR

Name	Color	Status when ON	Status when OFF
RUN	Green	Normally operating	Being stopped
ERR	Red	Malfunction occurs	Normally operating

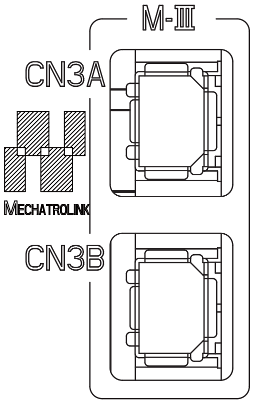
(b) Status Indication Details

Classification	LED Indicator Status		Indication	Troubleshooting
	RUN	ERR		
Initial Status	○	●	Power ON	Indicates the MTP2910 Module status when the power turns ON. The ERR LED goes out when the initialization process starts. If this state remains unchanged, module failure is occurring. Replace the Module.
Normal Status	●	○	Normally operating	The MTP2910 Module is operating normally to output pulses.
	★	○	CPU STOP	The CPU in stop status. Execute CPU RUN operation.
Error Status	○	★	The number of flashes indicates the type of hardware error: 2: RAM diagnostic error 3: ROM diagnostic error 4: CPU function diagnostic error 5: FPU function diagnostic error 6: Shared memory diagnostic error	MTP2910 Module hardware error. Replace the Module.
	★	★	The number of flashes indicates the type of software error: 2: Watchdog timeout 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 inhibit exception 9: Slot FPU inhibit exception	MTP2910 Module software error. Replace the Module.

Note: ○: Unlit, ●: Lit, ★: Flashes, –: Not specified

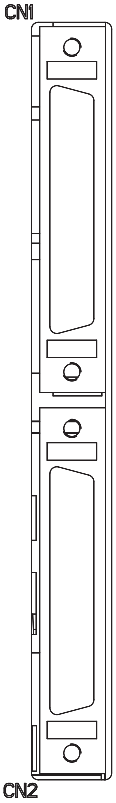
8.2.3 MECHATROLINK-III Connectors

Connect the MECHATROLINK-III cable.



8.2.4 I/O Connectors

Connect an MTP2910 Module and external I/O signals with I/O cables.

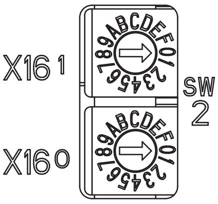


8.2.5 Station Number Selection Switch

Set the MECHATROLINK-III station number.

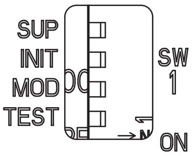
The setting range is 3 to EF (hexadecimal).

When multiple modules are connected, make sure there is no duplication of station numbers.

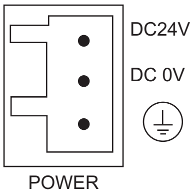


8.2.6 Operation Switch

Select the CPU operating condition when the power is turned on.



8.2.7 External Wiring Terminals



Terminal Name	Function
DC 24 V	+24 VDC
DC 0 V	0 VDC
FG	Protective grounding terminal

8.3 Mounting an MTP2910 Module

8.3.1 Method

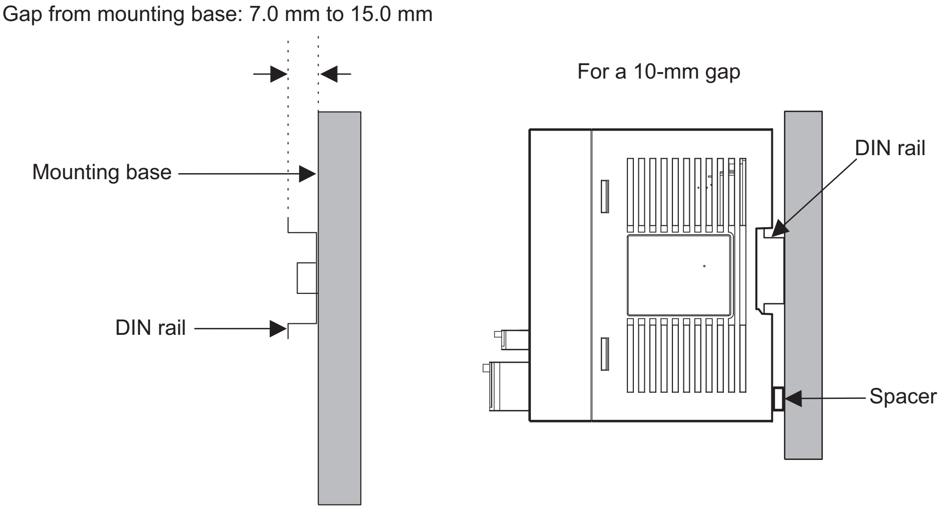
There are two methods for mounting an MTP2910 Module.

- Using DIN rail (standard)
- Using screws

(1) DIN Rail Mounting

(a) DIN Rails and Spacer

Several types of DIN rails are available: with 7-mm to 15-mm gap from the mounting base as shown in the following diagram. If mounting an MTP2910 Module using DIN rail with 10 mm gap, install a spacer on the rear of the MTP2910 Module near the bottom to protect the MTP2910 Module from vibration and shock.

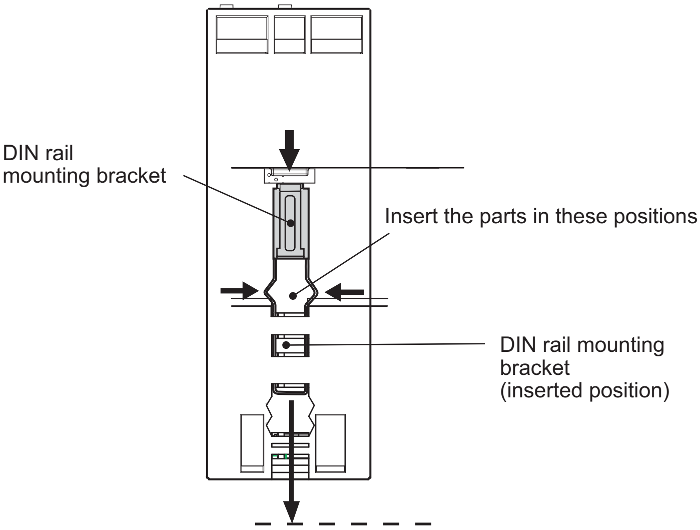


(b) Procedure for Mounting to DIN Rail

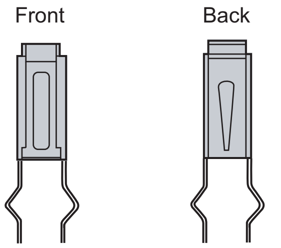
Use the following procedure to attach the DIN rail mounting parts to the MTP2910 Module and then mount the MTP2910 Module to the DIN rail.

1. Insert the DIN rails to the dotted line in the two slots on the rear of the MTP2910 Module as shown in the following figure.

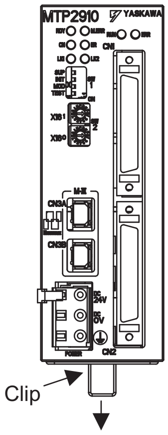
MTP2910 Module Rear Side



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

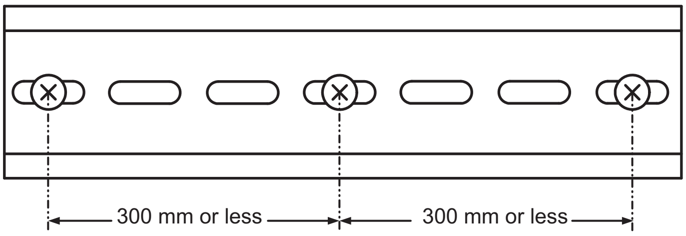


2. Pull the DIN rail mounting clips down to release them.



■ Fixing a DIN Rail

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



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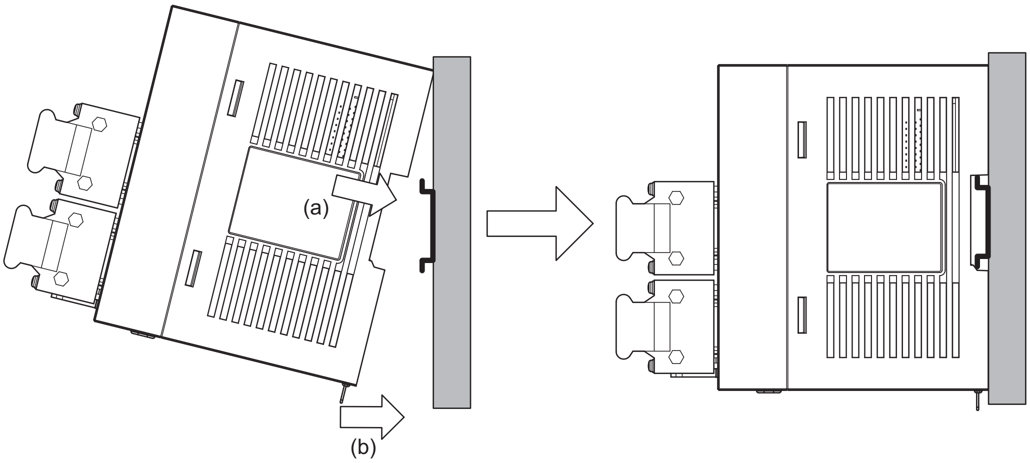
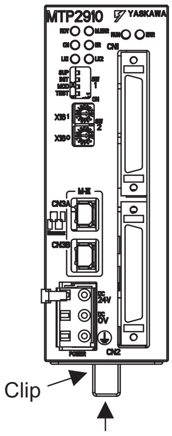
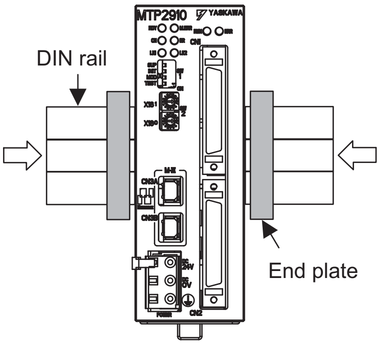
3. Hook the MTP2910 Module to the top of the DIN rail (a), and then push the MTP2910 Module towards the mounting base to secure it in place (b).



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



5. Place end plates on both sides of the MTP2910 Module to secure it to the DIN rail.

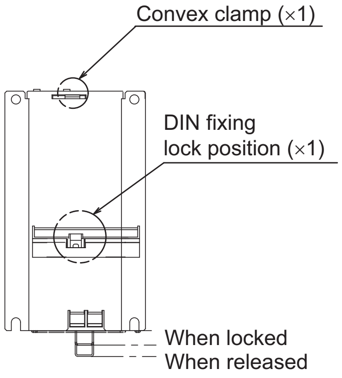


This completes the installation procedure.

(2) Screwed Method

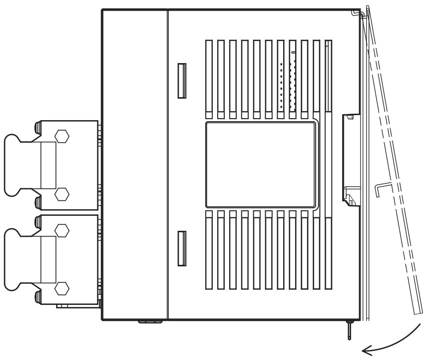
Use a panel mounting clamp model JEPMC-OP2400-E (optional) by the following procedure to mount an MTP2910 Module on the panel.

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

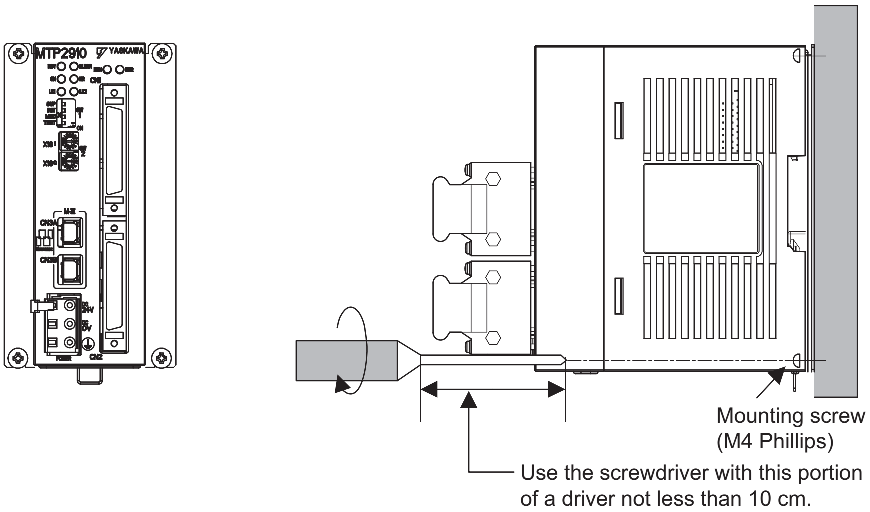


Attachment for mounting panel

2. Insert one convex portion at the top of the panel mounting clamp into the hole of the MTP2910 Module case.



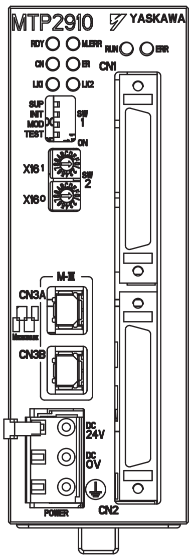
3. Push the clamp as indicated by an arrow above onto the MTP2910 Module case and use the DIN fixing lock to fix MTP2910 Module.
4. Push the MTP2910 Module mounted clamp onto the mounting plate as shown in the figure below, and use four mounting screws to firmly secure the clamp.



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

8.3.2 Mount Direction

Be sure to mount the MTP2910 Module from the front using a DIN rail or panel mounting clamp.

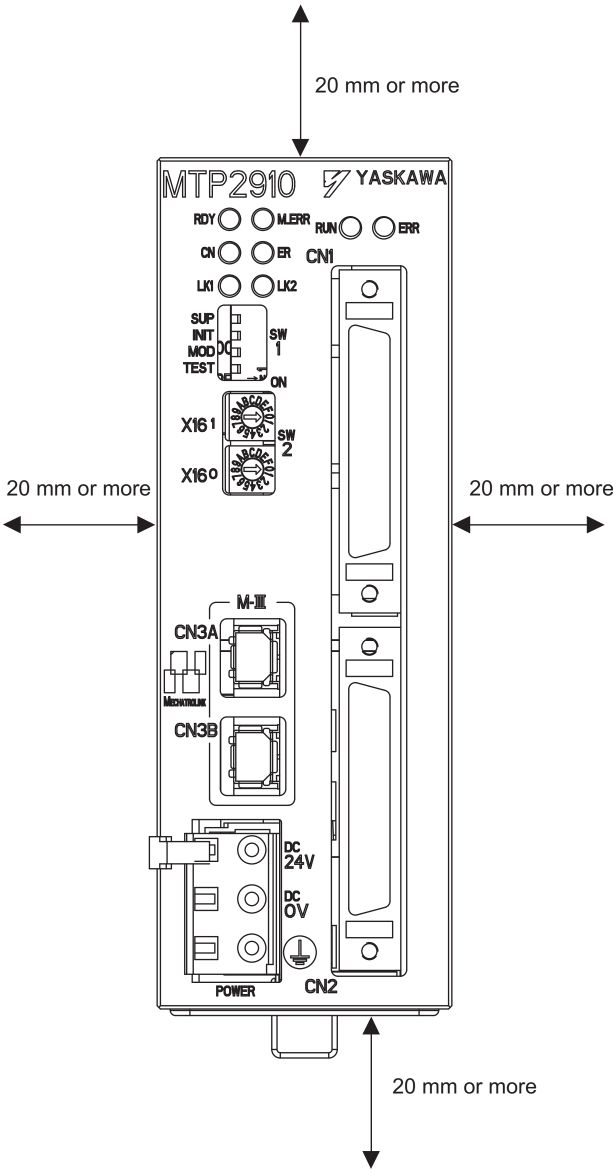


View from front,
when attached

8.3.3 Space Required for Mounting an MTP2910 Module

Install MTP2910 Module so that enough space is left around it as shown in the following figure:

- Mount condition
  - Vertical and horizontal directions: 20 mm or more



8.4 Specifications

8.4.1 General Specifications

The general specifications for MTP2910 Module are shown below.

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% RH (with no condensation)
	Ambient Storage Humidity	5% to 95% RH (with no condensation)
	Pollution Level	Pollution level 1 (conforming to JIS B3501)
	Corrosive Gas	There must be no flammable or corrosive gas.
	Operating Altitude	2,000 m above sea level or lower
Mechanical Operating Conditions	Vibration Resistance	Conforming to JIS B3502 • 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 B3502 Peak acceleration of 147 m/s^2 (15 G) twice for 11 ms each in X, Y, and Z directions
Electrical Operating Conditions	Noise Resistance	Conforming to EN 61000-6-2, EN 55011 (Group1, ClassA)
Installation Requirements	Ground	Ground to 100 Ω max.
	Cooling Method	Natural cooling
	Mounting Direction	See *8.3 Mounting an MTP2910 Module*.
Compliant Standards (Certification process is under way to obtain the certificate.)		UL, CSA, CE

8.4.2 Performance Specifications

(1) Hardware Specifications

The hardware specifications of the MTP2910 Module are shown below.

Item			Specifications
Name			Pulse output module
Abbreviated Name			MTP2910
Model			JEPMC-MTP2910-E
Power Supply Section (POWER-CN)		Input Voltage	24 VDC (±20%)
		Current Consumption	0.5 A max.
Communication Interface (CN3A/CN3B)		Communication Standard	MECHATROLINK-III
Number of Controlled Axes			4
I/O Section (CN1/CN2)	Pulse Output	Methods	CW/CCW, Sign, and Phase A/B
		Max. Frequency	4 Mpps (million pulses per second) when using CW/CCW or Sign method 1 Mpps (million pulses per second) when using Phase A/B method (before multiplication)
		Interface	5-V differential output
		Other Functions	Polarity can be switched between positive logic and negative logic by setting the parameter
	Digital Inputs		5-point × 4 channels, source mode input DI_0: Independent input (individual power supply) 24 V ±10% / 4.1 mA, 12 V ±10% / 10.9 mA, 5 V ±10% / 3.9 mA DI_1 to 4: Common power supply 24 V ±10% / 4.1 mA <Assignment Example> DI_0 : Zero point/general-purpose Note: When using DI_0 as the zero-point return signal, the pulse width of 2 ms or more is required. DI_1 : Dog signal/general-purpose DI_2 : Limit 1/general-purpose DI_3: Limit 2/general-purpose DI_4: General-purpose
	Digital Outputs		4-point × 4 channels, open collector (sink mode output) (24 V/100 mA) <Assignment Example> DO_0: Excitation ON DO_1: General-purpose DO_2: General-purpose DO_3: General-purpose

Note: Use a 24-VDC power supply and external input power supply with double or reinforced insulation.

(2) Switch Specifications

The specifications of the switches provided on the MTP2910 Module are as follows.

(a) SW1

The SW1 switch sets the CPU operation mode at power-on.

Note: The SW1 setting is read at power-on. If the setting is changed after power-on, the descriptions in the table below will not be applicable.

Device Code	Name	Setting	Operation	Initial Setting	Remarks
S1-4	SUP	ON	SYSTEM load	OFF	ON: The MTP2910 Module will start running in a mode where the firmware version can be upgraded.
		OFF	Normal run		
S1-3	INIT	ON	Parameter initialization	OFF	• S1-2 set to OFF and S1-3 set to ON: The parameters will be initialized to the factory defaults at startup. However, the settings written in the nonvolatile memory will be kept unchanged. • Both S1-2 and S1-3 set to ON: Both the parameters and nonvolatile memory will be initialized to the factory defaults.
		OFF	Normal run		
S1-2	MODE	ON	Function selection	OFF	Used in combination with S1-3 setting to initialize the nonvolatile memory.
		OFF			
S1-1	TEST	ON	Reserved by system	OFF	Used for final adjustment before shipment
		OFF			

(b) SW2

The SW2 switch sets the station address of MTP2910 Module as a slave device of the MECHATROLINK-III network.

Name	Setting Range	Operation	Initial Setting	Remarks
$\times 16^1$	0 to F	Station address (Upper digit)	0	F cannot be used.
$\times 16^0$	0 to F	Station address (Lower digit)	3	–

Note: To use both CH1 and CH2, set the sub address “00h” and “01h” in addition to the station address.
Example: If the station address is set to 03h (S2 = 0h, S3 = 3h), the station address designation from the master device is 0003h for CH1, and 0103h for CH2.

(3) Reference Pulse Forms

The MTP2910 Module supports three reference pulse output methods, all of which are 5-V differential output.

- CW/CCW
- Sign
- Phase A/B

The details on each method are described below.

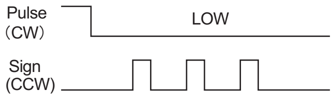
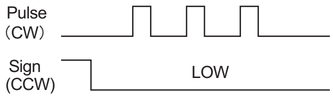
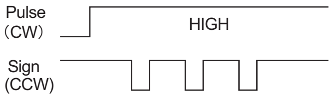
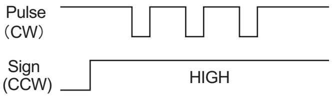
Note: Select the method and the polarity using the parameters. Refer to *8.6 Parameter Settings* for details.

(a) CW/CCW Method

CW pulse: Reverse rotation reference pulse for the motor

CCW pulse: Forward rotation reference pulse for the motor

The table below shows the reference pulse output forms with different polarities.

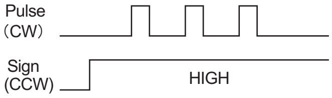
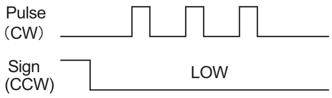
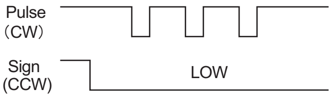
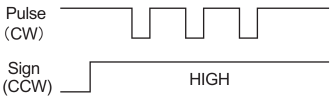
Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

(b) Sign Method

CW pulse: Reference pulse

CCW pulse: Sign (Forward rotation at High level, and reverse rotation at Low level)

The table below shows the reference pulse output forms with different polarities.

Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

(c) Pulses A/B Method

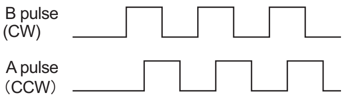
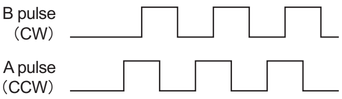
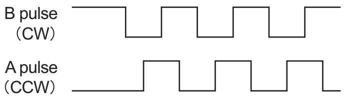
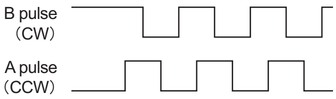
CW pulse: Pulse B

CCW pulse: Pulse A

When the phase of the pulse B is advanced from pulse A: Forward rotation reference pulse

When the phase of the pulse B is lagged behind pulse A: Reverse rotation reference pulse

The table below shows the reference pulse output forms with different polarities.

Polarity	Forward Rotation Reference for Motor (CCW)	Reverse Rotation Reference for Motor (CW)
Positive Logic		
Negative Logic		

8.4.3 MECHATROLINK-III Communication Specifications

The general specifications of MECHATROLINK-III communications are given below.

Item	Specifications	
Communications Protocol	MECHATROLINK-III	
Classification	Slave[*1]	
Station Address Setting Range	03 to EF (hexadecimal)	
Transmission Speed	100 Mbps	
Supported Transmission Cycles	0.125[*2] ms, 0.25 ms, 0.5 ms, 1 ms to 8 ms (granularity: 0.5 ms)	
Number of Bytes per Station for Cyclic Communications	64 bytes	
Supported Communication Methods	Cyclic communications, event-driven communications, message communications	
Supported Profile	Standard I/O profile	
Supported Commands	Cyclic communications	NOP, PRM_RD, PRM_WR[*3], ID_RD, CONFIG, ALM_RD, ALM_CLR, SYNC_SET[*1], CONNECT[*1], DISCONNECT, PPRM_RD, PPRM_WR[*3], MEM_RD, MEM_WR[*3], DATA_RWA, DATA_RWS
	Event-driven communications	NOP, ID_RD, CONNECT[*1], DISCONNECT, MEM_RD
	Message communications	Read memory content, Write memory content, Read memory content: non contiguous, Write memory content: non contiguous, Read maximum message size

* 1. Setting the parameter No. 0300 (***Selection of Operation Modes***) to 0 (Normal running) makes the MTP2910 Module a multi-slave device that uses the command and response areas for 2 lines. When the parameter No.0300 is set to 0, set the same value in COM_TIM (communication cycle) in the command data for 2 axes. The MTP2910 Module starts synchronous communications by the first received CONNECT command (SYNCMODE = 1) or SYNC_SET command.

* 2. Set the communication cycle to 250 µs or more when the transmission cycle is set to 125 µs.

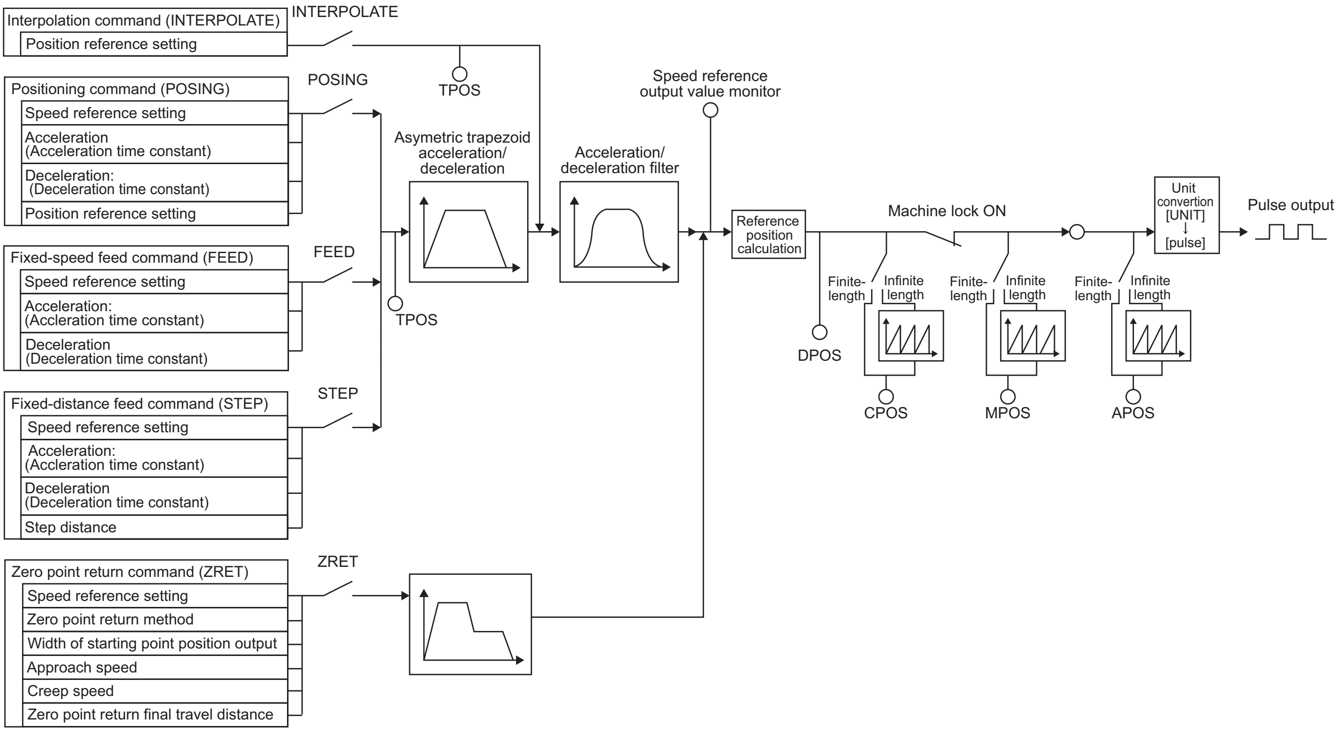
* 3. The parameters written by the PPM_WR, PPRM_WR, MEM_WR commands, or tool (IOWin) to the volatile or nonvolatile memory will be validated after the CONFIG command is executed.

IMPORTANT

The pulse output control cycle is 0.5 ms. When the communication cycle is set to 0.25 ms, the response data will be refreshed every 0.5 ms.

8.4.4 MTP2910 Module Position Control Block Diagram

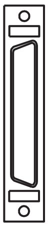
The following block diagram shows the position control using a MTP2910 Module.



8.5 External I/O Signals and Connection Examples

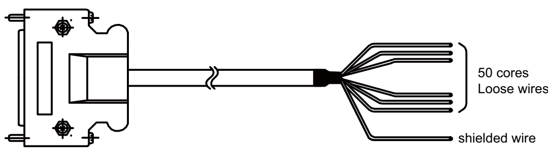
8.5.1 Specifications of Connection Cables and Connectors

(1) Connectors



Name	Connector Name	No. of Pins	Connector Model		Manufacturer
			Module	Cable	
External I/O Connectors	CN1, CN2	50	10250-52A3PL	• Connector: 10150-3000VE • Shell: : 10350-52A0-008 (Screw lock) : 10350-52F0-008 (One-touch-lock)	Sumitomo 3M Limited

(2) Standard Cable Models and Appearance

Name	Model	Length	Appearance (JEPMC-W2064-□□)
Cable for MTP2910 Module	JEPMC-W2064-A5-E	0.5 m	
	JEPMC-W2064-10-E	1.0 m	
	JEPMC-W2064-30-E	3.0 m	

(3) Standard Cable Wiring Chart

The wiring chart of the loose wire of the JEPMC-W2064-□□-E standard cable is shown below.

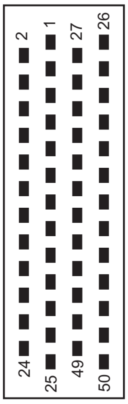
Terminal No.	Dot Mark	Wire Color	Dot Mark	Terminal No.
1	-	Orange	–	26
2	-	Gray	–	27
3	-	White	–	28
4	-	Yellow	–	29
5	-	Pink	–	30
6	- -	Orange	– –	31
7	- -	Gray	– –	32
8	- -	White	– –	33
9	- -	Yellow	– –	34
10	- -	Pink	– –	35
11	- - -	Orange	– – –	36
12	- - -	Gray	– – –	37
13	- - -	White	– – –	38
14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

8.5.2 Connector Pin Layouts

The pin layout and each terminal function of the CN1 and CN2 connectors of the MTP2910 Modules are described below.

(1) Connector CN1

(a) Pin Layout on Connection Side



		1	(NC)			26	(NC)
2	CW1+	3	CW1-	27	CCW1+	28	CCW1-
4	SG	5	DI1_0+	29	SG	30	(NC)
6	DI1_0-(24V)	7	DI1_0-(5/12V)	31	DO1_0	32	DO1_0R
8	DI1_1	9	DI1_2	33	DO1_1	34	DO1_1R
10	DI1_3	11	DI1_4	35	DO1_2	36	DO1_3
12	(NC)	13	CW2+	37	(NC)	38	CCW2+
14	CW2-	15	SG	39	CCW2-	40	SG
16	DI2_0+	17	DI2_0-(24V)	41	(NC)	42	DO2_0
18	DI2_0-(5/12V)	19	DI2_1	43	DO2_0R	44	DO2_1
20	DI2_2	21	DI2_3	45	DO2_1R	46	DO2_2
22	DI2_4	23	24V_1	47	DO2_3	48	24V_1
24	0V_1	25	(NC)	49	0V_1	50	(NC)

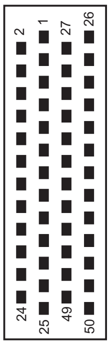
(b) Terminal Functions

No.	Signal Name*	I/O	Function	No.	Signal Name*	I/O	Function
1	(NC)	–	–	26	(NC)	–	–
2	CW1+	O	CH1 CW output (+)	27	CCW1+	O	CH1 CCW output (+)
3	CW1-	O	CH1 CW output (–)	28	CCW1-	O	CH1 CCW output (–)
4	SG	–	A ground (Shared with GND in the board)	29	SG	–	A ground (Shared with GND in the board)
5	DI1_0+	I	CH1 input _0 (+)	30	(NC)	–	–
6	DI1_0-(24V)	I	CH1 input _0 (–) 24 V	31	DO1_0	O	CH1 DO output _0
7	DI1_0-(5/12V)	I	CH1 input _0 (–) 5 V/12 V	32	DO1_0R	O	CH1 DO output _0 (with 1.5 kΩ)
8	DI1_1	I	CH1 input _1	33	DO1_1	O	CH1 DO output _1
9	DI1_2	I	CH1 input _2	34	DO1_1R	O	CH1 DO output _1 (with 1.5 kΩ)
10	DI1_3	I	CH1 input _3	35	DO1_2	O	CH1 DO output _2
11	DI1_4	I	CH1 input _4	36	DO1_3	O	CH1 DO output _3
12	(NC)	–	–	37	(NC)	–	–
13	CW2+	O	CH2 CW output (+)	38	CCW2+	O	CH2 CCW output (+)
14	CW2-	O	CH2 CW output (–)	39	CCW2-	O	CH2 CCW output (–)
15	SG	–	A ground (Shared with GND in the board)	40	SG	–	A ground (Shared with GND in the board)
16	DI2_0+	I	CH2 input _0 (+)	41	(NC)	–	–
17	DI2_0-(24V)	I	CH2 input _0 (–) 24 V	42	DO2_0	O	CH2 DO output _0
18	DI2_0-(5/12V)	I	CH2 input _0 (–) 5 V/12 V	43	DO2_0R	O	CH2 DO output _0 (with 1.5 kΩ)
19	DI2_1	I	CH2 input _1	44	DO2_1	O	CH2 DO output _1
20	DI2_2	I	CH2 input _2	45	DO2_1R	O	CH2 DO output _1 (with 1.5 kΩ)
21	DI2_3	I	CH2 input _3	46	DO2_2	O	CH2 DO output _2
22	DI2_4	I	CH2 input _4	47	DO2_3	O	CH2 DO output _3
23	24V_1	I	I/O power supply input (24 V)	48	24V_1	I	I/O power supply input (24 V)
24	0V_1	I	I/O power supply input (0 V)	49	0V_1	I	I/O power supply input (0 V)
25	(NC)	–	–	50	(NC)	–	–

* Depending on the output mode, the signal name (pulse output signal name) CCW in the above tables can be Sign or Phase-A, and CW can be Pulse or Phase-B.
Refer to *8.4.2 (3) Reference Pulse Forms* for the relation between each output mode and the signals.

(2) Connector CN2

(a) Pin Layout on Connection Side



		1	(NC)			26	(NC)
2	CW3+			27	CCW3+		
		3	CW3-			28	CCW3-
4	SG			29	SG		
		5	DI3_0+			30	(NC)
6	DI3_0-(24V)			31	DO3_0		
		7	DI3_0-(5/12V)			32	DO3_0R
8	DI3_1			33	DO3_1		
		9	DI3_2			34	DO3_1R
10	DI3_3			35	DO3_2		
		11	DI3_4			36	DO3_3
12	(NC)			37	(NC)		
		13	CW4+			38	CCW4+
14	CW4-			39	CCW4-		
		15	SG			40	SG
16	DI4_0+			41	(NC)		
		17	DI4_0-(24V)			42	DO4_0
18	DI4_0-(5/12V)			43	DO4_0R		
		19	DI4_1			44	DO4_1
20	DI4_2			45	DO4_1R		
		21	DI4_3			46	DO4_2
22	DI4_4			47	DO4_3		
		23	24V_2			48	24V_2
24	0V_2			49	0V_2		
		25	(NC)			50	(NC)

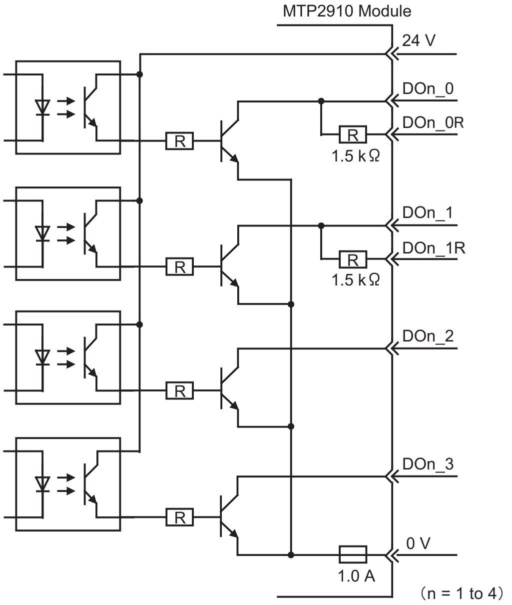
(b) Terminal Functions

No.	Signal Name*	I/O	Function	No.	Signal Name*	I/O	Function
1	(NC)	–	–	26	(NC)	–	–
2	CW3+	O	CH3 CW output (+)	27	CCW3+	O	CH3 CCW output (+)
3	CW3-	O	CH3 CW output (–)	28	CCW3-	O	CH3 CCW output (–)
4	SG	–	A ground (Shared with GND in the board)	29	SG	–	A ground (Shared with GND in the board)
5	DI3_0+	I	CH3 input _0 (+)	30	(NC)	–	–
6	DI3_0-(24V)	I	CH3 input _0 (–) 24 V	31	DO3_0	O	CH3 DO output _0
7	DI3_0-(5/12V)	I	CH3 input _0 (–) 5 V/12 V	32	DO3_0R	O	CH3 DO output _0 (with 1.5 kΩ)
8	DI3_1	I	CH3 input _1	33	DO3_1	O	CH3 DO output _1
9	DI3_2	I	CH3 input _2	34	DO3_1R	O	CH3 DO output_1 (with 1.5 kΩ)
10	DI3_3	I	CH3 input _3	35	DO3_2	O	CH3 DO output _2
11	DI3_4	I	CH input _4	36	DO3_3	O	CH3 DO output _3
12	(NC)	–	–	37	(NC)	–	–
13	CW4+	O	CH4 CW output (+)	38	CCW4+	O	CH4 CCW output (+)
14	CW4-	O	CH4 CW output (–)	39	CCW4-	O	CH4 CCW output (–)
15	SG	–	A ground (Shared with GND in the board)	40	SG	–	A ground (Shared with GND in the board)
16	DI4_0+	I	CH4 input _0 (+)	41	(NC)	–	–
17	DI4_0-(24V)	I	CH4 input _0 (–) 24 V	42	DO4_0	O	CH4 DO output _0
18	DI4_0-(5/12V)	I	CH4 input _0 ((–) 5 V/12 V	43	DO4_0R	O	CH4 DO output _0 (with 1.5 kΩ)
19	DI4_1	I	CH4 input _1	44	DO4_1	O	CH4 DO output _1
20	DI4_2	I	CH4 input _2	45	DO4_1R	O	CH4 DO output _1 (with 1.5 kΩ)
21	DI4_3	I	CH4 input _3	46	DO4_2	O	CH4 DO output _2
22	DI4_4	I	CH4 input _4	47	DO4_3	O	CH4 DO output _3
23	24V_1	I	I/O power supply input (24 V)	48	24V_1	I	I/O power supply input (24 V)
24	0V_1	I	I/O power supply input (0 V)	49	0V_1	I	I/O power supply input (0 V)
25	(NC)	–	–	50	(NC)	–	–

* Depending on the output mode, the signal name (pulse output signal name) CCW in the above tables can be Sign or Phase-A, and CW can be Pulse or Phase-B.
Refer to *8.4.2 (3) Reference Pulse Forms* for the relation between each output mode and the signals.

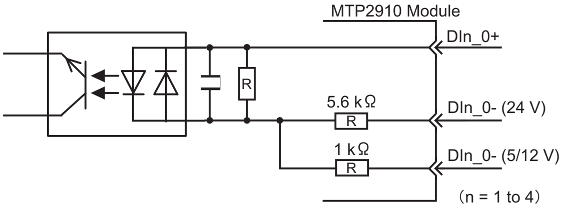
8.5.3 Circuit Configuration and Connection Examples

(1) Digital Output Circuit (DOn_0 to 3)

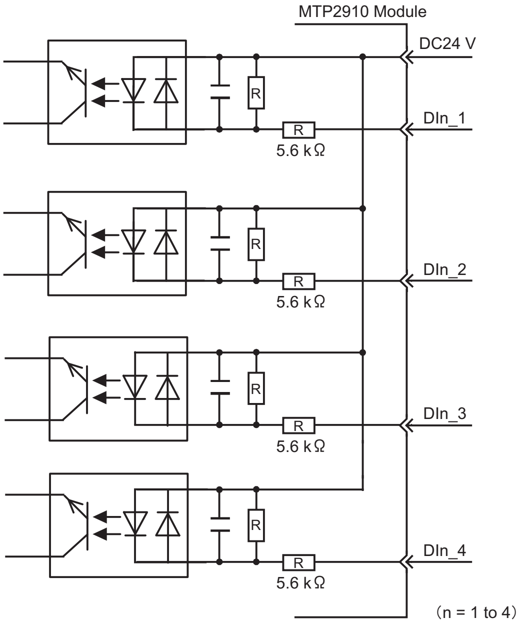


Note: The eight digital output signals of CH1 and CH2 for CN1 share one 0V power terminal as the reference potential (0V) inside CN1. The eight digital output signals of CH3 and CH4 for CN2 also share one 0V power terminal inside CN2. However, the terminals of CN1 and CN2 are not connected internally.

(2) Digital Input Circuit (DIn_0)



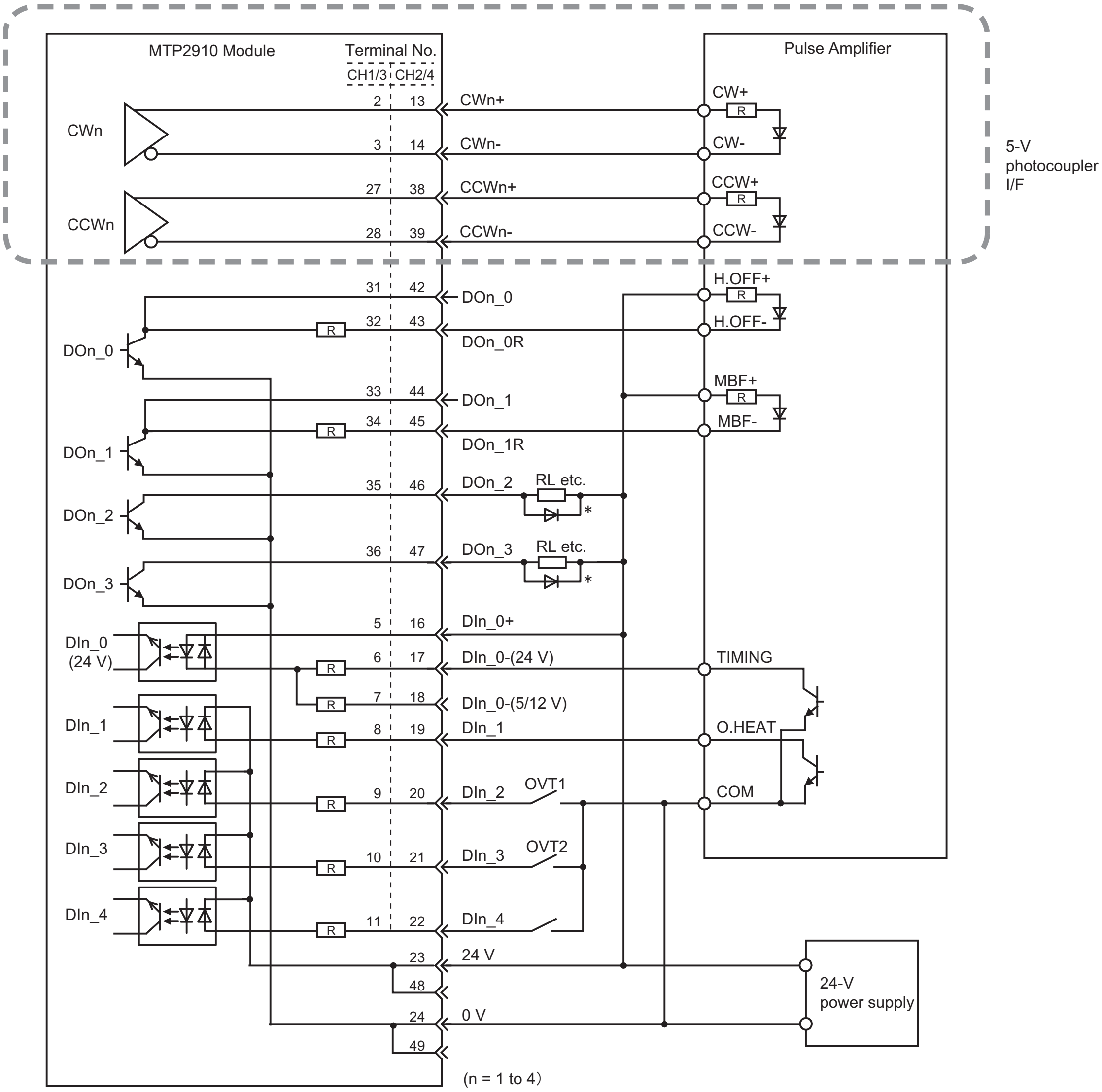
(3) Digital Input Circuit (DIn_1 to 4)



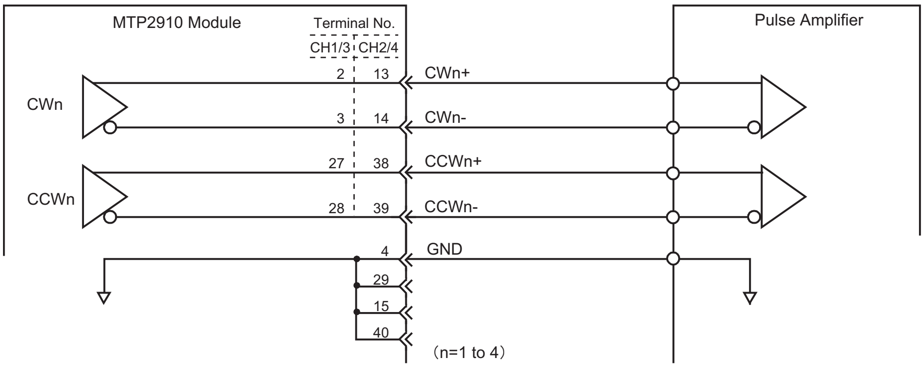
Note: The eight digital output signals of CH1 and CH2 for CN1 share one 0V power terminal as the reference potential (0V) inside CN1. The eight digital output signals of CH3 and CH4 for CN2 also share one 0V power terminal inside CN2. However, the terminals of CN1 and CN2 are not connected internally.

(4) Connection Example

Note: The area enclosed with a broken line will be changed as shown in • *Example of Connection to Line Receiver I/F* when using a line receiver I/F.



- Example of Connection to Line Receiver I/F

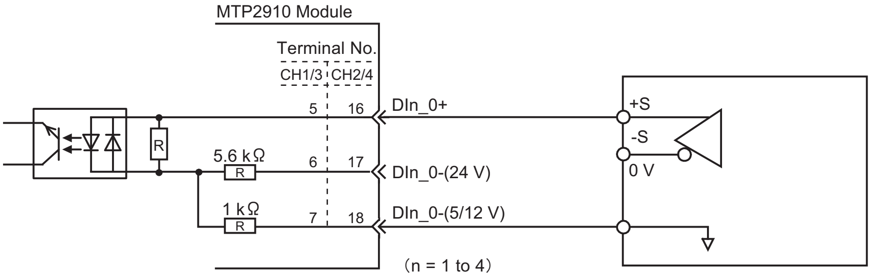


* When connecting an induction load, connect a flywheel diode in parallel with the induction load.

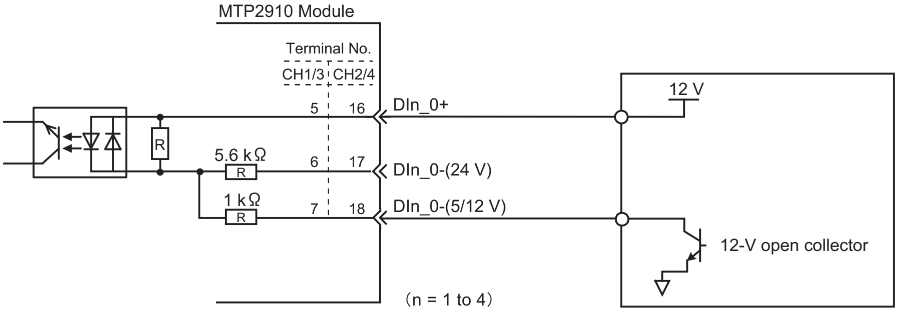
(5) DIn_0 Connection Example

The DIn_0 can be connected to not only a 24-V power supply but also to a 5-V differential input and a 12-V open collector.

(a) Example of Connection to 5 V Differential Input



(b) Example of Connection to 12 V Open Collector Input



8.6 Parameter Settings

8.6.1 Parameter List

The parameters required to set for the MTP2910 Module are listed below.

These parameters can be set using the IOWin. For details, refer to *2.5.1 Editing Parameters*.

Parameter No. (Hexadecimal) n = Axis No.	Data Size (Number of bytes)	Parameter Name	Description
0n00	2	Selection of operation modes	Specify the application method of the axis.
0n01	2	Function selection flag 1	Specify the following items: • Axis type • Forward/reverse software limit enabled/disabled • Deceleration LS reversal
0n04	2	Reference unit selection	Specify the unit for reference.
0n05	2	Number of digits below decimal point	Specify the number of digits below the decimal point for the minimum reference unit.
0n06	4	Travel distance per machine rotation	Specify the load travel amount per load axis rotation.
0n08	2	Servo motor gear ratio	Specify the value “m” when the load axis rotates n times while the motor axis rotates m times.
0n09	2	Machine gear ratio	Specify the value “n” when the load axis rotates n times while the motor axis rotates m times.
0n0A	4	Infinite length axis reset position (POSMAX)	Set the position that will be used to reset the number of POSMAX turns when the bit 0 (Axis type) of the parameter No. 0n01 is set to 1 (Infinite length axis).
0n0C	4	Positive software limit value	Specify the position where the controller will detect the software limit in the positive direction.
0n0E	4	Negative software limit value	Specify the position where the controller will detect the software limit in the negative direction.
0n14	2	Hardware signal selection 1	Specify the reference pulse polarity and output method.
0n15	2	Hardware signal selection 2	Specify the following items: • Deceleration LS signal • Zero point return forward/reverse limit signal • Excitation ON output signal polarity
0n19	2	Pulse output maximum frequency	Set the maximum output frequency for the reference pulse.
0n22	2	Rated motor speed	Set the rated motor speed.
0n24	4	Number of pulses per motor rotation	Set the number of pulses per motor rotation.
0n26	2	Function setting 1	Specify the following items: • Speed units • Acceleration/deceleration units • Filter type
0n28	4	NEAR signal output width	Specify the range to be used to detect the position proximity.
0n2A	4	Straight line acceleration/acceleration time constant	Set the linear acceleration rate or linear acceleration time constant.
0n2C	4	Straight line deceleration/deceleration time constant	Set the linear deceleration rate or linear deceleration time constant.

(cont'd)

Parameter No. (Hexadecimal) n = Axis No.	Data Size (Number of bytes)	Parameter Name	Description
0n2E	2	Filter time constant	Set the acceleration/deceleration filter time constant.
0n2F	2	Bias speed for index deceleration/acceleration filter	Set the bias speed for the exponential acceleration/ deceleration filter.
0n30	2	Zero point return method	Specify the zero point return method.
0n31	2	Width of starting point position output	Set the width at which the zero point position bit turns ON.
0n32	4	Approach speed	Set the approach speed for a zero point return operation after having passed the deceleration LS.
0n34	4	Creep rate	Set the creep speed for a zero point return operation for the axis to reach the zero point position after the zero point signal is detected.
0n36	4	Zero point return travel distance	Set the distance from where the zero point signal is detected to the zero point position.
0n38	4	Step travel distance	Set the movement amount for when the **Motion Command** is set to 8 (STEP).
0n3A	4	Zero point position in machine coordinate system offset	Set the offset to shift the machine coordinate system.
0n3C	4	Work Coordinate System Offset	Set the offset to shift the work coordinate system.
0n3E	4	Number of POSMAX turns presetting data	Set the value to reset the number of POSMAX turns when the POSMAX preset bit (bit 6: **Run Command Setting**) is set to 1 (ON).

8.6.2 Parameter Details

(1) Selection of Operation Mode

<table>
<tr><td colspan="2" rowspan="2">Selection of operation modes</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n00
n = Axis No.</td><td>2</td><td>0 and 1</td><td>–</td><td>0</td></tr>
<tr><td>Description</td><td colspan="6">Specify the application method of the axis.
0: Normal running (default)
Use this setting when actually using an axis.
1: Axis unused
No control will be performed for an axis set to this mode, and the response data will not be updated. If an axis is changed from normal running mode to this mode, the values in the response data will be held at the current status except for the **Run Status**, which will be cleared to zeros.
Set any axis that is not being used to this mode (Axis unused) to reduce the processing time.</td></tr>
</table>

(2) Function Selection Flag 1

<table>
<tr><td colspan="3" rowspan="2">Function selection flag 1</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n01
n = Axis No.</td><td>2</td><td>–</td><td>–</td><td>0000H</td></tr>
<tr><td rowspan="4">Description</td><td>Bit 0</td><td colspan="6">Axis type selection
Set whether or not there is a limit on controlled axis travel.
0: Finite length axis (default); The axis will have limited movement. The software limit function is enabled.
1: Infinite length axis; The axis will have unlimited movement. The software limit function is disabled.
If an infinite length axis is set, the position information will be reset each time the position exceeds the value set for ***Infinite Length Axis Reset Position (POSMAX)*** (parameter No.0n0A).</td></tr>
<tr><td>Bit 1</td><td colspan="6">Forward software limit enabled/disabled
Set whether or not to use the software limit function in the positive direction.
0: Disabled (default)
1: Enabled
Set the software limit in the ***Forward Software Limit*** (parameter No.0n0C).
This setting is disabled if bit 0 (Axis type selection) is set to 1 (Infinite length axis.)
The software limit function is enabled only after completing a zero point return or zero point setting operation (bit 5 of the **Position Management Status** is ON).</td></tr>
<tr><td>Bit 2</td><td colspan="6">Reverse software limit enabled/disabled
Set whether or not to use the software limit function in the negative direction.
0: Disabled (default)
1: Enabled
Set the software limit in the ***Reverse Software Limit*** (parameter No.0n0E).
This setting is disabled if bit 0 (Axis type selection) is set to 1 (Infinite length axis.).
The software limit function is enabled only after completing a zero point return or zero point setting operation (bit 5 of the **Position Management Status** is ON).</td></tr>
<tr><td>Bit 5</td><td colspan="6">Deceleration LS reversal
Set whether or not to reverse the polarity of DI_1 signal used as DEC1.
0: Not reverse (default)
1: Reverse (The zero point return deceleration LS signal (bit 8: **Function Setting 3**) will not be reversed.)</td></tr>
</table>

(3) Reference Unit Selection

Reference unit selection	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n04 n = Axis No.	2	0 to 3	–	0
Description	Set the unit for the reference. 0: pulse (electronic gear disabled) 1: mm 2: deg 3: inch The minimum reference unit is determined by this parameter and the parameter No. 0n05 (***Number of Digits below Decimal Point***). If pulse is selected, the electronic gear ratio set in the parameter No. 0n08 and 0n09 will be disabled.				

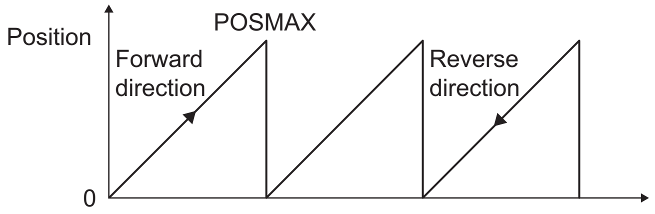
Number of digits below decimal point	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n05 n = Axis No.	2	0 to 5	–	3
Description	Set the number of digits below the decimal point in the reference unit. The minimum reference unit is determined by this parameter and the parameter No. 0n04 (***Reference Unit Selection***). <Example> When the reference unit is set to mm and the number of digits below decimal point is set to 3, a reference unit of 1 will be 0.001 mm. The setting of this parameter is disabled if the reference unit is set to pulse.				

Travel distance per machine rotation	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n06 n = Axis No.	4	1 to 2^{31}-1	Reference unit	10000
Description	Specify the load travel amount per load axis rotation in reference units.				

Servo motor gear ratio	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n08 n = Axis No.	2	1 to 65535	rev (revolutions)	1
Description	Set the gear ratio between the motor and the load. The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft. • Gear ratio at Servomotor: m • Gear ratio at load: n The setting of this parameter is disabled if the parameter No. 0n04 (***Reference Unit Selection***) is set to pulse.				

<table>
<tr><td rowspan="2" colspan="2">Machine gear ratio</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n09
n = Axis No.</td><td>2</td><td>1 to 65535</td><td>rev (revolutions)</td><td>1</td></tr>
<tr><td>Description</td><td colspan="6">Set the gear ratio between the motor and the load.
The following two values are set for a configuration in which the load shaft will turn n times in response to m turns of the motor shaft.
• Gear ratio at Servomotor: m
• Gear ratio at load: n
The setting of this parameter is disabled if the parameter No. 0n04 (***Reference Unit Selection***) is set to pulse.</td></tr>
</table>

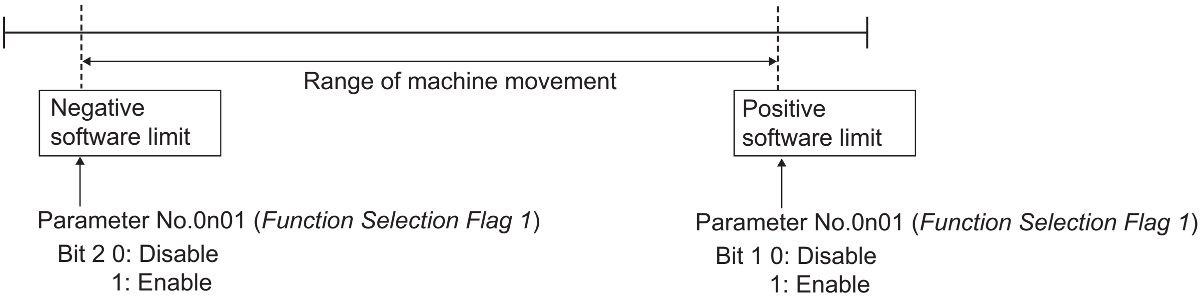
(4) Infinite Length Axis Reset Position (POSMAX)

<table>
<tr><td rowspan="2" colspan="2">No. 10
Infinite length axis reset position (POSMAX)</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n0A
n = Axis No.</td><td>4</td><td>1 to 2^{31}-1</td><td>Reference unit</td><td>360000</td></tr>
<tr><td>Description</td><td colspan="6">Set the reset position when an infinite length axis is set.
Enabled when bit 0 (Axis type selection) of the parameter No. 0n01 is set to 1 (Infinite length axis). The position data for infinite axes is controlled in the range from 0 to POSMAX.
 </td></tr>
</table>

(5) Software Limits

<table>
<tr><td rowspan="2" colspan="2">Positive software limit value</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n0C
n = Axis No.</td><td>4</td><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td><td>$2^{31}-1$</td></tr>
<tr><td>Description</td><td colspan="6">Set the position to be detected for the software limit in the positive direction.
If an axis attempts to move in the positive direction past the position set here, a positive software limit alarm will occur.
Enabled when bit 1 (Forward software limit enabled disabled) of the parameter No. 0n01 is set to 1 (enabled).</td></tr>
<tr><td rowspan="2" colspan="2">Negative software limit value</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n0E
n = Axis No.</td><td>4</td><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td><td>-2^{31}</td></tr>
<tr><td>Description</td><td colspan="6">Set the position to be detected for the software limit in the negative direction.
If an axis attempts to move in the negative direction past the position set here, a negative software limit alarm will occur.
Enabled when bit 2 (Reverse software limit enabled/disabled) of the parameter No. 0n01 is set to 1 (enabled).</td></tr>
</table>

Outline of Software Limit



Note: 1. The software limit function is enabled only after completing a Zero point return or Zero point setting completed (bit 5 of the **Position Management Status** is ON).

2. Refer to *8.8 Software Limit Function* for details.

(6) Hardware Signal Selection 1

Hardware signal selection 1		Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
		0n14 n = Axis No.	2	–	–	0000H
Description	Bit 8	Pulse output signal polarity selection Select the reference pulse polarity. 0: Positive logic (default) 1: Negative logic The reference pulse form to be used is determined by the combination of bit 9 and bit A (Pulse output method selection). Refer to *8.4.2 (3) Reference Pulse Forms* for details.				
	Bits 9 and A	Pulse output method selection Select the reference pulse output method. 00: CW/CCW (default) 01: Sign 10: Phase A/B pulses The reference pulse form to be used is determined by the combination with bit 8 (Pulse output signal polarity selection). Refer to *8.4.2 (3) Reference Pulse Forms* for details.				

(7) Hardware Signal Selection 2

Hardware signal selection 2		Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
		0n15 n = Axis No.	2	–	–	0000H
Description	Bit 0	Deceleration LS signal selection Select the signal to be used as DEC1. 0: Use Zero point return deceleration signal bit (bit 8: **Function Selection 3**) (default) 1: Use DI_1 signal.				
	Bit 1	Zero point return reverse limit signal selection Select the signal to be used as the reverse rotation zone limit signal for zero point return. 0: Use Zero point return reverse LS signal bit (bit 9: **Function Selection 3**) (default) 1: Use the DI_2 signal				
	Bit 2	Zero point return forward limit signal selection Select the signal to be used as the reverse rotation zone limit signal for zero point return. 0: Use Zero point return forward LS signal bit (bit A: **Function Selection 3**) (default) 1: Use the DI_3 signal				
	Bit 4	Excitation ON output signal polarity selection 0: Positive logic (default) 1: Negative logic				

- Notes on Application of Excitation ON Output Signal Polarity Selection Function

Strictly observe the following procedure to use the “Excitation ON output signal polarity selection” function.

- Power ON and Power OFF procedures when bit 4 (Excitation ON output signal polarity selection) is set to 1 (Negative logic)

<Power ON>

Turn on the power to the MTP2910 Module first, and then turn on the power to the pulse motor driver.

During initialization of the MTP2910 Module, this function is disabled. If the power to the pulse motor driver’s turned on first, the machine may unexpectedly move during initialization of the MTP2910 Module because the excitation ON signal will be output to the negative logic pulse motor driver.

<Power OFF>

Turn off the power to the pulse motor driver first, and then turn off the power to the MTP2910 Module.

When the power to the MTP2910 Module is turned off, this function is disabled. If the power to the pulse motor driver is not turned off first, the machine may unexpectedly move because the excitation ON signal will be output to the negative logic pulse motor driver.

- Always turn off the power to the pulse motor driver before changing the setting of Excitation ON output signal polarity selection.

The excitation ON output signal polarity will be reversed at the moment the setting is changed. If the power to the pulse motor drive is not off, the machine may unexpectedly move because the signal to switch the excitation state will be output to the pulse motor diver at the moment the setting is changed.

(8) Pulse Output Maximum Frequency

Pulse output maximum frequency	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n19 n = Axis No.	2	1 to 400	10 kHz	400
Description	Set the maximum output frequency of reference pulse in units of 10 kHz. <Example> Set 400 for the maximum frequency 4000 kHz.				

(9) Encoder Settings

Rated motor speed	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n22 n = Axis No.	2	1 to 32000	min^{-1}	3000
Description	Set the rated motor speed in 1 min^{-1} units. Set this parameter based on the specifications of the motor that is used.				
Number of pulses per motor rotation	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n24 n = Axis No.	4	1 to $2^{31}-1$	pulse	200
Description	Set the number of pulses per motor rotation. Set the value in accordance with the specifications of the motor, so that the set value represents the actual number of pulses needed for the motor to rotate once. <Example> If a motor rotates once per 1000 pulses, set the number of pulses to 1000.				

(10) Function Setting 1

Function setting 1	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n26 n = Axis No.	2	–	–	0011H

Description	Bit 0 to Bit 3	Speed units Set the unit for speed reference. 0: Reference unit/s 1: 10^n reference unit/min (default) (n = ***Number of Digits below Decimal Point*** (Parameter No. 0n05)) 2: 0.01% 3: 0.0001%
	Bit 4 to Bit 7	Acceleration/deceleration units Set whether to specify acceleration/deceleration rates or acceleration/deceleration time constants for acceleration deceleration commands. 0: Acceleration/deceleration rate (reference units/s^2) 1: Acceleration/deceleration time constant (ms) (default)
	Bit 8 to Bit B	Filter type Set the acceleration/deceleration filter type. 0: No filter (default) 1: Exponential acceleration/deceleration filter 2: Moving average filter

(11) NEAR Signal Output Width

NEAR signal output width	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n28 n = Axis No.	4	0 to 65535	refer-ence unit	0

Description	Position proximity (NEAR) bit (bit 3: **Position Management Status**) will be turned ON when the absolute value of the difference between the Machine coordinate system reference position (MPOS) bit (bit 2: **Monitor Selection 1 and 2**) and the Machine coordinate system feedback position (APOS) bit (bit 4: **Monitor Selection 1 and 2**) is within the rage set here. Note: The Machine coordinate system feedback position (APOS) of the MTP2910 Module must be the position where the reference position from the previous communication cycle is returned.

(12) Acceleration/Deceleration Settings

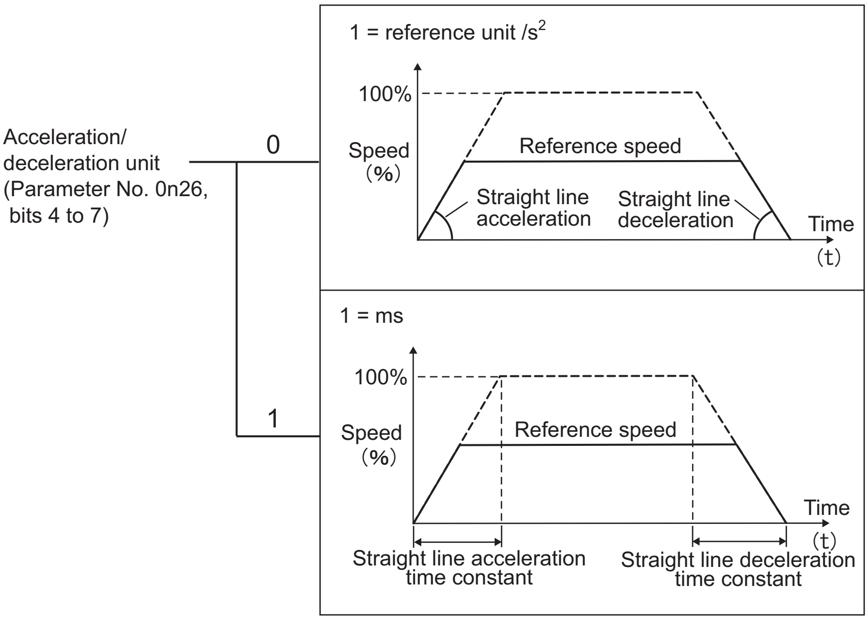
Straight line acceleration/ Acceleration time constant	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n2A n = Axis No.	4	0 to $2^{31}-1$	*	0
Description	Set the linear acceleration rate or linear acceleration time constant.				

Straight line deceleration/ Deceleration time constant	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n2C	4	0 to $2^{31}-1$	*	0
Description	Set the linear deceleration rate or linear deceleration time constant.				

* The setting unit for this parameter depends on the bit 4 to 7 (Acceleration/deceleration units) of the parameter No. 0n26, but the result of applying the acceleration/deceleration unit setting is not shown here.

The following two methods can be used to specify the acceleration/deceleration speed.

- Setting the acceleration/deceleration speed
- Setting the time to reach the rated speed from zero speed.
  For this method, the setting range is 0 to 32,767 ms. A parameter warning will occur if the setting exceeds 32,767.



(13) Filter

Filter time constant	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n2E n = Axis No.	2	0 to 65535	0.1 ms	0
Description	Set the acceleration/deceleration filter time constant. Always make sure that bit 0 (Distribution completed (DEN)) of the **Position Management Status** is set to 1 before changing the time constant.				

Bias speed for index acceleration/deceleration filter	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n2F n = Axis No.	2	0 to 32767	*	0
Description	Set the bias speed for the exponential acceleration/deceleration filter.				

* The setting unit for this parameter depends on bits 4 to 7 (Acceleration/deceleration units) of the parameter No. 0n26, but the result of applying the acceleration/deceleration unit setting is not shown here.

Note: There are two types of acceleration/deceleration filter: an exponential acceleration/deceleration filter and a moving average filter.

(14) Zero Point Return

Zero point return method	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n30 n = Axis No.	2	0 to 19	–	2
Description	Set the operation method when the **Motion Command** is set to 3 (Zero point return). The following three methods are available. 2: DEC1 + ZERO 4: DEC2 + ZERO 5: DEC1 + LMT + ZERO Note: Refer to *8.9.1 (3) (b) Zero Point Return (ZRET)* for details on each zero point return method.				

Width of starting point position output	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n31 n = Axis No.	2	0 to 65535	Reference unit	100
Description	Set the width in which the Zero point position bit (bit 4: **Position Management Status**) will be ON.				

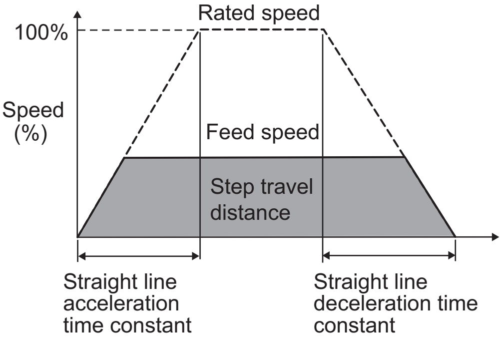
Approach speed	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n32 n = Axis No.	4	-2^{31} to $2^{31}-1$	*	1000
Description	Set the approach speed for a zero point return operation after the deceleration LS is passed.				

Creep speed	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n34 n = Axis No.	4	-2^{31} to $2^{31}-1$	*	500
Description	Set the creep speed for a zero point return operation after the ZERO signal is detected.				

Zero point return travel distance	Parameter No. (Hexadecimal)	Data Size (No. of Bytes)	Setting Range	Setting Unit	Default Value
	0n36 n = Axis No.	4	-2^{31} to $2^{31}-1$	Reference unit	0
Description	Set the distance from where the ZERO signal is detected to the zero point position.				

* The setting unit for this parameter depends on bits 0 to 3 (Speed units) of the parameter No. 0n26, but the result of applying the speed unit setting is not shown here.

(15) STEP Travel Distance

<table>
<tr><td colspan="2" rowspan="2">Step travel distance</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n38
n = Axis No.</td><td>4</td><td>0 to $2^{31}-1$</td><td>Reference unit</td><td>1000</td></tr>
<tr><td>Description</td><td colspan="6">Set the moving amount when the Motion Command is set to 8 (STEP operation)

Note: Refer to <i>8.9.1 (3) (e) STEP Operation (STEP)</i> for details on STEP commands.</td></tr>
</table>

(16) Coordinate System Settings

<table>
<tr><td colspan="2" rowspan="2">Zero point position in machine coordinate system offset</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n3A
n = Axis No.</td><td>4</td><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td><td>0</td></tr>
<tr><td>Description</td><td colspan="6">Set the offset to shift the machine coordinate system.
Note: This parameter is always enabled, so be sure that the setting is correct.</td></tr>
<tr><td colspan="2" rowspan="2">Work coordinate system offset</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n3C
n = Axis No.</td><td>4</td><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td><td>0</td></tr>
<tr><td>Description</td><td colspan="6">Set the offset to shift the work coordinate system.
Note: This parameter is always enabled, so be sure that the setting is correct.</td></tr>
<tr><td colspan="2" rowspan="2">Number of POSMAX turns presetting data</td><td>Parameter No. (Hexadecimal)</td><td>Data Size (No. of Bytes)</td><td>Setting Range</td><td>Setting Unit</td><td>Default Value</td></tr>
<tr><td>0n3E
n = Axis No.</td><td>4</td><td>-2^{31} to $2^{31}-1$</td><td>Rev</td><td>0</td></tr>
<tr><td>Description</td><td colspan="6">When POSMAX preset bit (bit 6: Run Command Setting) is set to 1 (ON) and the number of POSMAX turns (bit 5: Monitor Selection 1 and 2) reaches the value set here, it will be reset.</td></tr>
</table>

8.7 Parameter Setting Examples

Set the parameters for the following items to enable motion control that is compatible with the machine's specifications.

- Reference unit
- Axis Type (Finite length axis/Infinite length axis)
- Electronic Gear
- Position Reference
- Speed Reference
- Acceleration/Deceleration Settings
- Acceleration/Deceleration Filter Settings

The following tables provide details of setting examples for the above items.

8.7.1 Reference Unit

Pulses, millimeters, degrees, or inches can be used as the reference unit for motion control. The reference unit is specified in the parameter No. 0n04 (***Reference Unit Selection***).

The minimum reference unit that can be specified is determined by the setting of the parameter No. 0n05 (***Number of Digits below Decimal Point***).

The following table shows the smallest reference unit determined by the Number of digits below decimal point and by the Reference unit selection.

Parameter No. 0n05: Number of Digits Below Decimal Point	Parameter No. 0n04: *Reference Unit Selection*			
	0: pulse	1: mm	2: deg	3: inch
0: 0 digits	1 pulse	1 mm	1 deg	1 inch
1: 1 digits	1 pulse	0.1 mm	0.1 deg	0.1 inch
2: 2 digits	1 pulse	0.01 mm	0.01 deg	0.01 inch
3: 3 digits	1 pulse	0.001 mm	0.001 deg	0.001 inch
4: 4 digits	1 pulse	0.0001 mm	0.0001 deg	0.0001 inch
5: 5 digits	1 pulse	0.00001 mm	0.00001 deg	0.00001 inch

Minimum reference unit

8.7.2 Axis Type Selection (Finite Length Axis/Infinite Length Axis)

There are two types of position control: Finite Length Position Control that is performed within a specified range, and Infinite Length Position Control that is performed without a specified range. Infinite length position control can reset the position to 0 after one rotation, e.g., belt conveyors, or move in one direction only, without resetting position after one rotation. Bit 0 (Axis type selection) of the parameter No 0n01 (***Function Selection Flag 1***) sets which of these types of position control is to be used. When the axis type is set to infinite length axis, set the reset position of the infinite length axis in the parameter No. 0n0A (***Infinite Length Axis Reset Position (POSMAX)***).

The details of the Axis type selection are listed in the following table.

Parameter No.	Name	Description	Default Value
0n01, bit 0	Function selection flag 1, Axis type selection	Specify the position control method for the controlled axis. 0: Finite Length Axis Set a finite length axis if control is performed within a limited length or for an axis that uses infinite length control in one moving direction only without resetting the position every rotation. 1: Infinite Length Axis Set an infinite length axis for an axis that uses infinite length control while resetting the position every rotation.	0
0n0A	Infinite length axis reset position (POSMAX)	Set the reset position of the position data when an infinite length axis has been set for the axis type using the reference unit.	360000

8.7.3 Electronic Gear

In contrast to the reference unit input to the Machine Controller, the moving unit in the mechanical system is called the “output unit.” The electronic gear converts position or speed units from reference units to output units for the mechanical system without going through an actual mechanism, such as a gear.

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

The electronic gear function is enabled when the following settings are made:

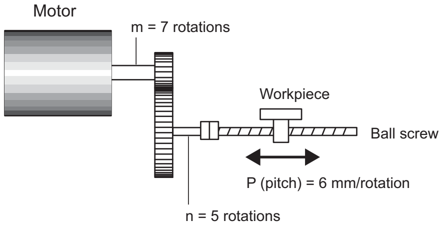
- Parameter No. 0n06: ***Travel Distance per Machine Rotation***
- Parameter No. 0n08: ***Servo Motor Gear Ratio***
- Parameter No. 0n09: ***Machine Gear Ratio***

Note: The electronic gear is disabled when pulse is specified as the Reference Unit.

The following setting example uses ball screw and rotating table workpieces.

(1) Parameter Setting Example When Using a Ball Screw

- Machine specifications: Ball screw axis rotates 5 times for each 7 rotations of the motor shaft (see the figure on the right).
- Reference unit: 0.001 mm



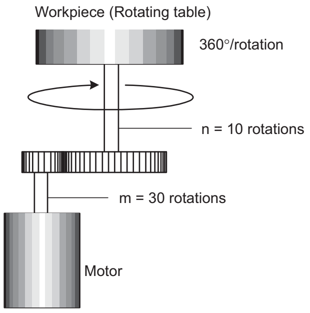
To move the workpiece 0.001 mm for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for the parameters No.0n06, No.0n08, and No.0n09.

- Parameter No. 0n06: Travel distance per machine rotation = 6 mm/0.001 mm = 6000 (reference units)
- Parameter No. 0n08: Servo motor gear ratio = m = 7
- Parameter No. 0n09: Machine gear ratio = n = 5

Note: Set the SERVOPACK gear ratio to 1:1.

(2) Parameter Setting Example When Using a Rotating Table

- Machine specifications: Rotating table axis rotates 10 times for each 30 rotations of the motor shaft (see the figure on the right).
- Reference unit: 0.1°



To rotate the table 0.1° for 1 reference unit input under the conditions outlined above, i.e., for 1 reference unit = 1 output unit, make the following settings for the parameters No.0n06, No.0n08, and No.0n09.

- Parameter No. 0n06: Travel distance per machine rotation = 360°/0.1° = 3600 (reference units)
- Parameter No. 0n08: Servo motor gear ratio = m = 30
- Parameter No. 0n09: Machine gear ratio = n = 10

Note: 1. The gear ratio for parameters No.0n08 and No.0n09 (m/n) may be constant, e.g., m = 3 and n = 1.
2. Set the SERVOPACK gear ratio to 1:1.

8.7.4 Position Reference

The target position value for position control is set in the **Position Reference Setting**. There are two methods that can be set for using the Position reference setting: Absolute Mode to set directly the coordinate of the target position value as an absolute value or Incremental Addition Mode to add the moving amount from the previous position reference value as a incremental value.

The following table lists the parameter details relating to position references.

Parameter/ Command Data	Parameter No./ Command Byte No.	Name	Description	Default Value
Command Data	Axis 1 or 3: Bytes 14 and 15 Axis 2 or 4: Bytes 42 and 43	Motion command control flag Bit 5: Position reference type	Specify the type of position data. 0: Incremental Addition Mode Adds the present moving amount value to the previous value of the **Position Reference Setting** and sets the result in the **Position Reference Setting**. 1: Absolute Mode Sets the coordinate of the target position in the **Position Reference Setting**. Note: 1. Always set to 0 when using a motion program. 2. Always set to 0 when bit 0 (Axis type selection) of the parameter No. 0n01 is set to 1 (Infinite length axis).	0
	Axis 1 or 3: Bytes 28 to 31 Axis 2 or 4: Bytes 56 to 59	Position reference setting	Set the position data. • Incremental Addition Mode (Position reference type = 0) The moving amount (incremental distance) specified this time will be added to the previous value of the **Position Reference Setting**. **Position Reference Setting** = Previous value of **Position Reference Setting** + Incremental distance <Example> If a travel distance of 500 is specified and the previous value of "Position reference setting" is 1000, the following will occur: **Position Reference Setting** = 1000 + 500 = 1500 • Absolute Mode (Position reference type = 1) The coordinate value of the target position is set. <Example> Set 10000 to move to a coordinate value of 10000. **Position Reference Setting** = 10000	0

The following table compares the advantage and disadvantage of incremental addition mode and absolute mode.

Position Reference Type	Advantage	Disadvantage
Incremental Addition Mode	It is not necessary to consider the relationship between **Position Reference Setting** and the current position when canceling a move. Incremental addition mode can be used both for finite or infinite length axis type.	**Position Reference Setting** does not necessarily equal the coordinate value of the target position, so the position reference can be difficult to understand intuitively.
Absolute Mode	The coordinate of the target position is specified directly, making it easy to understand intuitively.	The current position must be set in **Position Reference Setting** whenever the power supply is turned ON or a move is canceled. If this is not done, the axis may move suddenly when a move command is started. Absolute mode cannot be used for an infinite length axis type.

8.7.5 Speed Reference

There are two methods of setting the speed reference for the feed speed or other speeds. One method involves using reference units and the other method involves setting the percentage (%) of the rated speed.

The following table shows the parameters relating to speed references.

Parameter/ Command Data	Parameter No./Command Byte No.	Name	Description	Default Value
Parameters	0n05	Number of digits below decimal point	Set the number of digits below the decimal point in the reference unit to be input. The minimum reference unit is determined by this parameter and the parameter No.0n04 (***Reference Unit Selection***). <Example> Reference unit = mm, Number of digits below decimal point = 3, 1 reference unit = 0.001 mm	3
	0n22	Rated motor speed	Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.	3000
	0n24	Number of pulses per motor rotation	Set the number of pulses (the value after multiplication) per motor rotation. <Example> If a motor rotates once per 1000 pulses, set the number of pulses to 1000.	200
	0n26	Function setting 1 Bits 0 to 3: Speed units	Set the unit for speed reference. 0: Reference unit/s 1: 10^n reference units/min (n: number of digits below decimal point) 2: 0.01% 3: 0.0001%	1
Command Data	Axis 1 or 3: Bytes 24 to 27 Axis 2 or 4: Bytes 52 to 55	Speed reference setting	Set the feed speed. The unit for this parameter is set in bits 0 to 3 (Speed units) of the parameter No. 0n26 (Function setting 1). <Example> When the number of digits below decimal point = 3 The setting of Speed units bits determines the other units as follows: • Speed Unit Set to 0: Reference units/s pulse unit: 1 = 1 pulse/s mm unit: 1 = 0.001 mm/s deg unit: 1 = 0.001 deg/s Inch unit: 1 = 0.001 inch/s • Speed Unit Set to 1: 10^n reference units/min pulse unit: 1 = 1000 pulse/min mm unit: 1 = 1 mm/min deg unit: 1 = 1 deg/min inch unit: 1 = 1 inch/min • Speed Unit Set to 2: 0.01% Set as a percentage of the rated speed (1 = 0.01%) unrelated to the reference unit setting.	–
	Axis 1 or 3: Bytes 18 and 19 Axis 2 or 4: Bytes 46 and 47	Override	Setting an output ratio (%) for the setting allows the positioning speed to be changed without changing the Speed reference setting. Setting unit: 1 = 0.01%	–

(1) Speed Reference Setting Example

- Parameter No. 0n05: Number of digits below decimal point = 3
- Parameter No. 0n22: Rated motor speed = 3000 min^{-1}
- Parameter No. 0n24: Number of pulses per motor rotation = 65536 pulses/rev

The following table shows the setting example for the Speed reference to obtain the target feed speed (reference speed).

Parameter No. 0n26, Bit 0 to 3 (Speed units) Setting	Parameter No. 0n04 (Reference unit selection) Setting	Reference Speed (Target Feed Speed)	Setting Method for **Speed Reference Setting**
0 Reference unit/s	pulse	• 500 s^{-1}	500 (s^{-1}) × 65536 (pulse/R) = 37268000 (pulse/s)
		• 1500 min^{-1}	1500 (min^{-1}) × 65536 (pulse/R) ÷ 60 (s/min) = 1638400 (pulse/s)
	mm	• Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	500 (mm/s)÷ 0.001 = 500000 (mm/s) Note: Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 ÷ 60 (s/min) = 15000 (mm/s) Note: Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
1 10^n reference units/min (n: Number of digits below decimal point) (= 3)	pulse	• 500 s^{-1}	500 (s^{-1}) × 65536 (pulse/R) ÷ 1000* × 60 (s/min) = 1966080 (1000 pulse/min)
		• 1500 min^{-1}	1500 (min^{-1}) × 65536 (pulse/R) ÷ 1000* = 98304 (1000 pulse/min)
	mm	• Feed speed of 500 mm/s with a machine that travels 10 mm for each rotation	500 (mm/s) ÷ 0.001 × 1000 × 60 (s/min) = 30000 (1000 mm/s) Note: Determined by feed speed and number of digits below decimal point (0.001 in the above equation), regardless of machine configuration.
		• Feed speed of 900 mm/min with a machine that travels 10 mm for each rotation	900 (mm/min) ÷ 0.001 × 1000 = 900 (1000 mm/min) Note: Determined by feed speed, regardless of machine configuration.
2 0.01%	–	• 1500 min^{-1}	1500 (min^{-1}) ÷ 3000 (min^{-1}) × 100(%) ÷ 0.01 = 5000 (0.01%) Note: Determined by what percentage the feed speed is of the rated speed.

* 1000 = 10^n

(2) Override Setting Example

The Override can set the speed as a percentage (output ratio) of the target feed speed, in 0.01% units. The Override is set independently of Reference unit, Number of digits below decimal point, and other parameters.

A typical example of Override setting is shown below.

Setting Example

Output ratio 25%: 25 ÷ 0.01 = 2500
50%: 50÷0.01 = 5000
75%: 75÷0.01 = 7500
100%: 100÷0.01 = 10000

8.7.6 Acceleration/Deceleration Settings

The acceleration/deceleration can be set to either the rate of acceleration/deceleration or the time required to reach the rated speed from 0. The settings method used depends on the related parameter settings.

The parameters related to acceleration/deceleration settings are listed in the following table.

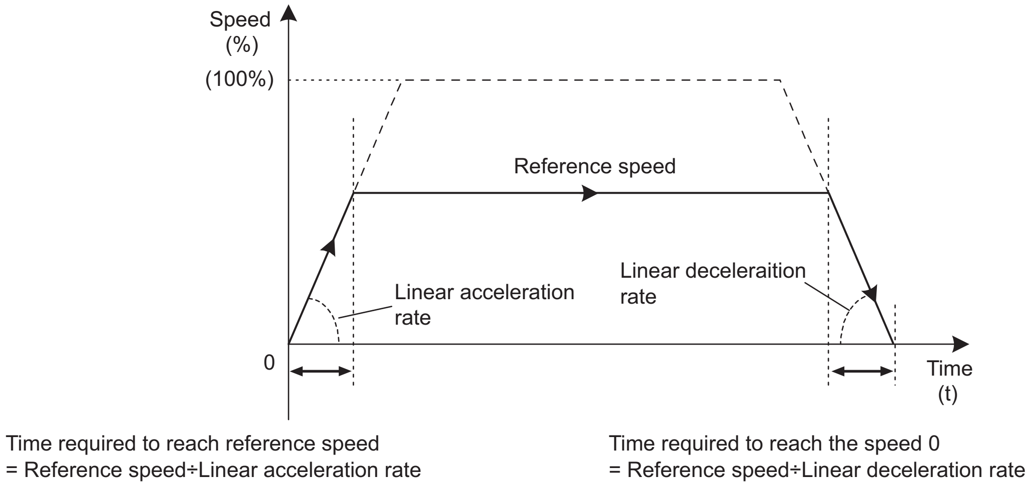
Parameter/ Command Data	Parameter No./Command Byte No.	Name	Description	Default Value
Parameters	0n05	Number of digits below decimal point	Set the number of digits below the decimal point in the input reference unit. The minimum reference unit is determined by this parameter and the parameter No. 0n04 (***Reference Unit Selection***). <Example> Reference unit selection = mm, Number of digits below decimal point = 3, 1 reference unit = 0.001 mm	3
	0n22	Rated motor speed	Set the number of rotations when the motor is rotated at the rated speed (100% speed). Confirm the motor specifications before setting this parameter.	3000
	0n24	Number of pulses per motor rotation	Set the number of pulses (the value after multiplication) per motor rotation. <Example> For the motor that rotates once by the 1000 pulse references, set 1000.	200
	0n26	Function setting 1 Bits 4 to 7: Acceleration/deceleration units	Set the unit for acceleration/deceleration. 0: Reference units/s^2 1: ms	1
	0n2A	Straight line acceleration/Acceleration time constant	Set the rate of acceleration or acceleration time constant according to the setting of bits 4 to 7 of the parameter No. 0n26. • Acceleration/Deceleration Units is set to 0 (Reference units/s^2), set the rate of acceleration. pulse unit: 1 = 1 pulse/s^2 mm unit: 1 = 1 reference unit/s^2 deg unit: 1 = 1 reference unit/s^2 inch unit: 1 = 1 reference unit/s^2 <Example: Number of Decimal Places = 3> mm unit: 1 = 0.001 mm/s^2 deg unit: 1 = 0.001 deg/s^2 inch unit: 1 = 0.001 inch/s^2 • When Acceleration/Deceleration Units is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.	0
	0n2C	Straight line deceleration/Deceleration time constant	Set the rate of deceleration or deceleration time constant according to the setting of bits 4 to 7 of the parameter No. 0n26. • Acceleration/Deceleration Units is set to 0 (Reference units/s^2), set the rate of deceleration. pulse unit: 1 = 1 pulse/s^2 mm unit: 1 = 1 reference unit/s^2 deg unit: 1 = 1 reference unit/s^2 inch unit: 1 = 1 reference unit/s^2 • When Acceleration/Deceleration Units is set to 1 (ms), set the time constant to go from 0 to the rated speed without relation to the reference unit.	0

(1) Acceleration/Deceleration Units and Speed Changes Over Time

The parameter No. 0n2A (***Straight Line Acceleration/Acceleration Time Constant***) and No. 0n2C (***Straight Line Deceleration/Deceleration Time Constant***) settings change depending on the setting of bits 4 to 7 (Acceleration/deceleration unit) of the parameter No. 0n26 as shown in the following figure.

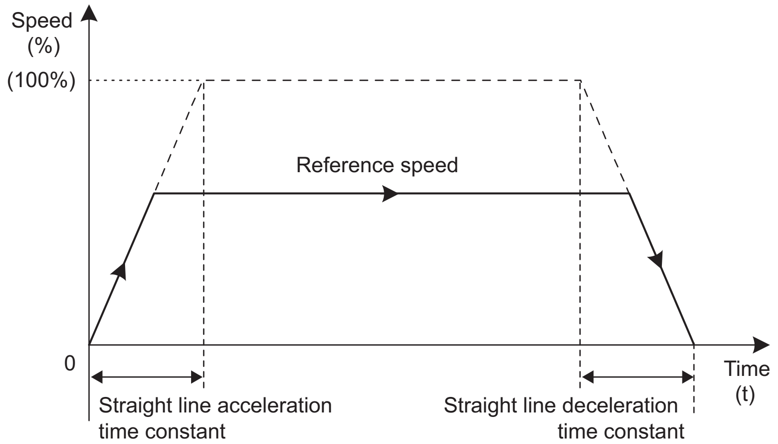
(a) When Bits 4 to 7 (Acceleration/Deceleration Unit) of Parameter No. 0n26 Set to 0 (Reference Unit/s^2)

The settings of the parameter No. 0n2A and No. 0n2C are handled as the linear acceleration rate and linear deceleration rate.



(b) When Bits 4 to 7 (Acceleration/Deceleration Unit) of Parameter No. 0n26 Set to 1 (ms)

The setting of the parameter No. 0n2A is handled as the straight line acceleration time constant required to reach rated speed from zero using linear acceleration. The setting of the parameter No. 0n2C is handled as the straight line deceleration time constant required to reach zero from the rated speed using linear deceleration.

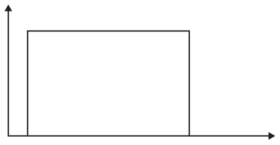
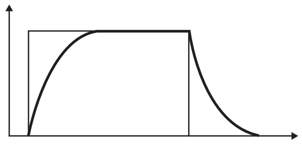
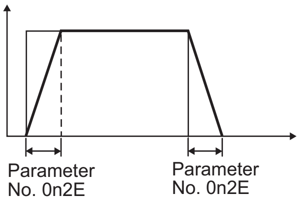
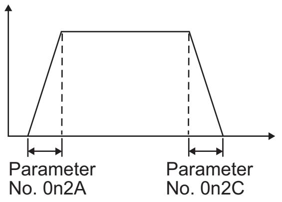
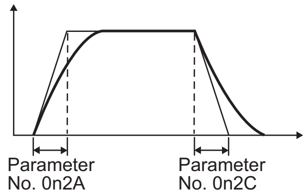
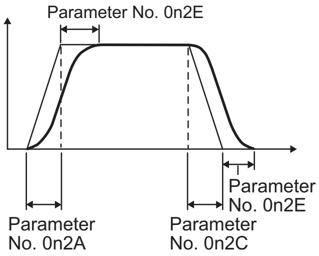


8.7.7 Acceleration/Deceleration Filter Settings

There are two types of acceleration/deceleration filter: **The exponential acceleration/deceleration filter** and **the moving average filter**. These filter settings can be used to set non-linear acceleration/deceleration curves. The parameters related to the acceleration/deceleration filter settings are listed in the following table.

Parameter No.	Name	Description	Default Value
0n26	Function setting 1 Bit 8 to B: Filter type	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0
0n2E	Filter time constant	Sets the acceleration/deceleration filter time constant. Always make sure that pulse distribution has been completed (bit 0 of the **Position Management Status** is ON (1)) before changing the time constant.	0

The following figure shows the relationship between acceleration/deceleration patterns and each parameter.

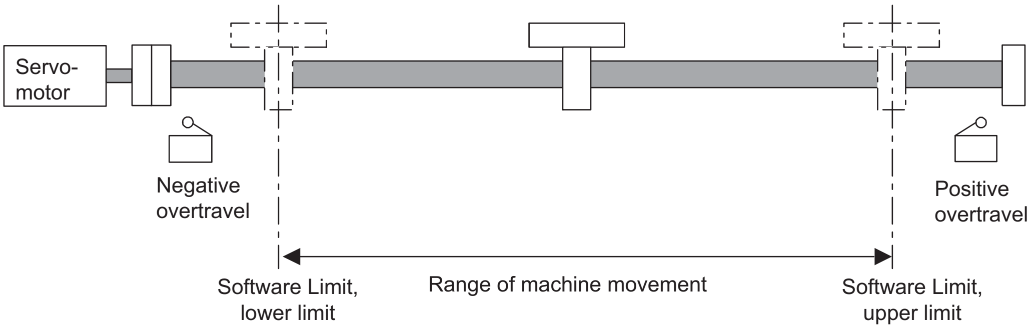
<table>
<tr><td rowspan="2"></td><td colspan="3">Filter Type</td></tr>
<tr><td>Parameter No. 0n26, bits 8 to B=0 (No filter)</td><td>Parameter No. 0n26, bits 8 to B=1 (Exponential acceleration/ deceleration filter)</td><td>Parameter No. 0n26, bits 8 to B=2 (Moving average filter)</td></tr>
<tr><td>No Acceleration/ Deceleration
0n2A = 0
0n2C = 0</td><td>
Note: Step input</td><td>
Note: Curvature depends on Parameter No. 0n2E</td><td> </td></tr>
<tr><td>With Acceleration/ Deceleration</td><td> </td><td>
Note: Curvature depends on relationship between parameter No. 0n2E, 0n2A, and 0n2C.</td><td> </td></tr>
</table>

8.8 Software Limit Function

The software limit function is used to set upper and lower limits for the range of machine movement in parameters so the Machine Controller can constantly monitor the operating range of the machine. The function can be used to help prevent machine runaway or damage due to incorrect operation as well as incorrect references in a motion program.

Disable the software limits in the SERVOPACK to use the Machine Controller for position control in the machine coordinate system.

Note: Refer to your SERVOPACK manual for the procedure on disabling software limits.



8.8.1 Parameter Settings

The following fixed parameters must be set in order to use the software limit function.

Parameter No.	Name	Unit	Setting/Range
0n01	Function selection flag 1 Bit 1:Forward soft limit Bit 2:Reverse soft limit	–	0: Disable, 1: Enable
0n0C	Positive software limit value	Reference unit	–2147483648 to 2147483647
0n0E	Negative software limit value	Reference unit	–2147483648 to 2147483647

Note: The software limit function is enabled only after completing a Zero Point Return or Zero Point Setting operation. Therefore, the zero point return operation or the zero point setting operation must be performed again after the following operations.

- The power is turned ON.
- Any parameters are changed and saved.

8.8.2 Effects of the Software Limit Function

If a position reference that exceeds the positive and negative software limit is executed with the software limit function enabled, an alarm will occur and the MTP2910 Module will stop the axis. The axis stopping method depends on the motion command as shown below.

Motion command	Axis Stopping Method
POSING FEED STEP	The axis will start decelerating before the software limit position and stop at the software limit position.
INTERPOLATE	The pulse distribution command will stop executing at the software limit position. The Servo will perform an emergency stop.

8.8.3 Monitoring and Clearing Alarms

(1) Monitoring Alarms

If an axis exceeds a software limit, a Positive/Negative Soft Limit alarm will occur. This alarm can be monitored in the **Alarm**.

Name	Response Data	Meaning	
Alarm	Axis 1 or 3: Bytes 10 and 11 Axis 2 or 4: Bytes 38 and 39	Bit 3: ON	Positive Software Limit
		Bit 4: ON	Negative Software Limit

(2) Clearing Software Limit Alarms

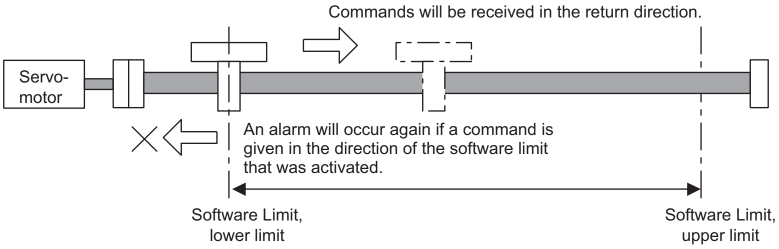
Clear software limit alarms and reset the alarm status using the procedure below.

1. Set Alarm clear bit (bit F: **RUN Command Setting**) to 1 (Alarm clear ON).

   The **Alarm** will be cleared.

Name	Response Data	Meaning	
Run command setting	Axis 1 or 3: Bytes 4 and 5 Axis 2 or 4: Bytes 32 or 33	Bit F: 1	Alarm clear ON

2. Use the FEED or STEP command to return the workpiece in the opposite direction of the software limit to reset the alarm status.



8.9 Operation Details

Note: Refer to *Appendix B* for MECHATROLINK communication specifications.

8.9.1 Command Data

Command Format

Byte	Command	Byte	Command
0	CMD	32	Run command setting
1	WDC	33	
2	CMD_CTRL	34	Monitor selection
3		35	
4	Run command setting	36	Function setting 3
5		37	
6	Monitor selection	38	Reserved (0)
7		39	
8	Function setting 3	40	Motion command
9		41	
10	Reserved (0)	42	Motion command control flag
11		43	
12	Motion command	44	Reserved (0)
13		45	
14	Motion command control flag	46	Override
15		47	
16	Reserved (0)	48	Bias speed
17		49	
18	Override	50	General-purpose DO
19		51	
20	Bias speed	52	Speed reference setting
21		53	
22	General-purpose DO	54	
23		55	
24	Speed reference setting	56	Position reference setting
25		57	
26		58	
27		59	
28	Position reference setting	60	Reserved (0)
29		61	
30		62	
31		63	

IMPORTANT

Bytes 4 through 31 are assigned to Axis 1 (Axis 3), and bytes 32 through 59 are assigned to Axis 2 (Axis 4).

(1) Command Data List

The command data to MTP2910 Module are listed below.

Command Byte Number		Command Data Name	Contents
Axis 1 or 3	Axis 2 or 4		
1		CMD	Command code
2		WDC	Watchdog data
3		CMD_CTRL	Command control
4, 5	32, 33	Run command setting	Specify the following commands: • Servo ON • Machine lock • POSMAX preset • Alarm clear
6	34	Monitor selection 1	Specify the contents of Monitor 1 and Monitor 2.
7	35	Monitor selection 2	
8, 9	36, 37	Function setting 3	Specify the following signal status: • Zero point return deceleration LS signal • Zero point return reverse/forward limit signals
12, 13	40, 41	Motion command	Set a motion command
14, 15	42, 43	Motion command control flag	Specify the following command bit: • Command pause • Command abort • FEED/STEP direction • Zero point return direction • Position reference type
16, 17	44, 45	Reserved (0)	Reserved by system
18, 19	46, 47	Override	Set the percentage of the Speed reference setting in the command data to output.
20, 21	48, 49	Bias speed	Set the speed reference offset value.
22, 23	50, 51	General-purpose DO	Specify the status ON/OFF of the general-purpose DO_1 to 3.
24 to 27	52 to 55	Speed reference setting	Set the speed reference.
28 to 31	56 to 59	Position reference setting	Set the position reference.

(2) Command Data Details

(a) CMD

Command code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) WDC

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used to establish synchronous communication and for detection of out-of-sync state.		

(c) CMD_CTRL

Command control (Byte 2 and 3)	Setting Range	Setting Unit
	–	–
Description	Control for standard I/O profile command Bit 3: ALM_CLR (Clear communication alarm/warning) is disabled when set to 0, and clears alarm when set to 1	

(d) Run Command Setting

Run command setting (Axis 1 or 3: Bytes 4 and 5 Axis 2 or 4: Bytes 32 and 33)		Setting Range	Setting Unit
		–	–
Description	Bit 0	Servo ON Send a SERVO ON command to the SERVOPACK. (DO_0 turns ON.) 0: Servo OFF (default) 1: Servo ON	
	Bit 1	Machine lock Set or release the machine lock mode. 0: Machine lock mode released (default) 1: Machine lock mode During the machine lock mode, the Calculated position in machine coordinate system (CPOS) will be updated but no movement will occur on the axis. A change in the machine lock mode is valid after all pulses have been distributed.	
	Bit 6	POSMAX preset Reset the Number of POSMAX turns bit (bit 5: **Monitor Selection 1 and 2**) to the value set in the parameter No. 0n3E (***Number of POSMAX Turns Presetting Data***). 0: POSMAX Preset OFF (default) 1: POSMAX Preset ON	
	Bit F	Alarm clear Clear alarms at rising edge of this bit. 0: Alarm clear OFF (default) 1: Alarm clear ON Note: Do not execute Alarm clear during axis movement using motion commands. Using Alarm clear may affect axis movement.	

(e) Monitor Selection 1 and 2

Monitor selection 1, 2 (Axis 1 or 3: Bytes 6 and 7 Axis 2 or 4: Bytes 34 and 35)	Setting Range	Setting Unit
	0 to 6	–
Description	Select the contents of Monitor 1 and 2. 0: Target position in machine coordinate system (TPOS) 1: Calculated position in machine coordinate system (CPOS) 2: Machine coordinate system reference position (MPOS) 3: 32-bit coordinate system position (DPOS) 4: Machine coordinate system feedback position (APOS) 5: Number of POSMAX turns 6: Speed reference output monitor	

(f) Function Setting 3

<table>
<tr><td colspan="2" rowspan="2">Function setting 3
(Axis 1 or 3: Bytes 8 and 9,
Axis 2 or 4: Bytes 36 and 37)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td rowspan="3">Description</td><td>Bit 8</td><td colspan="2">Zero point return deceleration LS signal
Set the zero point return deceleration LS signal (DEC1) to ON or OFF.
0: OFF (default)
1: ON
Note: This bit is valid when the parameter No. 0n15, bit 0 (Deceleration LS signal selection) is set to 0 (Use bit 8 of Function Selection 3).</td></tr>
<tr><td>Bit 9</td><td colspan="2">Zero point return reverse limit signal
Set the zero point return reverse zone signal output to ON or OFF.
0: OFF (default)
1: ON
Note: This bit is valid when the parameter No. 0n15, bit 1 (Zero point return reverse limit signal) is set 0 (Use bit 9 of Function Selection 3).</td></tr>
<tr><td>Bit A</td><td colspan="2">Zero point return forward limit signal
Set the zero point return forward zone signal output to ON or OFF.
0: OFF (default)
1: ON
Note: This bit is valid when the parameter No. 0n15, bit 2 (Zero point return forward limit signal) is set to 0 (Use bit A of Function Selection 3).</td></tr>
</table>

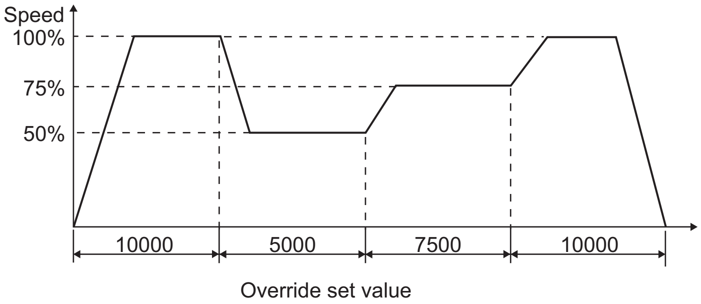
(g) Motion Command

<table>
<tr><td colspan="2" rowspan="2">Motion command
(Axis 1 or 3: Bytes 12 and 13,
Axis 2 or 4: Bytes 40 and 41)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>0 to 65535</td><td>–</td></tr>
<tr><td>Description</td><td colspan="3">Set a motion command.
0: No command (NOP)
1: Positioning (POSING)
3: Zero point return (ZRET)
4: Interpolation (INTERPOLATE)
5: Reserved for system use (ENDOF_INTERPOLATE)
7: JOG operation (FEED)
8: STEP operation (STEP)
9: Zero point setting (ZSET)
10: Reserved for system use (ACC)
11: Reserved for system use (DCC)
12: Reserved for system use (SCC)
Note: Refer to <i>8.9.1 (3) How to Set and Execute a Motion Command</i> for details.</td></tr>
</table>

(h) Motion Command Control Flag

<table>
<tr><td colspan="3" rowspan="2">Motion command control flag
(Axis 1 or 3: Bytes 14 and 15,
Axis 2 or 4: Bytes 42 and 43)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td rowspan="5">Description</td><td>Bit 0</td><td colspan="3">Command pause
The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving during positioning (bit 1: Motion Command) or the STEP operation (bit 8: Motion Command).
0: Command Pause OFF (default)
1: Command Pause ON
While this bit is 1, the command is held. When this bit is changed to 0, the hold is canceled and operation restarts. After the axis has been stopped, the Command hold completed bit (bit 1: Motion Command Status) will turn ON.</td></tr>
<tr><td>Bit 1</td><td colspan="3">Command abort
0: Command Abort OFF (default)
1: Command Abort ON
The axis will decelerate to a stop if this bit is changed to 1 while an axis is moving during positioning (bit 1: Motion Command), zero point return (bit 3: Motion Command), JOG operation (bit 7: Motion Command), or STEP operation (bit 8: Motion Command), and the remaining movement will be canceled.</td></tr>
<tr><td>Bit 2</td><td colspan="3">JOG/STEP direction
Set the movement direction for JOG operation (bit 7: Motion Command) or STEP operation (bit 8: Motion Command).
0: Forward (default)
1: Reverse</td></tr>
<tr><td>Bit 3</td><td colspan="3">Zero point return direction
Set the direction to move for zero point return (bit 3: Motion Command). This setting is valid for zero point return using DEC1 + ZERO method.
0: Reverse (default)
1: Forward</td></tr>
<tr><td>Bit 5</td><td colspan="3">Position reference type
Specify whether the value set for the Position Reference Setting is an Incremental Addition Mode value (calculated by adding the movement amount to the current position) or an Absolute Mode value (an absolute position).
0: Incremental addition mode (default)
1: Absolute mode
Always set this parameter to Incremental Addition Mode when using infinite axes.</td></tr>
</table>

(i) Override

Override (Axis 1 or 3: Bytes 18 and 19, Axis 2 or 4: Bytes 46 and 47)		Setting Range	Setting Unit
		0 to 32767	0.01%
Description	Set the percentage of the **Speed Reference Setting** to output in units of 0.01%. Note: The override value is always enabled. Set to 10000 (fixed) when not using the override function. **Speed Reference Setting** × Override = Output speed This parameter can be changed at any time to any value during execution of speed reference, and acceleration/deceleration is performed immediately according to the set value.  When the override is set to 0, the output speed is 0 and the motor will not operate.		

(j) Bias Speed

Bias speed (Axis 1 or 3: Bytes 20 and 21, Axis 2 or 4: Bytes 48 and 49)		Setting Range	Setting Unit
		0 to 32767	*
Description	Set the speed reference offset value. This parameter is used by the following commands. Refer to *8.9.1 (3) How to Set and Execute a Motion Command* for details. 1: Positioning (POSING) 3: Zero point return (ZRET) 7: JOG operation (FEED) 8: STEP operation (STEP) Note: If feed speed × **Override** < **Bias Speed**, the feed speed will be increased to the bias speed.		

* The setting unit for this parameter depends on bits 0 to 3 (Speed unit selection) of the parameter No. 0n26, but the result of applying the speed unit setting is not shown here.

(k) General-purpose DO

General-purpose DO (Axis 1 or 3: Byte 22 and 23, Axis 2 or 4: Byte 50 and 51)		Setting Range	Setting Unit
		–	–
Description	Set the general-purpose DO_1 to 3 to ON or OFF. Bit 0: Reserved by system use (invalid) Bit 1: Sets DO_1 to ON or OFF 0: OFF (default) 1: ON Bit 2: Sets DO_2 to ON or OFF 0: OFF (default) 1: ON Bit 3: Sets DO_3 to ON or OFF 0: OFF (default) 1: ON		

(l) Speed Reference Setting

Speed reference setting (Axis 1 or 3: Bytes 24 to 27, Axis 2 or 4: Bytes 52 to 55)		Setting Range	Setting Unit
		-2^{31} to $2^{31}-1$	*
Description	Set the speed reference. This parameter is used by the following commands. Refer to *8.9.1 (3) How to Set and Execute a Motion Command* for details. 1: Positioning (POSING) 3: Zero point return (ZRET) 7: JOG operation (FEED) 8: STEP operation (STEP)		

* The setting unit for this parameter depends on bits 0 to 3 (Speed unit selection) of the parameter No. 0n26, but the result of applying the speed unit setting is not shown here.

(m) Position Reference Setting

Position reference setting (Axis 1 or 3: Bytes 28 to 31, Axis 2 or 4: Bytes 56 to 59)			Setting Range	Setting Unit
			-2^{31} to $2^{31}-1$	Reference unit
Description	Set the position reference. This parameter is used for the following command. 1: Positioning (POSING) 4: Interpolation (INTERPOLATE) ■ Related Command Data Position reference type bit (bit 5: **Motion Command Control Flag**)			

(3) How to Set and Execute a Motion Command

The setting and execution of a motion command (set in **Motion Command**) is explained in details.

(a) Positioning (POSING)

The POSING command positions the axis to the target position using the specified target position and speed. Parameters related to acceleration and deceleration are set in advance.

- Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.
2	The Servo ON condition.	Running bit (bit 1: **Run Status**) is ON.
3	Motion command execution has been completed.	The **Motion Command Response Code** is 0 and Command executing bit (bit 0: **Motion Command Status**) is OFF.

2. Set the required parameters and command data by referring to *8.9.1 (3) • Related Data*.
3. Set the positioning motion command and the target position.

   a) The position reference type (bit 5: **Motion Command Control Flag**) is set to 0 (Incremental addition mode)

   Set the **Motion Command** to 1, and then add the incremental value to the **Position Reference Setting** to set the target position.

   The positioning operation will starts. The **Motion Command Response Code** will be 1 during the positioning.

   The Position proximity bit (bit 3: **Position Management Status**) will turn ON when the axis approaches the target position.

   The Positioning completed bit (bit 1: **Position Management Status**) will turn ON when the axis reaches the target position and the positioning will complete.

Note: 1. The target position can be changed during positioning operation.
2. When the target position is changed so that there is no sufficient deceleration distance or after the new target position has already been passed, the MTP2910 Module decelerates the system to a stop and then repositions according to the new target position.

b) The position reference type (bit 5: **Motion Command Control Flag**) is set to 1 (Absolute mode)

Set the target position in the **Position Reference Setting**, and then set the **Motion Command** to 1.

Positioning will start. The **Motion Command Response Code** will be 1 during the positioning.

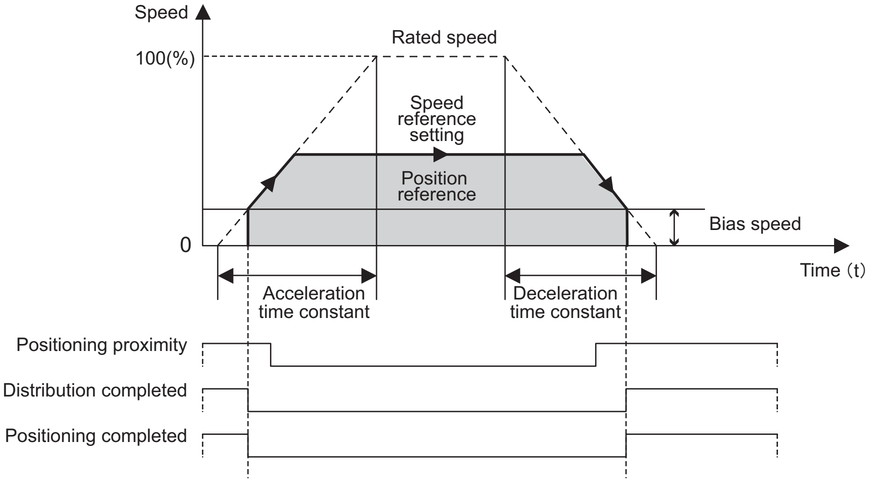
The Position proximity bit (bit 3: **Position Management Status**) will turn ON when the axis approaches the target position.

The Positioning completed bit (bit 1: **Position Management Status**) will turn ON when the axis reaches the target position, and the positioning will complete.

Note: 1. The target position can be changed during positioning operation.
2. When the target position is changed so that there is no sufficient deceleration distance or after the new target position has already been passed, the MTP2910 Module decelerates the system to a stop and then repositions according to the new target position.

4. Set the **Motion Command** to 0 to execute the NOP motion command to complete the positioning operation.

POSING Operation Pattern



■ Terminology: Command execution

When a command code is stored in the **Motion command**, execution of the motion command corresponding to that code is started. Used in describing motion command operations.

- Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted. A command is held by setting the Command pause bit (bit 0: **Motion Command Control Flag**) to 1 (ON).

- Set the Command pause bit (bit 0: **Motion Command Control Flag**) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command hold completed bit (bit 1: **Motion Command Status**) will turn ON.
- Reset the Command pause bit (bit 0: **Motion Command Control Flag**) to 0 (OFF). The command hold status will be cleared and the remaining portion of the positioning will be restarted.

• Aborting

Axis travel can be stopped during command execution and the remaining travel will be canceled by aborting execution of a command. A command is aborted by setting the Command abort bit (bit 1: **Motion Command Control Flag**) to 1 (ON).

- Set the Command abort bit (bit 1: **Motion Command Control Flag**) to 1. The axis will decelerate to a stop.
- When the axis is stopped, the remaining travel will be canceled and the Positioning completed bit (bit C: **Position Management Status**) will turn ON.
- The positioning will restart if the Command abort bit (bit 1: **Motion Command Control Flag**) is reset to 0 (OFF) during abort processing.
- This type of operation will also be performed if the motion command is changed during axis movement.

• Related Parameters

a) Parameters

Parameter No.	Parameter Name	Setting	Default Setting
0n26, Bits 0 to 3	Function setting 1 (Speed unit selection)	Select the setting unit for the **Speed Reference Setting**. 0: Reference unit/s 1: 10^n reference units/min (n = ***Number of Digits below Decimal Point*** (parameter No. 0n05)) 2: 0.01% 3: 0.0001%	1: 10^n reference units/min
0n26, Bits 4 to 7	Function setting 1 (Acceleration unit selection)	Select the setting unit for the parameter No. 0n2A (***Straight Line Acceleration/Acceleration Time Constant***) and No. 0n2C (***Straight Line Deceleration/Deceleration Time Constant***). 0: Reference unit /s^2 1: ms	1: ms
0n26, Bits 8 to B	Function setting 1 (Filter type)	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
0n28	NEAR signal output width	Set the range in which the Position proximity bit (bit 3: **Position Management Status**) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
0n2A	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0
0n2C	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
0n2E	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/deceleration filter or moving average filter can be selected in the parameter No. 0n26 (***Function setting 1***). This parameter is valid when Positioning completed bit (bit 1: **Position management status**) is ON (1).	0

b) Command Data

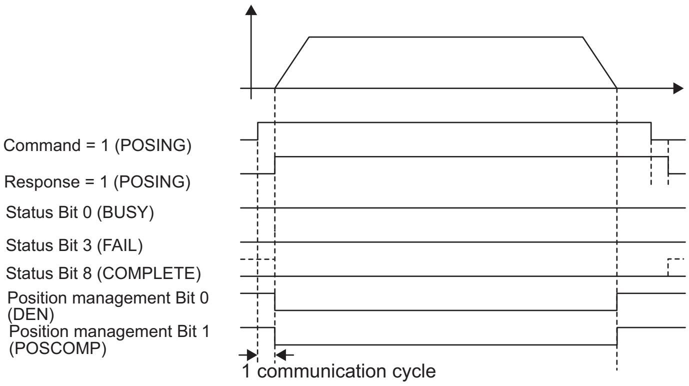
Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
12 and 13	40 and 41	Motion command	Set to 1 for positioning operation. Setting to 0 will abort the operation.
14 and 15, Bit 0	42 and 43, Bit 0	Command pause	The axis will decelerate to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Hold 1: Hold
14 and 15, Bit 1	42 and 43, Bit 1	Command abort	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Abort 1: Abort When this bit is reset to 0 (OFF) after deceleration to a stop, the operation depends on the setting of Position reference type bit (bit 5: **Motion Command Control Flag**). (0: Remains stopped 1: Restarts positioning to the target position)
14 and 15, Bit 5	42 and 43, Bit 5	Position reference type	Switch the type of position reference. 0: Incremental addition mode 1: Absolute mode Note: Set this bit before setting the **Motion Command** to 1.
18 and 19	46 and 47	Override	This parameter allows the positioning speed to be changed without changing the **Speed Reference Setting**. This setting can be changed during operation. Setting range: 0 to 32767 (0 to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50% = 5000
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Specify the speed for the positioning. Set a positive value only. If a negative value is set, an error will occur.
28 to 31	56 to 59	Position reference setting	Set the target position for positioning. This setting can be changed during operation. The meaning of the setting depends on the status of Position reference type bit (bit 5: **Motion Command Control Flag**).

c) Response Data

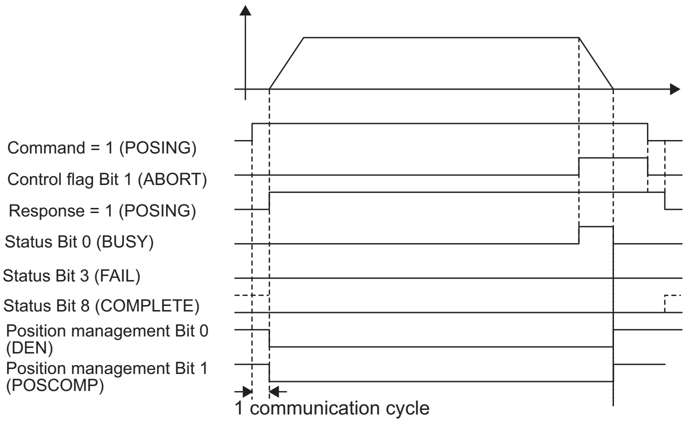
Response Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
8 and 9	36 and 37	Warning	Stores the most current warning. (bit setting)
10 and 11	38 and 39	Alarm	Stores the most current alarm. (bit setting)
12 and 13	40 and 41	Motion command response code	Indicates the motion command that is being executed. The response code will be 1 during POSING command execution.
14 and 15, Bit 0	42 and 43, Bit 0	Command executing	Turns ON when abort processing is being performed for POSING command. Turns OFF when abort processing has been completed.
14 and 15, Bit 1	42 and 43, Bit 1	Command hold completed	Turns ON when a deceleration to a stop has been completed as the result of setting the Command pause bit (bit 0: **Motion Command Control Flag**) to 1 during POSING command execution (**Motion Command Response Code** = 1).
14 and 15, Bit 3	42 and 43, Bit 3	Command error end	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
14 and 15, Bit 8	42 and 43, Bit 8	Command execution completed	Always OFF for POSING command. Use the Positioning completed bit (bit 1: **Position Management Status**) to confirm completion of this command.
20 and 21, Bit 0	48 and 49, Bit 0	Distribution completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.
20 and 21, Bit 1	48 and 49, Bit 1	Positioning completed	Turns ON when the Distribution completed bit (bit 0: **Position Management Status**) turns ON.
20 and 21, Bit 3	48 and 49, Bit 3	Position proximity	The operation depends on the setting of the parameter No. 0n28 (***NEAR Signal Output Width***). Parameter No. 0n28 = 0:Turns ON when Distribution completed bit (bit 0: **Position Management Status**) turns ON. Parameter No. 0n28 ≠ 0:Turns ON when the current position is in the range specified in the parameter 0n28 (***NEAR Signal Output Width***) even if pulse distribution has not been completed.

• Timing Charts

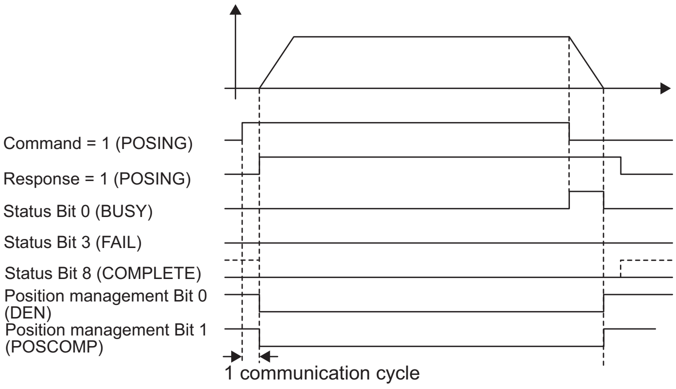
a) Normal Execution



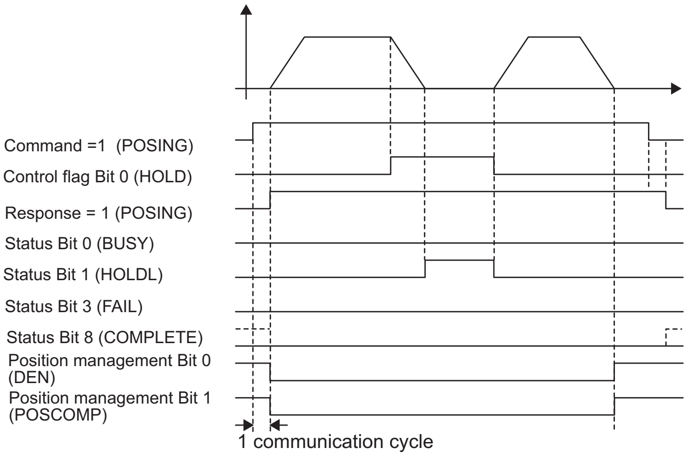
b) Execution when Aborted



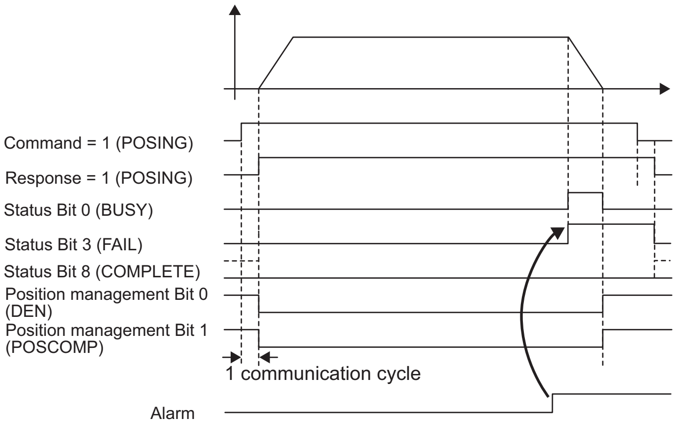
c) Execution when Aborting by Changing the Command



d) Command Hold



e) Execution when an Alarm Occurs



(b) Zero Point Return (ZRET)

When the Zero Point Return command (ZRET) is executed, the axis will return to the zero point of the machine coordinate system.

The zero point return command is executed using the method selected from three methods listed below.

IMPORTANT

- The MTP2910 Module is not provided with the function to latch feedback pulses*. It is necessary to latch feedback pulses externally for the applications that require repetitive accuracy.
- For the zero point return operation that is implemented using the MTP2910 Module, the ZERO signal is detected using the polling software. Therefore, design the circuit to turn ON the ZERO signal for 2 ms or more so that the MTP2910 Module can detect the ZERO signal without fail.
- The range check for the parameter No. 0n32 (***Approach Speed***) and parameter No. 0n34 (***Creep Speed***) that are used for the zero point return operation is performed only at the start of zero point return operation. Do not change the approach speed and creep speed after the zero point return operation starts.

* In this manual, "latch" means to hold the reference position when a signal is detected.

• Zero Point Return Methods

The following table lists three zero point return methods that are supported by the MTP2910 Module. Select the best method for the machine according to the setting parameters.

Parameter No. 0n30 Setting	Zero Point Return Method	Description	Signals
2	DEC1+ ZERO	Applies a 3-step deceleration method using deceleration limit switch and ZERO signal.	DEC1 signal: DI_1 or bit 8 of the **Function Setting 3** (The signal specified in bit 0 of the parameter No. 0n15 (***Hardware Signal Selection 2***)) ZERO signal: DI_0 (Latches by ZERO signal)
4	DEC2+ ZERO	Uses the deceleration limit switch as the zone signals and the ZERO signal as the zero-point signal.	DEC2 signal: DI_1 or bit 8 of the **Function Setting 3** (The signal specified in bit 0 of the parameter No. 0n15 (***Hardware Signal Selection 2***)) ZERO signal: DI_0 (Latches by ZERO signal)
5	DEC1+ LMT+ ZERO	Uses the deceleration limit switch and two limit signals for zero point return as the zone signals and the ZERO signal as the zero-point signal.	DEC1 signal: DI_1 or bit 8 of the **Function Setting 3** (The signal specified in bit 0 of the parameter No. 0n15 (***Hardware Signal Selection 2***)) Reverse LMT: DI_2 or bit 9 of the **Function Setting 3** (The signal specified in bit 1 of the parameter No. 0n15 (***Hardware Signal Selection 2***)) Forward LMT: DI_3 or bit A of the **Function Setting 3** (The signal specified in bit 2 of the parameter No. 0n15 (***Hardware Signal Selection 2***)) ZERO signal: DI_0 (Latches by ZERO signal)

- Execution/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.
2	The Servo ON condition.	The Running bit (bit 1: **Run Status**) is ON.

2. Refer to *8.9.1 (3) (b) Zero Point Return (ZRET)* and set the required parameters.
3. Set the **Motion Command** to 3 to execute the ZRET motion command.

   The zero point return operation will start. The **Motion Command Response Code** will be 3 during the operation.

   The Position proximity bit (bit 3: **Position Management Status**) will turn ON when the axis reaches the zero point and zero point return has been completed.
4. Set the **Motion Command** to 0 to execute the NOP motion command and then complete the zero point return operation.

- Holding

Holding execution is not possible during zero point return operation. The Command pause bit (bit 0: **Motion Command Control Flag**) is ignored.

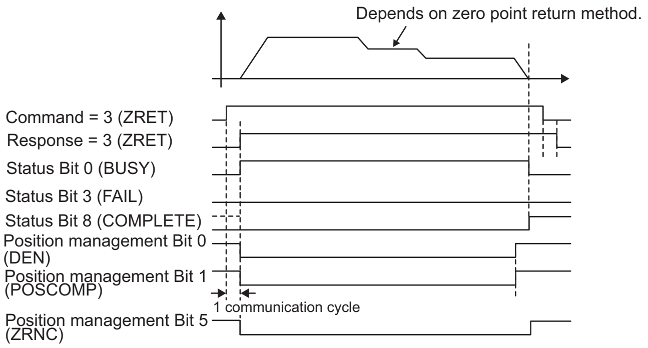
- Aborting

The zero point return can be canceled by aborting execution of a command. A command is aborted by setting the Command abort bit (bit 1: **Motion Command Control Flag**) to 1.

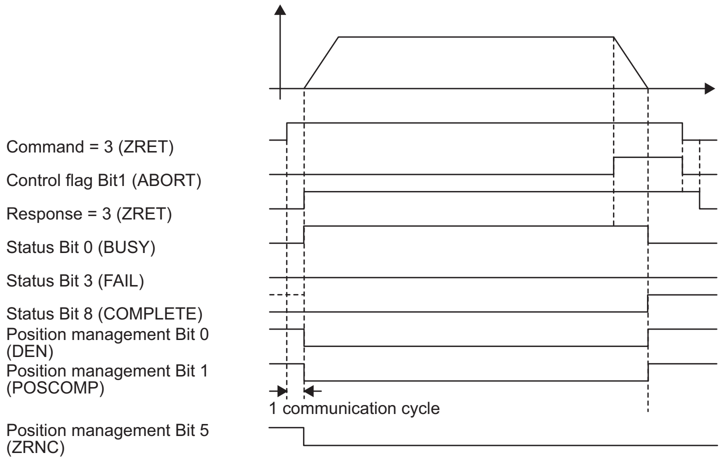
  - Set the Command abort bit (bit 1: **Motion Command Control Flag**) to 1. The axis will decelerate to a stop.
  - When the axis has decelerated to a stop the remain travel will be canceled and the Positioning completed bit (bit 1: **Position Management Status**) will turn ON.
  - This type of operation will also be performed if the motion command is changed during axis movement.

- Timing Charts

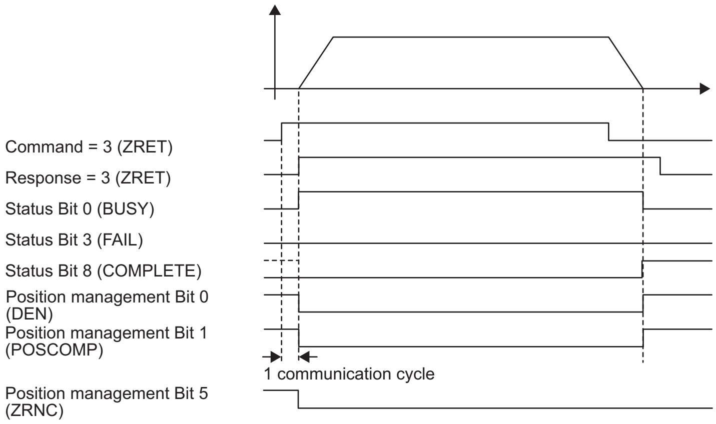
a) Normal Execution



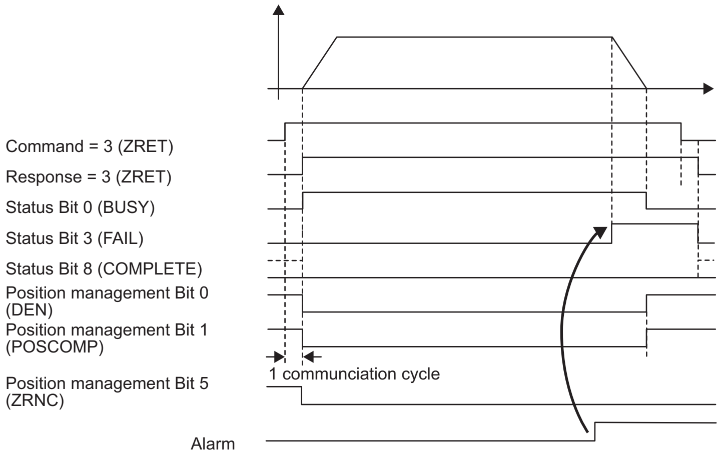
b) Execution when Aborted



c) Execution when Aborting by Changing the Command



d) Execution when an Alarm Occurs



- Zero Point Return Methods and Related Parameters

This section explains the operation that occurs after starting a zero point return and the parameters that need to be set before executing the command for each zero point return method.

a) DEC1+ ZERO (Parameter No. 0n30 (***Zero Point Return Method***) = 2)

- Operation after Zero Point Return Starts

The axis starts moving at the speed specified by the **Speed Reference Setting** in the direction specified by the Zero point return direction bit (bit 3: **Motion Command Control Flag**).

↓

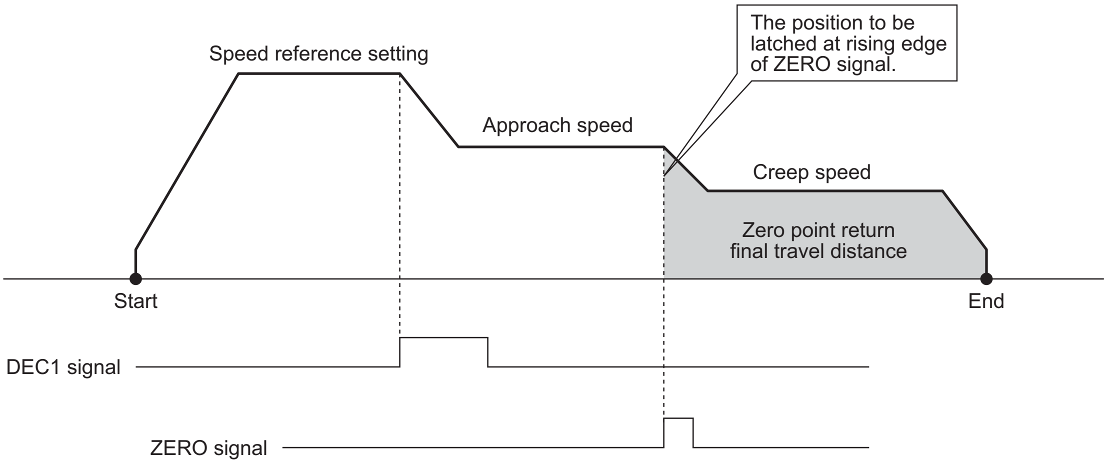
When the rising edge of DEC1 signal is detected, the axis will decelerate to the speed specified by the parameter No.0n32 (***Approach Speed***).

↓

When the axis position is latched at the rising edge of ZERO signal after passing the DEC1, the axis will decelerate to the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. When the positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



- Related Data
  - Parameters

Parameter No.	Name	Setting	Default Setting
0n30	Zero point return method	2: DEC1 + ZERO	0
0n32	Approach speed	Set the approach speed shown in the previous figure. Only a positive value can be set; a negative value will result in an error.	1000
0n34	Creep speed	Set the creep speed shown in the previous figure. Only a positive value can be set; a negative value will result in an error.	500
0n36	Zero point return final travel distance	Set the zero point return final travel distance shown in the previous figure. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.	0
0n01, Bit 5	Deceleration LS reversal selection	Set whether to reverse or not to reverse the polarity of DI_1 signal that is used as DEC1 signal. 0: Not reverse 1: Reverse (Bit 8 of **Function Setting 3** will not be reversed.)	0: Not reverse
0n15, Bit 0	Deceleration LS signal selection	Select the signal to be used as DEC1 signal. 0: Depends on bit 8 of **Function Setting 3** 1: DI_1 signal	0: Depends on bit 8 of **Function Setting 3**
0n26, Bits 0 to 3	Speed unit selection	Select the unit for the settings of the **Speed Unit Setting**, parameter No. 0n32 (***Approach Speed***), and parameter No. 0n34 (***Creep Speed***). 0: Reference unit/s 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min

  - Command Data

Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
14 and 15, Bit 3	42 and 43, Bit 3	Zero point return direction	Set the zero point return direction.
18 and 19	46 and 47	Override	This parameter allows the zero point return speed to be changed without changing the value of the **Speed Reference Setting**. Set the speed as a percentage of the Speed reference setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50%: 5000 Note: This parameter is invalid for the parameter No. 0n32 (***Approach Speed***) and No.0n34 (***Creep Speed***).
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.

b) DEC2+ ZERO (***Zero Point Return Method*** = 4)

With this method, the machine position is detected by ON/OFF status of DEC2 signal to return the machine automatically. The zero point return operation is always performed under the same condition.

- Operation after Zero Point Return Starts

<When the zero point return start position is in High zone>

The axis starts moving in forward direction at the speed specified by the **Speed Reference Setting**.

↓

When the falling edge of DEC2 signal is detected, the axis will decelerate to a stop.

↓

After deceleration to a stop, the axis will start moving in reverse direction at the speed specified by the parameter No. 0n32 (***Approach Speed***).

↓

When the rising edge of DEC2 signal is detected, the axis will decelerate to a stop.

↓

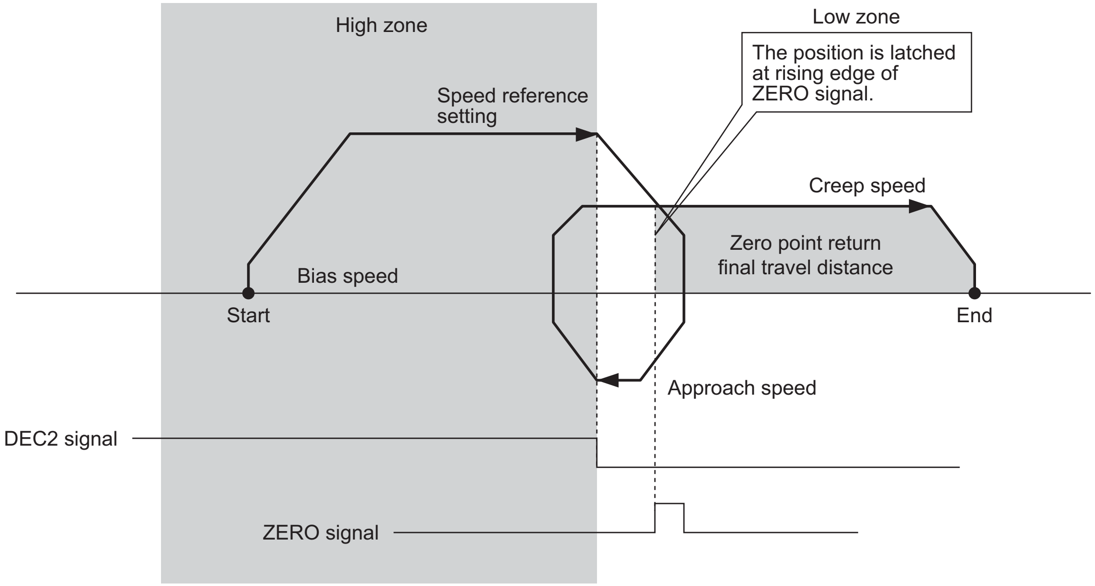
After deceleration to a stop, the axis will start moving in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After the falling edge of DEC2 signal is detected, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. When the positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



<When the zero point return start position is in Low zone>

The axis starts moving in reverse direction at the speed specified by the parameter No. 0n32 (***Approach Speed***).

↓

Whe the rising edge of DEC2 signal is detected, the axis will decelerate to a stop.

↓

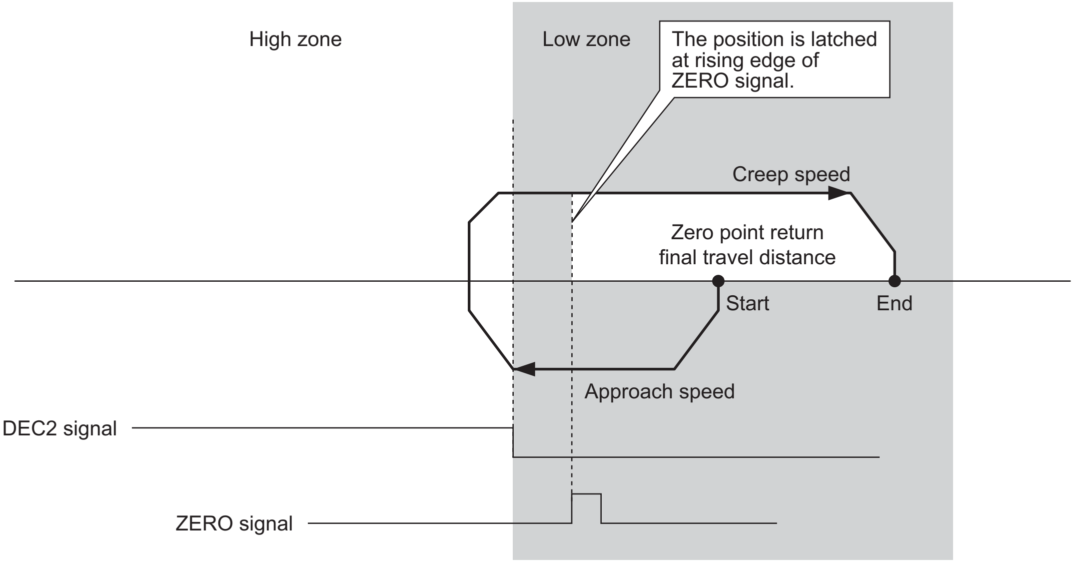
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

When the falling edge of DEC2 signal is detected, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. When the positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



- Related Data
  - Parameters

Parameter No.	Name	Setting	Default Setting
0n30	Zero point return method	4: DEC2 + ZERO	0
0n32	Approach speed	Set the approach speed shown in the previous figure. Only a positive value can be set, a negative value will result in an error.	1000
0n34	Creep speed	Set the creep speed shown in the previous figure. Only a positive value can be set; a negative value will result in an error.	500
0n36	Zero point return final travel distance	Set the zero point return final travel distance shown in the previous figure. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.	0
0n01, Bit 5	Deceleration LS reversal selection	Set whether to reverse or not to reverse the polarity of DI_1 signal that is used as DEC1 signal. 0: Not reverse 1: Reverse (Bit 8 of **Function Setting 3** will not be reversed.)	0: Not reverse
0n15, Bit 0	Deceleration LS signal selection	Select the signal to be used as DEC1 signal. 0: Depends on bit 8 of the **Function Setting 3** 1: DI_1 signal	0: Depends on bit 8 of the **Function Setting 3**
0n26, Bits 0 to 3	Speed unit selection	Select the unit for the settings of the **Speed Unit Setting**, parameter No. 0n32 (***Approach Speed***), and parameter No. 0n34 (***Creep Speed***). 0: Reference unit/s 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min

  - Command Data

Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
14 and 15, Bit 3	42 and 43, Bit 3	Zero point return direction	Set the zero point return direction.
18 and 19	42 and 47	Override	This parameter allows the zero point return speed to be changed without changing the value of the **Speed Reference Setting**. Set the speed as a percentage of the Speed reference setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50%: 5000 Note: This parameter is invalid for the parameter No.0n32 (***Approach Speed***) and No.0n34 (***Creep Speed***).
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.

c) DEC1+ LMT+ZERO (Parameter No. 0n30 (***Zero Point Return Method*** = 5)

With this method, the machine position is detected by ON/OFF status of DEC1, reverse LMT, and forward LMT signals to return the machine automatically. The zero point return operation is always performed under the same condition.

- Operation after Zero Point Return Starts

<When the zero point return start position is in the zone A>

The axis starts moving in forward direction at the speed specified by the **Speed Reference Setting**.

↓

When the falling edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

After deceleration to a stop, the axis will move in reverse direction at the speed specified by the parameter No. 0n32 (***Approach Speed***).

↓

When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

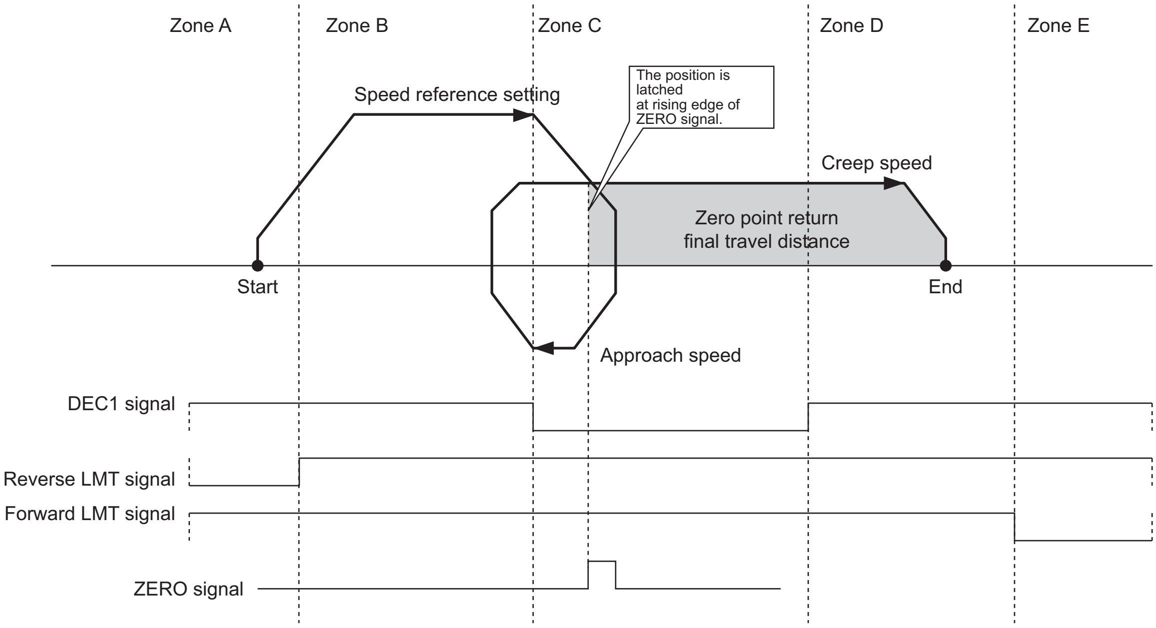
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After detecting the falling edge of DEC1, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



<When the zero point return start position is in the zone B>

The axis starts moving in reverse direction at the speed specified by the parameter No. 0n32 ***Approach Speed***.

↓

When the falling edge of reverse LMT signal is detected, the axis will decelerate to a stop.

↓

After deceleration to a stop, the axis will move in forward direction at the speed specified by the **Speed Reference Setting**.

↓

When the falling edge of DEC1 is detected, the axis will decelerate to a stop.

↓

After deceleration to a stop, the axis will move in reverse direction at the speed specified by the parameter No. 0n32 (***Approach Speed***).

↓

When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

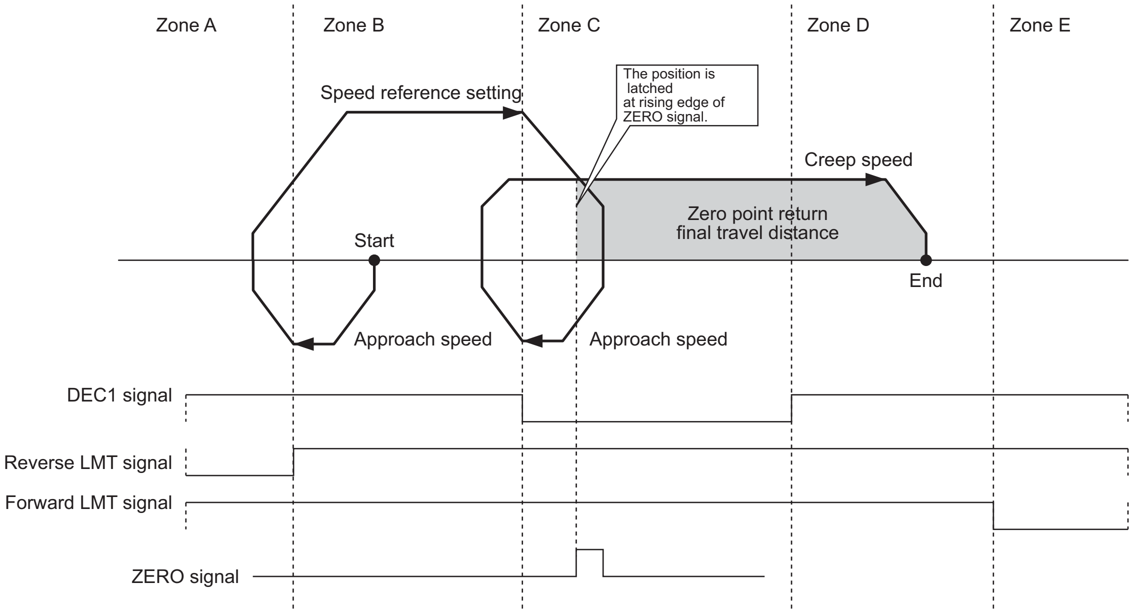
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After detecting the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



<When the zero point return start position is in the zone C>

The axis starts moving in reverse direction at the speed specified by the parameter No. 0n34 (***Creep speed***).

↓

When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

When the falling edge of reverse LMT signal is detected, the axis will decelerate to a stop.

↓

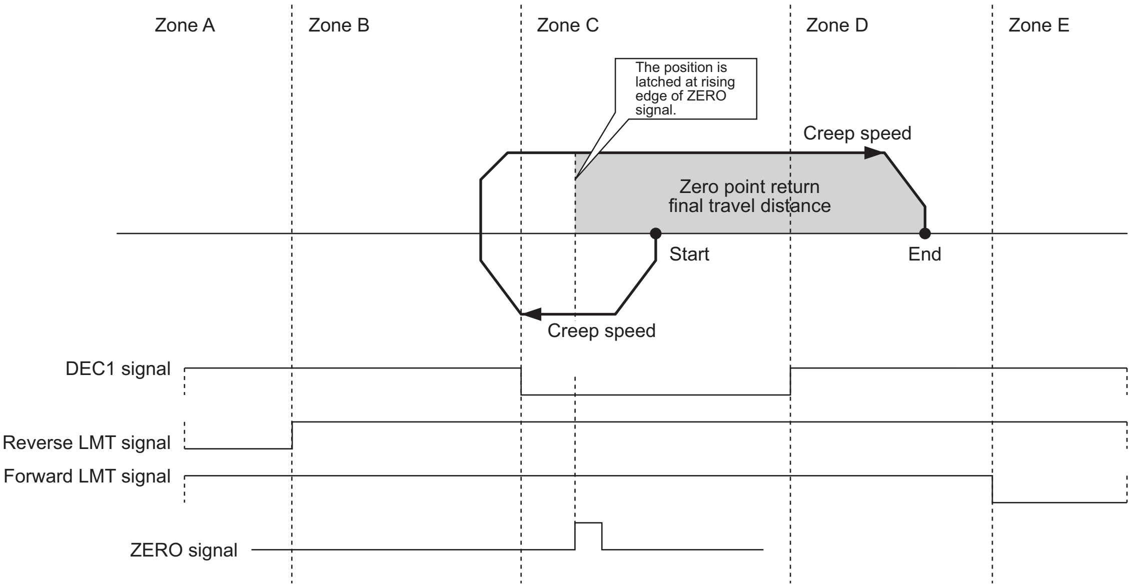
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After detecting the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



<When the zero point return start position is in the zone D>

The axis starts moving in reverse direction at the speed specified by the parameter No. 0n32 (***Approach Speed***).

↓

When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

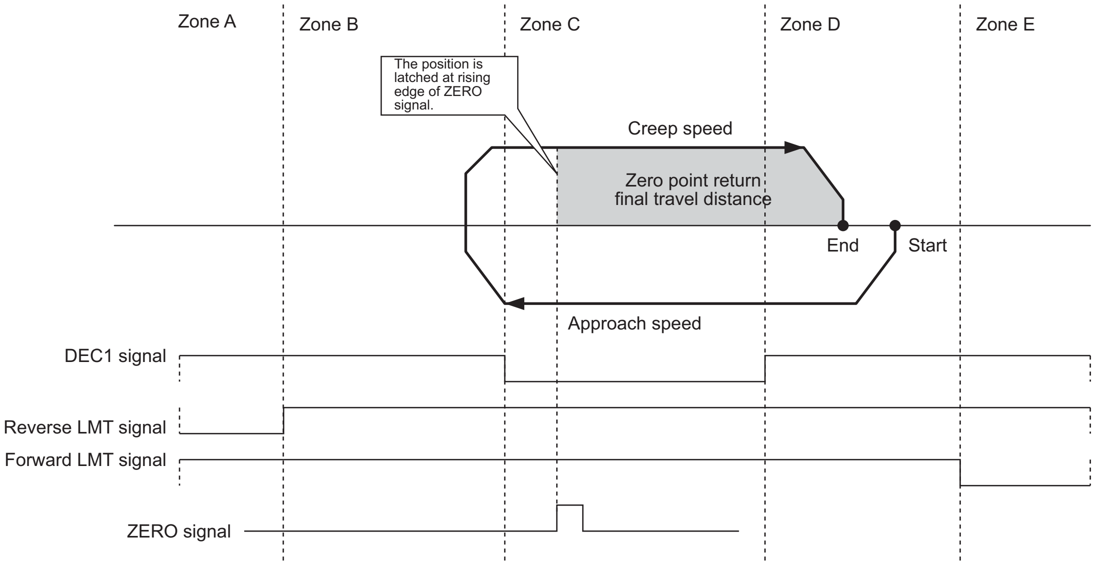
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After detection the falling edge of DEC1 signal, the position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



<When the zero point return start position is in the zone E>

The axis starts moving in reverse direction at the speed specified by the parameter No. 0n32 (***Approach speed***).

↓

When the rising edge of DEC1 signal is detected, the axis will decelerate to a stop.

↓

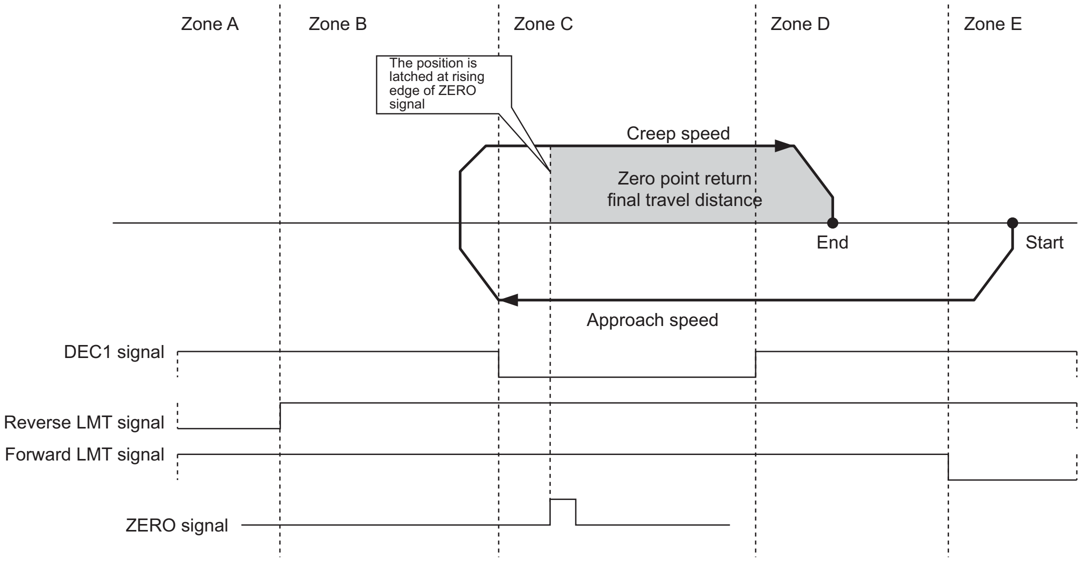
After deceleration to a stop, the axis will move in forward direction at the speed specified by the parameter No. 0n34 (***Creep Speed***).

↓

After detectin the falling edge of DEC1 signal, the axis position will be latched at the rising edge of ZERO signal.

↓

The axis will move for the distance specified by the parameter No. 0n36 (***Zero Point Return Travel Distance***) from the latched position and stop. After positioning is completed, a machine coordinate system will be established with the final stop position as the zero point.



- Related Data
  - Parameters

Parameter No.	Name	Setting	Default Setting
0n30	Zero point return method	5: DEC1 + LMT + ZERO	0
0n32	Approach speed	Set the approach speed shown in the previous figure. Only a positive value can be set, a negative value will result in an error.	1000
0n34	Creep speed	Set the creep speed shown in the previous figure. Only a positive value can be set; a negative value will result in an error.	500
0n36	Zero point return final travel distance	Set the zero point return final travel distance shown in the above figure. If the sign is positive, travel will be toward the zero point return direction; if the sign is negative, travel will be away from the zero point return direction.	0
0n01, Bit 5	Deceleration LS reversal selection	Set whether to reverse or not to reverse the polarity of DI_1 signal that is used as DEC1 signal. 0: Not reverse 1: Reverse (Bit 8 of the **Function Setting 3** will not be reversed.)	0: Not reverse
0n15, Bit 0	Deceleration LS signal selection	Select the signal to be used as DEC1 signal. 0: Depends on bit 8 of the **Function setting 3** 1: DI_1 signal	0: Depends on bit 8 of the **Function Setting 3**
0n26, Bits 0 to 3	Speed unit selection	Select the unit for the settings of the **Speed Unit Setting**, parameter No. 0n32 (***Approach Speed***), and parameter No. 0n34 (***Creep Speed***). 0: Reference unit/s 1: 10^n reference units/min 2: Percentage (%) of rated speed	1: 10^n reference units/min

  - Command Data

Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
14 and 15, Bit 3	42 and 43, Bit 3	Zero point return direction	Set the zero point return direction.
18 and 19	42 and 47	Override	This parameter allows the zero point return speed to be changed without changing the value of the **Speed Reference Setting**. Set the speed as a percentage of the Speed reference setting. This setting can be changed during operation. Setting range: 0 to 32767 (0% to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50%: 5000 Note: This parameter is invalid for the parameter No. 0n32 (***Approach Speed***) and No.0n34 (***Creep Speed***).
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Set the speed to use when starting a zero point return. Only a positive value can be set; a negative value will result in an error.

(c) Interpolation (INTERPOLATE)

The INTERPOLATE command positions the axis according to the target position that changes in synchronization with the communication cycle.

- Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.
2	The Servo ON condition.	The Running bit (bit 1: **Run Status**) is ON.

2. Refer to *8.9.1 (3) • Related Data* to set the required parameters and command data.
3. Set the interpolation motion command and the target position.

   a) The Position reference type bit (bit 5: **Motion Command Control Flag**) is set to 0 (Incremental addition mode)

   Set the **Motion Command** to 4, and then add the incremental value for each communication cycle to the **Position Reference Setting** to set the target position.

   The positioning operation will starts. The **Motion Command Response Code** will be 4 during the positioning.

   The Position proximity bit (bit 3: **Position Management Status**) will turn ON when the axis approaches the target position.

   b) The Position reference type bit (bit 5: **Motion Command Control Flag**) is set to 1 (Absolute mode)

   Set the target position in the **Position Reference Setting**, and then set the **Motion Command** to 4.

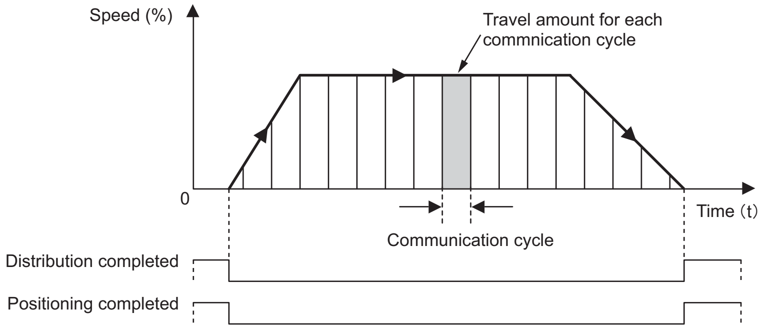
   Positioning will start. The **Motion Command Response Code** will be 4 during the positioning.

   The Position proximity bit (bit 3: **Position Management Status**) will turn ON when the axis approaches the target position.

   The Distribution completed bit (bit 1: **Position Management Status**) will turn ON when the axis reaches the target position, and the positioning will complete.

4. Set the **Motion Command** to 0 to execute the NOP motion command and the complete the positioning operation.

INTERPOLATE Operation Pattern



- Holding and Aborting

The Command hold bit (bit 0: **Motion Command Control Flag**) and the Command abort bit (bit 1: **Motion Command Control Flag**) cannot be used.

If 0 is set for the **Motion Command** while the axis is moving, the interpolation operation will immediately stops.

- Related Data

a) Parameters

Parameter No.	Name	Setting	Default Setting
0n26, Bits 8 to B	Function setting 1 (Filter type selection)	Set the acceleration/deceleration filter type. 0: No filter 1.Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
0n28	NEAR signal output width	Set the range in which the Position proximity bit (bit 3: **Position Management Status**) will turn ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
0n2E	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential or moving average filter can be selected by setting the parameter No. 0n26 (***Function Setting 1***). This parameter is valid when the Positioning completed bit (bit 0: **Position Management Status**) is set to 1 (ON).	0

b) Command Data

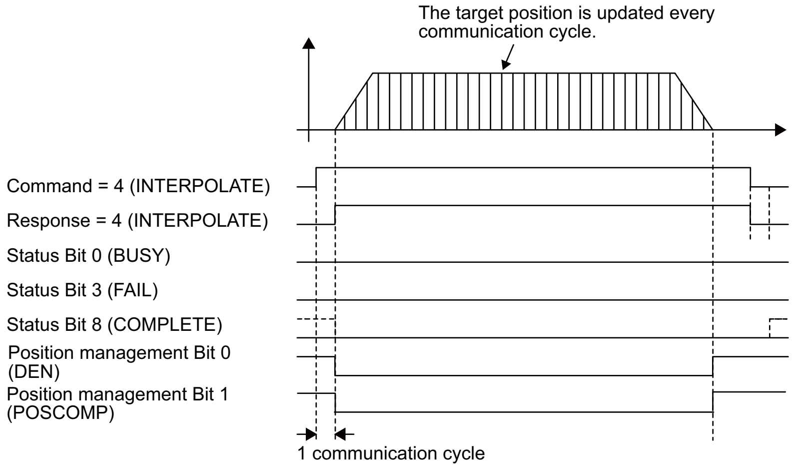
Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
12 and 13	40 and 41	Motion command	Set to 4 to execute interpolation. If 0 is set during interpolation operation, the operation will stop.
14 and 15, Bit 5	42 and 43, Bit 5	Position reference type	Switch the type of position reference. 0: Incremental addition mode 1: Absolute mode Note: Set this bit before setting the **Motion Command** to 4.

c) Response Data

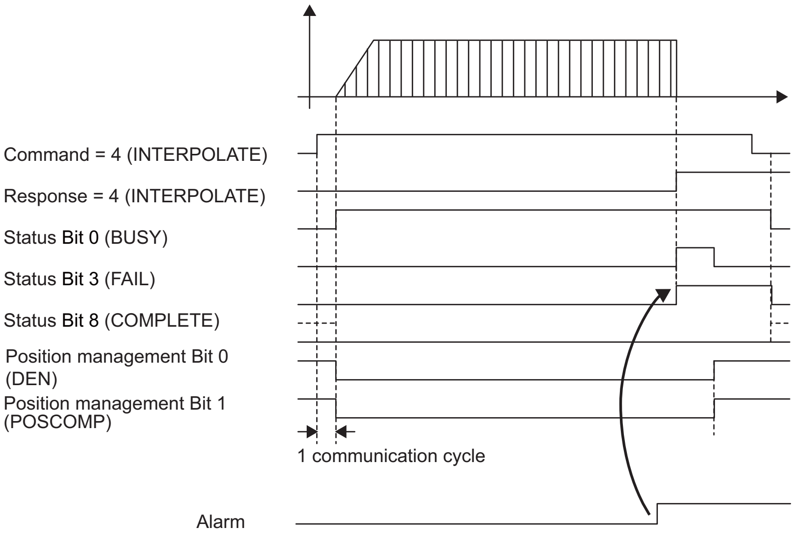
Response Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
8 and 9	36 and 37	Warning	Store the most current warning. (bit setting)
10 and 11	38 and 39	Alarm	Store the most current alarm. (bit setting)
12 and 13	40 and 41	Motion command response code	Indicate the motion command that is being executed. The response code is 4 during INTERPOLATE command execution.
14 and 15, Bit 0	42 and 43, Bit 0	Command executing	Always OFF for INTERPOLATE command.
14 and 15, Bit 1	42 and 43, Bit 1	Command hold completed	Always OFF for INTERPOLATE command.
14 and 15, Bit 3	42 and 43, Bit 3	Command error end	Turn ON if an error occurs during INTERPOLATE command execution. The axis will decelerate to a stop if it is moving. Turn OFF when another command is executed.
20 and 21, Bit 0	48 and 49, Bit 0	Command execution completed Distribution completed	This parameter is not used for INTERPOLATE command. Always OFF for INTERPOLATE command. Use the Positioning completed bit (bit 1: **Position Management Status**) to confirm the completion of command execution. Turn ON when the distribution of move command has been completed. This bit is OFF while a move command is being executed.
20 and 21, Bit 1	48 and 49, Bit 1	Positioning completed	Turn ON when the Distribution completed bit (bit 0: **Position Management Status**) turns ON.
20 and 21, Bit 3	48 and 49, Bit 3	Position proximity	The operation depends on the setting of the parameter No. 0n28 (***NEAR Signal Output Width***). Parameter No. 0n28 = 0:Turns ON when Distribution completed bit (bit 0: **Position Management Status**) turns ON. Parameter No. 0n28 ≠ 0:Turns ON when the current position is in the range of the parameter No. 0n28 (***NEAR Signal Output Width***) even if pulse distribution has not been completed.

- Timing Charts

a) Normal Execution



b) Execution when an Alarm Occurs



(d) JOG Operation (FEED)

The FEED command starts movement in the specified travel direction at the specified travel speed. Execute the NOP motion command (0 for the **Motion Command**) to stop the operation.

Parameters related to acceleration and deceleration are set in advance.

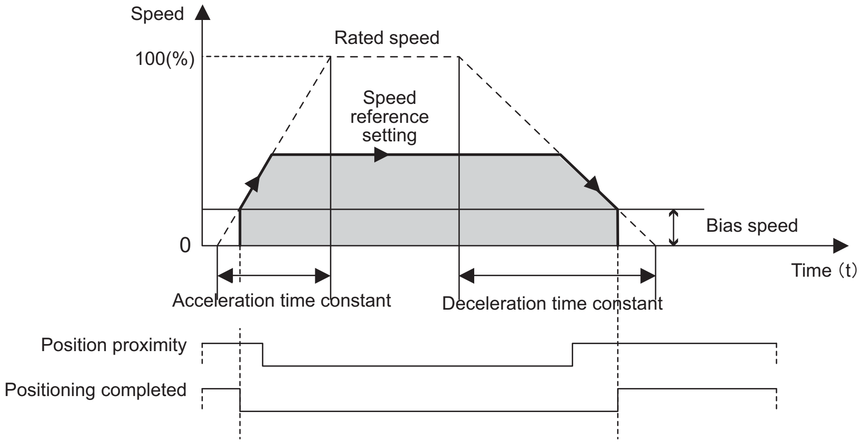
- Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.
2	The Servo ON condition.	The Running bit (bit 1: **Run Status**) is ON.

2. Refer to *8.9.1 (3) • Related Data* to set the required parameters and command data.
3. Set the **Motion Command** to 7 to execute the FEED motion command.
   JOG operation will start. The **Motion Command Response Code** will be 7 during the execution.
4. Set the **Motion Command** to 0 to execute the NOP motion command.
   The Positioning completed bit (bit 1: **Position Management Status**) turns ON and the JOG operation has been completed.

FEED Operation Pattern



- Holding

Holding execution is not possible during FEED command execution. The Command hold bit (bit 0: **Motion Command Control Flag**) is ignored.

- Aborting

Axis travel can be stopped during FEED command execution by aborting execution of a command.
A command is aborted by setting the Command abort bit (bit 1: **Motion Command Control Flag**) to 1 (ON).

- Set the Command abort bit (bit 1: **Motion Command Control Flag**) to 1 (ON). The axis will decelerate to a stop.
- When the axis has stopped, the Positioning completed bit (bit 1: **Position Management Status**) will turn ON.
- The JOG operation will restart if the Command abort bit (bit 1: **Motion Command Control Flag**) is reset to 0 during abort processing.
- This type of operation will also be performed if the **Motion Command** is changed during axis movement.

- Related Data

a) Parameters

Parameter No.	Name	Setting	Default Setting
0n26, Bits 0 to 3	Function setting 1 (Speed unit selection)	Select the setting unit for the **Speed Reference Setting**. 0: Reference unit/s 1: 10^n reference units/min (n = ***Number of Digits below Decimal Point*** (parameter No. 0n05) 2: 0.01% 3: 0.0001%	1: 10^n reference units/min
0n26, Bits 4 to 7	Function setting 1 (Acceleration unit selection)	Select the setting unit for the parameter No. 0n2A (***Straight Line Acceleration/Acceleration Time Constant***) and No. 0n2C (***Straight Line Deceleration/Deceleration Time Constant***). 0: Reference unit /s^2 1: ms	1: ms
0n26, Bits 8 to B	Function setting 1 (Filter type)	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
0n28	NEAR signal output width	Set the range in which the Position proximity bit (bit 3: **Position Management Status**) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
0n2A	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0
0n2C	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
0n2E	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/deceleration filter or moving average filter can be selected in the parameter No. 0n26 (***Function Setting 1***). This parameter is valid when Positioning completed bit (bit 1: **Position management Status**) is ON (1).	0

b) Command Data

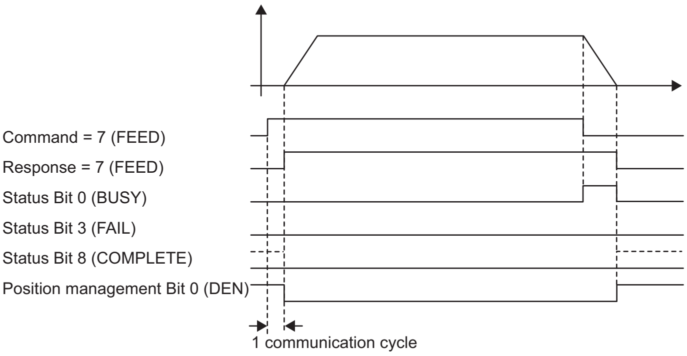
Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
12 and 13	40 and 41	Motion command	Set to 7 for JOG operation. Setting to 0 will abort the operation.
14 and 15, Bit 1	42 and 43, Bit 1	Command abort	The axis will decelerate to a stop if this bit is set to 1 (ON) during JOG operation. 0: Cancel Abort 1: Abort When this bit is reset to 0 (OFF) after decelerating to a stop, the operation depends on the setting of the Position reference type bit (bit 5: **Motion Command Control Flag**). (0: Remains stopped 1: Restarts positioning to the target position)
18 and 19	46 and 47	Override	This parameter allows the positioning speed to be changed without changing the **Speed Reference Setting**. This setting can be changed during operation. Setting range: 0 to 32767 (0 to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50% = 5000
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Specify the speed for the JOG operation. Set a positive value only. If a negative value is set, an error will occur.

c) Response Data

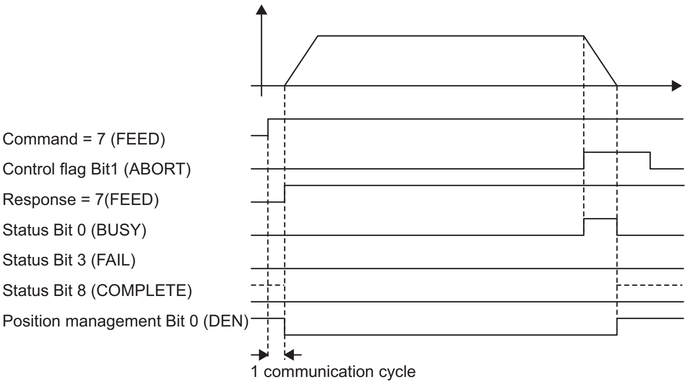
Response Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
8 and 9	36 and 37	Warning	Stores the most current warning. (bit setting)
10 and 11	38 and 39	Alarm	Stores the most current alarm. (bit setting)
12 and 13	40 and 41	Motion command response code	Indicates the motion command that is being executed. The response code will be 7 during FEED command execution.
14 and 15, Bit 0	42 and 43, Bit 0	Command executing	Turns ON when abort processing is being performed for FEED command. Turns OFF when abort processing has been completed.
14 and 15, Bit 1	42 and 43, Bit 1	Command hold completed	Always OFF for FEED command.
14 and 15, Bit 3	42 and 43, Bit 3	Command error end	Turns ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
14 and 15, Bit 8	42 and 43, Bit 8	Command execution completed	Always OFF for FEED command. Use the Positioning completed bit (bit 1: **Position Management Status**) to confirm completion of this command.
20 and 21, Bit 0	48 and 49, Bit 0	Distribution completed	Turns ON when pulse distribution has been completed for the move command. Turns OFF during execution of the move command.
20 and 21, Bit 1	48 and 49, Bit 1	Positioning completed	Turns ON when the Distribution completed bit (bit 0: **Position Management Status**) turns ON.
20 and 21, Bit 3	48 and 49, Bit 3	Position proximity	The operation depends on the setting of the parameter No. 0n28 (***NEAR Signal Output Width***). Parameter No. 0n28 = 0:Turns ON when Distribution completed bit (bit 0: **Position Management Status**) turns ON. Parameter No. 0n28 ≠ 0:Turns ON when the current position is in the range of the parameter No. 0n28 (***NEAR Signal Output Width***) even if pulse distribution has not been completed.

- Timing Charts

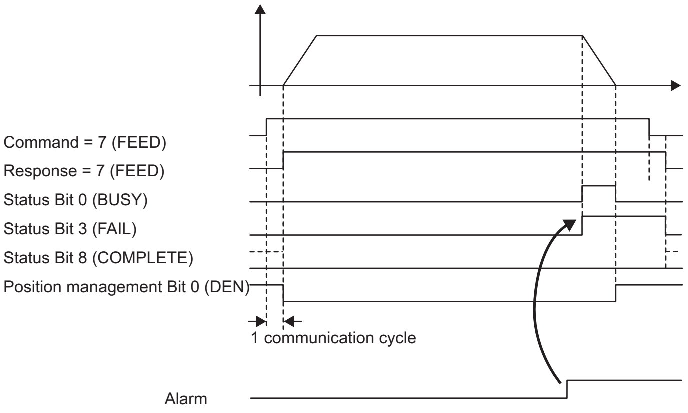
a) Normal Execution



b) Execution when Aborted



c) Execution when an Alarm Occurs



(e) STEP Operation (STEP)

The STEP command executes a positioning for the specified travel direction, travel amount, and travel speed.

Parameters related to acceleration and deceleration are set in advance.

- Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.
2	The Servo ON condition.	The Running bit (bit 1: **Run Status**) is ON.

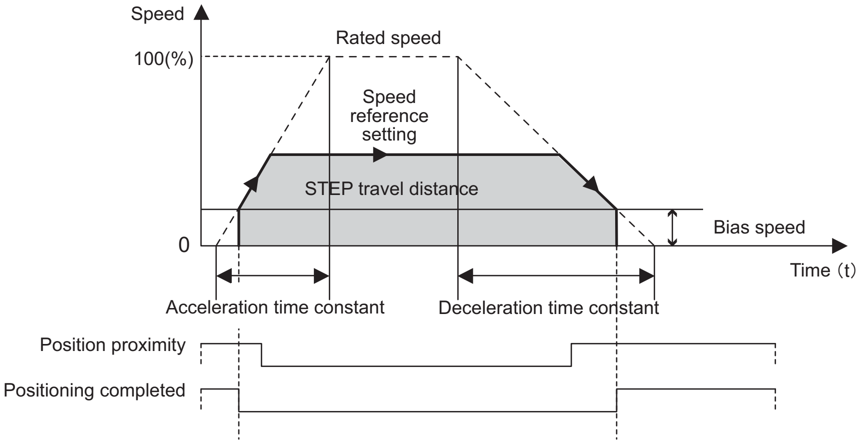
2. Refer to *8.9.1 (3) • Related Data* to set the required parameters and command data.
3. Set the **Motion Command** to 8 to execute the STEP motion command.

   STEP operation will start. The **Motion Command Response Code** will be 8 during the execution.

   The Position proximity bit (bit 3: **Position Management Status**) turns ON when the axis approaches the target position.

   The Distribution completed bit (bit 1: **Position Management Status**) turns ON when the axis reaches the target position.
4. Set the **Motion Command** to 0 to execute the NOP motion command. The STEP operation has been completed.

STEP Operation Pattern



- Holding

Axis travel can be stopped during command execution and then the remaining travel can be restarted.
A command is held by setting the Command pause bit (bit 0: **Motion Command Control Flag**) to 1.

- Set the Command pause bit (bit 0: **Motion Command Control Flag**) to 1. The axis will decelerate to a stop.
- When the axis has stopped, the Command hold completed bit (bit 1: **Motion Command Status**) will turn ON.
- Turn OFF the Command pause bit (bit 0: **Motion Command Control Flag**).
  The command hold status will be cleared and the remaining portion of the positioning will be restarted.

- Aborting

Axis travel can be stopped during command execution and the remaining travel will be cancelled by aborting execution of a command. A command is aborted by setting the Command abort bit (bit 1: **Motion Command Control Flag**) to 1 (ON).

- Set the Command abort bit (bit 1: **Motion Command Control Flag**) to 1 (ON). The axis will decelerate to a stop.
- When the axis has stopped, the remaining portion of the positioning will be canceled and the Positioning completed bit (bit 1: **Position Management Status**) will turn ON.
- This type of operation will also be performed if the motion command is changed during axis movement.

- Related Data

a) Parameters

Parameter No.	Name	Setting	Default Setting
0n26, Bits 0 to 3	Function setting 1 (Speed unit selection)	Select the setting unit for the **Speed Reference Setting**. 0: Reference unit/s 1: 10^n reference units/min (n = ***Number of Digits below Decimal Point*** (parameter No. 0n05)) 2: 0.01% 3: 0.0001%	1: 10^n reference units/ min
0n26, Bits 4 to 7	Function setting 1 (Acceleration unit selection)	Select the setting unit for the parameter No. 0n2A (***Straight Line Acceleration/Acceleration Time Constant***) and No. 0n2C (***Straight Line Deceleration/Deceleration Time Constant***). 0: Reference unit/s^2 1: ms	1: ms
0n26, Bits 8 to B	Function setting 1 (Filter type)	Set the acceleration/deceleration filter type. 0: No filter 1: Exponential acceleration/deceleration filter 2: Moving average filter	0: No filter
0n28	NEAR signal output width	Set the range in which the Position proximity bit (bit 3: **Position Management Status**) turns ON. The Position proximity bit will turn ON when the absolute value of the difference between the reference position and the feedback position is less than the value set here.	0
0n2A	Straight line acceleration/ Acceleration time constant	Set the acceleration rate or acceleration time constant for positioning.	0
0n2C	Straight line deceleration/ Deceleration time constant	Set the deceleration rate or deceleration time constant for positioning.	0
0n2E	Filter time constant	Set the acceleration/deceleration filter time constant. Either exponential acceleration/deceleration filter or moving average filter can be selected in the parameter No. 0n26 (***Function setting 1***). This parameter is valid when Positioning completed bit (bit 1: **Position Management Status**) is ON (1).	0
0n38	STEP travel amount	Set the travel amount of STEP operation.	1000

b) Command Data

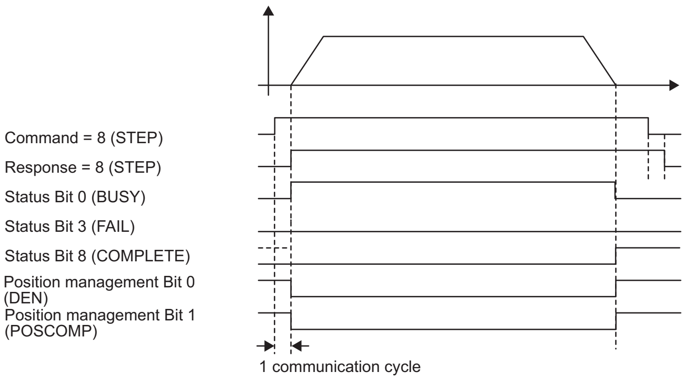
Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
12 and 13	40 and 41	Motion command	Set to 8 for STEP operation. Setting to 0 will abort the operation.
14 and 15, Bit 0	42 and 43, Bit 0	Command pause	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning operation. When this bit is set to 0 (OFF), the positioning will restart. 0: Cancel Hold 1: Hold
14 and 15, Bit 1	42 and 43, Bit 1	Command abort	The axis will decelerated to a stop if this bit is set to 1 (ON) during positioning. 0: Cancel Abort 1: Abort When this bit is reset to 0 (OFF) after decelerating to a stop, the operation depends on the Position reference type bit (bit 5: **Motion Command Control Flag**). (0: Remains stopped 1: Restart positioning toward the target position)
14 and 15, Bit 5	42 and 43, Bit 5	Position reference type	Switch the position reference type. 0: Incremental addition mode 1: Absolute mode Note: Set this bit before setting the **Motion Command** to 8.
18 and 19	46 and 47	Override	This parameter allows the positioning speed to be changed without changing the **Speed Reference Setting**. This setting can be changed during operation. Setting range: 0 to 32767 (0 to 327.67%) Setting unit: 1 = 0.01% <Example> Setting for 50% = 5000
20 and 21	48 and 49	Bias speed	Set the offset value of speed reference.
24 to 27	52 to 55	Speed reference setting	Specify the speed for the STEP operation. Set a positive value only. If a negative value is set, an error will occur.

c) Response Data

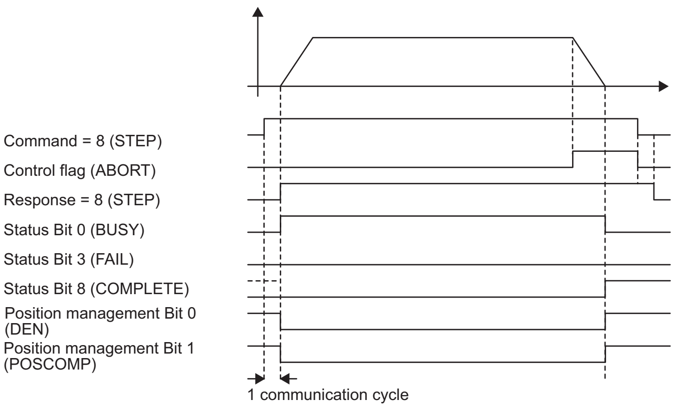
Response Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
8 ant 9	36 and 37	Warning	Store the most current warning. (bit setting)
10 and 11	38 and 39	Alarm	Store the most current alarm. (bit setting)
12 and 13	40 and 41	Motion command response code	Indicate the motion command that is being executed. The response code will be 8 during STEP command execution.
14 and 15, Bit 0	42 and 43, Bit 0	Command executing	Turn ON when abort processing is being performed for STEP command. Turns OFF when the execution completes.
14 and 15, Bit 1	42 and 43, Bit 1	Command hold completed	Always OFF for STEP command.
14 and 15, Bit 3	42 and 43, Bit 3	Command error end	Turn ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
14 and 15, Bit 8	42 and 43, Bit 8	Command execution completed	Always OFF for STEP command. Use the Positioning completed bit (bit 1: **Position Management Status**) to check the completion of command execution.
20 and 21, Bit 0	48 and 49, Bit 0	Distribution completed	Turn ON when pulse distribution has been completed for the move command. Turn OFF during execution of the move command.
20 and 21, Bit 1	48 and 49, Bit 1	Positioning completed	Turn ON when the Distribution completed bit (bit 0: **Position Management Status**).
20 and 21, Bit 3	48 and 49, Bit 3	Position proximity	The operation depends on the setting of the parameter No. 0n28 (***NEAR Signal Output Width***). Parameter No. 0n28 = 0:Turns ON when Distribution completed bit (bit 0: **Position Management Status**) turns ON. Parameter No. 0n28 ≠ 0:Turns ON when the current position is in the range of the parameter No. 0n28 (***NEAR Signal Output Width***) even if pulse distribution has not been completed.

- Timing Charts

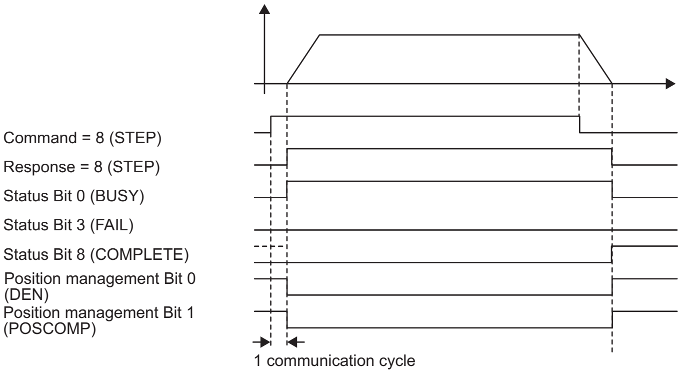
a) Normal Execution



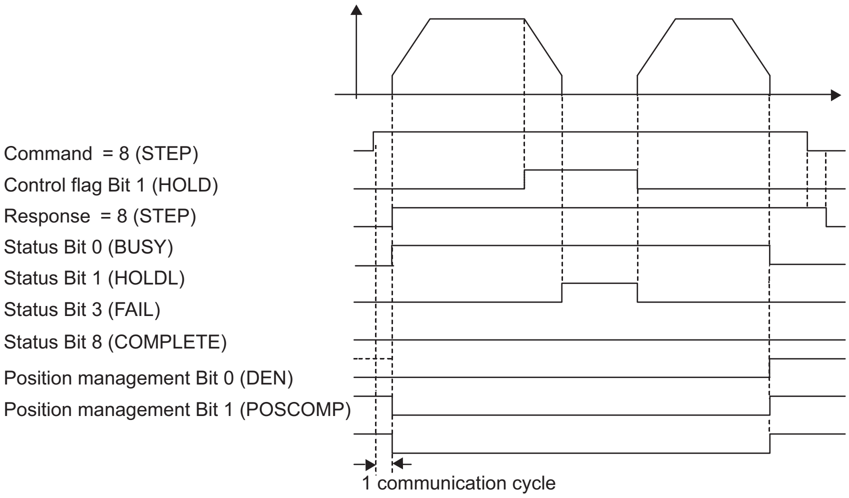
b) Execution when Aborted



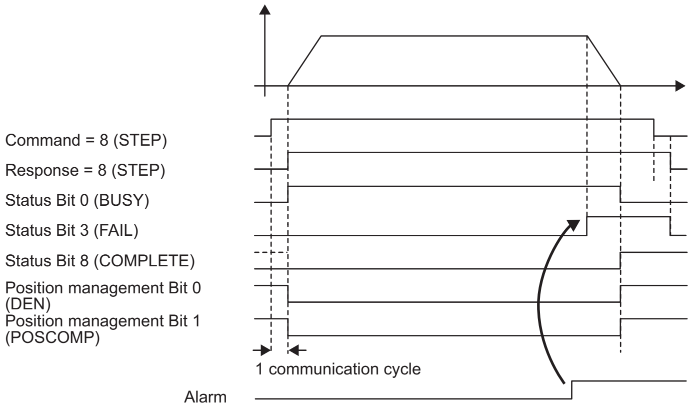
c) Execution when Aborting by Changing the Command



d) Execution when Held (Command pause)



e) Execution when an Alarm Occurs



(f) Zero Point Setting (ZSET)

The ZSET command sets the current position as the zero point of the machine coordinate system. This enables setting the zero point without performing a zero point return operation.

When using software limits, always execute the zero point setting or zero point return operation. The software limit function will be enabled after the zero point setting operation has been completed.

• Executing/Operating Procedure

1. Check to see if all the following conditions are satisfied.

No.	Execution Conditions	Confirmation Method
1	There are no alarms.	Both the **Warning** and **Alarm** are 0.

2. Set the parameter No.0n3A (***Zero Point Position in Machine Coordinate System Offset***).
3. Set the **Motion Command** to 9 to execute the ZSET motion command.

   A new machine coordinate system will be established with the current position as the zero point. The **Motion Command Response Code** will be 9 during the zero point setting operation.

   The Zero point return completed bit (bit 5: **Position Management Status**) will turn ON when zero point setting has been completed.
4. Set the **Motion Command** to 0 to execute the NOP motion command. The zero point setting operation completes.

• Holding/Aborting

The Command pause bit (bit 0: **Motion Command Control Flag**) and the Command abort bit (bit 1: **Motion Command Control Flag**) cannot be used.

• Related Data

a) Parameters

Parameter No.	Name	Setting	Default Setting
0n3A	Zero point position in machine coordinate system offset	Set the position offset from the machine coordinate system zero point after completing the zero point setting operation.	0

b) Command Data

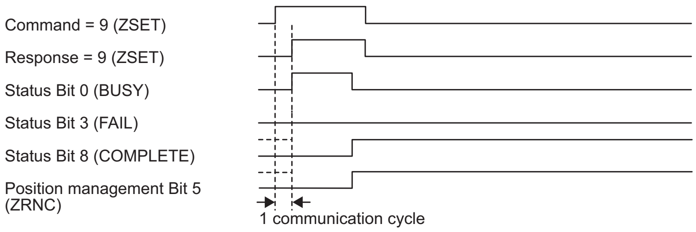
Command Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
12 and 13	40 and 41	Motion command	Set to 9 for ZSET operation.

c) Response Data

Response Byte No.		Name	Setting
Axis 1 or 3	Axis 2 or 4		
8 and 9	36 and 37	Warning	Store the most current warning. (bit setting)
10 and 11	38 and 39	Alarm	Store the most current alarm. (bit setting)
12 and 13	40 and 41	Motion command response code	Indicate the motion command that is being executed. The response code will be 9 during ZSET command execution.
14 and 15, Bit 0	42 and 43, Bit 0	Command executing	Turn ON when abort processing is being performed. Turns OFF when the abort processing completes.
14 and 15, Bit 1	42 and 43, Bit 1	Command hold completed	Always OFF for ZSET command.
14 and 15, Bit 3	42 and 43, Bit 3	Command error end	Turn ON if an error occurs during command execution. The axis will decelerate to a stop if it is moving. Turns OFF when another command is executed.
14 and 15, Bit 8	42 and 43, Bit 8	Command execution completed	Always OFF for ZSET command. Use the Positioning completed bit (bit 1: **Position Management Status**) to check the completion of command execution.

- Timing Chart

a) Normal Execution



8.9.2 Response Data

Response Format

Byte	Response	Byte	Response
0	RCMD	32	Run status
1	RWDC	33	
2	CMD_STAT	34	Monitor selection
3		35	
4	Run status	36	Warning
5		37	
6	Monitor selection	38	Alarm
7		39	
8	Warning	40	Motion command response code
9		41	
10	Alarm	42	Motion command status
11		43	
12	Motion command response code	44	Reserved (0)
13		45	
14	Motion command status	46	Reserved (0)
15		47	
16	Reserved (0)	48	Position management status
17		49	
18	Reserved (0)	50	General-purpose DI monitor
19		51	
20	Position management status	52	Monitor 1
21		53	
22	General-purpose DI monitor	54	
23		55	
24	Monitor 1	56	Monitor 2
25		57	
26		58	
27		59	
28	Monitor 2	60	Reserved (0)
29		61	
30		62	
31		63	

IMPORTANT

Bytes 4 through 31 are assigned to Axis 1 (Axis 3), and bytes 32 through 59 are assigned to Axis 2 (Axis 4).

(1) Response Data List

The response data from the MTP2910 Module are listed below.

Response Byte No.		Response Data Name	Contents
Axis 1 or 3	Axis 2 or 4		
0		RCMD	Command code
1		RWDC	Watchdog data
2, 3		CMD_STAT	Command status
4, 5	32, 33	Run status	Motion module operation ready/not ready, Servo ON/OFF
6	34	Monitor selection 1	Selected items for Monitor 1 and 2
7	35	Monitor selection 2	
8, 9	36, 37	Warning	Warning
10, 11	38, 39	Alarm	Alarm
12, 13	40, 41	Motion command response code	Code of the motion command that is being executed
14, 15	42, 43	Motion command status	Motion command status
16, 17	44, 45	Reserved (0)	Reserved by system
18, 19	46, 47	Reserved (0)	Reserved by system
20, 21	48, 49	Position management status	Position management status
22, 23	50, 51	General-purpose DI monitor	General-purpose DI_0 to 4 not input/being input
24 to 27, or 28 to 31	52 to 55, or 56 to 59	Target position in machine coordinate system (TPOS)	Target position in the machine coordinate system
		Calculated position in machine coordinate system (CPOS)	Calculated position in the machine coordinate system
		Machine coordinate system reference position (MPOS)	Reference position in the machine coordinate system
		32-bit coordinate system position (DPOS)	Reference position in the machine coordinate system
		Machine coordinate system feedback position (APOS)	Reference position in the machine coordinate system
		Number of POSMAX turns	Number of POSMAX turns
		Speed reference output monitor	Speed reference that is being output

(2) Response Data Details

(a) RCMD

Command code (Byte 0)		Setting Range	Setting Unit
		20, 21 (Hexadecimal)	–
Description	Command code of standard I/O profile command DATA_RWA (20 (hexadecimal)): Read data/Write data command (asynchronous) DATA_RWS (21 (hexadecimal)): Read data/Write data command (synchronous)		

(b) RWDC

Watchdog (Byte 1)		Setting Range	Setting Unit
		–	–
Description	Watchdog data of standard I/O profile command Used to establish synchronous communication and for detection of out of-sync-state.		

(c) CMD_STAT

Command status (Bytes 2 and 3)		Setting Range	Setting Unit
		–	–
Description	Standard I/O Profile Command Status Bit 0: D_ALM 0: Normal status, 1: Device in alarm status Bit 1: D_WAR 0: Normal status, 1: Device in warning status Bit 2: CMDRDY 0: Command reception disabled, 1: Command reception enabled Bit 3: ALM_CLR_CMP 0: ALM_CLR command execution not completed, 1: ALM_CLR command execution completed Bit 8 to B: CMD_ALM Any value other than 0: Command error status Bit C to F: COMM_ALM Any value other then 0: Communication error status		

(d) Run Status

Run status (Axis 1 or 3: Bytes 4 and 5 Axis 2 or 4: Bytes 32 and 33)			Setting Range	Setting Unit
			–	–
Description	Bit 0	Motion Module operation ready 0: Operation not ready 1: Operation ready This bit turns ON when RUN preparations for the Motion Module have been completed. This bit will be OFF under the following conditions: • Major damage has occurred. • Axis that is not used was selected. • Parameter setting error • Parameters are being changed.		
	Bit 1	Running (Servo ON) This bit is ON while the axis is in Servo ON status. OFF: Stopped ON: Running (Servo ON)		

(e) Monitor Selection 1 and 2

Monitor selection 1, 2 (Axis 1 or 3: Bytes 6 and 7, Axis 2 or 4: Bytes 34 and 35)		Setting Range	Setting Unit
		0 to 6	–
Description	Bit 0	Selected item for monitor 1 and 2 0: Target position in machine coordinate system (TPOS) 1: Calculated position in machine coordinate system (CPOS) 2: Machine coordinate system reference position (MPOS) 3: 32-bit coordinate system position (DPOS) 4: Machine coordinate system feedback position (APOS) 5: Number of POSMAX turns 6: Speed reference output monitor	

(f) Warning

Warning (Axis 1 or 3: Bytes 8 and 9, Axis 2 or 4: Bytes 36 and 37)		Setting Range	Setting Unit
		–	–
Description	Bit 1	Data setting error 0: In setting range 1: Outside setting range This bit turns ON when the set data is outside of the setting range.	
	Bit 2	Parameter error 0: In setting range 1: Outside setting range This bit turns ON when one or more parameters is set outside the parameter setting range.	
	Bit 4	Motion command setting error 0: Command setting normal 1: Command setting error This bit turns ON when a motion command that cannot be used is set.	

(g) Alarm

Alarm (Axis 1 or 3: Bytes 10 and 11, Axis 2 or 4: Bytes 38 and 39)		Setting Range	Setting Unit
		–	–
Description	Bit 3	Positive soft limit (positive software limit) 0: In positive software limit range 1: Not in positive software limit range This bit turns ON if a move command that exceeds the positive software limit is executed with the following conditions: A finite axis is selected, the positive software limit is enabled, and a zero point return operation has been completed. Note: Refer to *8.8 Software Limit Function* for details.	
	Bit 4	Negative soft limit (negative software limit) 0: In negative software limit range 1: Not in negative software limit range This bit turns ON if a move command that exceeds the negative software limit is executed with the following conditions: A finite axis is selected, the negative software limit is enabled, and a zero point return operation has been completed. Note: Refer to *8.8 Software Limit Function* for details.	
	Bit 5	Servo OFF 0: Servo ON 1: Servo OFF This bit turns ON when a move command is executed during Servo OFF status.	
	Bit 8	Excessive speed 0: Speed normal 1: Excessive speed This bit turns ON when the output exceeds the value set for the parameter No. 0n19 (***Pulse Output Maximum Frequency***).	
	Bit D	Zero point not set 0: Zero point already set 1: Zero point not set This bit turns ON if a move command other than JOG and STEP is executed without setting the zero point for the axis defined as an infinite length axis.	

(h) Motion Command Response Code

Motion command response code (Axis 1 or 3: Bytes 12 and 13, Axis 2 or 4: Bytes 40 and 41)	Setting Range	Setting Unit
	0 to 65535	–
Description	Stores the motion command code for the command that is currently being executed. This is the motion command code that is currently being executed and is not necessarily the same as the motion command that is set in the **Motion Command**.	

(i) Motion Command Status

<table>
<tr><td colspan="3" rowspan="2">Motion command status
(Axis 1 or 3: Bytes 14 and 15,
Axis 2 or 4: Bytes 42 and 43)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td rowspan="4">Description</td><td>Bit 0</td><td colspan="3">Command executing (BUSY)
0: READY (completed)
1: BUSY (processing)
This bit indicates the motion command status. Refer to <i>8.9.1 (3) How to Set and Execute a Motion Command</i> for details on command timing charts.
This bit turns ON during execution of commands that have been completed or during abort processing.</td></tr>
<tr><td>Bit 1</td><td colspan="3">Command hold completed (HOLDL)
0: Command hold processing not completed
1: Command hold completed
This bit turns ON when command hold processing has been completed. Refer to <i>8.9.1 (3) How to Set and Execute a Motion Command</i> for details on command timing charts.</td></tr>
<tr><td>Bit 3</td><td colspan="3">Command error occurrence (FAIL)
0: Normal completion
1: Abnormal completion
This bit turns ON if motion command processing does not complete normally.
If motion command execution ends in an error, the axis will stop any motion. Refer to <i>8.9.1 (3) How to Set and Execute a Motion Command</i> for details on command timing charts.</td></tr>
<tr><td>Bit 8</td><td colspan="3">Command execution completed (COMPLETE)
0: Normal execution not completed
1: Normal execution completed
This bit turns ON when motion command processing was completed normally. Refer to <i>8.9.1 (3) How to Set and Execute a Motion Command</i> for details on command timing charts.</td></tr>
</table>

(j) Position Management Status

<table>
<tr><td colspan="3" rowspan="2">Position management status
(Axis 1 or 3: Bytes 20 and 21,
Axis 2 or 4: Bytes 48 and 49)</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>–</td><td>–</td></tr>
<tr><td rowspan="7">Description</td><td>Bit 0</td><td colspan="3">Distribution completed (DEN)
0: Distributing pulses
1: Distribution completed
This bit turns ON when pulse distribution has been completed for a move command.</td></tr>
<tr><td>Bit 1</td><td colspan="3">Positioning completed (POSCOMP)
0: Outside Positioning Completed Width
1: In Positioning Completed Width
This bit turns ON when pulse distribution has been completed and the current position is within the Positioning Completed Width.</td></tr>
<tr><td>Bit 3</td><td colspan="3">Position proximity (NEAR)
0: Outside position proximity range
1: In position proximity range
The operation of this bit depends on the setting of the parameter No. 0n28 (NEAR signal output width).
Parameter No. 0n28 = 0:Turns ON when Distribution completed bit (bit 0: **Position Management Status**) turns ON.
Parameter No. 0n28 ≠ 0:Turns ON when the current position is in the range of the parameter No. 0n28 (***NEAR Signal Output Width***) even if pulse distribution has not been completed.</td></tr>
<tr><td>Bit 4</td><td colspan="3">Zero point position (ZERO)
0: Outside zero point position range
1: In zero point position range
This bit turns ON when the Machine coordinate system reference position (MPOS) is within the range of the parameter No. 0n31 (***Width of Starting Point Position Output***) from the zero point position.</td></tr>
<tr><td>Bit 5</td><td colspan="3">Zero point return (setting) completed (ZRNC)
0: Zero point return (setting) not completed
1: Zero point return (setting) completed
This bit turns ON when a zero point return (setting) has been completed.
This bit turns OFF when a new zero point return (setting) operation is started.</td></tr>
<tr><td>Bit 6</td><td colspan="3">Machine lock ON (MLKL)
0: Machine lock mode released
1: Machine lock mode
This bit turns ON when the Machine Lock bit (bit 1: **Run Command Setting**) is set to 1 and the axis has actually entered machine lock mode.</td></tr>
<tr><td>Bit 9</td><td colspan="3">POSMAX turn number presetting completed (TPRSE)
0: Preset not completed
1: Preset completed
This bit turns ON when the POSMAX preset bit (bit 6: **Run Command Setting**) is set to 1 (ON) and the Number of POSMAX turns has been preset with the value set in the parameter No. 0n3E (***Number of POSMAX Turns Presetting Data***).</td></tr>
</table>

(k) General-purpose DI Monitor

General-purpose DI monitor (Axis 1 or 3: Bytes 22 and 23, Axis 2 or 4: Bytes 50 and 51)		Setting Range	Setting Unit
		–	–
Description	Bit 0	General-purpose DI_0 This bit turns ON when the general-purpose DI_0 is being input. 0: General-purpose DI_0 not input 1: General-purpose DI_0 being input	
	Bit 1	General-purpose DI_1 This bit turns ON when the general-purpose DI_1 is being input. 0: General-purpose DI_1 not input 1: General-purpose DI_1 being input	
	Bit 2	General-purpose DI_2 This bit turns ON when the general-purpose DI_2 is being input. 0: General-purpose DI_2 not input 1: General-purpose DI_2 being input	
	Bit 3	General-purpose DI_3 This bit turns ON when the general-purpose DI_3 is being input. 0: General-purpose DI_3 not input 1: General-purpose DI_3 being input	
	Bit 4	General-purpose DI_4 This bit turns ON when the general-purpose DI_4 is being input. 0: General-purpose DI_4 not input 1: General-purpose DI_4 being input	

(I) Monitor 1 and 2

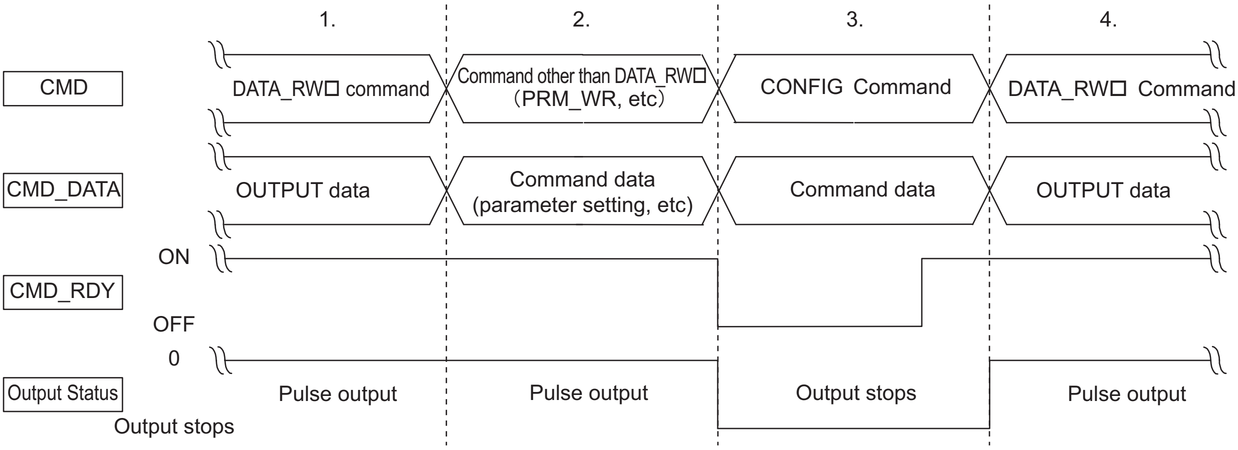
<table>
<tr><td colspan="2" rowspan="2">Target position in machine coordinate system (TPOS)
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td></tr>
<tr><td>Description</td><td colspan="3">Store the target position in the machine coordinate system managed by the MTP2910 Module.
This is the target position for each communication cycle for INTERPOLATE command.
• The data will be set to 0 when the power supply is turned ON.
• The data is updated even when the machine lock mode is enabled.
• The data will not be reset even when an infinite length axis type is selected.</td></tr>
<tr><td colspan="2" rowspan="2">Calculated position in machine coordinate system (CPOS)
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td></tr>
<tr><td>Description</td><td colspan="3">Store the calculated position in the machine coordinate system managed by the MTP2910 Module.
This position data is the target position for each communication cycle.
• The data will be set to 0 when the power supply is turned ON.
• The data is updated even when the machine lock mode is enabled.
• When an infinite length axis type is selected, a range from 0 to (Infinite length axis reset position (POSMAX) - 1) is stored.</td></tr>
<tr><td colspan="2" rowspan="2">Machine coordinate system reference position (MPOS)
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td></tr>
<tr><td>Description</td><td colspan="3">Store the reference position in the machine coordinate system managed by the MTP2910 Module.
• When an infinite length axis type is selected, this data is the same as Calculated position in machine coordinate system (CPOS).
• This data is updated within the range from -2^{31} to $2^{31}-1$ regardless of the axis type, finite length or infinite length.</td></tr>
<tr><td colspan="2" rowspan="2">32-bit coordinate system position (DPOS)
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td></tr>
<tr><td>Description</td><td colspan="3">Store the reference position in the machine coordinate system managed by the MTP2910 Module.
• When an infinite length axis type is selected, this data is the same as Calculated position in machine coordinate system (CPOS).
• This data is updated within the range from -2^{31} to $2^{31}-1$ regardless of the axis type, finite length or infinite length.</td></tr>
<tr><td colspan="2" rowspan="2">Machine coordinate system feedback position (APOS)
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit</td></tr>
<tr><td>Description</td><td colspan="3">Store the feedback position in the machine coordinate system managed by the MTP2910 Module.
The MTP2910 Module has no interface to acquire the feedback position. To keep the compatibility with the MTP2910 Module and other Motion Modules, the MTP2910 Module uses the reference position from the previous communication cycle instead of the feedback position data.
• This data will be set to 0 when a Zero Point Return (ZRET) is executed.
• When an infinite length axis type is selected, a range of 0 to (Infinite length axis reset position (POSMAX) - 1) is stored.</td></tr>
<tr><td colspan="2" rowspan="2">Number of POSMAX turns
(Axis 1 or 3: Bytes 24 to 27, or Bytes 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Bytes 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>rev</td></tr>
<tr><td>Description</td><td colspan="3">This parameter is valid for an infinite length axis.
The count stored in this data goes up and down every time the current position exceeds the value set in the parameter No. 0n0A (***Infinite Length Axis Reset Position***).</td></tr>
<tr><td colspan="2" rowspan="2">Speed reference output monitor
(Axis 1 or 3: Bytes 24 to 27, or Byte 28 to 31,
Axis 2 or 4: Bytes 52 to 55, or Byte 56 to 59 (selectable))</td><td>Setting Range</td><td>Setting Unit</td></tr>
<tr><td>-2^{31} to $2^{31}-1$</td><td>Reference unit/
Transmission speed</td></tr>
<tr><td>Description</td><td colspan="3">Store the speed reference that is being output.</td></tr>
</table>

8.9.3 Command Data/Response Data Processing Timing

The command processing is carried out within the same communication cycle in which the MTP2910 Module receives the command.

Note: 1. The ON/OFF signal that is shorter than the communication cycle will not be reflected in the host controller.
2. When using an INTERPOLATE command in a communication cycle that is 500 µs or longer, set the moving average setting to the same value as that used for the communication cycle.

- Output operation when switching a command



Section 1: The value of OUTPUT data (digital value) is output in accordance with the parameter setting.

Section 2: If a command other than DATA_RW☐ is being executed, the processing in section 1 will also continue.
Example: When the positioning operation is specified, the positioning operation in section 2 will also continue.

Section 3: If the CONFIG command is issued, the pulse output will be stopped.
Example: When the positioning operation is specified and the positioning operation in section 2 is continued, the operation will stop at this point.

Section 4: If the parameter is changed by a write parameter command (such as PRM_WR, PPRM_WR, MEM_WR) in section 2, the value of the OUTPUT data will be output in accordance with the changed parameter setting.

8.10 MECHATROLINK-III Communications Related Information

8.10.1 ID_CODE

The MTD2310 Module returns values in conformity with MECHATROLINK-III communication specifications, using ID_CODE.

ID_CODE Table

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
01	Vendor ID Code	Vendor-specific ID code	4	Supported	00000000 (Yaskawa Electric Corporation)
02	Device Code	Product-specific code	4	Supported	02400005
03	Device Version	Product version information	4	Supported	00000100
04	Device Definition (MDI) File version	Information of the device definition file (MDI) version the product supports	4	Supported	00001000
05	Extended Address Setting	Number of extended addresses the product supports	4	Supported	00000002
06	Serial No.	Product serial number	32	Unsupported	–
10	Profile Type 1	Profile type 1 the product supports	4	Supported	00000030 (Standard I/O profile)
11	Profile Version 1	Profile version 1 the product supports	4	Supported	00000100
12	Profile Type 2	Profile type 2 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 2)
13	Profile Version 2	Profile version 2 the product supports	4	Supported	00000000
14	Profile Type 3	Profile type 3 the product supports	4	Supported	000000FF (This value indicates that the product does not support the profile type 3)
15	Profile Version 3	Profile version 3 the product supports	4	Supported	00000000
16	Minimum Value of Transmission Cycle	The minimum transmission cycle the product supports	4	Supported	000030D4
17	Maximum Value of Transmission Cycle	The maximum transmission cycle the product supports	4	Supported	000C3500
18	Granularity of Transmission Cycle	The transmission cycle granularity levels the product supports	4	Supported	00000002
19	Minimum Value of Communication Cycle	The minimum communication cycle the product supports	4	Supported	000061A8
1A	Maximum Value of Communication Cycle	The maximum communication cycle the product supports	4	Supported	0061A800
1B	Number of Transmission Bytes	Number of transmission bytes for the product	4	Supported	00000010
1C	Number of Transmission Bytes (Current Setting)	Currently set number of transmission bytes for the product	4	Supported	00000010
1D	Profile Type (Current Selection)	Profile type selected by CONNECT command	4	Supported	00000030
20	Supported Communication Mode	Communication mode the product supports	4	Supported	00000007

ID_CODE Table (cont'd)

ID_CODE (Hexadecimal)	Name	Contents	Size (No. of bytes)	Supported/ Unsupported	Value (Hexadecimal)
21	MAC Address	MAC address	4	Unsupported	–
30	List of Supported Main Commands	List of the main commands the product supports	32	Supported	6000E07F
					00000003
					00000000
					00000000
					00000000
					00000000
					00000000
					00000000
38	List of Supported Sub Commands	Not used with a standard I/O profile	32	Unsupported	–
40	List of Common Parameters	Not used with a standard I/O profile	32	Unsupported	–
80	Main Device Name	Main device name	32	Supported	4D50454A
					544D2D43
					31393250
					00452D30
					00000000
					00000000
					00000000
					00000000
90	Sub Device 1 Name	Sub device 1 name	32	Unsupported	–
98	Sub Device 1 Version	Sub device 1 version	4	Unsupported	–
A0	Sub Device 2 Name	Sub device 2 name	32	Unsupported	–
A8	Sub Device 2 Version	Sub device 2 version	4	Unsupported	–
B0	Sub Device 3 Name	Sub device 3 name	32	Unsupported	–
B8	Sub Device 3 Version	Sub device 3 version	4	Unsupported	–

8.10.2 Virtual Memory

Data are stored in the virtual memory addresses as shown below.

(1) Device Information Area

Address	Contents
0000 0000 to 0000 0003	Not specified
0000 0004 to 0000 0007	Vendor ID code
0000 0008 to 0000 000B	Device code
0000 000C to 0000 000F	Device version
0000 0010 to 0000 0013	Device definition (MDI) file version
0000 0014 to 0000 0017	Extended address setting
0000 0018 to 0000 0037	Serial No.
0000 0038 to 0000 003F	Not specified
0000 0040 to 0000 0043	Profile type 1
0000 0044 to 0000 0047	Profile version 1
0000 0048 to 0000 004B	Profile type 2
0000 004C to 0000 004F	Profile version 2
0000 0050 to 0000 0053	Profile type 3
0000 0054 to 0000 0057	Profile version 3
0000 0058 to 0000 005B	Minimum value of transmission cycle
0000 005C to 0000 005F	Maximum value of transmission cycle
0000 0060 to 0000 0063	Granularity of transmission cycle
0000 0064 to 0000 0067	Minimum value of communication cycle
0000 0068 to 0000 006B	Maximum value of communication cycle
0000 006C to 0000 006F	Number of transmission bytes
0000 0070 to 0000 0073	Number of transmission bytes (current setting)
0000 0074 to 0000 0077	Profile type (current selection)
0000 0078 to 0000 007F	Not specified

Address	Contents
0000 0080 to 0000 0083	Supported communication mode
0000 0084 to 0000 008B	MAC address
0000 008C to 0000 00BF	Not specified
0000 00C0 to 0000 00DF	List of supported main commands
0000 00E0 to 0000 00FF	List of supported subcommands
0000 0100 to 0000 011F	List of supported common parameters
0000 0120 to 0000 01FF	Not specified
0000 0200 to 0000 021F	Main device name
0000 0220 to 0000 023F	Not specified
0000 0240 to 0000 025F	Sub device 1 name
0000 0260 to 0000 0263	Sub device 1 version
0000 0264 to 0000 027F	Not specified
0000 0280 to 0000 029F	Sub device 2 name
0000 02A0 to 0000 02A3	Sub device 2 version
0000 02A4 to 0000 02BF	Not specified
0000 02C0 to 0000 02DF	Sub device 3 name
0000 02E0 to 0000 02E3	Sub device 3 version
0000 02E4 to 0000 0FFF	Not specified
0000 1000 to 0000 FFFF	Not specified

(2) Vendor Parameter Area (Axis #1)

Address	Parameter No.	Contents (Axis #1)
8000 0000 to 8000 0001	0100	Selection of operation modes
8000 0002 to 8000 0003	0101	Function selection flag 1
8000 0004 to 8000 0007	–	Reserved (0)
8000 0008 to 8000 0009	0104	Reference unit selection
8000 000A to 8000 000B	0105	Number of digits below decimal point
8000 000C to 8000 000F	0106	Travel distance per machine rotation
8000 0010 to 8000 0011	0108	Servo motor gear ratio
8000 0012 to 8000 0013	0109	Machine gear ratio
8000 0014 to 8000 0017	010A	Infinite length axis reset position (POSMAX)
8000 0018 to 8000 001B	010C	Positive software limit value
8000 001C to 8000 001F	010E	Negative software limit value
8000 0020 to 8000 0027	–	Reserved (0)
8000 0028 to 8000 0029	0114	Hardware signal selection 1
8000 002A to 8000 002B	0115	Hardware signal selection 2
8000 002C to 8000 0031	–	Reserved (0)
8000 0032 to 8000 0033	0119	Pulse output maximum frequency
8000 0034 to 8000 0043	–	Reserved (0)
8000 0044 to 8000 0047	0122	Rated motor speed
8000 0048 to 8000 004B	0124	Number of pulses per motor rotation
8000 004C to 8000 004D	0126	Function setting 1
8000 004E to 8000 004F	–	Reserved (0)

Address	Parameter No.	Contents (Axis #1)
8000 0050 to 8000 0053	0128	NEAR signal output width
8000 0054 to 8000 0057	012A	Straight line acceleration/ Acceleration time constant
8000 0058 to 8000 005B	012C	Straight line deceleration/ Deceleration time constant
8000 005C to 8000 005D	012E	Filter time constant
8000 005E to 8000 005F	012F	Bias speed for index deceleration/acceleration filter
8000 0060 to 8000 0061	0130	Zero point return method
8000 0062 to` 8000 0063	0131	Width of starting point position output
8000 0064 to 8000 0067	0132	Approach speed
8000 0068 to 8000 006B	0134	Creep speed
8000 006C to 8000 006F	0136	Zero point return travel distance
8000 0070 to 8000 0073	0138	Step travel distance
8000 0074 to 8000 0077	013A	Zero point position in machine coordinate system offset
8000 0078 to 8000 007B	013C	Work coordinate system offset
8000 007C to 8000 007F	013E	Number of POSMAX turns presetting data

(3) Vendor Parameter Area (Axis #2)

Address	Parameter No.	Contents (Axis #2)
8000 0080 to 8000 0081	0200	Selection of operation modes
8000 0082 to 8000 0083	0201	Function selection flag 1
8000 0084 to 8000 0087	–	Reserved (0)
8000 0088 to 8000 0089	0204	Reference unit selection
8000 008A to 8000 008B	0205	Number of digits below decimal point
8000 008C to 8000 008F	0206	Travel distance per machine rotation
8000 0090 to 8000 0091	0208	Servo motor gear ratio
8000 0092 to 8000 0093	0209	Machine gear ratio
8000 0094 to 8000 0097	020A	Infinite length axis reset position (POSMAX)
8000 0098 to 8000 009B	020C	Positive software limit value
8000 009C to 8000 009F	020E	Negative software limit value
8000 00A0 to 8000 00A7	–	Reserved (0)
8000 00A8 to 8000 00A9	0214	Hardware signal selection 1
8000 00AA to 8000 00AB	0215	Hardware signal selection 2
8000 00AC to 8000 00B1	–	Reserved (0)
8000 00B2 to 8000 00B3	0219	Pulse output maximum frequency
8000 00B4 to 8000 00C3	–	Reserved (0)
8000 00C4 to 8000 00C7	0222	Rated motor speed
8000 00C8 to 8000 00CB	0224	Number of pulses per motor rotation
8000 00CC to 8000 00CD	0226	Function setting 1
8000 00CE to 8000 00CF	–	Reserved (0)

Address	Parameter No.	Contents (Axis #2)
8000 00D0 to 8000 00D3	0228	NEAR signal output width
8000 00D4 to 8000 00D7	022A	Straight line acceleration/ Acceleration time constant
8000 00D8 to 8000 00DB	022C	Straight line deceleration/ Deceleration time constant
8000 00DC to 8000 00DD	022E	Filter time constant
8000 00DE to 8000 00DF	022F	Bias speed for index deceleration/acceleration filter
8000 00E0 to 8000 00E1	0230	Zero point return method
8000 00E2 to 8000 00E3	0231	Width of starting point position output
8000 00E4 to 8000 00E7	0232	Approach speed
8000 00E8 to 8000 00EB	0234	Creep speed
8000 00EC to 8000 00EF	0236	Zero point return travel distance
8000 00F0Å` 8000 00F3	0238	Step travel distance
8000 00F4 to 8000 00F7	023A	Zero point position in machine coordinate system offset
8000 00F8 to 8000 00FB	023C	Work coordinate system offset
8000 00FC to 8000 00FF	023E	Number of POSMAX turns presetting data

(4) Vendor Parameter Area (Axis #3)

Address	Parameter No.	Contents (Axis #3)
8000 0100 to 8000 0101	0300	Selection of operation modes
8000 0102 to 8000 0103	0301	Function selection flag 1
8000 0104 to 8000 0107	–	Reserved (0)
8000 0108 to 8000 0109	0304	Reference unit selection
8000 010A to 8000 010B	0305	Number of digits below decimal point
8000 010C to 8000 010F	0306	Travel distance per machine rotation
8000 0110 to 8000 0111	0308	Servo motor gear ratio
8000 0112 to 8000 0113	0309	Machine gear ratio
8000 0114 to 8000 0117	030A	Infinite length axis reset position (POSMAX)
8000 0118 to 8000 011B	030C	Positive software limit value
8000 011C to 8000 011F	030E	Negative software limit value
8000 0120 to 8000 0127	–	Reserved (0)
8000 0128 to 8000 0129	0314	Hardware signal selection 1
8000 012A to 8000 012B	0315	Hardware signal selection 2
8000 012C to 8000 0131	–	Reserved (0)
8000 0132 to 8000 0133	0319	Pulse output maximum frequency
8000 0134 to 8000 0143	–	Reserved (0)
8000 0144 to 8000 0147	0322	Rated motor speed
8000 0148 to 8000 014B	0324	Number of pulses per motor rotation
8000 014C to 8000 014D	0326	Function setting 1
8000 014E to 8000 014F	–	Reserved (0)

Address	Parameter No.	Contents (Axis #3)
8000 0150 to 8000 0153	0328	NEAR signal output width
8000 0154 to 8000 0157	032A	Straight line acceleration/ Acceleration time constant
8000 0158 to 8000 015B	032C	Straight line deceleration/ Deceleration time constant
8000 015C to 8000 015D	032E	Filter time constant
8000 015E to 8000 015F	032F	Bias speed for index deceleration/acceleration filter
8000 0160 to 8000 0161	0330	Zero point return method
8000 0162 to 8000 0163	0331	Width of starting point position output
8000 0164 to 8000 0167	0332	Approach speed
8000 0168 to 8000 016B	0334	Creep speed
8000 016C to 8000 016F	0336	Zero point return travel distance
8000 0170 to 8000 0173	0338	Step travel distance
8000 0174 to 8000 0177	033A	Zero point position in machine coordinate system offset
8000 0178 to 8000 017B	033C	Work coordinate system offset
8000 017C to 8000 017F	033E	Number of POSMAX turns presetting data

(5) Vendor Parameter Area (Axis #4)

Address	Parameter No.	Contents (Axis #4)
8000 0180 to 8000 0181	0400	Selection of operation modes
8000 0182 to 8000 0183	0401	Function selection flag 1
8000 0184 to 8000 0187	–	Reserved (0)
8000 0188 to 8000 0189	0404	Reference unit selection
8000 018A to 8000 018B	0405	Number of digits below decimal point
8000 018C to 8000 018F	0406	Travel distance per machine rotation
8000 0190 to 8000 0191	0408	Servomotor gear ratio
8000 0192 to 8000 0193	0409	Machine gear ratio
8000 0194 to 8000 0197	040A	Infinite length axis reset position (POSMAX)
8000 0198 to 8000 019B	040C	Positive software limit value
8000 019C to 8000 019F	040E	Negative software limit value
8000 01A0 to 8000 01A7	–	Reserved (0)
8000 01A8 to 8000 01A9	0414	Hardware signal selection 1
8000 01AA to 8000 01AB	0415	Hardware signal selection 2
8000 01AC to 8000 01B1	–	Reserved (0)
8000 01B2 to 8000 01B3	0419	Pulse output maximum frequency
8000 01B4 to 8000 01C3	–	Reserved (0)
8000 01C4 to 8000 01C7	0422	Rated motor speed
8000 01C8 to 8000 01CB	0424	Number of pulses per motor rotation
8000 01CC to 8000 01CD	0426	Function setting 1
8000 01CE to 8000 01CF	–	Reserved (0)

Address	Parameter No.	Contents (Axis #4)
8000 01D0 to 8000 01D3	0428	NEAR signal output width
8000 01D4 to 8000 01D7	042A	Straight line acceleration/ Acceleration time constant
8000 01D8 to 8000 01DB	042C	Straight line deceleration/ Deceleration time constant
8000 01DC to 8000 01DD	042E	Filter time constant
8000 01DE to 8000 01DF	042F	Bias speed for index deceleration/acceleration filter
8000 01E0 to 8000 01E1	0430	Zero point return method
8000 01E2 to 8000 01E3	0431	Width of starting point position output
8000 01E4 to 8000 01E7	0432	Approach speed
8000 01E8 to 8000 01EB	0434	Creep speed
8000 01EC to 8000 01EF	0436	Zero point return travel distance
8000 01F0 to 8000 01F3	0438	Step travel distance
8000 01F4 to 8000 01F7	043A	Zero point position in machine coordinate system offset
8000 01F8 to 8000 01FB	043C	Work coordinate system offset
8000 01FC to 8000 01FF	043E	Number of POSMAX turns presetting data

8.11 Alarm/Warning Code List

The list of alarms and warnings that are generated by the MECHATROLINK communication function is as follows.

8.11.1 Alarm List

Category	Alarm Code	COMM_ ALM	Alarm Details	Countermeasures	Alarm Clearance
Communication Setting Error	A.E41 (Communication data size setting error)	0	Occurs when communication data was not received.	Review the controller's communication settings.	Not possible
Communication Establishment Error	A.E40 (Transmission cycle setting error)	B	Occurs when an unsupported transmission cycle is set on reception of a CONNECT command.	Review the controller's transmission cycle setting.	Not possible
	A.E60 (Reception error)	9	Result of noise or other causes after communications are established when two consecutive reception errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET	Possible
	A.E62 (FCS error)	8	Result of noise or other causes after communications are established when two consecutive FCS errors occur.	Review the communication wiring and take countermeasures against noise. To restore, send ALM_CLR and then SYNC_SET.	Possible
	A.E63 (Synchronous frame not received)	A	Result of noise of other causes after communications are established when two consecutive failures to receive a synchronous frame occur.	Replace the module.	Possible
System Error	A.B6A (Communication LSI initialization error)	0	Occurs when initialization of the communication LSI has failed.	Replace the module.	Not possible

8.11.2 Warning List

(1) Communication Error (COMM_ALM)

Category	Warning Code	COMM_ ALM	Warning Details	Countermeasures	Alarm Clearance
Communication Alarm	A.960 (Communication error alarm)	2	Result of noise or other causes after communications are established when a reception error occurs.	Review the communication wiring and take countermeasures against noise.	Possible
Communication Establishment Error	A.962 (FCS error alarm)	1	Result of noise or other causes after communications are established when an FCS error occurs.		
	A.963 (Synchronous frame not received alarm)	3	Result of noise or other causes after communications are established when a synchronous frame is not received.		

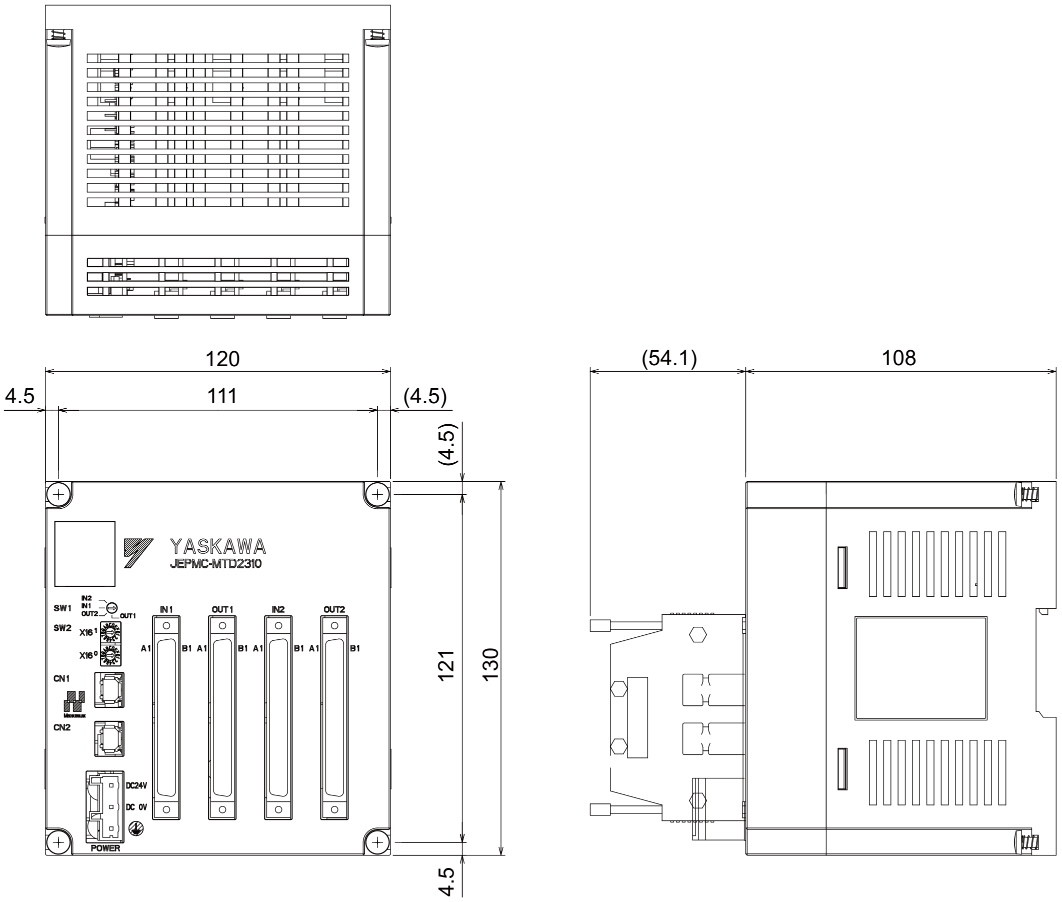
(2) Command Error (CMD_ALM)

Category	Warning Code	CMD_ ALM	Warning Details	Countermeasures	Alarm Clearance
Data Setting Warning	A.94A (ID number alarm)	9	Occurs when the ID number specified by ID_RD command is out of the valid ID number range.	Review the content of the command data issued by the controller. Refer to the setting conditions for each command and parameter.	Automatically cleared
	A.94B (Invalid data)	9	Occurs when data of a command other than ID_RD is out of the valid data range.		
Command Warning	A.95B (Unsupported command)	8	Occurs when an unsupported command is received.	Review the content of the command data issued by the controller.	
	A.95F (Undefined command)	8	Occurs at reception of a command other than those supported by MECHATROLINK-III specifications.		
	A.97A (Phase error)	C	Occurs at reception of a command that cannot be processed in the current phase.	Review the controller's command issue sequence.	

Appendix A

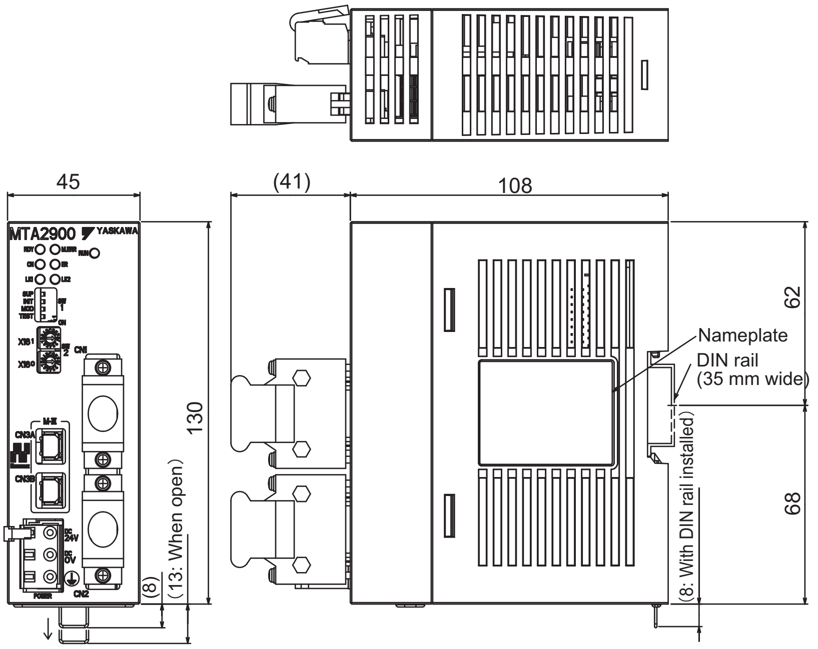
External Dimensions

A.1 64-point I/O Module (JEPMC-MTD2310-E)



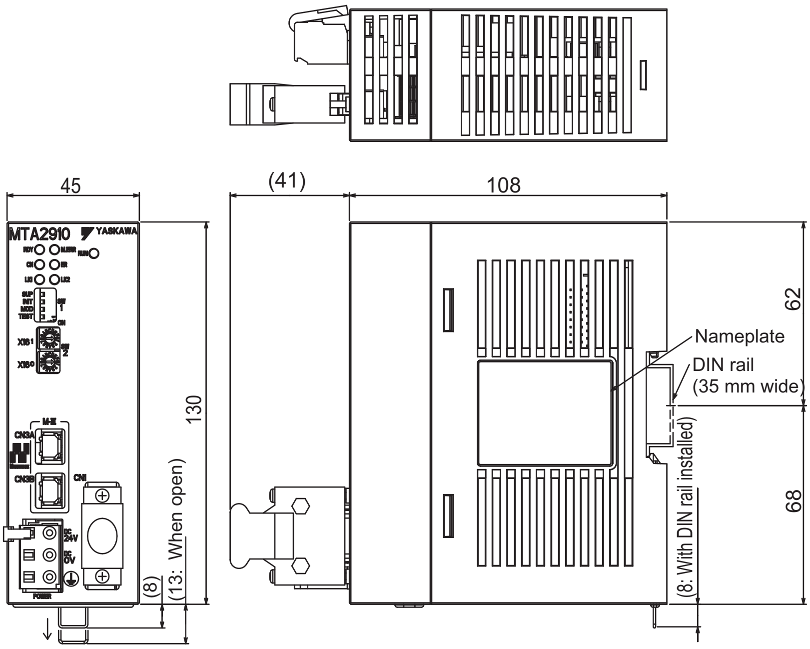
Units: mm

A.2 Analog Input Module (JEPMC-MTA2900-E)



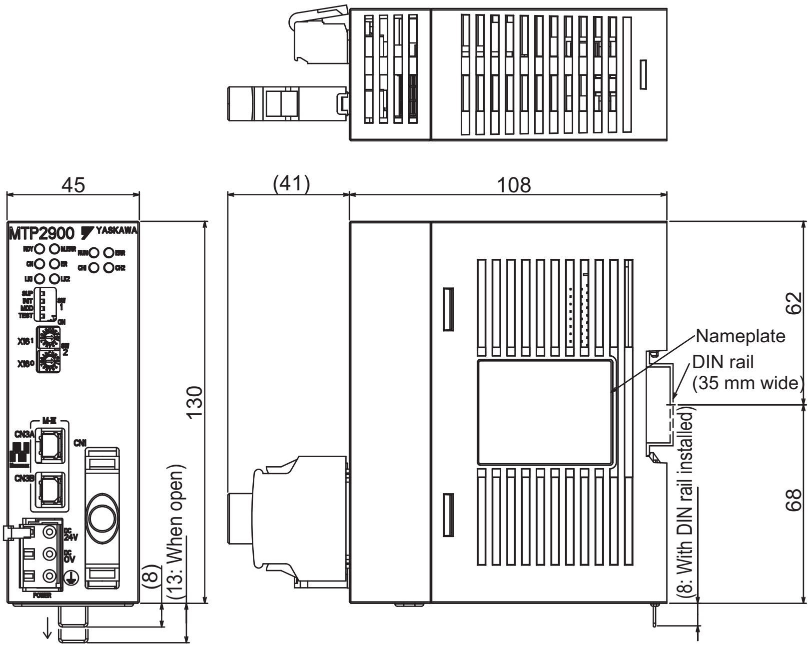
Units: mm

A.3 Analog Output Module (JEPMC-MTA2910-E)



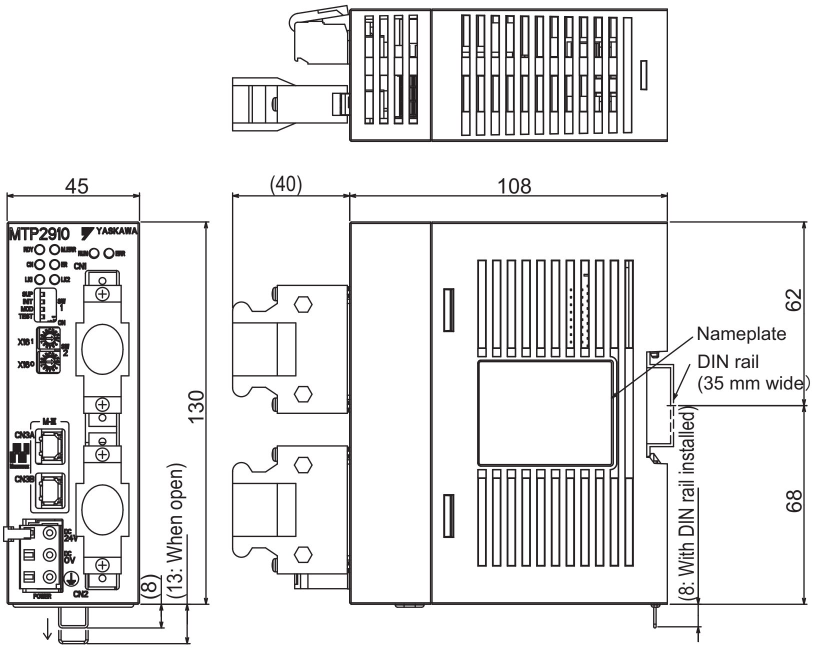
Units: mm

A.4 Pulse Input Module (JEPMC-MTP2900-E)



Units: mm

A.5 Pulse Output Module (JEPMC-MTP2910-E)



Units: mm

Appendix B

MECHATROLINK-III Communication Specifications

This appendix provides details of the MECHATROLINK-III communication specifications used with each module.

B.1 Standard I/O Profile Commands

B.1.1 Outline

The MECHATROLINK-III communication specifications specify the standard I/O profile for data exchanges with I/O devices.

In the standard I/O profile, connection type communications are carried out in accordance with the MECHATROLINK-III communication specifications.

The following table lists the commands applied in the standard I/O profile and indicates whether or not each command is supported by each module type.

Code (Hex.)	Command	Function	Module	
			MTD2310	MTA2900, MTA2910, MTP2900, MTP2910
00	NOP	No operation	Supported	Supported
01	PRM_RD	Read parameter	Not supported	Supported
02	PRM_WR	Write parameter	Not supported	Supported
03	ID_RD	Read ID	Supported	Supported
04	CONFIG	Device setup request	Supported	Supported
05	ALM_RD	Read alarm/warning	Supported	Supported
06	ALM_CLR	Clear alarm/warning state	Supported	Supported
0D	SYNC_SET	Request for establishing synchronous communication	Not supported	Supported
0E	CONNECT	Request for establishing connection	Supported	Supported
0F	DISCONNECT	Request for releasing connection	Supported	Supported
1B	PPRM_RD	Read nonvolatile parameter	Not supported	Supported
1C	PPRM_WR	Write nonvolatile parameter	Not supported	Supported
1D	MEM_RD	Read memory content	Not supported	Supported
1E	MEM_WR	Write memory content	Not supported	Supported
20	DATA_RWA	Read/write data (asynchronous)	Supported	Supported
21	DATA_RWS	Read/write data (synchronous)	Not supported	Supported

B.1.2 Details

This section describes the specifications of the standard I/O profiles.

The data format for commands and responses is shown below.

Table B.1 Data Format (Common Commands)

Byte	Command	Response	Reference
0	CMD	RCMD	• CMD/RCMD: Specified for individual commands. Refer to *B.1.1 Outline*. • WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)* • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • CMD_DATA/RSP_DATA: Specified for individual commands. Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)* to *B.1.2 (19) Data READ/ WRITE_S (Synchronous) Command (DATA_RWS: 21H)*.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	CMD_DATA	RSP_DATA	
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(1) Watchdog Data (WDT/RWDT)

During synchronous communications, the C1 master station exchanges synchronous data with slave stations every communication cycle. This synchronous data is called watchdog data, and watchdog data is used for the detection of synchronous communication establishment and imperfect synchronization.

(a) Data Format

The WDT field (command data) and RWDT field (response data) of C1 master station and each slave station are used.

The data format of each field s as shown below.

	Bit 7 … Bit 4	Bit 3 … Bit 0
WDT-	SN: The RSN value of RWDT to be copied	MN: Incremented by one for each communication cycle

	Bit 7 … Bit 4	Bit 3 … Bit 0
RWDT-	RSN: Incremented by one for each communication cycle	The MN value of WDT to be copied

(b) Error Detection

After synchronous communication starts, if the watchdog data of the remote station (RSN data when the slave station transmits the data, and MN data when the C1 master station transmits the data) is other than the previous value incremented by 1, an error will be detected except in the following cases:

- The C1 master station transmits a DISCONNECT (request to release connection) command in the next communication cycle.
- A communication error or transmission error has already been detected.

(2) Command Control (CMD_CTRL)

The following describes the CMD_CTRL command area.

In the MECHATROLINK-III protocol, the second and third bytes of the command format are specified as the CMD_CTRL area.

The CMD_CTRL area is specified as shown below by the communication specification.

Note that the designation in this field is valid even when a CMD_ALM has occurred.

(a) CMD_CTRL Area

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CMD_ID		Reserved (0)		ALM_CLR	Reserved (0)		

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0)							

(b) ALM_CLR: Clear Communication Alarm/Warning

- Definition

0: Clear alarm/warning disabled

1: Clear alarm/warning triggered

- Description

Clears the alarm/warning state at the rising edge.

The same processing as when ALM_CLR_MODE = 0 for the ALM_CLR command (the current alarm/warning state is cleared) is performed.

(c) CMD_ID: Command ID

This is not used in the standard I/O command profile.

(3) Command Status (CMD_STAT)

The following describes the CMD_STAT response area.

In the MECHATROLINK-III protocol, the second and third bytes of the response format are specified as the CMD_STAT area.

The CMD_STAT area is specified as shown below by the communication specification.

Note that the designation in this field is valid even when a CMD_ALM has occurred.

(a) CMD_STAT Area

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RCMD_ID		Reserved (0)		ALM_CLR_CMP	CMDRDY	D_WAR	D_ALM

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
COMM_ALM				CMD_ALM			

(b) D_ALM

- Definition

1: The device is in the alarm state.

0: Other (includes the states corresponding to COMM_ALM or CMD_ALM)

- Description

When a device-specific alarm other than the alarm state specified by COMM_ALM and CMD_ALM has occurred, the D_ALM status bit is set to 1.

D_ALM is independent of COMM_ALM and CMD_ALM.

When the slave station shifts from the device alarm state to the normal state as a result of the execution of the ALM_CLR command and CMD_CTRL.ALM_CLR, this bit is set to 0.

(c) D_WAR

- Definition

1: The device is in the warning state.

0: Other (includes the states corresponding to COMM_ALM or CMD_ALM)

- Description

The bit that indicates the device warning state of the slave station.

When a device-specific warning other than the warning state specified by COMM_ALM or CMD_ALM has occurred, the D_WAR status bit is set to 1.

D_WAR is independent of COMM_ALM and CMD_ALM.

When the slave station shifts from the device warning state to the normal state as a result of the execution of the ALM_CLR command and CMD_CTRL.ALM_CLR, this bit is set to 0.

(d) CMDRDY

- Definition

1: Command reception enabled

0: Other

- Description

CMDRDY = 0 means that command processing is in progress. While CMDRDY = 0, the slave station continues to process the current command, but the slave station will discard new commands received while CMDRDY = 0.

However, only the DISCONNECT command is executed immediately regardless of the CMDRDY value.

Completion of command execution is confirmed in accordance with the completion confirmation method of each command.

The hold time for CMDRDY = 0 is specified by individual commands.

If command execution is possible despite an alarm or warning state, CMDRDY is set to 1.

(e) ALM_CLR_CMP

- Definition

1: Completion of execution of ALM_CLR

0: Other

- Description
  - ALM_CLR_CMP = 1 means that CMD_CTRL.ALM_CLR = 1 has been received and alarm clear processing has been completed.
  - ALM_CLR_CMP can be cancelled by setting "0" for CMD_CTRL.ALM_CLR.

(f) RCMD_ID

This is not used in the standard I/O command profile.

(g) CMD_ALM

- Definition

Notifies the command error state.

- Description

The code that indicates a command error. CMD_ALM is independent of COMM_ALM, D_ALM and D_WAR.

If a normal command is received after the occurrence of a command error, CMD_ALM is automatically cleared.

The phase doesn't change even if the status of CMD_ALM is not "0."

Code		Contents	Remarks
–	0	Normal	–
Warning	1	–	Not used.
	2	–	
	3	–	
	4	–	
	5	–	
	6	–	
	7	–	
Alarm	8	Unsupported command received	The slave station notifies the alarm state and the command is not executed.
	9	Invalid data	
	A	Command execution condition error	
	B	Subcommand combination error	
	C	Phase error	
	D	–	
	E	–	
	F	–	

(h) COMM_ALM

- Definition

Notifies the communication error state.

- Description

The code that indicates the error state of MECHATROLINK communication. COMM_ALM is independent of CMD_ALM, D_ALM and D_WAR.

CMD_ALM is cleared at the rising edge of CMD_CTRL.ALM_CLR or by the ALM_CLR command.

Code		Contents	Remarks
–	0	Normal	–
Warning	1	FCS error	Occurs when an error is detected once.
	2	Command data not received	
	3	Synchronous frame not received	
	4	–	
	5	–	
	6	–	
	7	–	
Alarm	8	FCS error	These occur when an error is detected by the following error detection method. 8, 9, A: Detected if an error is detected twice consecutively using the error detection method for warnings 1, 2, 3 described above. B, C: Detected if an error is detected once.
	9	Command data not received	
	A	Synchronous frame not received	
	B	Synchronization time interval error	
	C	WDT error	
	D	–	
	E	–	
	F	–	

(4) No Operation Command (NOP: 00H)

The NOP command is used for network control.

The current state is returned as a response.

(a) Confirmation of Completion

Confirm that RCMD = NOP (= 00H) and CMD_STAT.CMDRDY = 1.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 1, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.2 Data Format (NOP)

Byte	Command	Response	Reference
0	NOP (00H)	NOP (00H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(5) Read Parameter Command (PRM_RD: 01H)

The PRM_RD command is used to read parameters by specifying the parameter number and data size.

If the reading is not successfully completed due to an incorrect designation (such as a parameter number that does not exist), a warning will be detected. When a warning is detected, the warning bit and warning code are set in the response. The NO and SIZE in the response are the values specified in the command, whether or not the reading has been completed.

(a) Confirmation of Completion

Confirm that RCMD = PRM_RD (= 01H), CMD_STAT.CMDRDY = 1, and also the setting for NO and SIZE of the response data.

When CMD_STAT.ALM or CMD_STAT.WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.3 Data Format (PRM_RD)

Byte	Command	Response	Reference
0	PRM_RD (01H)	PRM_RD (01H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • When the NO data is invalid, "9H" is set for CMD_ALM. • When the SIZE data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	NO	NO	
5			
6	SIZE	SIZE	
7	Reserved (0)	Reserved (0)	
8	Reserved (0)	PARAMETER	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

NO: Parameter number

SIZE: Parameter data size (byte)

PARAMETER: Parameter data

(6) Write Parameter Command (PRM_WR: 02H)

The PRM_WR command is used to write parameters by specifying the parameter number, data size, and parameter data.

After writing the parameter data offline, the device must be set up again to validate the setting. Send the CONFIG command to set up the device again.

If the writing is not successfully completed due to an incorrect designation (such as a value outside the setting range), a warning will be detected. When a warning is detected, the warning bit and warning code will be set in the response. The value specified in the command is set in the PARAMETER of the response, whether or not the writing has been completed.

(a) Confirmation of Completion

Confirm that RCMD = PRM_WR (= 02H), CMD_STAT.CMDRDY = 1, and also the setting for NO, SIZE, and PARAMETER of the response.

When CMD_STAT.ALM or CMD_STAT.WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.4 Data Format (PRM_WR)

Byte	Command	Response	Reference
0	PRM_WR (02H)	PRM_WR (02H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • When the NO data is invalid, "9H" is set for CMD_ALM. • When the SIZE data is invalid, "9H" is set for CMD_ALM. • When the PARAMETER data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	NO	NO	
5			
6	SIZE	SIZE	
7	Reserved (0)	Reserved (0)	
8	PARAMETER	PARAMETER	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

NO: Parameter number

SIZE: Parameter data size (byte)

PARAMETER: Parameter data

(7) Read ID Command (ID_RD: 03H)

The ID_RD command is used to read the ID of a device. This command reads the product information as ID data.

The ID data is selected in detail by specifying ID_CODE.

(a) Confirmation of Completion

Confirm that RCMD = ID_RD (= 03H) and CMD_STAT.CMDRDY = 1, and also the setting for the ID_CODE, OFFSET and SIZE of the response.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.5 Data Format (ID_RD)

Byte	Command	Response	Reference
0	ID_RD (03H)	ID_RD (03H)	• WDT/RWD: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • When the ID_CODE data is invalid, "9H" is set for CMD_ALM. • When the OFFSET data is invalid, "9H" is set for CMD_ALM. • When the SIZE data does not match, "9H" is set for CMD_ALM. • When CMD_ALM = 9 occurs, the ID becomes an indefinite value.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	ID_CODE	ID_CODE	
5	OFFSET	OFFSET	
6	SIZE	SIZE	
7			
8	Reserved (0)	ID	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

ID_CODE: ID data selection code
OFFSET: ID read offset
SIZE: Read data size (bytes)

The following table lists the ID_CODE and gives the details of each ID_CODE.

Table B.6 ID_CODE List

<table>
<tr><th>ID_CODE</th><th>Contents</th><th>Data Size</th><th>Data Type</th><th>Compliance*</th></tr>
<tr><td rowspan="2">01H</td><td>Vendor ID Code</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Vendor specific ID code. The vendor IDs are managed by the MECHATROLINK Members Association.</td></tr>
<tr><td rowspan="2">02H</td><td>Device Code</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Device specific code</td></tr>
<tr><td rowspan="2">03H</td><td>Device Version</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Device version information</td></tr>
<tr><td rowspan="2">04H</td><td>Device Definition File (MDI) Version</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Version of device definition file (MDI)
<table>
<tr><th>Bit No.</th><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>Version Definition</td><td colspan="8">Correction No.*1</td></tr>
</table>
<table>
<tr><th>Bit No.</th><th>Bit 15</th><th>Bit 14</th><th>Bit 13</th><th>Bit 12</th><th>Bit 11</th><th>Bit 10</th><th>Bit 9</th><th>Bit 8</th></tr>
<tr><td>Version Definition</td><td colspan="4">Major version *2</td><td colspan="4">Minor version*3</td></tr>
</table>
* 1. "0" is returned.
* 2. Major modification in MDI following addition or change of function such as addition of profile.
* 3. Minor modification in MDI following addition or change of function.
Bit 16 to 31: Reserved (0)</td></tr>
<tr><td rowspan="2">05H</td><td>Extended Address Setting</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Number of extended addresses used.
Extended addresses are used to provide a plurality of nodes to one station address.</td></tr>
<tr><td rowspan="2">06H</td><td>Serial No.</td><td>32 bytes</td><td>ASCII code
(Delimiter "0")</td><td>–</td></tr>
<tr><td colspan="4">Not supported</td></tr>
<tr><td rowspan="2">10H</td><td>Profile Type 1
(Primary)</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Profile type (primary) that the device supports.</td></tr>
<tr><td rowspan="2">11H</td><td>Profile Version 1
(Primary)</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Profile version (primary) that the device supports.
Up to three profile types can be supported.
<table>
<tr><th>Bit No.</th><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>Version Definition</td><td colspan="8">Minor version*1</td></tr>
</table>
<table>
<tr><th>Bit No.</th><th>Bit 15</th><th>Bit 14</th><th>Bit 13</th><th>Bit 12</th><th>Bit 11</th><th>Bit 10</th><th>Bit 9</th><th>Bit 8</th></tr>
<tr><td>Version Definition</td><td colspan="8">Major version*2</td></tr>
</table>
* 1. Modification following minor addition or change of function
* 2. Modification following major addition or change of function such as addition of profile
Bit 16 to 31: Reserved (0)</td></tr>
<tr><td rowspan="2">12H</td><td>Profile Type 2</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">00FFH means that it is not supported.</td></tr>
<tr><td rowspan="2">13H</td><td>Profile Version 2</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">0000H</td></tr>
</table>

* ✓: Compliant, – : Not compliant

Table B.6 ID_CODE List (cont'd)

<table>
<tr><th>ID_CODE</th><th>Contents</th><th>Data Size</th><th>Data Type</th><th>Compliance*</th></tr>
<tr><td rowspan="2">14H</td><td>Profile Type 3</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">00FFH means that it is not supported.</td></tr>
<tr><td rowspan="2">15H</td><td>Profile Version 3</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">0000H</td></tr>
<tr><td rowspan="2">16H</td><td>Minimum Value of Transmission Cycle</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">The minimum transmission cycle that the device supports from among the transmission cycles of granularity level specified in Granularity of Transmission Cycle (18H)
<Setting Example>
Setting: 3125 (units: 0.01 µs) → Minimum value of transmission cycle: 31.25 µs</td></tr>
<tr><td rowspan="2">17H</td><td>Maximum Value of Transmission Cycle</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">The maximum transmission cycle that the device supports from among the transmission cycles of granularity level specified in Granularity of Transmission Cycle (18H)
<Setting Example>
Setting: 800000 (units: 0.01 µs) → Maximum value of transmission cycle: 8 ms</td></tr>
<tr><td rowspan="2">18H</td><td>Granularity of Transmission Cycle</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">The following four granularity levels are available.
00H: 31.25, 62.5, 125, 250, 500 (µs), 2 to 64 (ms) (2 ms granularity)
01H: 31.25, 62.5, 125, 250, 500 (µs), 1 to 64 (ms) (1 ms granularity)
02H: 31.25, 62.5, 125, 250, 500 (µs), 1 to 64 (ms) (0.5 ms granularity)
03H: 31.25, 62.5, 125, 250, 500, 750 (µs), 1 to 64 (ms) (0.5 ms granularity)</td></tr>
<tr><td rowspan="2">19H</td><td>Minimum Value of Communication Cycle</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">The minimum communication cycle that the product supports from among communication cycles that are determined by the transmission cycles of granularity level specified in Granularity of Transmission Cycle (18H)
<Setting Example>
Setting: 3125 (units: 0.01 µs) → Minimum value of communication cycle: 31.25 µs</td></tr>
<tr><td rowspan="2">1AH</td><td>Maximum Value of Communication Cycle</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">The maximum communication cycle that the product supports from among communication cycles that are determined by the transmission cycles of granularity level specified in Granularity of Transmission Cycle (18H)
<Setting Example>
Setting: 800000 (units: 0.01 µs) → Maximum value of communication cycle: 8 ms</td></tr>
<tr><td rowspan="2">1BH</td><td>Number of Transmission Bytes</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Number of transmission bytes that the product supports
Each number of transmission bytes is allocated to the following bits. (Supported: 1, Not supported: 0)
<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td colspan="3">Reserved (0)</td><td>64 bytes</td><td>48 bytes</td><td>32 bytes</td><td>16 bytes</td><td>8 bytes</td></tr>
</table>
Bit 5 to 63: Reserved (0)</td></tr>
<tr><td rowspan="2">1CH</td><td>Number of Transmission bytes (Current Setting)</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Number of transmission bytes currently set for the device
Each number of transmission bytes is allocated to the following bits. (Supported: 1, Not supported: 0)
<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td colspan="3">Reserved (0)</td><td>64 bytes</td><td>48 bytes</td><td>32 bytes</td><td>16 bytes</td><td>8 bytes</td></tr>
</table>
Bit 5 to 63: Reserved (0)</td></tr>
<tr><td rowspan="2">1DH</td><td>Profile Type (Current Setting)</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Profile type selected in CONNECT command</td></tr>
</table>

* ✓: Compliant, ー : Not compliant

Table B.6 ID_CODE List (cont'd)

<table>
<tr><th>ID_CODE</th><th>Contents</th><th>Data Size</th><th>Data Type</th><th>Compliance*</th></tr>
<tr><td rowspan="2">20H</td><td>Supported Communication Mode</td><td>4 bytes</td><td>Binary data</td><td>✓</td></tr>
<tr><td colspan="4">Communication modes the product supports.
Each communication mode is allocated to the following bits. (Supported: 1, Not supported: 0)
<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td colspan="4">Reserved (0)</td><td>Ethernet communication</td><td>Message communication</td><td>Cyclic communication</td><td>Event-driven communication</td></tr>
</table>
Bit 4 to 63: Reserved (0)</td></tr>
<tr><td rowspan="2">21H</td><td>MAC Address</td><td>8 bytes</td><td>Binary data</td><td>–</td></tr>
<tr><td colspan="4">Not supported</td></tr>
<tr><td rowspan="2">30H</td><td>List of Supported Main Commands</td><td>32 bytes</td><td>Array</td><td>✓</td></tr>
<tr><td colspan="4">List of the main commands the device supports. Each command is allocated to the following bits.
Data Contents
Bit 0 to 39 - 0: Not supported
1: Supported
<table>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td>Reserved (0)</td><td>ALM_CLR</td><td>ALM_RD</td><td>CONFIG</td><td>ID_RD</td><td>PRM_WR</td><td>PRM_RD</td><td>NOP</td></tr>
</table>
<table>
<tr><th>Bit 15</th><th>Bit 14</th><th>Bit 13</th><th>Bit 12</th><th>Bit 11</th><th>Bit 10</th><th>Bit 9</th><th>Bit 8</th></tr>
<tr><td>DISCONNECT</td><td>CONNECT</td><td>SYNC_SET</td><td colspan="5">Reserved (0)</td></tr>
</table>
<table>
<tr><th>Bit 23</th><th>Bit 22</th><th>Bit 21</th><th>Bit 20</th><th>Bit 19</th><th>Bit 18</th><th>Bit 17</th><th>Bit 16</th></tr>
<tr><td colspan="8">Reserved (0)</td></tr>
</table>
<table>
<tr><th>Bit 31</th><th>Bit 30</th><th>Bit 29</th><th>Bit 28</th><th>Bit 27</th><th>Bit 26</th><th>Bit 25</th><th>Bit 24</th></tr>
<tr><td>Reserve (0)</td><td>MEM_WR</td><td>MEM_RD</td><td>PPRM_WR</td><td>PPRM_RD</td><td colspan="3">Reserved (0)</td></tr>
</table>
<table>
<tr><th>Bit 39</th><th>Bit 38</th><th>Bit 37</th><th>Bit 36</th><th>Bit 35</th><th>Bit 34</th><th>Bit 33</th><th>Bit 32</th></tr>
<tr><td colspan="6">Reserved (0)</td><td>DATA_RWS</td><td>DATA_RWA</td></tr>
</table>
Bit 40 to 255: Reserved (0)</td></tr>
<tr><td rowspan="2">38H</td><td>List of Supported Subcommands</td><td>32 bytes</td><td>Array</td><td>✓</td></tr>
<tr><td colspan="4">List of subcommands the device supports.
All bits are set to 0 because subcommands are not supported in the standard I/O profile.</td></tr>
<tr><td rowspan="2">40H</td><td>List of Supported Common Parameters</td><td>32 bytes</td><td>Array</td><td>✓</td></tr>
<tr><td colspan="4">List of common parameters the device supports.
All bits are set to 0 because there is no common parameter in the standard I/O profile.</td></tr>
<tr><td rowspan="2">80H</td><td>Main Device Name</td><td>32 bytes</td><td>ASCII code
(Delimiter: 00)</td><td>–</td></tr>
<tr><td colspan="4">Main device name in ASCII codes.
Note: For model determination at the host controller, do not use this ID_CODE. Use Device Code (02H) instead.</td></tr>
<tr><td rowspan="2">90H</td><td>Sub Device 1 Name</td><td>32 bytes</td><td>ASCII code
(Delimiter: 00)</td><td>–</td></tr>
<tr><td colspan="4">Not supported</td></tr>
<tr><td rowspan="2">98H</td><td>Sub Device 1 Version</td><td>4 bytes</td><td>Binary data</td><td>–</td></tr>
<tr><td colspan="4">Not supported</td></tr>
</table>

* ✓: Compliant, – : Not compliant

Table B.6 ID_CODE List (cont'd)

ID_CODE	Contents	Data Size	Data Type	Compliance*
A0H	Sub Device 2 Name (External Encoder Name)	32 bytes	ASCII code (Delimiter: 00)	–
	Not supported			
A8H	Sub Device 2 Version	4 bytes	Binary data	–
	Not supported			
B0H	Sub Device 3 Name	32 bytes	ASCII code (Delimiter: 00)	–
	Not supported			
B8H	Sub Device 3 Version	4 bytes	Binary data	–
	Not supported			
BCH to BFH	Reserved (0)			
C0H to FFFH	Not supported			
1000H to FFFFH	Reserved (0)			

* ✓: Compliant, – : Not compliant

(8) Setup Device Command (CONFIG: 04H)

This command is used to set up devices.

The contents of the processing to be executed are specified by the product specifications.

(A product that does not have the corresponding functions must immediately return a response for process completion.)

(a) Confirmation of Completion

Confirm that RCMD = CONFIG (= 04H) and CMD_STAT.CMDRDY = 1, and also the setting for the CONFIG_MOD of the response.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm or warning codes and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.CMD_COMM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.7 Data Format (CONFIG)

Byte	Command	Response	Reference
0	CONFIG (04H)	CONFIG (04H)	• WDT/RDWT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)* . • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • When the CONFIG_MOD data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	CONFIG_MOD	CONFIG_MOD	
5	Reserved (0)	Reserved (0)	
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

CONFIG_MOD: Configuration mode

0: Parameter re-calculation and setup

1: Common parameter batch writing into nonvolatile memory (not supported)

2: Parameter initialization to factory defaults

(e) Status during Execution of CONFIG Command

The table below shows each status before, during, and after the execution of CONFIG command.

Status	Before Execution	During Execution	After Execution
ALM	Current status	Current status	Current status
CMDRDY	1	0	1
Other	Current status	Indefinite	Current status

(9) Read Alarm or Warning Command (ALM_RD: 05H)

The ALM_RD command is used to read the alarm or warning state.

The current alarm or warning state is read to ALM_DATA as an alarm or warning code.

(a) Confirmation of Completion

Confirm that RCMD = ALM_RD (= 05H) and CMD_STAT.CMDRDY = 1, and also the setting for the ALM_RD_MOD and ALM_INDEX of the response.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.8 Data Format (ALM_RD)

Byte	Command	Response	Reference
0	ALM_RD (05H)	ALM_RD (05H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • If the ALM_RD_MOD data is invalid, "9H" is set for CMD_ALM. • If the ALM_INDEX data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	ALM_RD_MOD	ALM_RD_MOD	
5			
6	ALM_INDEX	ALM_INDEX	
7			
8	Reserved (0)	ALM_DATA	
9			
10			
11			
12			
13			
⋮			
63			

Note: ALM_DATA specifies an alarm using 2 bytes.
The alarm history arranges alarms in the order of occurrence starting from the latest alarm.
In the normal state, "0" is set.

(d) Command Parameters

- ALM_RD_MOD: Read mode

0: Reads the current alarm/warning state
Max. 12 alarms/warnings (2 bytes/1 alarm or warning, byte 8 to 31)
When the number of alarms/warnings is less than 12, "0" is set to the ALM_DATA portion where there is no alarm/warning.

1: Reads the alarm/warning history

Max. 12 records (2 bytes/record, byte 8 to 31)

When the number of alarm/warning records is less than 12, "0" is set to the ALM_DATA portion where there is no alarm/warning.

2: Individually reads the current alarm/warning details. (Not supported)

3: Individually reads the alarm/warning history details. (Not supported)

- ALM_INDEX: Alarm index (Not supported)

Set to "0".

- ALM_DATA: Alarm/warning code

(10) Clear Alarm or Warning Command (ALM_CLR: 06H)

The ALM_CLR command is used to clear the alarm or warning state. It changes the state of a slave station, but does not eliminate the cause of the alarm or warning. ALM_CLR should be used to clear the state after the cause of the alarm or warning has been eliminated.

When a communication error (reception error) or synchronous communication error (watchdog data error) occurs during synchronous communications, use SYNC_SET to restore synchronous communications after executing ALM_CLR.

(a) Confirmation of Completion

Confirm that RCMD = ALM_CLR (= 06H) and CMD_STAT.CMDRDY = 1, and also the setting for the ALM_CLR_MOD of the response.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.9 Data Format (ALM_CLR)

Byte	Command	Response	Reference
0	ALM_CLR (06H)	ALM_CLR (06H)	• WDT/RWDT: Refer to.*B.1.2 (1) Watchdog Data (WDT/ RWDT)* • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT).* • Can be used in phases 2 and 3. • If the ALM_CLR_MOD data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	ALM_CLR_MOD	ALM_CLR_MOD	
5			
6	Reserved (0)	Reserved (0)	
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

ALM_CLR_MOD: Clear alarm mode

0: Clears the current alarm/warning state

1: Clears the alarm history.

(11) Establish Synchronous Communication Command (SYNC_SET: 0DH)

The SYNC_SET command is used to start synchronous communications. Synchronous communications start at the completion of execution of this command. When synchronous communication is reset to asynchronous communication because of occurrence of an error (such as a communication error), use this command to restore the synchronous communications.

Synchronization is established on the base of the change edge of the watchdog data (WDT) in this command.

The C1 master station holds this command until the completion of processing of this command.

After the completion of execution of this command, watchdog data error detection will start.

(a) Confirmation of Completion

Confirm that RCMD = SYNC_SET (= 0DH) and CMD_STAT.CMDRDY = 1.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.10 Data Format (SYNC_SET)

Byte	Command	Response	Reference
0	SYNC_SET (0DH)	SYNC_SET (0DH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • In phase 3, this command is ignored. • When COMM_ALM = 8 (FCS error) or 9 (no response) occurs, send this command to restart synchronous communications.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(12) Establish Connection Command (CONNECT: 0EH)

The CONNECT command is used to establish a MECHATROLINK connection. When the command has been completed, the control of slave stations is started by means of MECHATROLINK communication.

(a) Confirmation of Completion

Confirm that RCMD = CONNECT (= 0EH) and CMD_STAT.CMDRDY = 1, and also that the settings of the VER, COM_MODE, COM_TIM, and PROFILE_TYPE of the response.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. (Refer to *B.1.2 (3) Command Status (CMD_STAT)*.)

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.11 Data Format (CONNECT)

Byte	Command	Response	Reference
0	CONNECT (0EH)	CONNECT (0EH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phase 1. In phases 2 and 3, this command is ignored. • If the VER data is invalid, "1H" or "9H" is set for CMD_ALM. • If the COM_TIM data is invalid, "1H" or "9H" is set for CMD_ALM. • If the PROFILE_TYPE data is invalid, "1H" or "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	VER	VER	
5	COM_MOD	COM_MOD	
6	COM_TIM	COM_TIM	
7	PROFILE_TYPE	PROFILE_TYPE	
8	Reserved (0)	Reserved (0)	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

- VER: MECHATROLINK application layer version

  VER = 30H

- COM_MOD: Communication mode

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SUBCMD	Reserved (0)			DTMODE		SYNCMODE	Reserved (0)

- SYNCMODE: Synchronous communication setting

  1: Starts synchronous communications

  (Watchdog data error detection enabled. Possible to use synchronous communication commands.)

  0: Starts asynchronous communications

  (Watchdog data error detection disabled. Impossible to use synchronous communication commands.)

- DTMODE: Communication method

  00: Single transmission

  01: Sequential transmission (Not supported)

  10: Reserved

  11: Reserved

- SUBCMD: Subcommand setting

  0: Subcommand disabled

- COM_TIM: Communication cycle setting

  Sets multiples of the transmission cycle as the communication cycle.

  Example: The transmission cycle is 0.5 ms and the communication cycle is 2 ms, then COM_TIM = 2/0.5 = 4

- PROFILE_TYPE: Profile type setting

  Sets the profile type to be used.

  To use the standard I/O profile commands, set PROFILE_TYPE = 30H

(13) Release Connection Command (DISCONNECT: 0FH)

When releasing a connection, the C1 master station transmits the DISCONNECT command for two or more communication cycles. At this time, the slave station interrupts current processing and then performs the initialization required to reestablish the connection. It then waits for the connect establishment request from the C1 master station.

The DISCONNECT command can be sent regardless of the state of the CMD_STAT.CMDRDY bit. If the DISCONNECT command is sent when the CMD_STAT.CMDRDY state bit is 0, processing is interrupted and this command is processed.

(a) Confirmation of Completion

Control with the command sending time of the C1 master station as two or more communication cycles.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.12 Data Forward (DISCONNECT)

Byte	Command	Response	Reference
0	DISCONNECT (0FH)	DISCONNECT (0FH)	• Can be used in all phases. • Upon receipt of the DISCONNECT command, operation shifts to phase 1. • When the control power is turned OFF at the same time the DISCONNECT command is sent, the response data is indefinite.
1	Reserved (0)	Reserved (0)	
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(14) Read Nonvolatile Parameter Command (PPRM_RD: 1BH)

The PPRM_RD command is used to read parameters in the nonvolatile memory by specifying the parameter number and data size.

If the reading is not successfully completed due to an incorrect designation (such as a parameter number that does not exist), a warning will be detected. When a warning is detected, the warning bit and warning code are set in the response. The NO and SIZE in the response are the values specified in the command, whether or not the reading has been completed.

(a) Confirmation of Completion

Confirm that RCMD = PPRM_RD (= 1BH), CMD_STAT.CMDRDY = 1, and also the settings of NO and SIZE of the response.

When CMD_STAT.ALM or CMD_STAT.WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.13 Data Format (PPRM_RD)

Byte	Command	Response	Reference
0	PPRM_RD (1BH)	PPRM_RD (1BH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3 • When the NO data is invalid, "9H" is set for CMD_ALM. • When the SIZE data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	NO	NO	
5			
6	SIZE	SIZE	
7	Reserved (0)	Reserved (0)	
8	Reserved (0)	PARAMETER	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

NO: Parameter number

SIZE: Parameter data size (bytes)

PARAMETER: Parameter data

(15) Write Nonvolatile Parameter Command (PPRM_WR: 1CH)

The PPRM_WR command is used to write parameters into the nonvolatile memory by specifying the parameter number, data size and parameter data.

If the writing is not successfully completed due to an incorrect designation (such as a value outside of the setting range), a warning will be detected. When a warning is detected, the warning bit and warning code will be set in the response. The value specified in the command is set in the PARAMETER in the response, whether or not the writing has been completed.

(a) Confirmation of Completion

Confirm that RCMD = PPRM_WR (= 1CH), CMD_STAT.CMDRDY = 1, and also the setting for NO, SIZE, and PARAMETER of the response.

When CMD_STAT.ALM or CMD_STAT.WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.14 Data Format (PPRM_WR)

Byte	Command	Response	Reference
0	PPRM_WR (1CH)	PPRM_WR (1CH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • Can be used in phases 2 and 3. • When the NO data is invalid, "9H" is set for CMD_ALM. • When the SIZE data is invalid, "9H" is set for CMD_ALM. • When the PARAMETER data is invalid, "1H" or "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	NO	NO	
5			
6	SIZE	SIZE	
7	Reserved (0)	Reserved (0)	
8	PARAMETER	PARAMETER	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

NO: Parameter number

SIZE: Parameter data size (byte)

PARAMETER: Parameter data

(16) Read Memory Content Command (MEM_RD: 1DH)

The MEM_RD command is used to read the data on the virtual memory by specifying the starting address and the data size of the virtual memory.

If the reading is not successfully completed due to an incorrect designation (such as invalid starting address or data size), a warning will be detected. When a warning is detected, the warning bit and warning code are set in the response. The ADDRESS and SIZE in the response are the values specified in the command, whether or not the reading has been completed.

(For more details about the virtual memory, refer to the section for the module to be used, listed below:

- *4.6.2 Virtual Memory* for MTD2310 Module
- *5.8.2 Virtual Memory* for MTA2900 Module
- *6.8.2 Virtual Memory* for MTA2910 Module
- *7.8.2 Virtual Memory* for MTP2900 Module
- *8.10.2 Virtual Memory* for MTP2910 Module

(a) Confirmation of Completion

Confirm that RCMD = MEM_RD (= 1DH), CMD_STAT.CMDRDY = 1, and also the setting for ADDRESS and SIZE of the response.

When CMD_STAT.ALM or CMD_STAT.WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.15 Data Format (MEM_RD)

Byte	Command	Response	Reference
0	MEM_RD (1DH)	MEM_RD (1DH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT)* • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT).* • Can be used in phases 2 and 3. • If any of the command errors below occur, "9H" is set for CMD_ALM - The MODE data is invalid - The DATA_TYPE data is invalid - SIZE > 4 - The ADDRESS data is invalid. • For errors other than the above, an alarm can be specified in the product specifications Example: By allocating the Reserved area to read alarms, etc.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5	MODE/ DATA_TYPE	MODE/ DATA_TYPE	
6	SIZE	SIZE	
7			
8	ADDRESS	ADDRESS	
9			
10			
11			
12	Reserved (0)	DATA	
13			
⋮			
63			

(d) Command Parameters

- MODE/DATA_TYPE: Mode/Data type

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MODE				DATA_TYPE			

  - MODE: Read mode

    0, 3 to F: Reserved by system

    1: Volatile memory
    Reads from a volatile memory such as SRAM.

    2: Nonvolatile memory (not supported)
    Reads from an nonvolatile memory such as E^2PROM.

  - DATA_TYPE: Data type

    0, 5 to F: Reversed by system

    1: Byte type (not supported)

    2: Short type

    3: Long type

    4: Long long type (not supported)

- SIZE: Number of data to read
- ADDRESS: Starting address to read
- DATA: Data

(17) Write Memory Content Command (MEM_WR: 1EH)

The MEM_WR command is used to write to the virtual memory by specifying the starting address, data size, and the virtual memory date.

If the writing processing is not successfully completed due to an incorrect designation such as invalid starting address and data size, a warning is detected. When a warning is detected, the warning bit and warning code are set in the response. The DATA in the response is the value specified in the command, whether or not the reading has been completed.

(For details on the virtual memory, refer to the following section of the module to be used.)

- *4.6.2 Virtual Memory* for MTD2310 Module
- *5.8.2 Virtual Memory* for MTA2900 Module
- *6.8.2 Virtual Memory* for MTA2910 Module
- *7.8.2 Virtual Memory* for MTP2900 Module
- *8.10.2 Virtual Memory* for MTP2910 Module

(a) Confirmation of Completion

Confirm that RCMD = MEM_WR (= 1EH), CMD_STAT.CMDRDY = 1, and also the setting for ADDRESS, SIZE, and DATA of the response.

When CMD_STAT.ALM or CMD_STAT. D_WAR = 1, use ALM_RD to read out the current alarm or warning code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.16 Data Format (MEM_WR)

Byte	Command	Response	Reference
0	MEM_WR (1EH)	MEM_WR (1EH)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT).* • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT).* • Can be used in phases 2 and 3. • If any of the command errors below occurs, "9H" is set for CMD_ALM. - The MODE data is invalid. - The DATA_TYPE data is invalid. - SIZE > 4 - The ADDRESS data is invalid. • For errors other than the above, an alarm can be specified in the product specifications. Example: By allocating the Reserved area to read alarms, etc.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5	MODE/ DATA_TYPE	MODE/ DATA_TYPE	
6	SIZE	SIZE	
7			
8	ADDRESS	ADDRESS	
9			
10			
11			
12	DATA	DATA	
13			
⋮			
63			

(d) Command Parameters

- MODE/DATA_TYPE: Mode/Data type

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MODE				DATA_TYPE			

  - MODE: Write mode

    1: Volatile memory
    Reads from a volatile memory such as SRAM.

    2: Nonvolatile memory (not supported)
    Reads from an nonvolatile memory such as E^{2}PROM.

  - DATA_TYPE: Data type

    0, 5 to F: Reversed by system

    1: Byte type (not supported)

    2: Short type

    3: Long type

    4: Long long type (not supported)

- SIZE: Number of data to write
- ADDRESS: Starting address to write
- DATA: Data

(18) Data READ/WRITE_A (Asynchronous) Command (DATA_RWA: 20H)

This command updates (asynchronously) I/O data.

(a) Confirmation of Completion

Confirm that RCMD = DATA_RWA (= 20H) and CMD_STAT.CMDRDY = 1.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT)*.

(b) Command Classification

Device group: Common motion command group

Communication type: Asynchronous communication command

(c) Data Format

Table B.17 Data Format (DATA_RWA)

Byte	Command	Response	Reference
0	DATA_RWA (20H)	DATA_RWA (20H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/ RWDT)*. • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT)*. • INPUT data are always updated. • Can be used in phases 2 and 3.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	OUTPUT data	INPUT data	
5			
6			
7			
8			
9			
10			
11			
12			
13			
:			
63			

(19) Data READ/WRITE_S (Synchronous) Command (DATA_RWS: 21H)

This command updates (synchronously) I/O data.

(a) Confirmation of Completion

Confirm that RCMD = DATA_RWS (= 21H) and CMD_STAT.CMDRDY = 1.

When CMD_STAT.D_ALM or CMD_STAT.D_WAR = 1, use ALM_RD to read out the current alarm code, and take appropriate action.

When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.1.2 (3) Command Status (CMD_STAT).*

(b) Command Classification

Device group: Common motion command group

Communication type: Synchronous communication command

(c) Data Format

Table B.18 Data Format (DATA_RWS)

Byte	Command	Response	Reference
0	DATA_RWS (21H)	DATA_RWS (21H)	• WDT/RWDT: Refer to *B.1.2 (1) Watchdog Data (WDT/RWDT).* • CMD_CTRL: Refer to *B.1.2 (2) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.1.2 (3) Command Status (CMD_STAT).* • In phase 2, "CH" is set for COM_ALM. • Can be used in phase 3.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	OUTPUT data	INPUT data	
5			
6			
7			
8			
9			
10			
11			
12			
13			
:			
63			

B.2 Profile Commands for ID Information Acquisition in Event-Driven Communication

B.2.1 Outline

The MECHATROLINK-III communication specifications specify cyclic communication in which communication is performed in fixed cycles, and event-driven communication in which communication is performed irregularly. Event-driven communication makes it possible to acquire the information necessary to carry out cyclic communication from the slave modules in advance.

In event-driven communication, a profile for event-driven communication ID information acquisition is specified.

In the profile for event-driven communication ID information acquisition, connection type communications are carried out according to the MECHATROLINK-III communication specifications. The number of transmission bytes is fixed as 16 bytes.

The following table shows the commands that are applied in the standard I/O profile.

Command Code (Hex.)	Command	Function	Synchronization Type
00	NOP	No operation	Asynchronous commands
03	ID_RD	Read ID	
0E	CONNECT	Request for establishing connection	
0F	DISCONNECT	Request for releasing connection	
ID	MEM_RD	Read memory	

B.2.2 Details

This section outlines the profile commands for event-driven communication ID information acquisition and explains the application layer commands.

The data format for commands and responses is shown below.

Byte	Command	Response	Reference
0	CMD	RCMD	• CMD/RCMD: Specified for individual commands. Refer to *B.2.1 Outline*. • WDT/RWDT: Not used • CMD_CTRL: Refer to *B.2.2 (1) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.2.2 (2) Command Status (CMD_STAT)*. • CMD_DATA/RSP_DATA: Specified for individual commands.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	CMD_DATA	RSP_DATA	
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

(1) Command Control (CMD_CTRL)

The following describes the CMD_CTRL command area.

In the MECHATROLINK-III protocol, the second and third bytes of the command format are specified as the CMD_CTRL area.

The CMD_CTRL area is specified as shown below by the communication specification.

Note that the designation in this field is valid even when a CMD_ALM has occurred.

(a) CMD_CTRL Area

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CMD_ID		Reserved (0)		ALM_CLR	Reserved (0)		

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0)							

(b) ALM_CLR: Clear Communication Alarm/Warning

- Definition

0: Clear alarm/warning disabled

1: Clear alarm/warning triggered

- Description

Clears the alarm/warning state at the rising edge.

The same processing as when ALM_CLR_MODE = 0 for the ALM_CLR command (the current alarm/warning state is cleared) is performed.

(c) CMD_ID: Command ID

This is not used with profiles for event-driven communication ID information acquisition.

(2) Command Status (CMD_STAT)

The following describes the CMD_STAT response area.

In the MECHATROLINK-III protocol, the second and third bytes of the response format are specified as the CMD_STAT area.

The CMD_STAT area is specified as shown below by the communication specification.

Note that the designation in this field is valid even when a CMD_ALM has occurred.

(a) CMD_STAT Area

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RCMD_ID		Reserved (0)		ALM_CLR_ CMP	CMDRDY	D_WAR	D_ALM

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
COMM_ALM				CMD_ALM			

(b) D_ALM

- Definition

The bit that indicates the device alarm state of the slave station.

1: The device is in the alarm state.

0: Other (includes the normal state and states corresponding to COMM_ALM or CMD_ALM)

- Description

When a device-specific alarm other than the alarm state specified by COMM_ALM and CMD_ALM has occurred, the D_ALM status bit is set to 1.

D_ALM is independent of COMM_ALM and CMD_ALM.

When the slave station shifts from the device alarm state to the normal state as a result of the execution of the ALM_CLR command and CMD_CTRL.ALM_CLR, this bit is set to 0.

(c) D_WAR

- Definition

The bit that indicates the device warning state of the slave station.

1: The device is in the warning state.

0: Other (includes the normal state and states corresponding to COMM_ALM or CMD_ALM)

- Description

When a device-specific warning other than the warning state specified by COMM_ALM or CMD_ALM has occurred, the D_WAR status bit is set to 1.

D_WAR is independent of COMM_ALM and CMD_ALM.

When the slave station shifts from the device warning state to the normal state as a result of the execution of the ALM_CLR command and CMD_CTRL.ALM_CLR, this bit is set to 0.

(d) CMDRDY

- Definition

1: Command reception enabled

0: Other

- Description

CMDRDY = 0 means that command processing is in progress. While CMDRDY = 0, the slave station continues to process the current command, but the slave station will discard new commands received while CMDRDY = 0.

However, only the DISCONNECT command is executed immediately regardless of the CMDRDY value.

Completion of command execution is confirmed in accordance with the completion confirmation method of each command.

The hold time for CMDRDY = 0 is specified by individual commands.

If command execution is possible despite an alarm or warning state, CMDRDY is set to 1.

(e) ALM_CLR_CMP

- Definition

1: Completion of execution of ALM_CLR

0: Other

- Description

  - ALM_CLR_CMP = 1 means that CMD_CTRL.ALM_CLR = 1 has been received and alarm clear processing has been completed. "1" is set for ALM_CLR_CMP even for alarms that cannot be cleared.
  - ALM_CLR_CMP can be cancelled by setting "0" for CMD_CTRL.ALM_CLR.

(f) RCMD_ID

This is not used with profiles for event-driven communication ID information acquisition.

(g) CMD_ALM

- Definition

Notifies the command error state.

- Description

The code that indicates a command error. CMD_ALM is independent of COMM_ALM, D_ALM and D_WAR.

If a normal command is received after the occurrence of a command error, CMD_ALM is automatically cleared.

The phase doesn't change even if the status of CMD_ALM is not "0".

Code		Contents	Remarks
–	0	Normal	–
Warning	1	Invalid data	These do not occur with this module.
	2	–	
	3	–	
	4	–	
	5	–	
	6	–	
	7	–	
Alarm	8	Unsupported command received	The slave station notifies the alarm state and the command is not executed.
	9	Invalid data	
	A	–	
	B	–	
	C	Phase error	
	D	–	
	E	–	
	F	–	

(h) COMM_ALM

- Definition

Notifies the communication error state.

- Description

The code that indicates the error state of MECHATROLINK communication. COMM_ALM is independent of CMD_ALM, D_ALM and D_WAR.

Code		Contents	Remarks
–	0	Normal	–
Warning	1	FCS error	Occurs when an error is detected once.
	2	–	
	–	–	
	4	–	
	5	–	
	6	–	
	7	–	
Alarm	8	FCS error	Occurs if an error is detected twice consecutively using the error detection method for warning 1, described above.
	9	–	
	A	–	
	B	–	
	C	–	
	D	–	
	E	–	
	F	–	

INFO

■ Supplementary Explanation of Alarms and Warnings

Examples where D_ALM, D_WAR, CMD_ALM, COMM_ALM has occurred are described.

Device alarm: Fuse blown (A.EF0) → D_ALM = 1

Command error: Invalid data (A.94B) → CMD_ALM = 9H

Communication error (warning): FCS reception error warning (A.962) → COMM_ALM = 1H

Communication error (alarm): FCS reception error alarm (A.E62) → COMM_ALM = 8H

(3) No Operation Command (NOP: 00H)

The NOP command is used for network control.

The current state is returned as a response.

(a) Confirmation of Completion

Confirm that RCMD = NOP (= 00H) and CMD_STAT.CMDRDY = 1.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Byte	Command	Response	Reference
0	NOP (00H)	NOP (00H)	• CMD_CTRL: Refer to *B.2.2 (1) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.2.2 (2) Command Status (CMD_STAT)*.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(4) Read ID Command (ID_RD: 03H)

The ID_RD command is used to read the ID of a device. This command reads the product information as ID data. The ID data is selected in detail by specifying ID_CODE.

(a) Confirmation of Completion

Confirm that RCMD = ID_RD (= 03H) and CMD_STAT.CMDRDY = 1, and also the setting for the ID_CODE, OFFSET and SIZE of the response.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Byte	Command	Response	Reference
0	ID_RD (03H)	ID_RD (03H)	• CMD_CTRL: Refer to *B.2.2 (1) Command Control (CMD_CTRL)*. • CMD_STAT: Refer to *B.2.2 (2) Command Status (CMD_STAT)*. On occurrence of any of the command errors below, the ID becomes an indefinite value, so it should not be read. • When the ID_CODE is invalid, or the OFFSET is invalid or the SIZE doesn't match: CMD_ALM = 9H (A.94A) will occur
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	ID_CODE	ID_CODE	
5	OFFSET	OFFSET	
6	SIZE	SIZE	
7			
8	Reserved (0)	ID	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

ID_CODE: ID data selection code

OFFSET: ID read offset

SIZE: Read data size (bytes)

IMPORTANT

- When an ID with a data size of 4 bytes is read
  Specify OFFSET = 0 and SIZE = 4.
- When an ID with a data size of 8 bytes or larger is read
  Specify 0 or a multiple of 4 for OFFSET, and 4 or 8 for SIZE.

For details on ID_CODE and its content, refer to *Table B.6 ID_CODE List* in *B.1.2 (d) Command Parameters*.

(5) Establish Connection Command (CONNECT: 0EH)

The CONNECT command is used to establish a MECHATROLINK connection. When the command has been completed, the control of slave stations is started by means of MECHATROLINK communication.

(a) Confirmation of Completion

Confirm that RCMD = CONNECT (= 0EH) and CMD_STAT.CMDRDY = 1, and also that the settings of the VER, COM_MOD, COM_TIM, and PROFILE_TYPE of the response agree with the set data.

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Byte	Command	Response	Reference
0	CONNECT (0EH)	CONNECT (0EH)	• CMD_CTRL: Refer to *B.2.2 (1) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.2.2 (2) Command Status (CMD_STAT).* If any of the command errors below occurs, the connection is not established. Phase 1 remains in effect. • If the VER data is invalid, "9H" is set for CMD_ALM. • If the COM_TIM data is invalid, "9H" is set for CMD_ALM. • If the PROFILE_TYPE data is invalid, "9H" is set for CMD_ALM.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	VER	VER	
5	COM_MOD	COM_MOD	
6	COM_TIM	COM_TIM	
7	PROFILE_TYPE	PROFILE_TYPE	
8	Reserved (0)	Reserved (0)	
9			
10			
11			
12			
13			
⋮			
63			

(d) Command Parameters

- VER: MECHATROLINK Application Layer Version
  Specify "30H" for VER.
- COM_MOD: Communication Mode Setting
  Specify "00H" for COM_MOD.
- COM_TIM: Communication Cycle Setting
  Specify "00H" for COM_TIM.
- PROFILE_TYPE: Profile Type Setting
  Specify "01H" for PROFILE_TYPE.

(6) Release Connection Command (DISCONNECT: 0FH)

When releasing a connection, the DISCONNECT command is transmitted. At this time, the slave station interrupts current processing and then performs the initialization required to reestablish the connection. It then waits for the connect establishment request from the C1 master station.

The DISCONNECT command can be sent regardless of the state of the CMD_STAT.CMDRDY bit. If the DISCONNECT command is sent when the CMD_STAT.CMDRDY state bit is 0, processing is interrupted and this command is processed.

(a) Confirmation of Completion

Confirm that RCMD = DISCONNECT (= 0FH).

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Byte	Command	Response	Reference
0	DISCONNECT (0FH)	DISCONNECT (0FH)	• Can be used in all phases. • Upon receipt of the DISCONNECT command, operation shifts to phase 1.
1	Reserved (0)	Reserved (0)	
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
⋮			
63			

(7) Read Memory Content Command (MEM_RD: 1DH)

The MEM_RD command is used to read the data on the virtual memory by specifying the stating address and the data size of the virtual memory.

If the reading is not successfully completed due to an incorrect designation (such as invalid starting address or data size), a warning will be detected in the slave station. When a warning is detected, the warning bit and warning code are set in the response. The ADDRESS and SIZE in the response are the values specified in the command, whether or not the reading has been completed.

(a) Confirmation of Completion

- Confirm that RCMD = MEM_RD (= 1DH), CMD_STAT.CMDRDY = 1, and also the setting for ADDRESS and SIZE of the response.
- When CMD_STAT.CMD_ALM or CMD_STAT.COMM_ALM ≠ 0, take appropriate action according to the codes. Refer to *B.2.2 (2) Command Status (CMD_STAT)*

(b) Command Classification

Device group: Common command group

Communication type: Asynchronous communication command

(c) Data Format

Byte	Command	Response	Reference
0	MEM_RD (1DH)	MEM_RD (1DH)	• CMD_CTRL: Refer to *B.2.2 (1) Command Control (CMD_CTRL).* • CMD_STAT: Refer to *B.2.2 (2) Command Status (CMD_STAT).* • Can be used in phase 2. • If any of the command errors below occurs, "9H" is set for CMD_ALM. - The MODE data is invalid - The DATA_TYPE data is invalid - SIZE > 4 - The ADDRESS data is invalid.
1	WDT	RWDT	
2	CMD_CTRL	CMD_STAT	
3			
4	Reserved (0)	Reserved (0)	
5	MODE/ DATA_TYPE	MODE/ DATA_TYPE	
6	SIZE	SIZE	
7			
8	ADDRESS	ADDRESS	
9			
10			
11			
12	Reserved (0)	DATA	
13			
14			
15			
⋮	Not used	Not used	
60			
61			
62			
63			

(d) Command Parameters

- MODE/DATA_TYPE: Mode/Data type

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MODE				DATA_TYPE			

  - MODE: Read mode

    0, 3 to F: Reserved by system

    1: Volatile memory
    Reads from a volatile memory such as SRAM.

    2: Nonvolatile memory (not supported)

    Reads from an nonvolatile memory such as E^2PROM.
  - DATA_TYPE: Data type

    0, 5 to F: Reversed by system

    1: Byte type (not supported)

    2: Short type

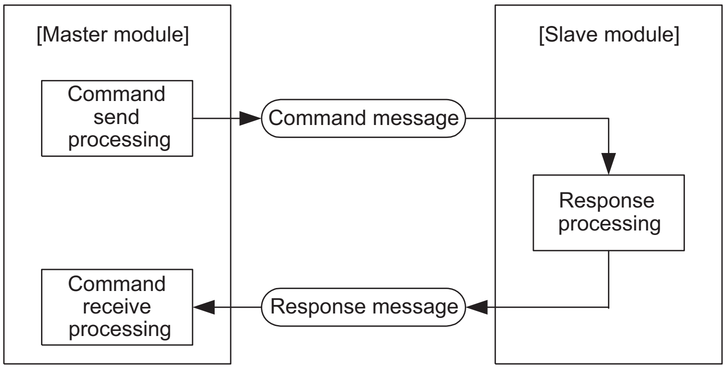
    3: Long type

    4: Long long type (not supported)
- SIZE: Number of data to read
- ADDRESS: Starting address to read
- DATA: Data

B.3 Message Communication

B.3.1 Outline

The MECHATROLINK-III message communication method is a master/slave method (half duplex communications) in which the slave modules return a response message in reply to a command message from the master module. Only the master module is able to issue a command message (communication start). The slave modules execute the function specified in the command message and return a response message.



B.3.2 Format

The message format comprises four fields for both the command and response:
the slave address, the function code, the extended address, and the data.

Slave Station Address
Function Code
Extended Address
Reserved (00 Hex.)
Subfunction Code
Mode/Data Type
Data Count (Hi)
Data Count (Lo)
Data

(1) Slave Station Address

This is the address of the slave station (01H to EFH). When the master station sends a command message to a slave station, the address of the slave station is set in this field. A slave station only accepts the command messages that are intended for it. When a slave station returns a response message to the master station, it sets its own address. This enables the master station to know which slave station the response is from.

(2) Function Code

This is a code that indicates the function of the MECHATROLINK message, and it is fixed as 42H. When a response message is returned after processing the specified message, the same function code is set for a normal response message, while the function code + 80H is set for an abnormal response message. This enables the master station to know which function code a response message relates to.

(3) Extended Address

Not used with this module. Set "0."

(4) Subfunction Code

This is a code that indicates the function of a message. The master station uses a function code to specify the function that a slave station is to execute. For details on the function codes that are valid with this module, refer to *B.3.6 Details*.

(5) Mode/Data Type

(a) Bit 7 to 4: Mode

Specify whether the memory to be read/written is volatile or nonvolatile.

The table below indicates which code is supported by which modules.

Code (Hexadecimal)	Function	Module	
		MTD2310	MTA2900, MTA2910, MTP2900 MTP2910
01	Volatile memory such as RAM	Supported	Supported
02	Nonvolatile memory such as E^2PROM	Not supported	Supported

(b) Bit 3 to 0: Data Type

Specify the type of data to read/write.

The table below indicates which code is supported by which modules.

Code (Hexadecimal)	Function	Module	
		MTD2310	MTA2900, MTA2910, MTP2900 MTP2910
02	Short type (2 bytes)	Not supported	Supported
03	Long type (4 bytes)	Supported	Supported

(6) Data Count

Specify the data size, taking the specified data type as the unit.

(7) Data

Set defined data for each function code. The data length, configuration and meaning are stipulated in accordance with each function code. The data is arranged in big endian format. For details, refer to the explanations of the message format for each function code.

Up to 64 bytes can be used in the data area.

B.3.3 Types of Slave Module Response

This module's responses to command messages from the master module fall into the following three types.

(1) Normal Response

When the command message has been received normally and processing has been performed normally, a normal response message is returned.

(2) Abnormal Response

If a command message has been received normally but it cannot be processed for some reason, an error response message is returned. For an error response message, function code + 80H is set in the function code field and an error code is set in the data field. For details on the error code, refer to *B.3.5 Error Code List*. For the error detection address, the command message initial address is returned.

(3) No Response

In the following cases, no response is returned.

- When a transmission error (overrun, framing, parity, etc.) is detected for the command message.
- When the slave station address in the command message and the slave station address set for the slave station don't match.
- When the data length of the command message is illegal.

B.3.4 List of Supported Subfunction Codes

The table below lists the subfunction codes provided by MECHATROLINK-III, and indicates which code is supported by which modules.

Subfunction Code (Hexadecimal)	Function	Module	
		MTD2310	MTA2900, MTA2910, MTP2900 MTP2910
01	Read memory content	Supported	Supported
02	Write memory content	Not supported	Supported
03	Read memory content: non contiguous	Not supported	Supported
04	Write memory content: non contiguous	Not supported	Supported
11	Read maximum message size	Supported	Supported

B.3.5 Error Code List

A list of the error codes that this module supports is presented below.

Code	Name	Contents
01H	Function code error	A function code or subfunction code that is not supported has been used.
02H	Memory address error	Access to an invalid memory address was attempted.
03H	Quantity fault	An invalid value is specified as the data count.
04H	Data type error	The specified mode or data type is not supported.
05H	Access limit error	Access to an invalid memory address was attempted.*
06H	Out of setting range error	The value of the data to be written was out of the setting range.
07H	Data consistency error	Access to a part of the memory in an area where an access to multiple memories is specified was attempted.
08H	Condition error	The contents of the command message cannot be processed when the conditions specified by the memory specifications have not been satisfied.
09H	Processing conflict error	The command message cannot be processed while another process is in progress (conflict with the other channel).

* This error occurs when using the following subfunction codes:

- Read memory content: non contiguous
- Write memory content: non contiguous

B.3.6 Details

This section gives details on the MECHATROLINK message functions that the I/O modules support.

(1) Read Memory Content (Subfunction Code: 01H)

(a) Function

Reads the specified count of data from the contiguous virtual memory starting from the specified initial address (32-bit length).

(b) Message Format

- Data type: Short (02H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (01H)	Subfunction code (01H)	Subfunction code (01H)
5	Mode/Data type (12H)	Mode/Data type (12H)	Error code
6	Number of short data	Number of short data	Reserved (00H)
7			
8	Initial address	1st data	Error detection address
9			
10		2nd data	
11			
⋮		⋮	
⋮		nth data	

- Data type: Long

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (01H)	Subfunction code (01H)	Subfunction code (01H)
5	Mode/Data type (13H)	Mode/Data type (13H)	Error code
6	Number of long data	Number of long data	Reserved (00H)
7			
8	Initial address	1st data	Error detection address
9			
10			
11			
12		2nd data	
13			
14			
15			
⋮		⋮	
⋮			
⋮			
⋮			
⋮		nth address	
⋮			
⋮			
⋮			

(c) Example Message

An example in which the 3 data units (long) of virtual memory content at memory address 00000004H are read is shown below.

Byte	Command		Response			
			When Normal		When Abnormal	
0	Slave station address	03H	Slave station address	03H	Slave station address	03H
1	Function code	42H	Function code	42H	Function code + 80H	C2H
2	Extended address	00H	Extended address	00H	Extended address	00H
3	Reserved	00H	Reserved	00H	Reserved	00H
4	Subfunction code	01H	Subfunction code	01H	Subfunction code	01H
5	Mode/data type	13H	Mode/data type	13H	Error code	02H
6	Number of long data	00H	Number of long data	00H	Reserved	00H
7		03H		03H		00H
8	Initial address	00H	1st data	00H	Error detection address	00H
9		00H		00H		00H
10		00H		02H		00H
11		04H		2BH		04H
12			2nd data	00H		
13				00H		
14				00H		
15				00H		
16			3rd data	00H		
17				00H		
18				00H		
19				63H		

(2) Write Memory Content (Subfunction Code: 02H)

(a) Function

Writes the specified count of data of the specified data type into the specified memory address (32-bit length) of the contiguous memories.

The maximum amount of data that can be read out once can be calculated from the message size obtained by using the subfunction code Read Maximum Message Size described in *B.3.6 (5) Read Maximum Message Size (Subfunction Code: 11H)*.

IMPORTANT

Before using a command to write memory, always confirm the product specifications.

(b) Message Format

- Data type: Short (02H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (02H)	Subfunction code (02H)	Subfunction code (02H)
5	Mode/Data type (12H)	Mode/Data type (12H)	Error code
6	Number of short data	Number of short data	Reserved (00H)
7			
8	Initial address		Error detection address
9			
10			
11			
12	1st data		
13			
14	2nd data		
15			
⋮	⋮		
⋮	nth data		

- Data type: Long (03H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (02H)	Subfunction code (02H)	Subfunction code (02H)
5	Mode/Data type (13H)	Mode/Data type (13H)	Error code
6	Number of long data	Number of long data	Reserved (00H)
7			
8	Initial address		Error detection address
9			
10			
11			
12	1st data		
13			
14			
15			
16	2nd data		
17			
18			
19			
⋮	⋮		
⋮			
⋮			
⋮			
⋮	nth data		
⋮			
⋮			
⋮			

(c) Message Example

An example in which 000000AH, 00000102H, and 00000F0DH of the virtual memory address 80000000H of the slave station 3 are written into contiguous memories is shown below.

Byte	Command		Response			
			When Normal		When Abnormal	
0	Slave station address	03H	Slave station address	03H	Slave station address	03H
1	Function code	42H	Function code	42H	Function code +80H	C2H
2	Extended address	00H	Extended address	00H	Extended address	00H
3	Reserved	00H	Reserved	00H	Reserved	00H
4	Subfunction code	02H	Subfunction code	02H	Subfunction code	02H
5	Mode/Data type	13H	Mode/Data type	13H	Error code	02H
6	Number of long data	00H	Number of long data	00H	Reserved	00H
7		03H		03H		00H
8	Initial address	80H			Error detection address	00H
9		00H				00H
10		00H				00H
11		00H				08H
12	1st data	00H				
13		00H				
14		00H				
15		0AH				
16	2nd data	00H				
17		00H				
18		01H				
19		02H				
20	3rd data	00H				
21		00H				
22		0FH				
23		0DH				

(3) Read Memory Content: Non contiguous (Subfunction Code: 03H)

(a) Function

Reads the specified count of data of the specified memory type from non-contiguous memories starting from the specified address (32-bit length).

The maximum number of data to be read out once can be calculated from the message size obtained by using the subfunction code Read Maximum Message Size (11H) described in *B.3.6 (5) Read Maximum Message Size (Subfunction Code: 11H)*.

(b) Message Format

- Data type: Short (02H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (03H)	Subfunction code (03H)	Subfunction code (03H)
5	Mode/Data type (12H)	Mode/Data type (12H)	Error code
6	Number of short data	Number of short data	Reserved (00H)
7			
8	1st address	1st data	Error detection address
9			
10		2nd data	
11			
12	2nd address	⋮	
13			
14		nth data	
15			
⋮	⋮		
⋮			
⋮			
⋮			
⋮	nth address		
⋮			
⋮			
⋮			

- Data type: Long (03H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (03H)	Subfunction code (03H)	Subfunction code (03H)
5	Mode/Data type (13H)	Mode/Data type (13H)	Error code
6	Number of long data	Number of long data	Reserved (00H)
7			
8	1st address	1st data	Error detection address
9			
10			
11			
12	2nd address	2nd data	
13			
14			
15			
⋮	⋮	⋮	
⋮			
⋮			
⋮			
⋮	nth address	nth data	
⋮			
⋮			
⋮			

(c) Message Example

An example in which the contents of the virtual memory addresses 80000004H, 80000104H, and 80000204H are read is shown below.

Byte	Command		Response			
			When Normal		When Abnormal	
0	Slave station address	03H	Slave station address	03H	Slave station address	03H
1	Function code	42H	Function code	42H	Function code +80H	C2H
2	Extended address	00H	Extended address	00H	Extended address	00H
3	Reserved	00H	Reserved	00H	Reserved	00H
4	Subfunction code	03H	Subfunction code	03H	Subfunction code	03H
5	Mode/Data type	13H	Mode/Data type	13H	Error code	02H
6	Number of long data	00H	Number of long data	00H	Reserved	00H
7		03H		03H		00H
8	1st address	80H	1st data	00H	Error detection address	00H
9		00H		20H		00H
10		00H		02H		00H
11		04H		2BH		08H
12	2nd address	80H	2nd data	00H		
13		00H		00H		
14		01H		00H		
15		04H		00H		
16	3rd address	80H	3rd data	00H		
17		00H		00H		
18		02H		00H		
19		04H		63H		

(4) Write Memory Content: Non contiguous (Subfunction Code: (04H)

(a) Function

Writes the specified count of data of the specified memory type starting from the specified address (32-bit length) into non-contiguous memories.

The maximum number of data to be read out once can be calculated from the message size obtained by using the subfunction code Read Maximum Message Size (11H) described in *B.3.6 (5) Read Maximum Message Size (Subfunction Code: 11H)*.

IMPORTANT

Before using a command to write memory, always confirm the product specifications.

(b) Message Format

- Data type: Short (02H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (04H)	Subfunction code (04H)	Subfunction code (04H)
5	Mode/Data type (12H)	Mode/Data type (12H)	Error code
6	Number of short data	Number of short data	Reserved (00H)
7			
8	1st address		Error detection address
9			
10			
11			
12	1st data		
13			
14	Reserved (00H)		
15			
16	2nd address		
17			
18			
19			
20	2nd data		
21			
22	Reserved (00H)		
23			
⋮	⋮		
⋮			
⋮			
⋮			
⋮	⋮		
⋮			
⋮	Reserved (00H)		
⋮			
⋮	nth address		
⋮			
⋮			
⋮			
⋮	nth address		
⋮			
⋮	Reserved (00H)		
⋮			

- Data type: Long (03H)

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code +80H (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (04H)	Subfunction code (04H)	Subfunction code (04H)
5	Mode/Data type (13H)	Mode/Data type (13H)	Error code
6	Number of long data	Number of long data	Reserved (00H)
7			
8	1st address		Error detection address
9			
10			
11			
12	1st data		
13			
14			
15			
16	2nd address		
17			
18			
19			
20	2nd data		
21			
22			
23			
⋮	⋮		
⋮			
⋮			
⋮			
⋮	⋮		
⋮			
⋮			
⋮			
⋮	nth address		
⋮			
⋮			
⋮			
⋮	nth data		
⋮			
⋮			
⋮			

(c) Message Example

An example in which the data of 0000000AH, 00000102H, and 00000F0DH are written into the virtual memory addresses 80000004H, 80000104H, and 80000204H of the slave station 3 is shown below.

Byte	Command		Response			
			When Normal		When Abnormal	
0	Slave station address	03H	Slave station address	03H	Slave station address	03H
1	Function code	42H	Function code	42H	Function code +80H	C2H
2	Extended address	00H	Extended address	00H	Extended address	00H
3	Reserved	00H	Reserved	00H	Reserved	00H
4	Subfunction code	04H	Subfunction code	04H	Subfunction code	04H
5	Mode/Data type	13H	Mode/Data type	13H	Error code	02H
6	Number of long data	00H			Reserved	00H
7		03H				00H
8	1st address	80H			Error detection address	00H
9		00H				00H
10		00H				00H
11		04H				08H
12	1st data	00H				
13		00H				
14		00H				
15		0AH				
16	2nd address	80H				
17		00H				
18		01H				
19		04H				
20	2nd data	00H				
21		00H				
22		01H				
23		02H				
24	3rd address	80H				
25		00H				
26		02H				
27		04H				
28	3rd data	00H				
29		00H				
30		0FH				
31		0DH				

(5) Read Maximum Message Size (Subfunction Code: 11H)

(a) Function

Reads the maximum size of a message.

The maximum message size is unsigned 32-bit data and the number of bytes is returned in the response.

Based on this maximum message size, a device that sends commands can calculate the maximum number of data that can be read or written for each command.

(b) Message Format

Byte	Command	Response	
		When Normal	When Abnormal
0	Slave station address	Slave station address	Slave station address
1	Function code (42H)	Function code (42H)	Function code + 80 (C2H)
2	Extended address (00H)	Extended address (00H)	Extended address
3	Reserved (00H)	Reserved (00H)	Reserved (00H)
4	Subfunction code (11H)	Subfunction code (11H)	Subfunction code (01H)
5	Reserved (00H)	Reserved (00H)	Error code
6	Reserved (00H)	Reserved (00H)	Reserved (00H)
7			
8		Maximum message size (in bytes)	Error detection address
9			
10			
11			

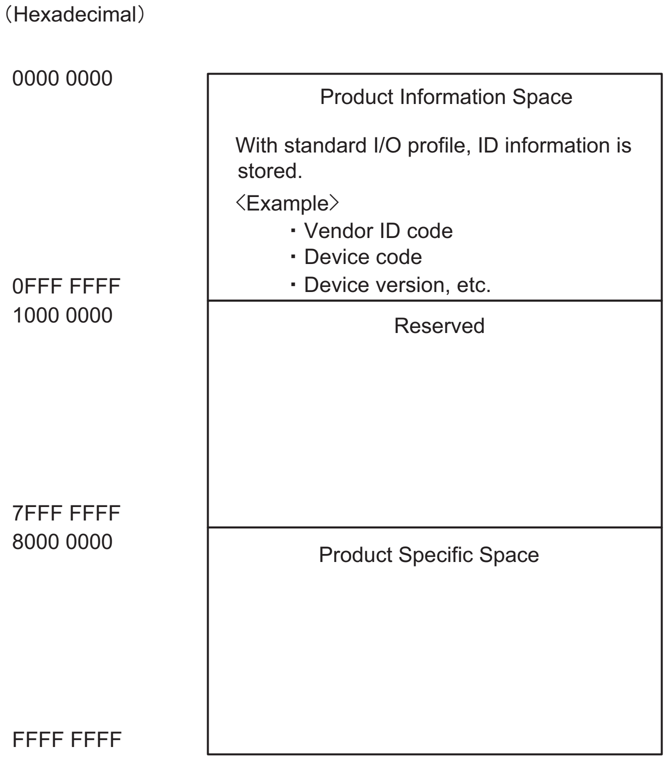
(c) Example Message

An example where the maximum message size is read from slave station 2 is shown below.

Byte	Command		Response			
			When Normal		When Abnormal	
0	Slave station address	02H	Slave station address	02H	Slave station address	02H
1	Function code	42H	Function code	42H	Function code + 80H	C2H
2	Extended address	00H	Extended address	00H	Extended address	00H
3	Reserved	00H	Reserved	00H	Reserved	00H
4	Subfunction code	11H	Subfunction code	11H	Subfunction code	11H
5	Reserved	00H	Reserved	00H	Error code	01H
6	Reserved	00H	Reserved	00H	Reserved	00H
7		00H		00H		00H
8			Maximum message size (in bytes)	00H	Error detection address	00H
9				00H		00H
10				00H		00H
11				40H		00H

B.4 Virtual Memory

MECHATROLINK-III specifications define the address spaces in the virtual memory as shown below to standardize the memory spaces of different vendors. The product specific space is reserved for the MECHATROLINK-III compliant device to use as required.



Appendix C

Noise Countermeasures and EMC Compliant Installation

C.1 Noise Countermeasures

This section describes noise countermeasures.

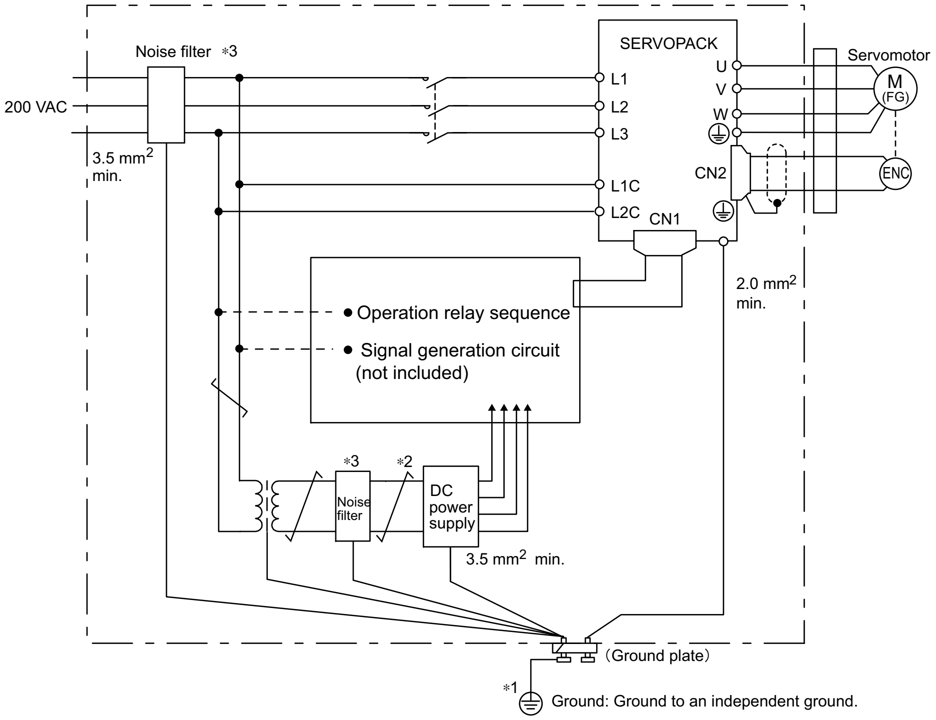
C.1.1 Outline

To prevent noise interference, take the following countermeasures against noise as required.

- Install the input reference device and noise filter as close to the Module as possible.
- Always install a surge absorber in the relay, solenoid, electromagnetic contactor coils.
- Do not bundle or run the power cable together with the I/O signal cables in the same duct. Keep the power cable separated from the I/O signal cables by at least 30 cm.
- Do not share the power supply with an electric welder or electrical discharge machine. When the Module is placed near a high-frequency generator, install a noise filter. For details on noise filter wiring, refer to *C.1.2 Noise Filter*.
- When the input signal is disrupted by noise, take appropriate action referring to *C.1.4 When the I/O Signal Cables are Disrupted by Noise*.
- Shield boxes are effective for preventing electromagnetic interference.

C.1.2 Noise Filter

The installation of a noise filter in the appropriate place will protect the Module from noise interference. The following diagram illustrates one example of wiring for noise countermeasures.



* 1. For ground wires connected to the ground plate, use a wire with a thickness of at least 2.0 mm^2 (preferably, copper flat braided wire).

* 2. should be twisted-pair wires.

* 3. When using a noise filter, follow the precautions in *C.1.3 Precautions on Connecting a Noise Filter*.

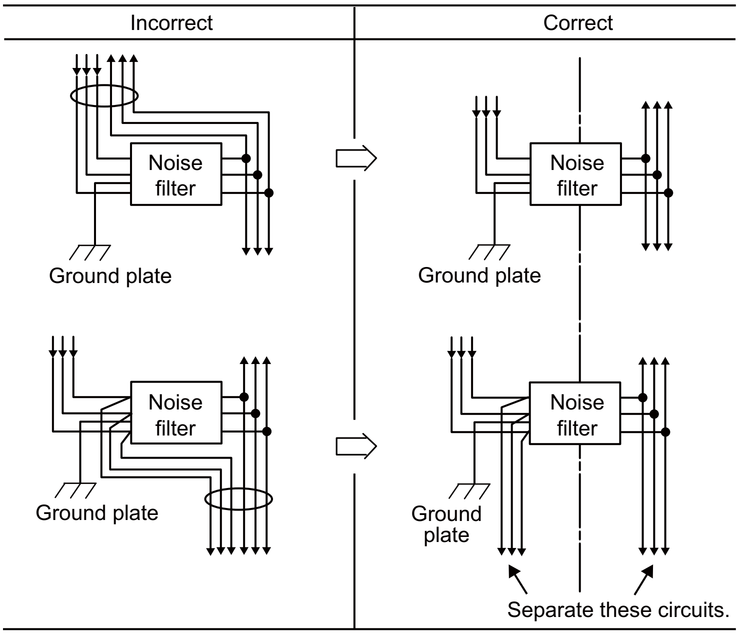
C.1.3 Precautions on Connecting a Noise Filter

Observe the following precautions when connecting a noise filter.

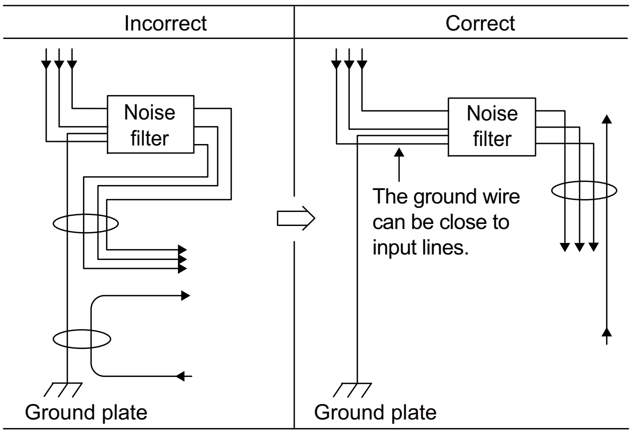
IMPORTANT

Some noise filters have a large leakage current. The grounding conditions also affect the extent of the leakage current. If necessary, select an appropriate leakage current detector or leakage breaker taking into account the grounding conditions and leakage current from the noise filter.
Contact the manufacturer of the noise filter for more details.

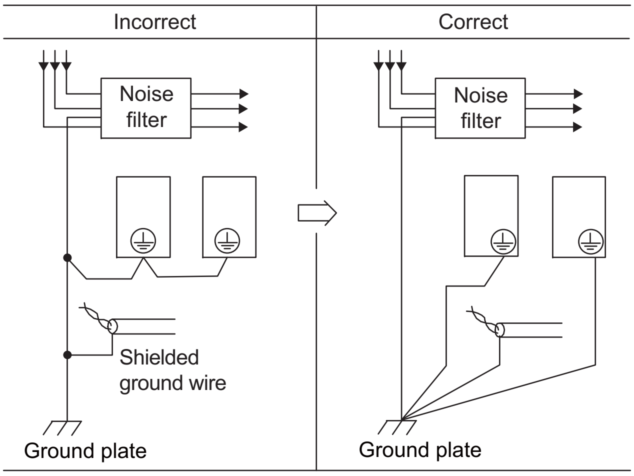
Do not put the input and output lines in the same duct or bundle them together.



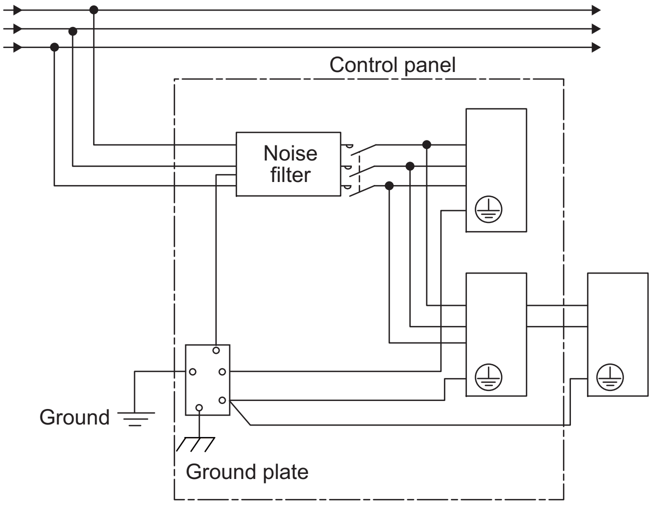
Separate the noise filter ground wire from the output lines. Do not accommodate the noise filter ground wire, output lines and other signal lines in the same duct or bundle them together.



Connect the noise filter ground wire directly to the ground plate. Do not connect the noise filter ground wire to other ground wires.



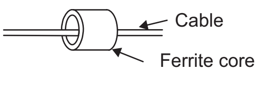
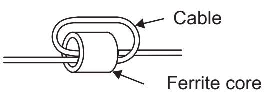
If a noise filter is located inside a control panel, connect the noise filter ground wire and the ground wires from other devices inside the control panel to the ground plate for the control panel first, then ground these wires.



C.1.4 When the I/O Signal Cables are Disrupted by Noise

Take a noise countermeasure when the I/O signal cables are interfered by noise.

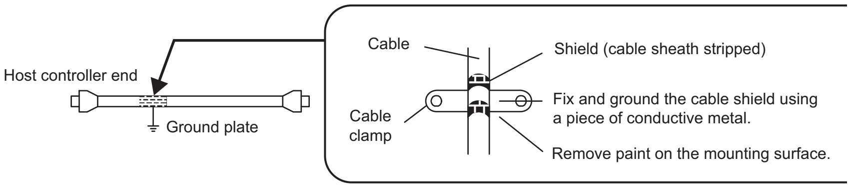
(1) Attach a Ferrite Core to the Cable

One turn	Two turns
	

(2) Fix the Cable

Fix and ground the cable shield using a piece of conductive metal such as a cable clamp.

- Example of cable clamp



(3) Shield Box

A shield box, which is a closed metallic enclosure, is effective as reinforced shielding against electromagnetic interference (EMI). The structure of the box should allow the main body, door, and cooling unit to be attached to the ground. The box opening should be as small as possible.

Note: Refer to *C.2.2 System Configuration* for ferrite core attachment, cable fixing, and shield box.

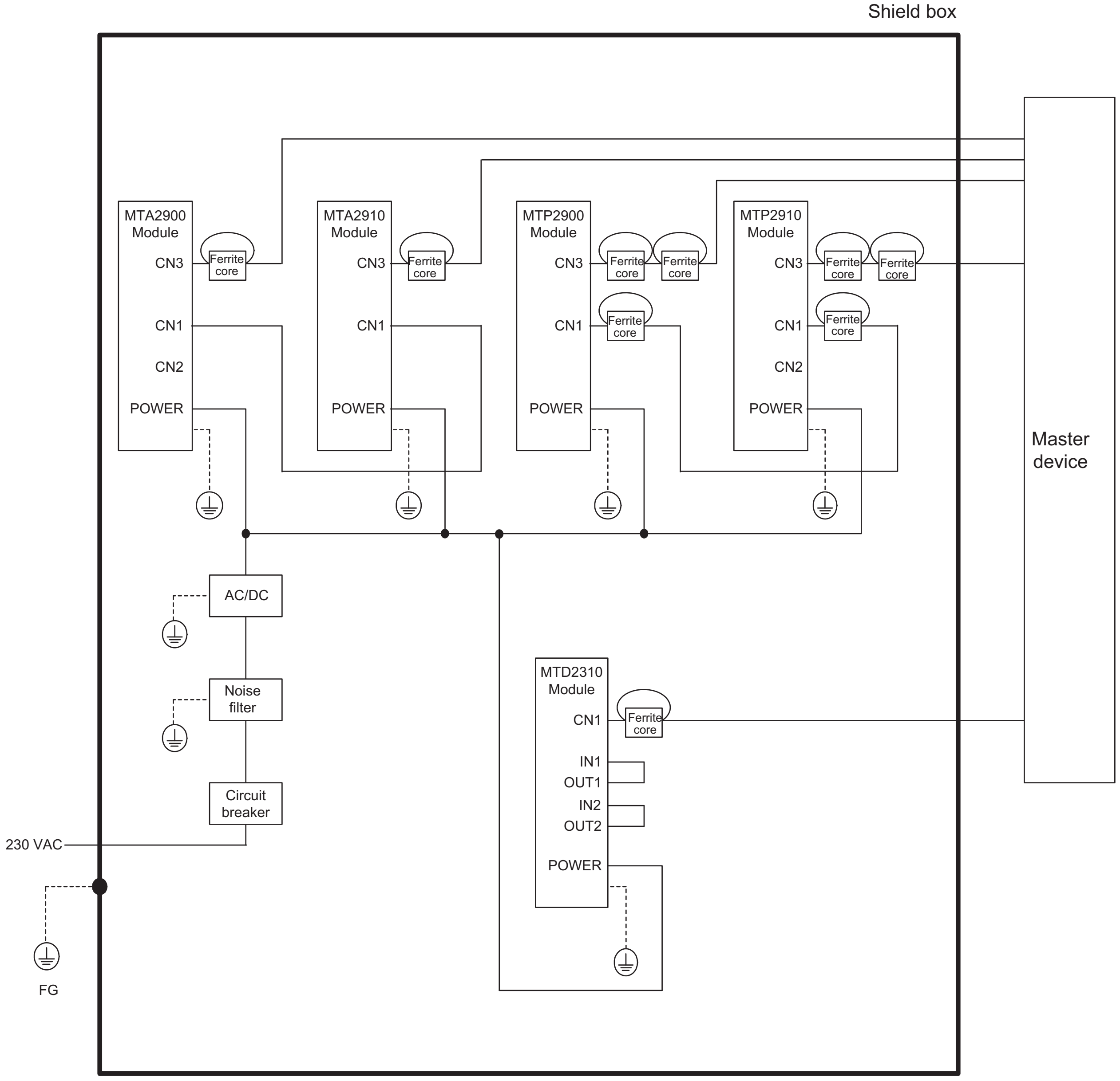
C.2 EMC Compliant Installation

C.2.1 Outline

This section describes the installation conditions and configuration specified for EMC certificate testing.

Note: The installation and configuration described here met the EMC requirements during in-house testing by EMC. However, the EMC compliance level may differ depending on actual system configuration, wiring, etc. Because the Modules described in this manual are built into machines, certification is required after installation in the user's product.

C.2.2 System Configuration



- Recommended Noise Filter and Ferrite Core Models

Name	Model	Manufacturer
Noise Filter	LF-210N	NEC TOKIN Corp.
Ferrite Core (Core)	ESD-SR-250	NEC TOKIN Corp.

Appendix D

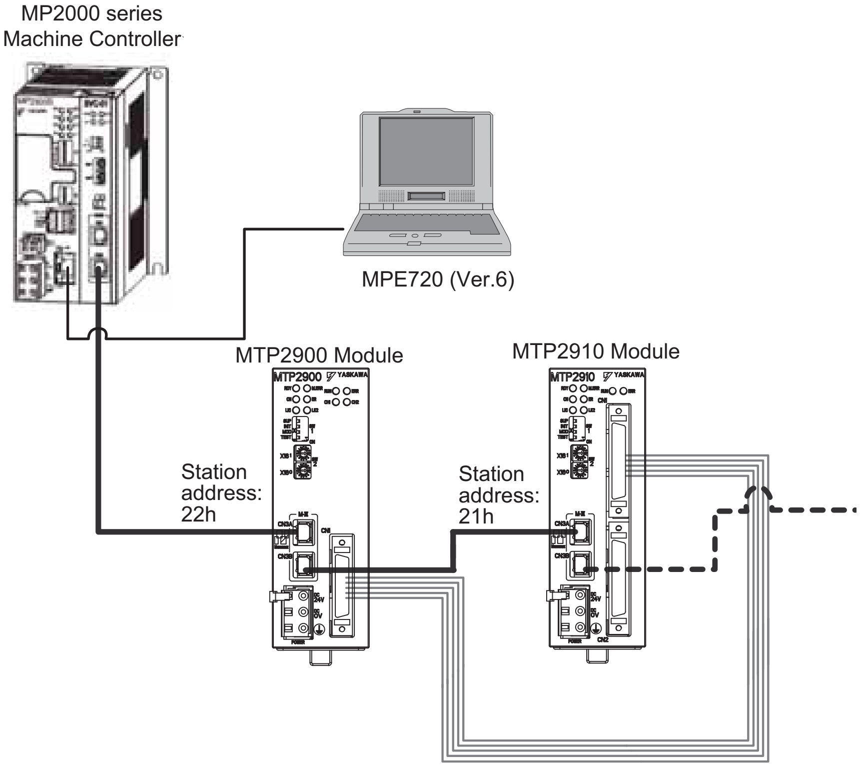
Sample Programs for MP2000 Series Machine Controller

This appendix provides sample programs for an MP2000 series Machine Controller that will operate the MTP2900 Module and the MTP2910 Module.

D.1 System Configuration

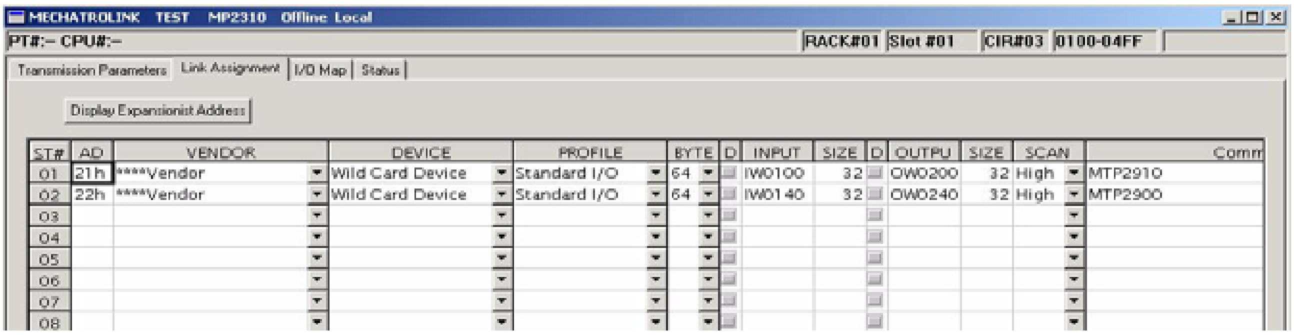
Using the sample program, pulses output from the MTP2910 Module are input to the MTP2900 Module.

The following system configuration is used.



System Configuration for Sample Programs

D.2 Module Configuration Definition



ST#	AD	VENDOR	DEVICE	PROFILE	BYTE	D	INPUT	SIZE	D	OUTPU	SIZE	SCAN	Comm
01	21h	****Vendor	Wild Card Device	Standard I/O	64	☐	IW0100	32	☐	OW0200	32	High	MTP2910
02	22h	****Vendor	Wild Card Device	Standard I/O	64	☐	IW0140	32	☐	OW0240	32	High	MTP2900
03						☐			☐				
04						☐			☐				
05						☐			☐				
06						☐			☐				
07						☐			☐				
08						☐			☐				

D.3 Registers

The register configurations for the MTP2900 Module and MTP2910 Module are given below.

D.3.1 MTP2900 Module

OW0240	(Reserved by system)
OW0241	(Reserved by system)
OW0242	Command setting
OW0243	Set function
OL0244	Count presetting data
OL0246	Agreed detection value
OL0248	Preset data of POSMAX turns
OL024A	Zone output minimum value
OL024C	Zone output maximum value
OL024E	Speed coincidence detection setting
OL0250	Speed coincidence detection width
OL0252	Frequency coincidence detection setting
OL0254	Frequency coincidence detection width
OL0256	Averaging count setting
OL0258	System monitor

IW0140	(Reserved by system)
IW0141	(Reserved by system)
IW0142	Status
IW0143	(Reserved by system)
IL0144	(Reserved by system)
IL0146	Counter value
IL0148	PI latch value/ Interval value
IL014A	(Reserved by system)
IL014C	Current count value after conversion
IL014E	PI latch value after conversion/ Interval value after conversion
IL0150	Number of POSMAX turns
IL0152	Feedback speed
IL0154	Detected frequency
IL0156	Average frequency
IL0158	System monitor

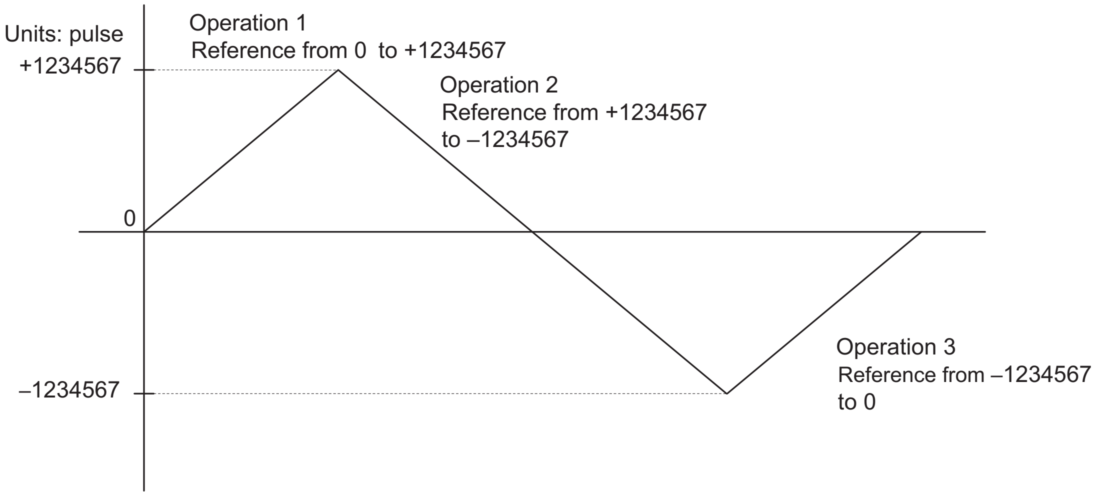
D.3.2 MTP2910 Module

OW0200	(Reserved by system)	IW0100	(Reserved by system)
OW0201	(Reserved by system)	IW0101	(Reserved by system)
OW0202	Run command setting	IW0102	Run status
OW0203	Monitor selection	IW0103	Monitor selection
OW0204	Function setting 3	IW0104	Warning
OW0205	(Reserved by system)	IW0105	Alarm
OW0206	Motion command	IW0106	Motion command response code
OW0207	Motion command control flag	IW0107	Motion command status
OW0208	(Reserved by system)	IW0108	(Reserved by system)
OW0209	Override	IW0109	(Reserved by system)
OW020A	Bias speed	IW010A	Position management status
OW020B	General-purpose DO	IW010B	General-purpose DI
OL020C	Speed reference setting	IL010C	Monitor 1
OL020E	Position reference setting	IL010E	Monitor 2
OW0210	Run command setting	IW0110	Run status
OW0211	Monitor selection	IW0111	Monitor selection
OW0212	Function setting 3	IW0112	Warning
OW0213	(Reserved by system)	IW0113	Alarm
OW0214	Motion command	IW0114	Motion command response code
OW0215	Motion command control flag	IW0115	Motion command status
OW0216	(Reserved by system)	IW0116	(Reserved by system)
OW0217	Override	IW0117	(Reserved by system)
OW0218	Bias speed	IW0118	Position management status
OW0219	General-purpose DO	IW0119	General-purpose DI
OL021A	Speed reference setting	IL011A	Monitor 1
OL021C	Position reference setting	IL011C	Monitor 2

D.4 Execution Sequence

The sample program runs operation by repeating Operations 1, 2, and 3 as illustrated in the diagram below.

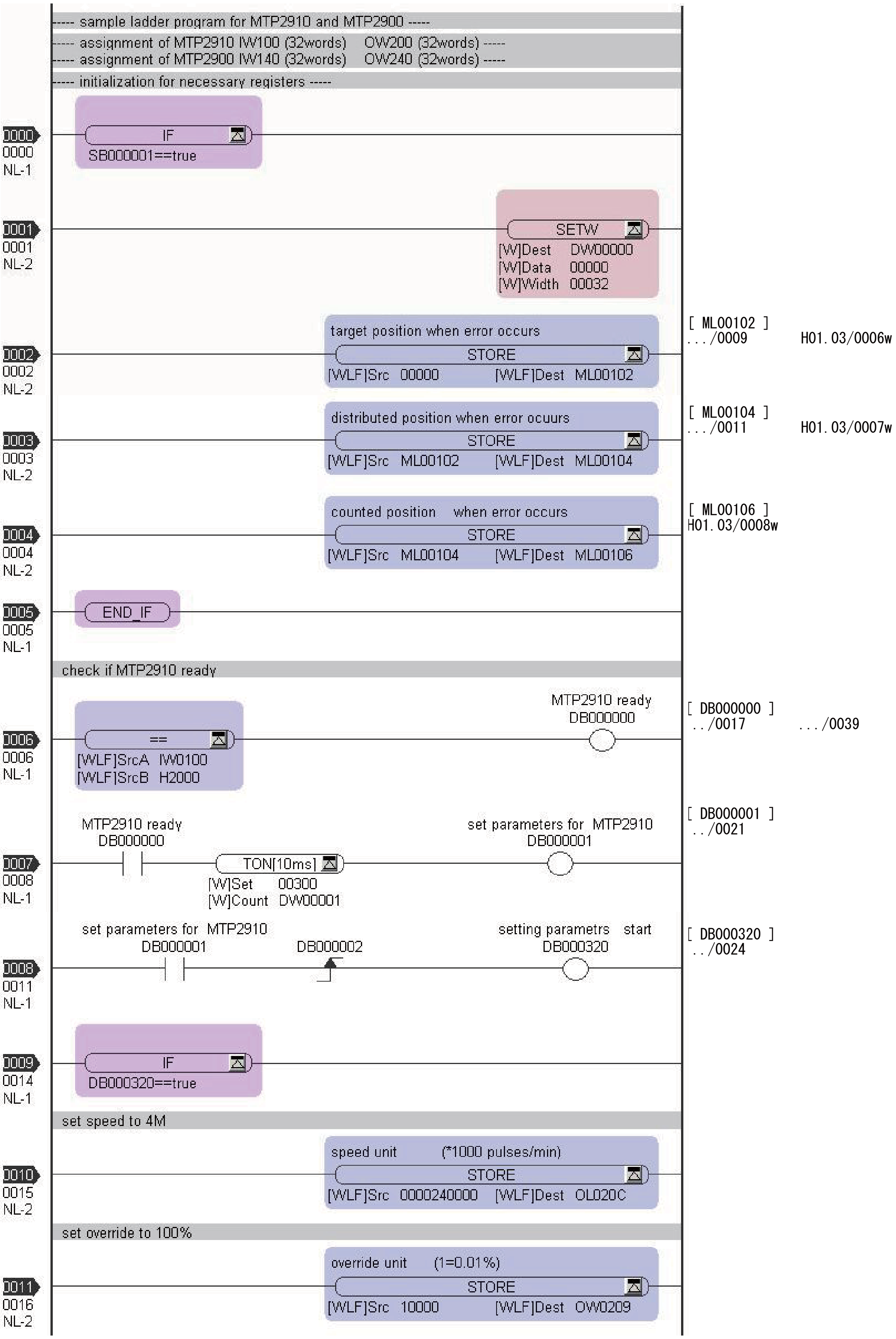
Pulses are output from the MTP2910 Module by using a POSING command and input to the MTP2900 Module. The reference position of the MTP2910 Module is compared with the current position counter count value of the MTP2900 Module.



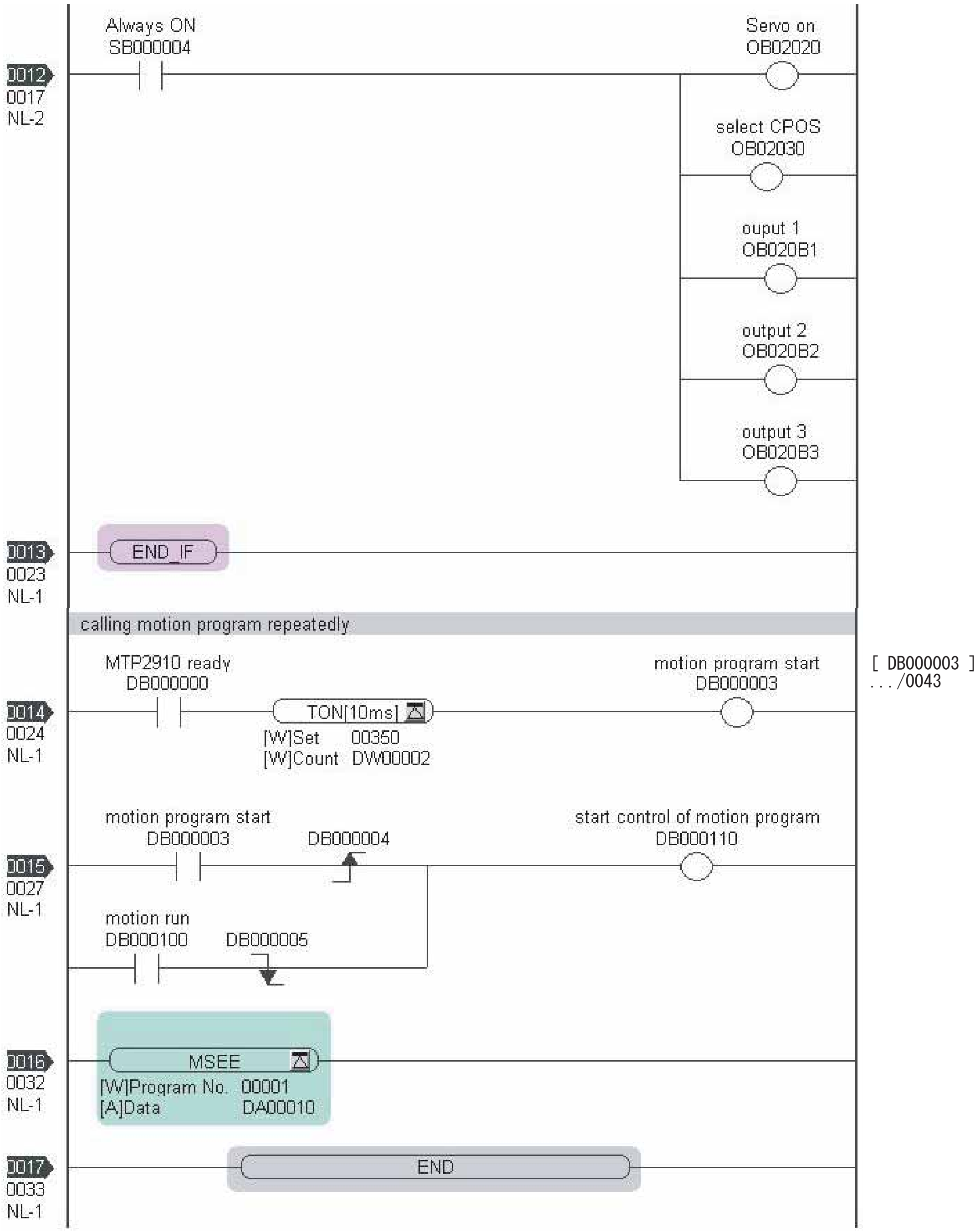
Sample Program Execution Sequence

D.5 Ladder Program and Motion Program Examples

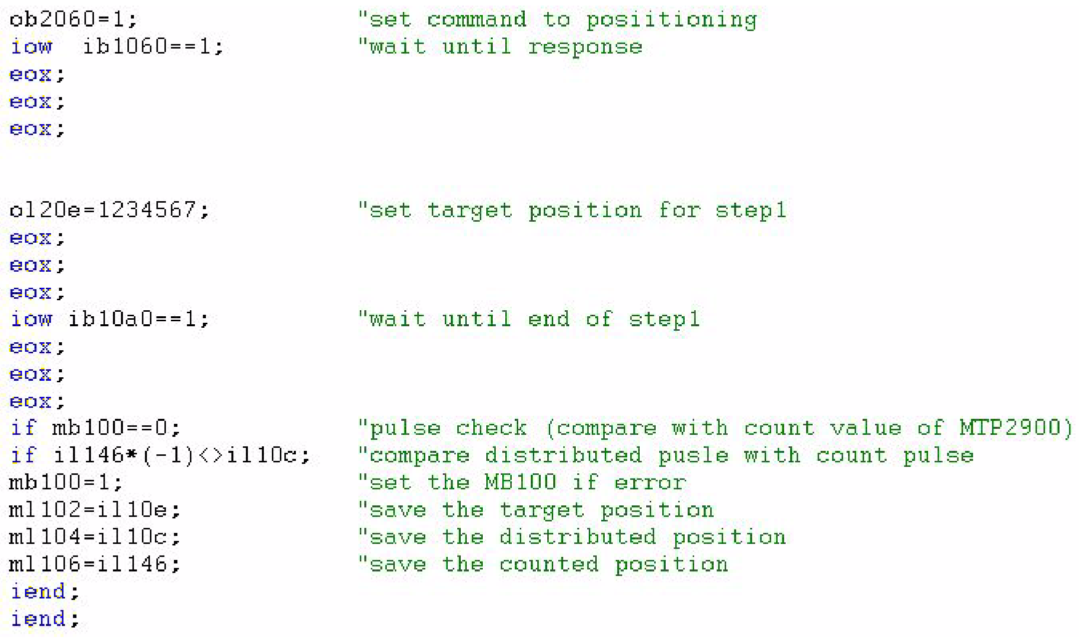
D.5.1 Initial Settings for MTP2900 and MTP2910 Modules, and Motion Program Repetitive Startup



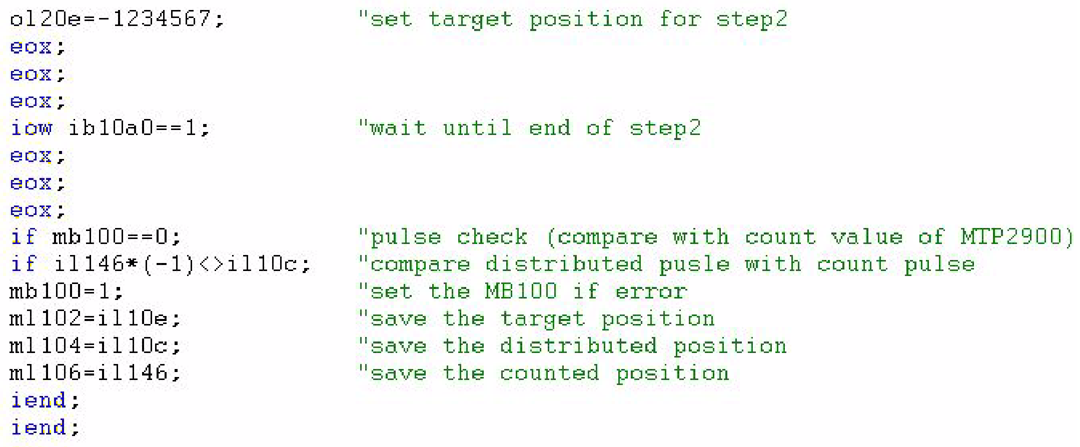
```
---- sample ladder program for MTP2910 and MTP2900 -----
---- assignment of MTP2910 IW100 (32words)   OW200 (32words) -----
---- assignment of MTP2900 IW140 (32words)   OW240 (32words) -----
---- initialization for necessary registers -----

0000  0000 NL-1   IF  SB000001==true

0001  0001 NL-2   SETW  [W]Dest DW00000  [W]Data 00000  [W]Width 00032

0002  0002 NL-2   target position when error occurs
                  STORE  [WLF]Src 00000   [WLF]Dest ML00102      [ ML00102 ]
                                                                 .../0009      H01.03/0006w

0003  0003 NL-2   distributed position when error ocuurs
                  STORE  [WLF]Src ML00102 [WLF]Dest ML00104      [ ML00104 ]
                                                                 .../0011      H01.03/0007w

0004  0004 NL-2   counted position    when error occurs
                  STORE  [WLF]Src ML00104 [WLF]Dest ML00106      [ ML00106 ]
                                                                 H01.03/0008w

0005  0005 NL-1   END_IF

check if MTP2910 ready

0006  0006 NL-1   ==  [WLF]SrcA IW0100  [WLF]SrcB H2000
                  MTP2910 ready DB000000                         [ DB000000 ]
                                                                 ../0017       .../0039

0007  0008 NL-1   MTP2910 ready DB000000
                  TON[10ms]  [W]Set 00300  [W]Count DW00001
                  set parameters for MTP2910 DB000001            [ DB000001 ]
                                                                 ../0021

0008  0011 NL-1   set parameters for MTP2910 DB000001
                  DB000002
                  setting parametrs  start DB000320              [ DB000320 ]
                                                                 ../0024

0009  0014 NL-1   IF  DB000320==true

set speed to 4M

0010  0015 NL-2   speed unit       (*1000 pulses/min)
                  STORE  [WLF]Src 0000240000  [WLF]Dest OL020C

set override to 100%

0011  0016 NL-2   override unit     (1=0.01%)
                  STORE  [WLF]Src 10000  [WLF]Dest OW0209
```


0012
0017
NL-2
Always ON
SB000004
Servo on
OB02020
select CPOS
OB02030
ouput 1
OB020B1
output 2
OB020B2
output 3
OB020B3
0013
0023
NL-1
END_IF
calling motion program repeatedly
0014
0024
NL-1
MTP2910 ready
DB000000
TON[10ms]
[W]Set 00350
[W]Count DW00002
motion program start
DB000003
[DB000003]
. . . /0043
0015
0027
NL-1
motion program start
DB000003
DB000004
start control of motion program
DB000110
motion run
DB000100
DB000005
0016
0032
NL-1
MSEE
[W]Program No. 00001
[A]Data DA00010
0017
0033
NL-1
END

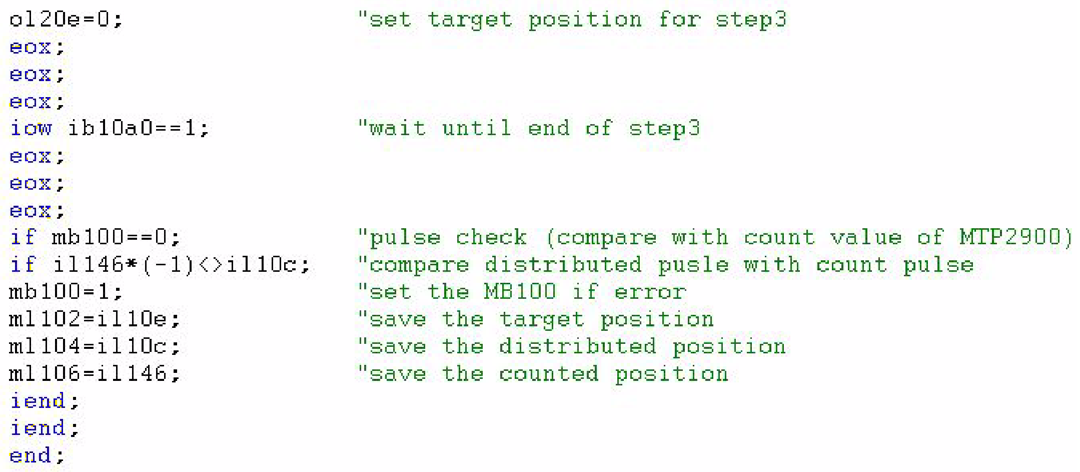
D.5.2 POSING Command of MTP2910 Module and Motion Program for Pulse Check by MTP2900 Module



```
ob2060=1;                "set command to posiitioning
iow  ib1060==1;          "wait until response
eox;
eox;
eox;

ol20e=1234567;           "set target position for step1
eox;
eox;
eox;
iow ib10a0==1;           "wait until end of step1
eox;
eox;
eox;
if mb100==0;             "pulse check (compare with count value of MTP2900)
if il146*(-1)<>il10c;    "compare distributed pusle with count pulse
mb100=1;                 "set the MB100 if error
ml102=il10e;             "save the target position
ml104=il10c;             "save the distributed position
ml106=il146;             "save the counted position
iend;
iend;
```



```
ol20e=-1234567;          "set target position for step2
eox;
eox;
eox;
iow ib10a0==1;           "wait until end of step2
eox;
eox;
eox;
if mb100==0;             "pulse check (compare with count value of MTP2900)
if il146*(-1)<>il10c;    "compare distributed pusle with count pulse
mb100=1;                 "set the MB100 if error
ml102=il10e;             "save the target position
ml104=il10c;             "save the distributed position
ml106=il146;             "save the counted position
iend;
iend;
```



```
ol20e=0;                 "set target position for step3
eox;
eox;
eox;
iow ib10a0==1;           "wait until end of step3
eox;
eox;
eox;
if mb100==0;             "pulse check (compare with count value of MTP2900)
if il146*(-1)<>il10c;    "compare distributed pusle with count pulse
mb100=1;                 "set the MB100 if error
ml102=il10e;             "save the target position
ml104=il10c;             "save the distributed position
ml106=il146;             "save the counted position
iend;
iend;
end;
```

Index

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MTA2900 Module

MTA2910 Module

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Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

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December 2010		0	–	Based on Japanese user’s manual, SIJP C880781 04B<2>-1 available on the web in September 2010.
			Front cover	Revision: Format
			All chapters	Completely revised
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MECHATROLINK-III Compatible

I/O Module

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