



Mitsubishi Electric AC Servo System

MITSUBISHI ELECTRIC SERVO SYSTEM
MELSERVO-JET

MR-JET-G
User's Manual
(Communication Function)

-MR-JET-_G_

SAFETY INSTRUCTIONS

Please read the instructions carefully before using the equipment.

To use the equipment correctly, do not attempt to install, operate, maintain, or inspect the equipment until you have read through this manual, installation guide, and appended documents carefully. Do not use the equipment until you have a full knowledge of the equipment, safety information and instructions.

In this manual, the safety instruction levels are classified into "WARNING" and "CAUTION".



WARNING

Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



CAUTION


Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury.

Note that the CAUTION level may lead to a serious consequence depending on conditions.


Please follow the instructions of both levels because they are important to personnel safety.

Forbidden actions and required actions are indicated by the following diagrammatic symbols.



Indicates a forbidden action. For example, "No Fire" is indicated by .



Indicates a required action. For example, grounding is indicated by .

In this manual, precautions for hazards that can lead to property damage, instructions for other functions, and other information are shown separately in the "Point" area.

After reading this manual, keep it accessible to the operator.

[Installation/wiring]

WARNING

- To prevent an electric shock, turn off the power and wait for 15 minutes or more before starting wiring and/or inspection.
 - To prevent an electric shock, ground the servo amplifier.
 - To prevent an electric shock, any person who is involved in wiring should be fully competent to do the work.
 - To prevent an electric shock, mount the servo amplifier before wiring.
 - To prevent an electric shock, connect the protective earth (PE) terminal of the servo amplifier to the protective earth (PE) of the cabinet, then connect the grounding lead wire to the ground.
 - To prevent an electric shock, do not touch the conductive parts.
-

[Setting/adjustment]

WARNING

- To prevent an electric shock, do not operate the switches with wet hands.
-

[Operation]

WARNING

- To prevent an electric shock, do not operate the switches with wet hands.
-

[Maintenance]

WARNING

- To prevent an electric shock, any person who is involved in inspection should be fully competent to do the work.
 - To prevent an electric shock, do not operate the switches with wet hands.
-

ABOUT THE MANUAL

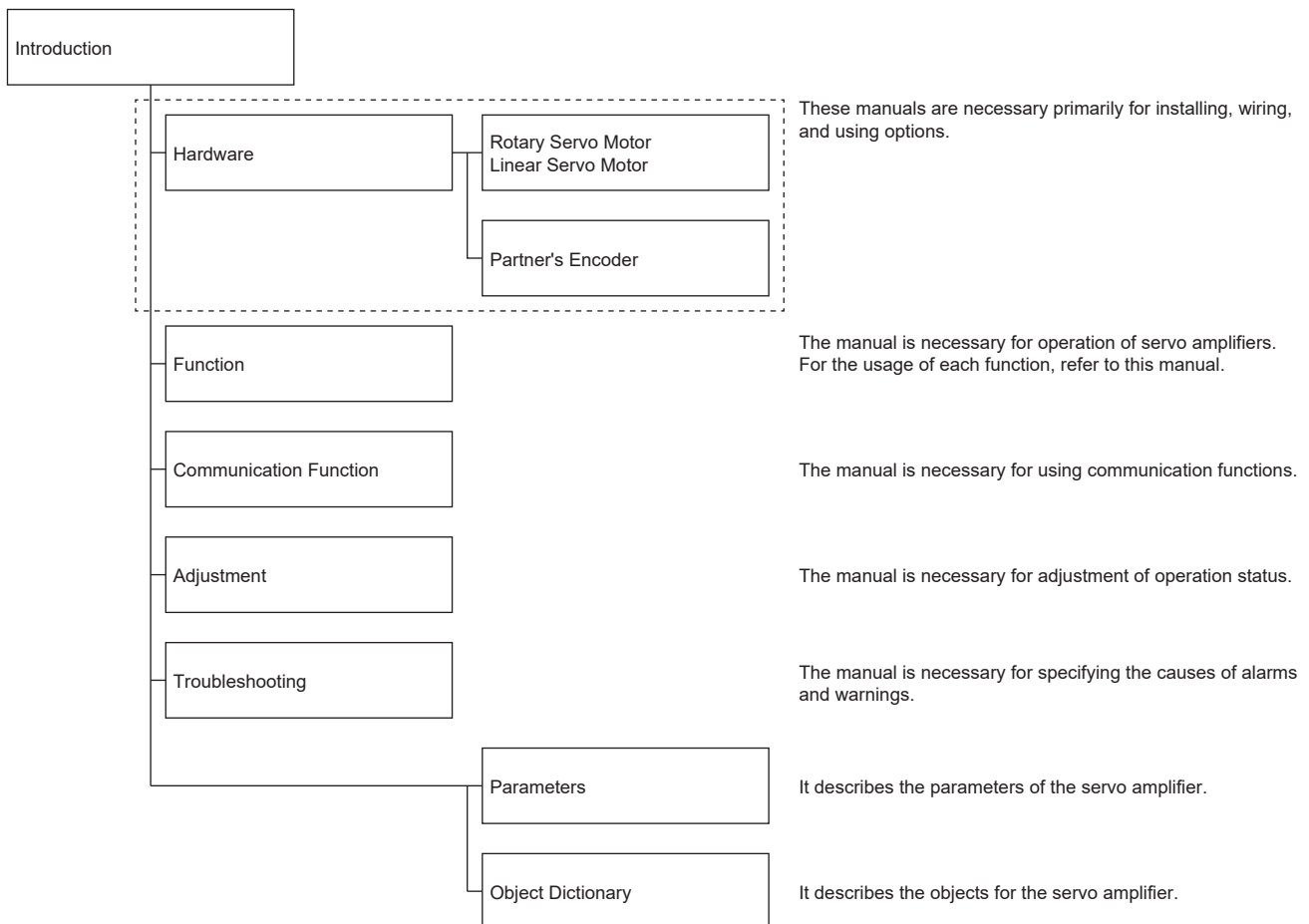
Point

e-Manuals are Mitsubishi Electric FA electronic book manuals that can be browsed with a dedicated tool.

e-Manuals enable the following:

- Searching for desired information in multiple manuals at the same time (manual cross searching)
- Jumping from a link in a manual to another manual for reference
- Browsing for hardware specifications by scrolling over the components shown in product illustrations
- Bookmarking frequently referenced information
- Copying sample programs to engineering software

If using the servo for the first time, prepare and use the following related manuals to ensure that the servo is used safely. For the related manuals, refer to the User's Manual (Introduction).



Global standards and regulations

Compliance with the indicated global standards and regulations is current as of the release date of this manual. Some standards and regulations may have been modified or withdrawn.

OBJECT UNITS

This section explains the pos units, vel units, and acc units used in this manual.

The degree unit is available on servo amplifiers with firmware version B6 or later.

The mm unit and inch unit are available on servo amplifiers with firmware version B8 or later in the positioning mode (point table method).

pos units

The standard unit can be changed using [Pr. PT01.2 Unit for position data] as shown in the following table.

| Setting value | Standard unit |
|---------------|---------------|
| 0 | mm |
| 1 | inch |
| 2 | degree |
| 3 | pulse |

vel units

The speed unit can be changed using [Pr. PT01.1 Speed/acceleration/deceleration unit selection] as shown in the following table. The command unit can be changed to "0.001 mm", "0.0001 inch", "0.001 degree", or "pulse" using [Pr. PT01.2].

| Setting value | Unit |
|---------------|--------------------------|
| 0 | 0.01 r/min, 0.01 mm/s *1 |
| 1 | Command unit/s |

*1 "0.01 mm/s" is used in the linear servo motor control mode.

acc units

The acceleration unit can be changed using [Pr. PT01.1] as shown in the following table. The command unit can be changed to "0.001 mm", "0.0001 inch", "0.001 degree", or "pulse" using [Pr. PT01.2].

| Setting value | Unit |
|---------------|-----------------------------|
| 0 | ms |
| 1 | Command unit/s ² |

U.S. CUSTOMARY UNITS

U.S. customary units are not shown in this manual. Convert the values if necessary according to the following table.

| Quantity | SI (metric) unit | U.S. customary unit |
|-------------------------------|---|--------------------------------|
| Mass | 1 [kg] | 2.2046 [lb] |
| Length | 1 [mm] | 0.03937 [inch] |
| Torque | 1 [N·m] | 141.6 [oz·inch] |
| Moment of inertia | 1 [(× 10 ⁻⁴ kg·m ²)] | 5.4675 [oz·inch ²] |
| Load (thrust load/axial load) | 1 [N] | 0.2248 [lbf] |
| Temperature | N [°C] × 9/5 + 32 | N [°F] |

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1 CC-Link IE TSN

1.1 Functions and configuration

This manual describes communication with the MR-JET-_G servo amplifiers using CC-Link IE TSN. In addition to this manual, reference the following manual when using CC-Link IE TSN.

📖 MR-JET-G User's Manual (Object Dictionary)

Outline

Motion mode

Motion mode is used with a controller supported by a CANopen profile. Combining with Mitsubishi Electric manufactured Motion modules enables advanced motion control such as positioning of multiple axes, synchronous control by sequential command or interpolation control. The positioning function built-in servo amplifier can be used for positioning operation. Motion mode supports CiA 402 drive profile.

Refer to the following for control modes supported by motion mode.

📖 Page 8 Function list

📖 Page 60 Control mode

System configuration

Compatible controller

| Category | Model |
|-------------------------|-----------------------------------|
| Motion module | RD78G RD78GH FX5-_SSC-G *1 |
| Master/local module | RJ71GN11-T2 *1 RJ71GN11-EIP *2 |
| Motion Control Software | SWM-G |

*1 Combine the module with the servo amplifier that has firmware version B9 or later.

*2 Combine the module with the servo amplifier that has firmware version D4 or later.

Function list

Communication-related function list (Application)

| Category | Subcategory | Function | Description | Detailed explanation |
|----------------------|------------------------------------|---|---|--|
| Network | Open network | CC-Link IE TSN communication protocol | This servo amplifier supports CC-Link IE TSN. | ☞ Page 10 Establishing and disconnecting the communication |
| | | CC-Link IE TSN communication setting | Network configuration settings and station-specific mode selection are performed by using GX Works3. | ☞ Page 13 Startup |
| | Common protocol | SLMP | This function supports SLMP (SeamLess Message Protocol). Parameter setting and monitoring are enabled. | ☞ Page 24 CC-Link IE TSN communication protocol |
| | Profile | CSP+ | File for describing the necessary information for startup, operation, and maintenance of CC-Link family connected products. | — |
| Application function | Functional safety | Safety communication function *1 | Connecting the servo amplifier with a programmable controller that supports functional safety enables safety sub-functions. | ☞ MR-JET User's Manual (Hardware) ☞ MR-JET User's Manual (Function) |
| | Cyclic transmission | Hold/Clear of output at CPU STOP and CPU stop error | When the CPU module of the cyclic master is at STOP, when the stop error occurs, Hold/Clear is automatically set on the refresh device output. The servo amplifier stops regardless of the setting of Hold/Clear of the cyclic master. | ☞ Page 22 Hold/Clear of output at CPU STOP and at CPU stop error |
| | RAS function | Automatic return | When a station that has been disconnected due to a data link error becomes normal, that particular station will automatically reconnect to the network, and restart the data link. | — |
| | Synchronization | CC-Link IE TSN network synchronous communication function | The control cycle of the slave station can be synchronized via the CC-Link IE TSN in accordance with the synchronization cycle specified by the master station. Thus, operation timing of other slave stations connected to the same network can be synchronized. | — |
| | Network system startup | Detect Now function | The master station reads the information (a model code, a device version, etc.) of the servo amplifier that is connected to the network and automatically sets the network configuration. | — |
| | | Station mode check | The master station checks whether the master station and the servo amplifier are in the same station mode by obtaining the station mode of the servo amplifier. | — |
| | Parameter setting | Parameter automatic setting | This is a function where the controller automatically writes the servo parameters when the servo amplifier is returning/entering. | ☞ Page 19 Parameter automatic setting |
| | Setting change | Remote reset | This is a function to reset a servo amplifier via the network. Servo parameters to be enabled at power cycle are reflected by resetting the servo amplifier. | ☞ Page 22 Remote reset |
| | | IP address setting | IP addresses are delivered from the controller to servo amplifiers via CC-Link IE TSN. | ☞ Page 18 IP address setting function |
| | CC-Link IE TSN Network diagnostics | Reserved station specification/cancellation | Stations not connected to the network can be included in the total number of stations for future connection. | ☞ Page 17 CC-Link IE TSN Network diagnostics |
| Time synchronization | Clock function | This function is used to acquire time information from the grand master (the station serving as a clock source) via CC-Link IE TSN so that this information may be used for the time management of functions performed by the servo amplifier, such as alarm history. | ☞ Page 22 Clock function | |

*1 This function is available only on the MR-JET-_G_-HS.

Communication specifications

Communication specifications of CC-Link IE TSN

| Item | Description | Remark |
|--|--|---|
| Physical layer | 1000BASE-T (1 Gbps), 100BASE-TX (100 Mbps) | Twisted pair |
| Communication connector | RJ-45 × 2 | — |
| Communication cable | Cable type | Category 5e or higher, (double shielded/STP) straight cable |
| | Standard | One of the following standards must be met. • IEEE802.3 1000BASE-T • ANSI/TIA/EIA-568-B (Category 5e) |
| | Connector | RJ-45 shielded connector |
| Network topology | Line, tree (star), ring ^{*7} | — |
| Communication speed | 1 Gbps, 100 Mbps ^{*3} | — |
| Transmission distance between stations | Max. 100 m | — |
| Number of connection nodes | Max. 254 stations | The number of connection nodes depends on the specifications of the controller. |
| Guaranteeing method of communication bandwidth | Time division | — |
| CC-Link IE TSN Class | Class B/A ^{*5} | For Class A, refer to the following. ☞ Page 16 CC-Link IE TSN Class A settings |
| CC-Link IE TSN protocol version | Class B ver. 1.0/2.0 ^{*5} Class A ver. 2.0 ^{*5} | — |
| Maximum response time in the timemanaged polling method (for CC-Link IE TSN Class A) | 512 μs | — |
| Synchronization method | IEEE802.1AS, IEEE1588 | — |
| Communication cycle ^{*1 *2 *4 *6 *8} | 125 μs, 250 μs, 500 μs, 1 ms, 1.5 ms, 2 ms, 2.5 ms, 3 ms, 3.5 ms, 4 ms, 4.5 ms, 5 ms, 5.5 ms, 6 ms, 6.5 ms, 7 ms, 7.5 ms, 8 ms | — |
| Cyclic transmission | [Motion mode] Communicates data cyclically between stations using PDOs. • Maximum RPDO size: 80 bytes/axis • Maximum TPDO size: 80 bytes/axis • The servo amplifiers support variable PDO mapping. | ☞ Page 26 Cyclic transmission ☞ Page 30 PDO mapping objects |
| Transient transmission | [Motion mode] Communicates data non-cyclically between stations using SLMP and other protocols. SDOs can be used to read and write objects of the servo amplifier. | ☞ Page 37 Transient transmission |
| Port No. | No. 161: For system use No. 5010: SLMP communication port (UDP/IP) No. 45237: For system use No. 45238: For system use No. 45239: For system use | — |

- *1 The communication cycle depends on the controller specifications and the number of the connected axes.
- *2 There are restrictions on the communication cycle depending on the function used. For details, refer to "CC-Link IE TSN restrictions" in the following manual.
☞ MR-JET-G User's Manual (Introduction)
- *3 The communication speed can be set to 1 Gbps or 100 Mbps. 100 Mbps can be used with servo amplifiers with firmware version B6 or later. When 100 Mbps is selected, the minimum communication cycle is 500 μs. When using 100 Mbps, set [Pr. NPA12 Communication speed] to "1h". For details, refer to "Network basic parameters" in the following manual.
☞ MR-JET-G User's Manual (Parameters)
- *4 Multiple communication cycles can be set with servo amplifiers with firmware version D0 or later. When using a servo amplifier with a firmware version earlier than D0, set the communication cycle to "Basic Period". For details, refer to the manual for the master station being used.
- *5 "Class B ver. 2.0" and "Class A ver. 2.0" can be selected by servo amplifiers with firmware version D0 or later.
- *6 For Class A, set the communication cycle to a value between 500 μs and 500 ms inclusive.
- *7 The ring topology is available on servo amplifiers with firmware version D8 or later. However, it is not available when CC-Link IE TSN Class A is used. If the ring topology is used, the number of slave stations in the same ring must be 60 or less. If more than 60 slave stations are connected to the network, [AL. 086.3 Network communication error 3] may occur.
- *8 The following communication cycles can be used by servo amplifiers with firmware version E0 or later: 1.5 ms, 2.5 ms, 3 ms, 3.5 ms, 4.5 ms, 5 ms, 5.5 ms, 6 ms, 6.5 ms, 7 ms, and 7.5 ms
For available communication cycles, refer to the controller manual.

Establishing and disconnecting the communication

Establishing the communication

Configure the system and set the parameters or rotary switches that are required for startup of the CC-Link IE TSN master station and the servo amplifier. The communication will be established if the settings of the master station and the servo amplifiers are made correctly. When the communication is established, the 7-segment LED display of the servo amplifiers changes to "controller is connected".

Disconnecting the communication

■Procedure for disconnecting the communication

When shutting off the system power or disconnecting the servo amplifier from the network, be sure to disconnect after servo-off. Failing to do so may trigger [AL. 086 Network communication error].

■Changing the communication configuration

Make sure that the servo amplifier is in servo-off state before changing the network configuration. Failing to do so may trigger [AL. 086].

Summary of object dictionary (OD)

The data that a device holds, such as control parameters, command values, and feedback values, is handled as an object composed of an Index, object name, object type, R/W attribute, and other elements. The data is exchanged between the master and device stations. The aggregate of these objects is called an object dictionary (OD).

Section definition of object dictionary

The following shows the structure of an object dictionary.

| Index | Description | Reference |
|----------------|--|---|
| 1000h to 1FFFh | Communication profile | IMR-JET-G User's Manual (Object Dictionary) |
| 2000h to 5FFFh | Objects group defined by Mitsubishi Electric | |
| 6000h to 9FFFh | CiA 402 drive profile | |

The classification of the objects defined by Mitsubishi Electric is as follows.

| Index | Description | Reference |
|----------------|------------------------------|--|
| 2000h to 27FFh | Servo parameter | IMR-JET-G User's Manual (Object Dictionary) |
| 2800h to 29FFh | Point table | |
| 2A00h to 2A7Fh | Alarm | |
| 2B00h to 2BFFh | Monitor | |
| 2C00h to 2C7Fh | Diagnostics | |
| 2D00h to 2DFFh | Manufacturer defined control | Page 47 Controlword/Control DI Page 53 Statusword/Status DO |

Saving object dictionary data

Some of object dictionary data is stored in a non-volatile memory and some is not. Use [Store parameters (Obj. 1010h)] for storing the object dictionary data in the non-volatile memory.

For details about objects that can be stored in the non-volatile memory, refer to the following manual.

 MR-JET-G User's Manual (Object Dictionary)

■Store parameters

Writing "65766173h" (= reverse order of the ASCII code "save") to [Save all parameters (Obj. 1010h: 01h)] enables the setting value of an object to be stored in the non-volatile memory of the servo amplifier.

It can take up to around 25 s for [Save all parameters (Obj. 1010h: 01h)] to write all the parameters. Do not shut off the power supply during writing.

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|---------------------|-----------|--------|-----------------------|
| 1010h | 0 | ARRAY | Store parameters | U8 | ro | Number of entries |
| | 1 | | Save all parameters | U32 | rw | Saves all parameters. |

Reading [Save all parameters (Obj. 1010h: 01h)] returns any of the following values. Bit 0 is "0" during saving and "1" when not saving.

| Bit | Description |
|-----|---|
| 0 | 0: Object cannot be saved by the command (save in progress) 1: Object can be saved by the command (save not in progress) |
| 1 | 0: Not automatically saved |

Point

To shut off the power supply after executing Store parameters, make sure that a save is not in progress (Bit 0 is on), then shut off the power.

■Restore default parameters

Objects can be reset to the factory setting.

To initialize objects, write "64616F6Ch" (= reverse order of the ASCII code "load") to [Restore all default parameters (Obj. 1011h: 01h)], then cycle the power. Writing a value other than "load" (= 64616F6Ch) triggers an error. Initialization can take up to around 25 s.

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|--------------------------------|-----------|--------|------------------------------|
| 1011h | 0 | ARRAY | Restore default parameters | U8 | ro | Number of entries |
| | 1 | | Restore all default parameters | U32 | rw | All parameter initialization |

Reading [Restore all default parameters (Obj. 1011h: 01h)] displays "00000001h" (initializing values).

Engineering software

The following explains the main purposes of the engineering software used in communication. For specific usages, refer to the manuals of the engineering software and controller.

Engineering software list


This list shows engineering software used in CC-Link IE TSN.

| Engineering software | Detailed explanation |
|----------------------|---|
| MR Configurator2 | <p>This is a software that has the following functions: servo amplifier adjustment, monitor display, diagnosis, reading/writing of servo parameters, and test operation. These functions are performed using a personal computer.</p> <p>Settings, such as a stroke limit, absolute position detection system, communication error detection time, are made with this software.</p> <p>If using MR Configurator2 via a network, start MR Configurator2 from GX Works3. The servo amplifier and the personal computer do not need to be connected with a USB cable because they communicate each other via the controller.</p> |
| GX Works3 | <p>This is a software that comprehensively supports the design and maintenance of the programmable controllers. The software performs settings such as servo amplifier profile (CSP+) registration, network configuration setting (station specific mode, link device setting, etc.), refresh setting, and network synchronization setting.</p> |

1.2 Startup

Outline

This chapter describes the setting procedure for CC-Link IE TSN. Refer to the following manual for startup of the servo amplifier.

 MR-JET-G User's Manual (Introduction)

Point

To ensure the safety of the system against unauthorized network access, take security measures such as using a firewall.

Network setting


Set GX Works3 as required for the servo amplifier network settings, then configure the network. Set the master station and servo amplifier of CC-Link IE TSN according to the following procedure.

If an alarm has occurred, refer to the following manual.

 MR-JET User's Manual (Troubleshooting)

1. Profile (CSP+ file) settings

Set the latest profile (CSP+ file).

 Page 14 Profile (CSP+ file) settings

2. Master station setting


Refer to the GX Works3 manual.

3. IP address setting


Set the IP address with the rotary switches and parameter.

 MR-JET-G User's Manual (Introduction)

Refer to the following when setting with parameters.

 Page 18 IP address setting function


Refer to the following when setting with engineering software.

 Page 23 IP address setting function via the master station

4. Network setting servo parameter setting

 MR-JET-G User's Manual (Parameters)

5. Network connection procedure

 Page 15 Network connection procedure

Profile (CSP+ file) settings

To connect the master station and servo amplifier correctly, a profile (CSP+ file) must be set in GX Works3.
For the CSP+ file, contact your local sales office.

Settings when connecting to Mitsubishi Electric Motion Unit

To control the stroke limit on the controller side, set [Pr. PD41]. For details, refer to the manual for the controller being used.

| Servo parameter | Name |
|-----------------|---------------------------------------|
| PD41.2 | Limit switch enabled status selection |
| PD41.3 | Sensor input method selection |

When using an absolute position detection system, set [Pr. PA03] and [Pr. PC29]. For details, refer to the manual for the controller being used.

| Servo parameter | Name |
|-----------------|---|
| PA03.0 | Absolute position detection system selection |
| PC29.5 | [AL. 0E3 Absolute position counter warning] selection |

If necessary, set the following servo parameters in accordance with the controller settings.

| Servo parameter | Name |
|-----------------|---|
| PN02 | Communication error - Detection time |
| PN05 | Communication error - Detection frequency setting |
| PN06.6 | Communication error - Alarm detection setting |

Set [Pr. NPA12] for use in 100 Mbps. By default, the communication speed in "Network automatic setting" is set to 1 Gbps.

| Network parameter | Name |
|-------------------|---------------------|
| NPA12 | Communication speed |

Network connection procedure

Follow the procedures below to set up the network.

1. Connect the master station and the servo amplifier with a network cable. There is no difference between CN1A and CN1B.
2. Turn on the power of the master station and the servo amplifier.
3. Open the diagnostic screen of GX Works3 and make sure that there is no error in the network. If the network is not connected, check the following contents.
 - Check if an alarm has occurred in the servo amplifier. If an alarm occurs, refer to the following manual and cancel the alarm.

 MR-JET User's Manual (Troubleshooting)

- Check that the values of the rotary switches and [Pr. NPA02 IP address] match the IP address set in the master station.


Network disconnection procedure

Refer to the following.

 Page 10 Disconnecting the communication

Changing the network configuration

Refer to the following.

 Page 10 Changing the communication configuration

CC-Link IE TSN Class A settings

To establish communication between the master and device stations (servo amplifiers) through CC-Link IE TSN Class A, configure the settings as follows.

Master station setting

Update the profile (CSP+) before configuring the network settings of the master station.

For CC-Link IE TSN Class A, the servo amplifier starts in the profile position mode. Set PDO mapping for profile mode operation (pp/pv/tq/hm).

For details, refer to the manual for GX Works3.

Servo parameter setting

Set [Pr. PN03.1 CC-Link IE TSN Class setting] to "1" (Class A ver. 2.0).

Setting the servo parameter using the multi-axis project in MR Configurator2 changes the CC-Link IE TSN Class of multiple servo amplifiers at a time.

| Servo parameter | Name |
|-----------------|------------------------------|
| PN03.1 | CC-Link IE TSN Class setting |

1.3 Application function

CC-Link IE TSN Network diagnostics

The servo amplifier supports the following CC-Link IE TSN Network diagnostic functions. Check the reference destination in the reference column for precautions specific to the servo amplifier. Refer to the GX Works3 manual for details of other functions.

| Function type | Function | Description | Reference |
|---|---|--|---|
| Monitoring function of network status | Network map monitor | The current network connection configuration is displayed as a diagram. Information such as the connection status of cables, duplication of IP address, and the disconnection status of stations can be monitored. The error history stored in the servo amplifier can be read and deleted. These operations can be performed by servo amplifiers with firmware version B0 or later. | — |
| | Selected station communication status monitor | The details of the unit status and the communication status of the selected station are displayed. If an error occurs in the unit, the cause of the error and its remedies can be checked. | ☞ Page 17 Selected station communication status monitor |
| Setting change function of network status | Reserved station specification/cancellation | This function designates a specified station as a reserved station, or cancels it. | — |
| Selected Station Operation | Remote Operation | A reset command can be sent to the specified station. | ☞ Page 17 Remote Operation |

Selected station communication status monitor

The detailed state of the currently selectable device on the network map monitor is displayed on the selected station communication status monitor. The items displayed on the selected station communication status monitor are shown below.

| Setting item | Description | Reference |
|-------------------------------|---|---|
| Status display | The status of the servo amplifier is displayed via LED. | ☞ MR-JET-G User's Manual (Introduction) |
| CC-Link IE TSN status display | The CC-Link IE TSN status (CN1A/CN1B connector LED) is displayed. | |

In the selected station communication status monitor, CN1A is displayed as PORT2, and CN1B as PORT1.

Remote Operation

The only executable function on servo amplifiers is Reset. When Reset is executed to the servo amplifier, the servo amplifier resets the software. For details on software reset, refer to "Software reset" in the following manual.

☞ MR-JET User's Manual (Function)

IP address setting function

IP addresses are delivered from the controller to servo amplifiers via CC-Link IE TSN.

Set the IP address required for CC-Link IE TSN communication from the following items. The IP address range is between 0.0.0.1 and 223.255.255.254. Set the IP address within the range.

| [Pr. NPA01 IP address setting] | Rotary switches (SW1/SW2) | IP address | | |
|--|--|------------|--|--|
| "00000000h" (The rotary switch is used.) | 00h | 1st octet | Use the value of/for [Pr. NPA02 IP address]. | |
| | | 2nd octet | | |
| | | 3rd octet | | |
| | | 4th octet | | |
| | 01h to FEh | 1st octet | Use the 1st to 3rd octet values of [Pr. NPA02 IP address]. | |
| | | 2nd octet | | |
| | | 3rd octet | | |
| | | 4th octet | The setting value of the rotary switch (SW1/SW2) is used. | |
| | FFh | — | Not available. | |
| | "00000001h" (Network parameters are used.) | — | 1st octet | Use the value of/for [Pr. NPA02 IP address]. |
| | | | 2nd octet | |
| | | | 3rd octet | |
| 4th octet | | | | |

The initial value of the IP address is as follows.

| Item | Initial value |
|-------------|---------------|
| IP address | 192.168.3.1 |
| Subnet mask | 255.255.255.0 |

Parameter automatic setting

The parameters of the servo amplifier are held by the master station, and are compared with those of the replaced servo amplifier. When there is a difference in those parameters, the parameters held by the CPU module are automatically written to the replaced servo amplifier.

Storage method of parameters

There are following two ways to store parameters in the master station.

- If data in the non-volatile memory of the servo amplifier are rewritten by the engineering software when a controller is connected via CC-Link IE TSN, the parameters in the CPU module are also updated automatically.
- If differences from the previously stored parameters are found in a periodical check, the parameters in the CPU module are also updated automatically (Set an interval in [Pr. PN20 Parameter automatic backup update interval] for that periodical check).

Parameters that can be stored

The parameters that can be written on the servo amplifier and stored with this function are as follows.

- Servo parameters
- Network parameters

Point

- When the parameter that requires power cycling after being set is changed by the parameter automatic setting, [AL. 09E.7 Parameter unreflected warning] occurs. Cycle the power of the servo amplifier.
- Do not turn off the power supply of the controller during backup. Before turning off the power supply of the controller, check the rewrite-status of the parameter file of the device station by using the event history function of the controller.
- Parameters that are automatically updated by the servo amplifier, such as auto tuning data, may not match the data stored in the device station parameter file on the controller. To match the data, first read the servo amplifier parameters using MR Configurator2 or other engineering tools, then reflect the readings on the device station parameter file on "Detail Setting" in "Parameter Automatic Setting" of GX Works3 before writing the readings to the controller again. Or, set [Pr. PN20 Parameter automatic backup update interval] so that the data can be backed up in the master station periodically.
- If performing automatic backup with the interval set in [Pr. PN20], use a master station which features power interruption protection. Failing to do so triggers [AL. 19E.1 Parameter automatic backup setting warning]. At this time, the automatic backup is disabled.
- If the network topology is changed after the power has been turned on, the backup may not be performed.

When the parameter automatic setting is used

Point

When using a servo amplifier with firmware version E0 or later, the servo parameters are distributed as follows.

- By setting [Pr. PN19.1 Parameter automatic setting - Forced distribution mode setting] to "1" (enabled), the servo parameters are distributed when the servo amplifier is connected to the controller whose parameter automatic setting is enabled.
- When the cyclic master such as the Motion module to be connected is changed, the servo parameters saved in the controller at the initial network connection are distributed.

If the servo amplifier saves (backs up) the parameters to the controller with automatic parameter setting, the destination controller will determine that there is no difference in the parameters from those held by the servo amplifier. Therefore, no parameters are distributed by the parameter automatic setting.

In this case, the following operation may cause differences in the parameters held by the servo amplifier and controller.

Actions to be taken differ depending on whether to use the parameters held by the servo amplifier or controller.

| Operation | Parameter to be used | Action |
|--|----------------------|--|
| A parameter of the servo amplifier was changed without transition to runtime. *1 | Servo amplifier side | ☞ Page 20 When using the parameters held by the servo amplifier |
| | Controller side | ☞ Page 20 When using the parameters held by the controller |
| The controller to be connected to the servo amplifier was changed. *2 | Servo amplifier side | ☞ Page 20 When using the parameters held by the servo amplifier *2 |
| | Controller side | ☞ Page 20 When using the parameters held by the controller |

*1 For servo amplifiers with firmware version D1 or earlier, this operation includes restoration to the factory defaults with "MR Mode Change".

*2 When using a servo amplifier with firmware version E0 or later, if the cyclic master such as the Motion module to be connected is changed, the servo parameters saved in the controller are distributed at the initial network connection. This applies to the cases where only the management master such as the CPU module is changed and where only the parameter files saved in the SD card are changed.

■When using the parameters held by the servo amplifier

Open the servo parameter setting window from the network setting window of the engineering software for the controller, and read parameters with the controller connected via CC-Link IE TSN. Then, write the parameter data to the controller.

■When using the parameters held by the controller

- For the servo amplifier with firmware version D4 or later

1. Initialize the setting of the servo amplifier.

Initialize the setting of the servo amplifier with "MR Mode Change". For details, refer to "Servo amplifier setting initialization" in the following manual.

📖MR-JET-G User's Manual (Introduction)

- When using the parameters saved in the controller for the servo amplifier with firmware version earlier than D4

1. Initialize the setting of the servo amplifier.

Initialize the setting of the servo amplifier with "MR Mode Change". For details, refer to "Servo amplifier setting initialization" in the following manual.

📖MR-JET-G User's Manual (Introduction)

2. Rewrite the parameters to the controller.

Write the parameters of the servo amplifier to the controller again.

- When using the parameters saved from the servo amplifier to the controller with the parameter automatic setting for the servo amplifier with firmware version earlier than D4

1. Initialize the setting of the servo amplifier.

Initialize the setting of the servo amplifier with "MR Mode Change". For details, refer to "Servo amplifier setting initialization" in the following manual.

 MR-JET-G User's Manual (Introduction)

2. Read the parameters.

Read the parameters saved in the controller with GX Works3.

3. Update the parameters.

Open the setting window of the servo parameters from the network setting window of GX Works3, and update the servo parameters.

4. Write the parameters.

Write the servo parameters to the controller again with GX Works3.

Hold/Clear of output at CPU STOP and at CPU stop error

This function sets Hold/Clear of the auto refresh device output when CPU module operation of the cyclic master is at STOP or at CPU stop error.

The following shows the servo amplifier status at CPU STOP and at stop error.

Motion mode

When both the motion control axis and motion non-control axis are at CPU STOP, the servo amplifier stops the servo motor in the manner commanded by the controller. At a stop error, the servo amplifier stops the servo motor by activating the dynamic brake.

The operation may vary depending on the type of the servo system controller and firmware version.

Remote reset

Resetting can be done by sending the reset command to the specified station.

The reset command can be sent from the Remote Operation window of GX Works3.

Refer to the following for details.

 Page 17 Remote Operation

Clock function

This function is used to acquire time information from the grand master (the station serving as a clock source) via CC-Link IE TSN so that this information may be used for the time management of functions performed by the servo amplifier, such as alarm history. The time synchronization protocol for the grand master and the servo amplifier uses IEEE1588 or IEEE802.1AS.

IP address setting function via the master station

This function is available on servo amplifiers with firmware version E0 or later.

The IP address of the device station can be set via the master station.

System configuration

Connect the following devices.

- Personal computer where the engineering software is installed
- Master station
- Servo amplifier to which the IP address is to be set

■Engineering software

When setting the IP address in "Network Configuration Settings", use the following software version of the engineering software.

| Engineering software | Version |
|----------------------|-----------------|
| GX Works3 | 1.100E or later |

■Master module

Update the master station to the supported firmware version. For details, refer to the manual for the master station being used.

■Profile

When setting the IP address in "Network Configuration Settings", use the following version of the servo amplifier profile.

| Name | Version |
|----------|-------------|
| MR-JET-G | 18 or later |

IP address setting method

Precautions

- If the IP address is set with this function when [Pr. NPA01 IP address setting] is set to "0" (The rotary switch is used.) and the rotary switch is set to a value other than "0", [AL. 19D.2 IP address change failed warning 1] occurs. In this case, the IP address setting is disabled.
- If this function is used when the communication is established between the servo amplifier and the master station, [AL. 19D.1 IP address change unreflected warning] may occur. If this alarm occurs, the IP address will be saved in [Pr. NPA02 IP address] but the change will not be applied. Power on the servo amplifier again or perform software reset to change the IP address.
- When setting the IP address with this function, do not change the rotary switch from "0". In addition, do not change [Pr. NPA01 IP address setting] from "1". If the master station and data are linked when the rotary switch is set to a value other than "0" and [Pr. NPA01] is "0", [Pr. NPA02] will be overwritten with the setting value of the rotary switch.
- If an error occurs due to indicator display and IP address setting, the servo amplifier may not support the IP address setting function via the master station. Check if the firmware version of the servo amplifier is E0 or later.

■Setting procedure

To use this function, set the rotary switch to "0" or set [Pr. NPA01 IP address setting] to "1" (Network parameters are used.).

The IP address set with this function is saved in [Pr. NPA02 IP address].

For details, refer to the manual for the master station being used.

1.4 Appendix

CC-Link IE TSN communication protocol

Communication management

The communication state of the device unit in CC-Link IE TSN is broadly classified as being either an "initialization phase" or an "under control communication phase" and then managed.

■Communication state management of the motion mode



The motion mode of the servo amplifier support CANopen profile.

For devices that support the CANopen profile, the communication state of CC-Link IE TSN is managed by the Network Management (NMT) state machine.

- Communication state

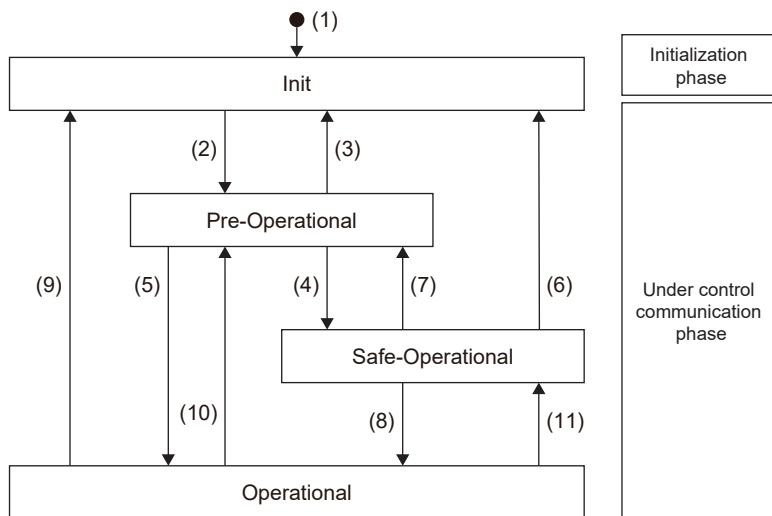
The NMT state machine manages the four states shown below (Init, Pre-Operational, Safe-Operational, and Operational).

The communication state transitions in each device station.

| State | Main processing details |
|------------------|---|
| Init | Operates in accordance with the procedures performed in "initialization phase" of CC-Link IE TSN, such as management master mediation, connection structure detection, propagation delay measurement, communication band setting. The servo motor cannot be operated. |
| Pre-Operational | The master station (the Motion module) and the device station (the servo amplifier) send and receive SDOs with transient transmission, and get ready to start or to resume operation by setting the control mode and PDO mappings as well as performing other preparations. The servo motor cannot be operated. Refer to the following for transient transmission.  Page 37 Transient transmission |
| Safe-Operational | The master station (the Motion module) and the device station (the servo amplifier) send and receive PDOs with cyclic transmission. The servo motor cannot be operated. Refer to the following for cyclic transmission.  Page 26 Cyclic transmission |
| Operational | The master station (the Motion module) and the device station (the servo amplifier) send and receive PDOs with cyclic transmission. The servo motor can be operated. |

The state transition diagram of the NMT state machine is as follows.

The servo amplifier transitions the communication state by receiving the SLMP command (NMT State Download) from the master station or by other means.



The controller and the servo amplifier perform the following procedure to establish communication (transition to "Operational").

| Transition No. | Operation |
|----------------|---|
| (1) | Power-on |
| (2) | During the transition from the initialization phase to the control communication phase of CC-Link IE TSN, the servo amplifier transitions from "Init" to "Pre-Operational". |
| (3) | When the master station issues NMT State Download (SLMP) for "Init" to the servo amplifier, or when a communication time-out occurs, the servo amplifier transitions from "Pre-Operational" to "Init". |
| (4) | When the master station issues NMT State Download (SLMP) for "Safe-Operational" to the servo amplifier, the servo amplifier transitions to "Safe-Operational". The master station performs control mode setting and PDO mapping setting on the servo amplifier. |
| (5) | When the master station issues NMT State Download (SLMP) for "Operational" to the servo amplifier, the servo amplifier transitions to "Operational". When PDO mapping setting is not performed on the servo amplifier, the state transitions on this route. |
| (6) | When the master station issues NMT State Download (SLMP) for "Init" to the servo amplifier, or when a communication time-out occurs, the servo amplifier transitions from "Safe-Operational" to "Init". |
| (7) | When the master station issues NMT State Download (SLMP) for "Pre-Operational" to the servo amplifier, the servo amplifier transitions to "Pre-Operational". |
| (8) | When the master station issues NMT State Download (SLMP) for "Operational" to the servo amplifier, the servo amplifier transitions to "Operational". |
| (9) | When the master station issues NMT State Download (SLMP) for "Init" to the servo amplifier, or when a communication time-out occurs, the servo amplifier transitions from "Operational" to "Init". |
| (10) | When the master station issues NMT State Download (SLMP) for "Pre-Operational" to the servo amplifier, the servo amplifier transitions to "Pre-Operational". |
| (11) | When the master station issues NMT State Download (SLMP) for "Safe-Operational" to the servo amplifier, the servo amplifier transitions to "Safe-Operational". |

■SLMP command

The SLMP commands used in communication state management are as follows.

| No. | Command name | Command | Sub command | Description |
|-----|--------------------|---------|-------------|-------------------|
| 1 | NMT State Upload | 4020h | 0007h | NMT State reading |
| 2 | NMT State Download | 4020h | 0008h | NMT State writing |

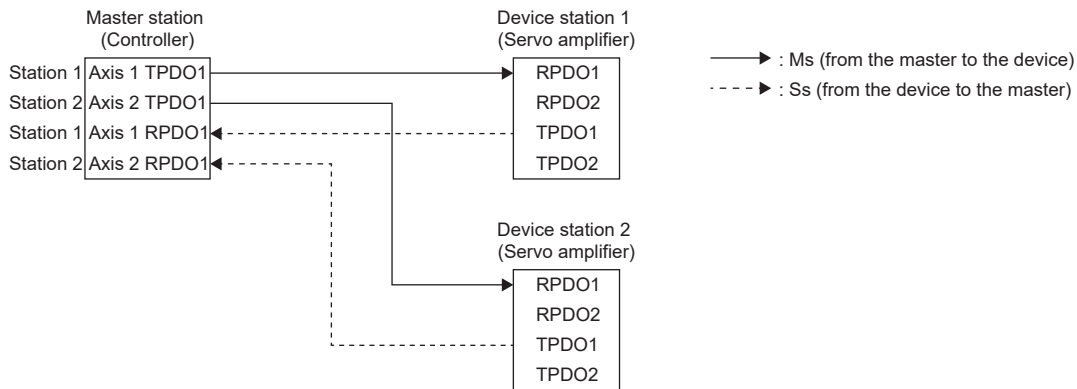
Cyclic transmission

Cyclic transmission is a function that cyclically exchanges data between stations.

Cyclic transmission of motion mode

Cyclic transmission of the motion mode is a function that uses PDOs to cyclically exchange data between stations. A PDO is an aggregate of objects such as [Modes of operation (Obj. 6060h)] and [Modes of operation display (Obj. 6061h)]. The placement of objects in a PDO is called PDO mapping, and the initial placement (default PDO mapping) is defined. The PDO received by each station is called an RPDO, and the PDO transmitted by each station is called a TPDO. PDOs are transferred using the cyclic Ms frame (from the master station to the device station) and the cyclic Ss frame (from the device station to the master station).

A conceptual figure of communication between the master station and the device station is shown below.



■Default PDO mapping

Default PDO mapping is the initial placement of objects included in a PDO. When there is no request from the controller or the engineering software to change PDO mapping objects, the servo amplifier operates using default PDO mapping.

- RPDO, TPDO 1st mapping ([1st Receive PDO Mapping (Obj. 1600h)] and [1st Transmit PDO Mapping (Obj. 1A00h)])
 PDO mapping for cyclic synchronous operation (csp/csv/cst/hm).

| RPDO (from the master station to the servo amplifier) | | |
|---|-------|-----------------------------|
| Offset Address | Index | Device name |
| 0000h | 1D01h | Watch dog counter DL |
| 0002h | 6060h | Modes of operation |
| 0003h | 0000h | GAP |
| 0004h | 607Ah | Target position |
| 0008h | 60FFh | Target velocity |
| 000Ch | 6040h | Controlword |
| 000Eh | 60E0h | Positive torque limit value |
| 0010h | 60E1h | Negative torque limit value |
| 0012h | 6071h | Target torque |
| 0014h | 2D20h | Velocity limit value |
| 0018h | 2D01h | Control DI 1 |
| 001Ah | 2D02h | Control DI 2 |
| 001Ch | 2D03h | Control DI 3 |
| 001Eh | 2D04h | Control DI 4 |
| 0020h | 2D05h | Control DI 5 |
| 0022h | 0000h | GAP |
| ... | ... | ... |

| TPDO (from the servo amplifier to the master station) | | |
|---|-------|------------------------------|
| Offset Address | Index | Device name |
| 0000h | 1D02h | Watch dog counter UL |
| 0002h | 6061h | Modes of operation display |
| 0003h | 0000h | GAP |
| 0004h | 6064h | Position actual value |
| 0008h | 606Ch | Velocity actual value |
| 000Ch | 60F4h | Following error actual value |
| 0010h | 6041h | Statusword |
| 0012h | 0000h | GAP |
| 0014h | 6077h | Torque actual value |
| 0016h | 2D11h | Status DO 1 |
| 0018h | 2D12h | Status DO 2 |
| 001Ah | 2D13h | Status DO 3 |
| 001Ch | 2D14h | Status DO 4 |
| 001Eh | 2D15h | Status DO 5 |
| 0020h | 2A41h | Current alarm |
| 0024h | 2D21h | Reserved |
| 0028h | 2D22h | Reserved |
| ... | ... | ... |

- RPDO, TPDO 2nd mapping ([2nd Receive PDO Mapping (Obj. 1601h)] and [2nd Transmit PDO Mapping (Obj. 1A01h)])
 PDO mapping for manufacturer setting.

- RPDO, TPDO 3rd mapping ([3rd Receive PDO Mapping (Obj. 1602h)] and [3rd Transmit PDO Mapping (Obj. 1A02h)])
PDO mapping for profile mode operation (pp/pv/tq/hm).

| RPDO (from the master station to the servo amplifier) | | |
|---|-------|----------------------|
| Offset Address | Index | Device name |
| 0000h | 6060h | Modes of operation |
| 0001h | 0000h | GAP |
| 0002h | 6040h | Controlword |
| 0004h | 607Ah | Target position |
| 0008h | 60FFh | Target velocity |
| 000Ch | 2D20h | Velocity limit value |
| 0010h | 6071h | Target torque |
| 0012h | 6081h | Profile velocity |
| 0016h | 6083h | Profile acceleration |
| 001Ah | 6084h | Profile deceleration |
| 001Eh | 6087h | Torque slope |
| 0022h | 2D01h | Control DI 1 |
| 0024h | 2D02h | Control DI 2 |
| 0026h | 2D03h | Control DI 3 |
| 0028h | 2D04h | Control DI 4 |
| ... | ... | ... |

| TPDO (from the servo amplifier to the master station) | | |
|---|-------|------------------------------|
| Offset Address | Index | Device name |
| 0000h | 6061h | Modes of operation display |
| 0001h | 0000h | GAP |
| 0002h | 6041h | Statusword |
| 0004h | 6064h | Position actual value |
| 0008h | 606Ch | Velocity actual value |
| 000Ch | 60F4h | Following error actual value |
| 0010h | 6077h | Torque actual value |
| 0012h | 2D11h | Status DO 1 |
| 0014h | 2D12h | Status DO 2 |
| 0016h | 2D13h | Status DO 3 |
| 0018h | 2D14h | Status DO 4 |
| 001Ah | 2D15h | Status DO 5 |
| ... | ... | ... |

- RPDO, TPDO 4th mapping ([4th Receive PDO Mapping (Obj. 1603h)] and [4th Transmit PDO Mapping (Obj. 1A03h)])
PDO mapping for positioning mode (pt/jg/hm).

| RPDO (from the master station to the servo amplifier) | | |
|---|-------|------------------------------|
| Offset Address | Index | Device name |
| 0000h | 6060h | Modes of operation |
| 0001h | 0000h | GAP |
| 0002h | 6040h | Controlword |
| 0004h | 6081h | Profile velocity |
| 0008h | 6083h | Profile acceleration |
| 000Ch | 6084h | Profile deceleration |
| 0010h | 2D60h | Target point table |
| 0012h | 2D01h | Control DI 1 |
| 0014h | 2D02h | Control DI 2 |
| 0016h | 2D03h | Control DI 3 |
| 0018h | 2D04h | Control DI 4 |
| ... | ... | ... |
| TPDO (from the servo amplifier to the master station) | | |
| Offset Address | Index | Device name |
| 0000h | 6061h | Modes of operation display |
| 0001h | 0000h | GAP |
| 0002h | 6041h | Statusword |
| 0004h | 6064h | Position actual value |
| 0008h | 606Ch | Velocity actual value |
| 000Ch | 60F4h | Following error actual value |
| 0010h | 6077h | Torque actual value |
| 0012h | 2D6Ah | M code actual value |
| 0013h | 0000h | GAP |
| 0014h | 2D68h | Point demand value |
| 0016h | 2D69h | Point actual value |
| 0018h | 2D11h | Status DO 1 |
| 001Ah | 2D12h | Status DO 2 |
| 001Ch | 2D13h | Status DO 3 |
| 001Eh | 2D14h | Status DO 4 |
| 0020h | 2D15h | Status DO 5 |
| 0022h | 2D17h | Status DO 7 |
| ... | ... | ... |

■ PDO mapping objects

The placement of objects in a PDO can be changed with PDO mapping objects ([1st Receive PDO Mapping (Obj. 1600h)] to [4th Receive PDO Mapping (Obj. 1603h)] and [1st Transmit PDO Mapping (Obj. 1A00h)] to [4th Transmit PDO Mapping (Obj. 1A03h)]).

The following table shows values for items such as the number of objects that can be mapped to the PDO and the initial size of the PDO.

| Item | Value |
|---------------------------------|---|
| RPDO maximum number of objects | 32 |
| TPDO maximum number of objects | 32 |
| RPDO initial size [byte] | 36 |
| TPDO initial size [byte] | 42 |
| RPDO maximum size [byte] | 80 |
| TPDO maximum size [byte] | 80 |
| Number of RPDO mapping settings | 4 ([1st Receive PDO Mapping (Obj. 1600h)], [2nd Receive PDO Mapping (Obj. 1601h)], [3rd Receive PDO Mapping (Obj. 1602h)] and [4th Receive PDO Mapping (Obj. 1603h)]) |
| Number of TPDO mapping settings | 4 ([1st Transmit PDO Mapping (Obj. 1A00h)], [2nd Transmit PDO Mapping (Obj. 1A01h)], [3rd Transmit PDO Mapping (Obj. 1A02h)] and [4th Transmit PDO Mapping (Obj. 1A03h)]) |

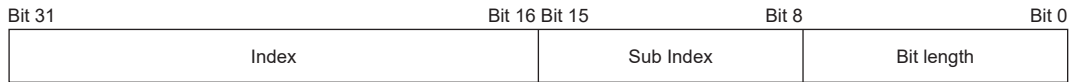
- PDO mapping objects between the master station and the servo amplifier

When changing the PDO mapping between the master station and the servo amplifier, use [1st Receive PDO Mapping] to [4th Receive PDO Mapping] for the RPDO and [1st Transmit PDO Mapping] to [4th Transmit PDO Mapping] for the TPDO.

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 10h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1601h | 0 | ARRAY | 2nd Receive PDO Mapping | U8 | rw | 06h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1602h | 0 | ARRAY | 3rd Receive PDO Mapping | U8 | rw | 0Fh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1603h | 0 | ARRAY | 4th Receive PDO Mapping | U8 | rw | 0Bh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 11h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1A01h | 0 | ARRAY | 2nd Transmit PDO Mapping | U8 | rw | 0Ah | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1A02h | 0 | ARRAY | 3rd Transmit PDO Mapping | U8 | rw | 0Ch | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |
| 1A03h | 0 | ARRAY | 4th Transmit PDO Mapping | U8 | rw | 11h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 27 Default PDO mapping |

- Setting contents of PDO mapping objects

The setting contents of PDO mapping objects (Sub Index 1 or later) are as follows.



Bit 0 to Bit 7: Bit length of the object to be mapped

Bit 8 to Bit 15: Sub Index of the object to be mapped

Bit 16 to Bit 31: Index of the object to be mapped

If placing [Modes of operation (Obj. 6060h: 00h)] (bit length 8) at the start address of [1st Receive PDO Mapping (Obj. 1600h)], set "60600008h" to [Mapped Object 001 (Obj. 1600h: 01h)].

- PDO mapping setting procedure

When a motion module is used as the motion control axis, the mapping is automatically changed on the motion module side. Using [1st Receive PDO Mapping (Obj. 1600h)] and [1st Transmit PDO Mapping (Obj. 1A00h)] as examples, the following shows the procedure for setting objects one at a time.

This is a procedure to assign [Target velocity (Obj. 60FFh: 00h)] to [Mapped Object 005 (Obj. 1600h: 05h)].

Before the change:

| Index | Sub Index | Setting value | Object contents |
|-------|-----------|---------------|---|
| 1600h | 00h | 4h | Number of entries |
| 1600h | 01h | 1D010008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 02h | 60600008h | [Modes of operation (Obj. 6060h: 00h)] |
| 1600h | 03h | 00000008h | [GAP (Obj. 0000h: 00h)] |
| 1600h | 04h | 60400010h | [Controlword (Obj. 6040h: 00h)] |
| 1600h | 05h | 00000008h | [GAP (Obj. 0000h: 00h)] |

After the change:

| Index | Sub Index | Setting value | Object contents |
|-------|-----------|---------------|---|
| 1600h | 00h | 5h | Number of entries |
| 1600h | 01h | 1D010008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 02h | 60600008h | [Modes of operation (Obj. 6060h: 00h)] |
| 1600h | 03h | 00000008h | [GAP (Obj. 0000h: 00h)] |
| 1600h | 04h | 60400010h | [Controlword (Obj. 6040h: 00h)] |
| 1600h | 05h | 60FF0020h | [Target velocity (Obj. 60FFh: 00h)] |

1. Set the value of [1st Receive PDO Mapping (Obj. 1600h: 00h)] to "0h" in transient communication (SDO message). In order to change Sub Index: 01h and later, the value must first be set to "0h".

| Index | Sub Index | Setting value | Object contents |
|-------|-----------|---------------|---|
| 1600h | 00h | 0h | Number of entries |
| 1600h | 01h | 1D010008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 02h | 60600008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 03h | 00000008h | [GAP (Obj. 0000h: 00h)] |
| 1600h | 04h | 60400010h | [Controlword (Obj. 6040h: 00h)] |

2. Set the value of [Mapped Object 005 (Obj. 1600h: 05h)] to "60FF0020h" in transient communication (SDO message).

| Index | Sub Index | Setting value | Object contents |
|-------|-----------|---------------|---|
| 1600h | 00h | 0h | Number of entries |
| 1600h | 01h | 1D010008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 02h | 60600008h | [Modes of operation (Obj. 6060h: 00h)] |
| 1600h | 03h | 00000008h | [GAP (Obj. 0000h: 00h)] |
| 1600h | 04h | 60400010h | [Controlword (Obj. 6040h: 00h)] |
| 1600h | 05h | 60FF0020h | [Target velocity (Obj. 60FFh: 00h)] |

3. Set the value of [1st Receive PDO Mapping (Obj. 1600h: 00h)] to "5h" in transient communication (SDO message). If there is an error in PDO mapping, an error code (SDO end code) is returned.

| Index | Sub Index | Setting value | Object contents |
|-------|-----------|---------------|---|
| 1600h | 00h | 5h | Number of entries |
| 1600h | 01h | 1D010008h | [Watchdog counter DL (Obj. 1D01h: 00h)] |
| 1600h | 02h | 60600008h | [Modes of operation (Obj. 6060h: 00h)] |
| 1600h | 03h | 00000008h | [GAP (Obj. 0000h: 00h)] |
| 1600h | 04h | 60400010h | [Controlword (Obj. 6040h: 00h)] |
| 1600h | 05h | 60FF0020h | [Target velocity (Obj. 60FFh: 00h)] |

4. The mapping contents are not stored in the non-volatile memory. Perform PDO mapping for each network connection.

■ Objects that require PDO mapping

- Objects that require RPDO mapping, categorized by control mode and function

◎: PDO mapping required ○: PDO mapping recommended —: PDO mapping not required

| Object name (Index) | Mode | | | | | | | | |
|---|------|-----|-------------------------|------------------|------------------|------------------|-----------------|------------------|------------------|
| | csp | csv | cst ct ^{*1} | pp ^{*2} | pv ^{*2} | tq ^{*2} | hm | pt ^{*3} | tg ^{*3} |
| [Watch dog counter DL (Obj. 1D01h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ ^{*6} | — | — |
| [Controlword (Obj. 6040h)] | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ |
| [Control DI 1 (Obj. 2D01h)] | ○ | ○ | — | ○ | ○ | — | — | ○ | ○ |
| [Control DI 2 (Obj. 2D02h)] | ○ | — | — | ○ | — | — | ○ | ○ | ○ |
| [Control DI 3 (Obj. 2D03h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Touch probe function (Obj. 60B8h)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*5} | — ^{*5} |
| [Target position (Obj. 607Ah)] | ◎ | — | — | ◎ | — | — | — | — | — |
| [Target velocity (Obj. 60FFh)] | — | ◎ | — | — | ◎ | — | — | — | — |
| [Target torque (Obj. 6071h)] | — | — | ◎ | — | — | ◎ | — | — | — |
| [Profile velocity (Obj. 6081h)] ^{*2} | — | — | — | ○ | — | — | — | — | ○ |
| [Profile acceleration (Obj. 6083h)] ^{*2} | — | — | — | ○ | ○ | — | — | — | ○ |
| [Profile deceleration (Obj. 6084h)] ^{*2} | — | — | — | ○ | ○ | — | — | — | ○ |
| [Torque slope (Obj. 6087h)] ^{*2} | — | — | — | — | — | ○ | — | — | — |
| [Velocity limit value (Obj. 2D20h)] | — | — | ○ | — | — | ○ | — | — | — |
| [Positive torque limit value (Obj. 60E0h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Negative torque limit value (Obj. 60E1h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Target point table (Obj. 2D60h)] ^{*3} | — | — | — | — | — | — | — | ◎ | — |

*1 Available on servo amplifiers with firmware version B0 or later.

*2 Available on servo amplifiers with firmware version B2 or later.

*3 Available on servo amplifiers with firmware version B8 or later.

*4 Available on servo amplifiers with firmware version C4 or later.

*5 It is "◎" when the touch probe function is used.

*6 It is "—" when the positioning mode (point table method) is used.

- Objects that require TPDO mapping, categorized by control mode and function

◎: PDO mapping required ○: PDO mapping recommended —: PDO mapping not required

| Object name (Index) | Mode | | | | | | | | |
|---|------|-----|----------------------|------------------|------------------|------------------|-----------------|------------------|------------------|
| | csp | csv | cst ct ^{*1} | pp ^{*2} | pv ^{*2} | tq ^{*2} | hm | pt ^{*3} | jg ^{*3} |
| [Watch dog counter UL (Obj. 1D02h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ ^{*7} | — | — |
| [Statusword (Obj. 6041h)] | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ |
| [Status DO 1 (Obj. 2D11h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 2 (Obj. 2D12h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 3 (Obj. 2D13h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 5 (Obj. 2D15h)] | — | — | — | ○ | — | — | — | ○ | ○ |
| [Status DO 7 (Obj. 2D17h)] | — | — | — | — | — | — | — | ○ | ○ |
| [Touch probe status (Obj. 60B9h)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*5} | — ^{*5} |
| [Position actual value (Obj. 6064h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Velocity actual value (Obj. 606Ch)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Following error actual value (Obj. 60F4h)] | ○ | — | — | ○ | — | — | — | ○ | ○ |
| [Torque actual value (Obj. 6077h)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Digital Inputs (Obj. 60FDh)] | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| [Touch probe pos1 pos value (Obj. 60BAh)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*6} | — ^{*6} |
| [Touch probe pos1 neg value (Obj. 60BBh)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*6} | — ^{*6} |
| [Touch probe pos2 pos value (Obj. 60BCh)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*6} | — ^{*6} |
| [Touch probe pos2 neg value (Obj. 60BDh)] ^{*4} | ○ | — | — | — | — | — | — | — ^{*6} | — ^{*6} |
| [Point actual value (Obj. 2D69h)] ^{*3} | — | — | — | — | — | — | — | ○ | ○ |
| [M code actual value (Obj. 2D6Ah)] ^{*3} | — | — | — | — | — | — | — | ○ | ○ |
| [Point demand value (Obj. 2D68h)] ^{*3} | — | — | — | — | — | — | — | ○ | ○ |

*1 Available on servo amplifiers with firmware version B0 or later.

*2 Available on servo amplifiers with firmware version B2 or later.

*3 Available on servo amplifiers with firmware version B8 or later.

*4 Available on servo amplifiers with firmware version C4 or later.

*5 It is "◎" when the touch probe function is used.

*6 It is "○" when the touch probe function is used.

*7 It is "—" when the positioning mode (point table method) is used.

■ Watchdog counter

The watchdog counter can be used to detect application stop of the cyclic transmission station. When a watchdog counter object is mapped to the RPDO of the servo amplifier, [AL. 086.2 Network communication error 2] is detected on the servo amplifier side. When a watchdog counter object is mapped to the TPDO of the servo amplifier, 1 is added to the watchdog counter on the servo amplifier at the end of each communication cycle, following which the current counter value is sent to the servo amplifier.

The watchdog counter value is an unsigned integer from 0 to 32767 that returns to 0 upon exceeding 32767.

For details of PDO mapping, refer to the following.

☞ Page 27 Default PDO mapping

☞ Page 30 PDO mapping objects

| Index | Sub Index | Object | Name | Data Type | Default | Description |
|-------|-----------|--------|----------------------|-----------|---------|-----------------------------|
| 1D01h | — | VAR | Watch dog counter DL | U16 | — | Watchdog counter (download) |
| 1D02h | — | VAR | Watch dog counter UL | U16 | — | Watchdog counter (upload) |

■PDO configuration object

To enable the data exchange by PDO mapping, perform settings for the PDO (RPDO and TPDO) by using PDO configuration objects ([1st PDO Config (Obj. 1C00h)] and [2nd PDO Config (Obj. 1C01h)]). In the factory setting, 1st PDO mapping objects ([1st Receive PDO Mapping (Obj. 1600h)] and [1st Transmit PDO Mapping (Obj. 1A00h)]) are assigned to [PDO Assignment (Obj. 1C00h: 01h)].

| Index | Sub Index | Object | Name | Data Type | Access | Default | Description |
|-------|-----------|--------|-----------------------|-----------|--------|---------|--|
| 1C00h | 0 | RECORD | 1st PDO Config | U8 | ro | — | Number of entries |
| | 1 | | PDO Assignment | U16 | rw | 1600h | Set the address (Index) of PDO mapping object. |
| | 2 | | PDO Enable | U16 | rw | 0001h | Enable or disable the PDO set in [PDO Assignment (Obj. 1C00h: 01h)]. 0000h: PDO disabled 0001h: PDO enabled |
| | 3 | | Error Handling | U16 | rw | 0001h | This object is available when an object set in [PDO Assignment] is mapped to RPDO. 0000h: Receive error is not detected. 0001h: Receive error is detected. 0002h: Error detection starts after receipt of the initial PDO. |
| | 4 | | Memory Address | U32 | rw | — | For PDO-receiving stations: the memory address of the sub-payload (the address in the memory space) For PDO-sending stations: the address at the start of the data to be stored in the sub-payload |
| | 5 | | Communication Address | U16 | rw | FFFFh | Set the 3rd octet and 4th octet of the source IP address of RPDO. This object is available when an object set in [PDO Assignment] is mapped to RPDO. 0000h to FFFEh: The 3rd octet and 4th octet of the source IP address FFFFh: Not set |
| 1C01h | 0 | RECORD | 2nd PDO Config | U8 | ro | — | Number of entries |
| | 1 | | PDO Assignment | U16 | rw | 1A00h | Refer to [PDO Assignment (Obj. 1C00h: 01h)]. |
| | 2 | | PDO Enable | U16 | rw | 0001h | Refer to [PDO Enable (Obj. 1C00h: 02h)]. |
| | 3 | | Error Handling | U16 | rw | 0001h | Refer to [Error Handling (Obj. 1C00h: 03h)]. |
| | 4 | | Memory Address | U32 | rw | — | Refer to [Memory Address (Obj. 1C00h: 04h)]. |
| | 5 | | Communication Address | U16 | rw | FFFFh | Refer to [Communication Address (Obj. 1C00h: 05h)]. |

■PDO Enable

The PDO can be set to enabled/disabled by using [PDO Enable (Obj. 1C00h: 02h or Obj. 1C01h: 02h)]. When the PDO is disabled, the PDO will be discarded on the receiving station side.

The following shows the PDO Enable setting value and the operation of the PDO receiving station.

| PDO Enable (Sub Index 2) | Cyclic communication enabled (control flag Bit 0 of the sub-payload) | Operation of PDO receiving station |
|--------------------------|--|--|
| 0: Disabled | 0: Disabled | The PDO is not transferred to the receipt memory |
| | 1: Enabled | The PDO is regarded as disabled |
| 1: Enabled | 0: Disabled | The PDO is not transferred to the receipt memory |
| | 1: Enabled | The PDO is regarded as enabled |

The following shows the PDO Enable setting value and the operation of the PDO sending station.

| PDO Enable (Sub Index 2) | Operation of PDO sending station |
|--------------------------|--|
| 0: Disabled | Sends the disabled PDO (sets the control flag Bit 0 of the sub-payload to "0") |
| 1: Enabled | Sends the enabled PDO (sets the control flag Bit 0 of the sub-payload to "1") |

Transient transmission

The transient transmission is a function that communicates data only when there is a communication request. Data communication is performed between stations by using SLMP and other protocols, regardless of the communication cycles. For CC-Link IE TSN, transient transmission and cyclic transmission are performed using different communication bands in order to ensure the stability of the cyclic transmission.

Transient transmission in the motion mode

With SLMP, actions such as reading the servo amplifier model code and accessing each object can be performed. For reading and writing each object, the SDO Download command, SDO Upload command, and other commands are used.

Request message format

The data length of request messages is 2047 bytes max.

| | | | | | | | | | | | |
|-----------------|-----------|------------|-----------|---------------------------------|---------------------------------|------------------------------------|--|---------------------|------------------|--------------|--------|
| Ethernet header | IP header | UDP header | SLMP | | | | | | | | Footer |
| | | | Subheader | Request destination network No. | Request destination station No. | Request destination module I/O No. | Request destination multi-drop station No. | Request data length | Monitoring timer | Request data | |

Response message format

There are two types of response messages, one for normal termination and one for abnormal termination. The data length of response messages is 2048 bytes max.

- At normal termination

| | | | | | | | | | | | |
|-----------------|-----------|------------|-----------|---------------------------------|---------------------------------|------------------------------------|--|----------------------|----------|---------------|--------|
| Ethernet header | IP header | UDP header | SLMP | | | | | | | | Footer |
| | | | Subheader | Request destination network No. | Request destination station No. | Request destination module I/O No. | Request destination multi-drop station No. | Response data length | End code | Response data | |

- At abnormal termination

| | | | | | | | | | | | | |
|-----------------|-----------|------------|-----------|---------------------------------|---------------------------------|------------------------------------|--|----------------------|----------------------|----------|---------------|--------|
| Ethernet header | IP header | UDP header | SLMP | | | | | | Response data length | End code | Response data | Footer |
| | | | Subheader | Request destination network No. | Request destination station No. | Request destination module I/O No. | Request destination multi-drop station No. | Response data length | | | | |

| | | | | | | | | | |
|-------------------|--|----------|-------------------------------------|-------------------------------------|------------------------------------|--|---------|-------------|--------|
| SLMP | | End code | Network No. (responding station) | Station No. (responding station) | Request destination module I/O No. | Request destination multi-drop station No. | Command | Sub command | Footer |
| Error information | | | | | | | | | |

SLMP command

The following is a list of SLMP commands.

| Command | Sub command | Remark |
|---------|-------------|-----------------------|
| 4020h | 0001h | ReadObject |
| 4020h | 0002h | WriteObject |
| 4020h | 0005h | ObjectSubIDReadBlock |
| 4020h | 0006h | ObjectSubIDWriteBlock |
| 4020h | 0007h | NMT State Upload |
| 4020h | 0008h | NMT State Download |

■Read Object (object read)

This command returns the value of the object corresponding to Index and Sub Index specified by the master station.

- Request message (after the command)

| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | L | H | — | — | L | H |
| 20h | 40h | 01h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | | Read data |
|----------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | — | — | L | H | L variable H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 37 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0001h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Read data: 00h (fixed) |
| Read data | Variable | Little | The return data of the object is stored. |

■Write Object (object write)

This command writes the specified value to the object corresponding to Index and Sub Index specified by the master station.

- Request message (after the command)


| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | | Write data |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | L | H | — | — | L | H | L variable H |
| 20h | 40h | 02h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at normal termination (after the end code))


| End code | | Index | | Sub Index | Reserved | Number of data value | |
|----------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | — | — | L | H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 37 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0002h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Write data: Specify the size in hexadecimal. (Unit: byte) |
| Write data | Variable | Little | Specify the write data of the object. |

■Object SubID Read Block (object sub-ID continuous read)

When an object sub ID continuous read request is given by the master station, the value of the object corresponding to the specified Index and the continuous Sub Index is returned.

- Request message (after the command)

| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | L | H | — | — | L | H |
| 20h | 40h | 05h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | | Read data |
|----------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | — | — | L | H | L variable H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 37 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0005h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Read data: Data size In the request message, it is 00h (fixed). |
| Read data | Variable | Little | The return data of the object is stored. |

■ Object SubID Write Block (object sub-ID continuous write)

When an object sub-ID continuous write request is given by the master station, the specified value is written to the object corresponding to the specified Index and the continuous Sub Index.

- Request message (after the command)


| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | | Write data |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | L | H | — | — | L | H | L variable H |
| 20h | 40h | 06h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | |
|----------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | — | — | L | H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 37 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|--|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0006h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Write data: Specify the size in hexadecimal. (Unit: byte) |
| Write data | Variable | Little | Specify the write data of the object. |

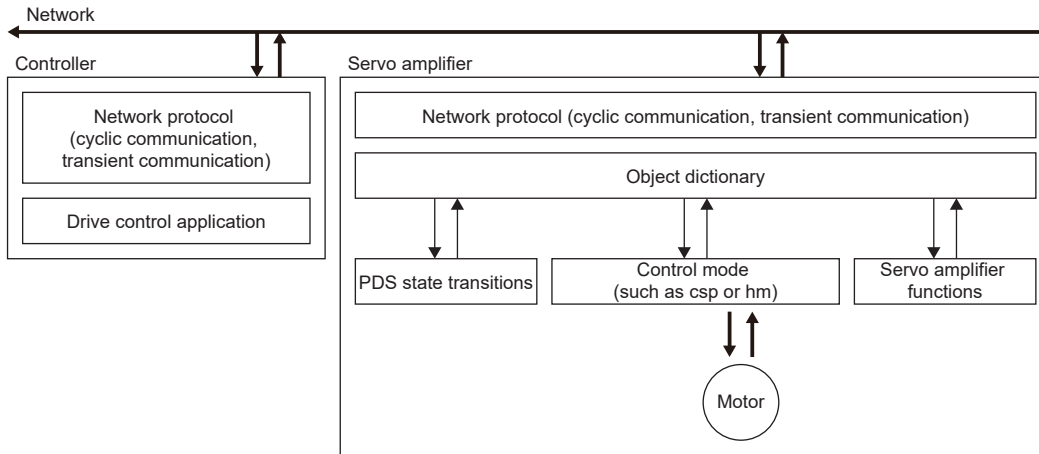
■ End code

The following shows end codes that are stored by the servo amplifier for SLMP.

| End code | Cause |
|----------|--|
| 0000h | The request was processed normally. |
| C059h | <ul style="list-style-type: none">• There is an error in the command or subcommand specification.• A command that is not prescribed is received. |
| C05Ch | There is an error in the request message. |
| C061h | The requested data length does not match the number of data. |
| CEE0h | The request cannot be processed because another request is in progress. |
| CEE1h | The requested message size has exceeded the processable range. |
| CEE2h | The response message size has exceeded the processable range. |
| CCCAh | A non-existent Index was specified. |
| CCD0h | The data size is different from the specified value. |
| CCD1h | The data size is larger than the specified value. |
| CCD2h | The data size is smaller than the specified value. |
| CCD3h | A non-existent Sub Index was specified. |
| CCC8h | Read operation was performed to a write only object. |
| CCC9h | <ul style="list-style-type: none">• Write operation was performed to a read only object.• The object is not read only for all AL states, but it was written to an object that cannot be written in the current AL state. |
| CCC7h | Write operation was performed to a response message mapped object. The following were written when the response message mapped object was not in the state where change is permitted. <ul style="list-style-type: none">• Anything other than "0" was written to Sub Index 0.• Write operation was performed to the corresponding Sub Index 1 to 32. |
| CCCBh | An object for which the response message mapping cannot be performed was written to the response message mapped object. |
| CCCCh | The total size of the response message mapped objects exceeds 64 bytes. |
| CCD4h | A value outside the parameter range was written. |
| CCD5h | A value larger than the parameter range was written. |
| CCD6h | A value smaller than the parameter range was written. |

Drive profile

This section explains the CiA 402 drive profile specification as well as the unique functions of servo amplifiers. Each function can be controlled by using the object dictionary via the network.

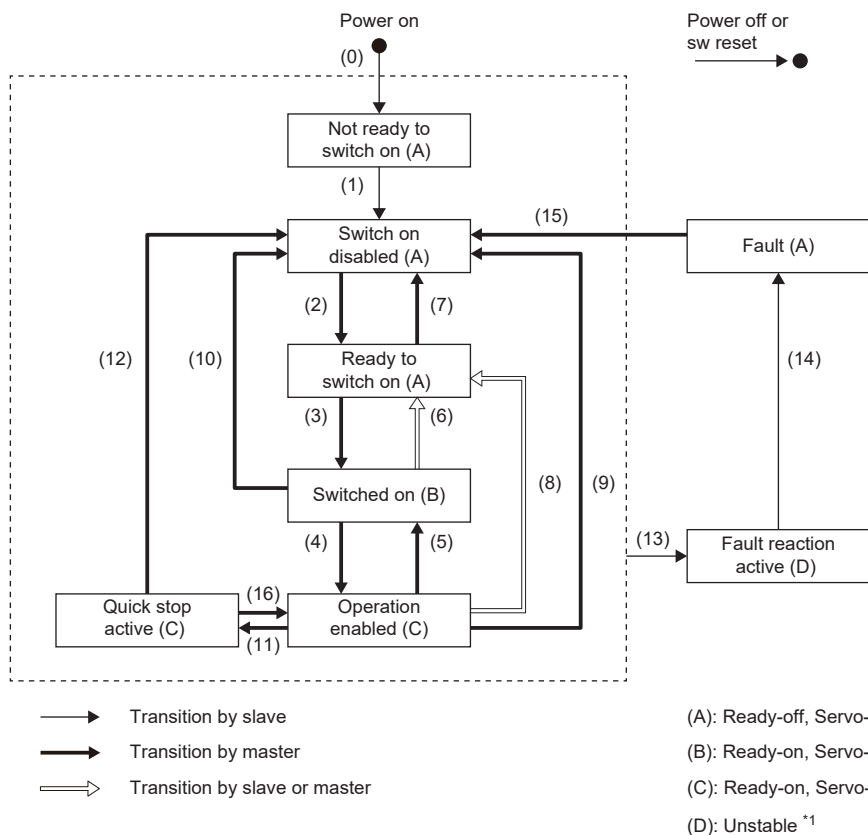


A list of drive profile specifications is as follows.

| Function name | Description | Reference |
|------------------------|--|----------------------------------|
| Control mode | Control such as the position mode, speed mode, and torque mode | ☞ Page 60 Control mode |
| PDS state transitions | Control method until the servo motor starts to operate | ☞ Page 44 PDS state transitions |
| Controlword/Control DI | Control of each function | ☞ Page 47 Controlword/Control DI |
| Statusword/Status DO | Monitor of each function | ☞ Page 53 Statusword/Status DO |

PDS state transitions

The internal state of the servo amplifier is managed by the PDS state defined in the CiA 402 drive profile specification. The servo motor can be operated immediately after turning on the power supply by shifting from the "Not ready to switch on" state to the "Operation enabled" state with the predetermined procedure.



*1 In the controller that displays the servo-on status by referring to the PDS status, the servo-on status on the controller may differ from the actual servo-on status.

Events and PDS state transitions

Setting Controlword enables control of the state transitions.

After the PDO communication is established (after the NMT state has reached "Operational"), the status is controlled by the master station transmitting commands (by setting Controlword) in accordance with the following table.

The following shows the PDS state transition events and operations.

| Transition No. | Event | Operation |
|----------------|--|---|
| (0) | Power supply is turned on | Initialization |
| (1) | Transitions automatically when the power supply is turned on | Communication setting |
| (2) | Transitions with the "Shutdown" command from the master station | None |
| (3) | Transitions with the "Switch On" command from the master station | The dynamic brake is released. |
| (4) | Transitions with the "Enable Operation" command from the master station | The operation becomes ready after servo-on. |
| (5) | Transitions with the "Disable Operation" command from the master station | The operation is disabled after servo-off. |
| (6) | Transitions with the "Shutdown" command from the master station | The dynamic brake operates. |
| (7) | Transitions with the "Disable Voltage" command or "Quick Stop" command from the master station | None |
| (8) | (A) Transitions with the "Shutdown" command from the master station (B) Transitions when the power supply is turned off | The operation is disabled after servo-off or dynamic braking. |
| (9) | Transitions with the "Disable Voltage" command from the master station | The operation is disabled after servo-off or dynamic braking. |
| (10) | Transitions with the "Disable Voltage" command or "Quick Stop" command from the master station | The dynamic brake operates. |
| (11) | (A) Transitions with the "Quick Stop" command from the master station (B) Transitions when the forced stop signal is turned off *1 | Quick Stop starts. |
| (12) *2 | (A) Transitions automatically after the completion of Quick Stop (when the value of [Quick stop option code (Obj. 605Ah)] is any of "1", "2", "3", or "4") (B) Transitions with the "Disable Voltage" command from the master station after completion of "Quick Stop" (C) Transitions when the power supply is turned off (when the value of [Quick stop option code (Obj. 605Ah)] is any of "5", "6", "7", or "8") | The operation is disabled after servo-off or dynamic braking. |
| (13) | Alarm occurrence | Processing against the alarm is executed. |
| (14) | Automatic transition | After the completion of the alarm occurrence processing, the operation is disabled by servo-off or the dynamic brake. |
| (15) | Transitions with the "Fault Reset" command from the master station | An alarm reset is performed. Resettable alarms are cleared. |
| (16) *3 | Transitions with the "Enable Operation" command from the master station (when the value of [Quick stop option code (Obj. 605Ah)] is any of "5", "6", "7", or "8") | The operation becomes ready after Quick Stop is canceled. |

*1 This event occurs when "1" (Quick stop active) is selected in [Pr. PF29.1 State selection with forced stop in progress].

*2 (B) and (C) are available on servo amplifiers with firmware version D0 or later.

*3 Available on servo amplifiers with firmware version D0 or later.

The following shows the related correspondence between the command bit setting and the PDS state. In order to avoid missing the command at the time of communication error, maintain the state of Bit 7 = 1 on the Fault Reset command for at least 10 ms when the communication cycle is 4 ms or less, or at least 20 ms when the communication cycle is 8 ms.

0: Off 1: On ×: Either on/off can be used.

| Command | Command Bit setting of Controlword | | | | | Transition No. |
|-------------------|------------------------------------|------------------------------|------------------------|----------------------------|-----------------------|----------------------|
| | Bit 7 Fault Reset | Bit 3 Enable Operation | Bit 2 Quick Stop | Bit 1 Enable Voltage | Bit 0 Switch On | |
| Shutdown | 0 | × | 1 | 1 | 0 | (2), (6), (8) |
| Switch On | 0 | 0 | 1 | 1 | 1 | (3) |
| Disable Voltage | 0 | × | × | 0 | × | (7), (9), (10), (12) |
| Quick Stop | 0 | × | 0 | 1 | × | (7), (10), (11) |
| Disable Operation | 0 | 0 | 1 | 1 | 1 | (5) |
| Enable Operation | 0 | 1 | 1 | 1 | 1 | (4), (16) |
| Fault Reset | 0 to 1 | × | × | × | × | (15) |

In order to transition from the "Switch on disabled" state to the "Operation enabled" state, it is necessary to give each command of the "Shutdown", "Switch On", and "Enable Operation" sequentially. However, it is also possible to transit directly from the ongoing state to the target state with one command.

| Current state | Command | Status after transition |
|--------------------|------------------|-------------------------|
| Switch on disabled | Switch On | Switched on |
| Switch on disabled | Enable Operation | Operation enabled |
| Ready to switch on | Enable Operation | Operation enabled |

Controlword/Control DI

By rewriting the Controlword and Control DI x objects from the master station, the PDS state can be switched and control instructions for various drive-provided functions can be given. [Controlword (Obj. 6040h)] is used for the control commands defined by CiA 402, and [Control DI 1 (Obj. 2D01h)] to [Control DI 10 (Obj. 2D0Ah)] are used for the control commands defined by Mitsubishi Electric.

The correspondence information of Control DI can be checked with [Supported Control DI (Obj. 2D00h)].

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|-------------------------|-----------|--------|--|
| 6040h | — | VAR | Controlword | U16 | rw | — |
| 2D00h | 0 | ARRAY | Supported Control DI | U8 | ro | Correspondence information of Control DI |
| 2D00h | 1 | ARRAY | Supported Control DI 1 | U16 | ro | Correspondence information for Control DI 1 When the signal is unsupported, the corresponding bit is "0". When the signal is supported, the corresponding bit is "1". When the signals corresponding to Control DI are Bit 4 and Bit 5, "0030h" is displayed. |
| : | | | | | | |
| 2D00h | 10 | ARRAY | Supported Control DI 10 | U16 | ro | Correspondence information for Control DI 10 |
| 2D01h | — | VAR | Control DI 1 | U16 | rw | Objects defined by Mitsubishi Electric |
| : | | | | | | |
| 2D0Ah | — | VAR | Control DI 10 | U16 | rw | Objects defined by Mitsubishi Electric |

Bit definition of Controlword


| Bit *1 | Symbol | Description | Reference |
|--------|--------|--|---|
| 0 | SO | Switch On | ☞ Page 45 Events and PDS state transitions |
| 1 | EV | Enable Voltage | |
| 2 | QS | Quick Stop | |
| 3 | EO | Enable Operation | |
| 4 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 5 | | | |
| 6 | | | |
| 7 | FR | Fault Reset | ☞ Page 45 Events and PDS state transitions |
| 8 | HALT | 0: Operation ready 1: Temporary stop | Refer to "Halt" in the following manual. 📖 MR-JET User's Manual (Function) |
| 9 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 10 | — | The value at reading is undefined. Set "0" when writing. | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Bit 0 to 3 and 7 are used for PDS state switching.

■ Bit definition of Control DI


With the communication function, reading the following objects enables reading of the on/off state of the input device. In addition, the input device can be set to on/off by writing to the following objects.

• Control DI 1

| Bit | Symbol | Description | Reference |
|-----|----------|--|---|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | C_CDP | Gain switching | Refer to "Signal (device) explanations" in the following manual.  MR-JET User's Manual (Hardware) |
| 5 | C_CLD *1 | Fully closed loop selection | |
| 6 | — | The value at reading is undefined. Set "0" when writing. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Available on servo amplifiers with firmware version C4 or later.

• Control DI 2

| Bit | Symbol | Description | Reference |
|-----|-----------|--|--|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | C_PC | Proportional control | Refer to "Signal (device) explanation" in the following manual.  MR-JET User's Manual (Hardware) |
| 9 | — | The value at reading is undefined. Set "0" when writing. | |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | C_ORST *2 | Operation alarm reset | — |

*2 Available on servo amplifiers with firmware version B2 or later.

- Control DI 3

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Control DI 4

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |


• Control DI 5

| Bit | Symbol | Description | Reference |
|-----|--------|--|--|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | C_CDP2 | Gain switching 2 | Refer to "Signal (device) explanation" in the following manual. MR-JET User's Manual (Hardware) |
| 5 | — | The value at reading is undefined. Set "0" when writing. | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | C_FLS | Input of upper stroke limit | Refer to "Stroke limit function" in the following manual. MR-JET User's Manual (Function) |
| 10 | C_RLS | Input of lower stroke limit | |
| 11 | C_DOG | Proximity dog | Refer to "Signal (device) explanation" in the following manual. MR-JET User's Manual (Hardware) |
| 12 | — | The value at reading is undefined. Set "0" when writing. | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 6

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Control DI 7

| Bit | Symbol | Description | Reference |
|-----|----------|--|--|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | C_OVR *1 | Override selection | Refer to "Override function" in the following manual.  MR-JET User's Manual (Function) |
| 8 | — | The value at reading is undefined. Set "0" when writing. | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Available on servo amplifiers with firmware version D4 or later.

- Control DI 8

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 9

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 10

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

Statusword/Status DO

The Statusword objects and the Status DO x objects notify the master station of the PDS state and other drive states. States defined by CiA 402 are notified by using [Statusword (Obj. 6041h)], and other states defined by Mitsubishi Electric are notified by using [Status DO 1 (Obj. 2D11h)] to [Status DO 10 (Obj. 2D1Ah)].

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|--------------|-----------|--------|--|
| 6041h | — | VAR | Statusword | U16 | ro | — |
| 2D11h | — | VAR | Status DO 1 | U16 | ro | Objects defined by Mitsubishi Electric |
| : | | | | | | |
| 2D17h | — | VAR | Status DO 7 | U16 | ro | Objects defined by Mitsubishi Electric |
| 2D1Ah | — | VAR | Status DO 10 | U16 | ro | Objects defined by Mitsubishi Electric |

Bit definition of Statusword

| Bit | Symbol | Description | Reference |
|-----|--------|--|---|
| 0 | RTSO | Ready-to-switch-on | ☞ Page 45 Events and PDS state transitions |
| 1 | SO | Switch-on | |
| 2 | OE | Operation-enabled | |
| 3 | F | Fault | |
| 4 | VE | Voltage-enabled 0: The bus voltage is lower than the specified (RA) level. 1: The bus voltage is equal to or higher than the specified level. | — |
| 5 | QS | Quick stop 0: In a Quick stop 1: Not in a Quick stop (including in the test mode) | ☞ Page 45 Events and PDS state transitions |
| 6 | SOD | Switch on disabled | |
| 7 | W | Warning 0: No warning has occurred. 1: A warning has occurred. | — |
| 8 | — | Reserved The value at reading is undefined. | — |
| 9 | RM | Remote 0: When not following the Controlword command 1: Operating in accordance with the Controlword command | — |
| 10 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 11 | ILA | Internal limit active 0: The forward rotation stroke end, reverse rotation stroke end, and software position limit have not been reached. 1: The forward rotation stroke end, reverse rotation stroke end, or software position limit has been reached. (Enabled in csp, csv, pp, pv, hm, pt, or jg mode) | — |
| 12 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 13 | | | |
| 14 | — | Reserved | — |
| 15 | — | The value at reading is undefined. | — |

- State coding

Bit 0 to Bit 3, Bit 5, and Bit 6 are switched depending on the PDS state (servo amplifier internal state). Details are as follows:

| Statusword (bin) | PDS state |
|---------------------|--------------------------------------|
| x0xx xxx0 x0xx 0000 | Not ready to switch on ^{*1} |
| x0xx xxx0 x1xx 0000 | Switch on disabled |
| x0xx xxx0 x01x 0001 | Ready to switch on |
| x0xx xxx0 x01x 0011 | Switched on |
| x0xx xxx0 x01x 0111 | Operation enabled |
| x0xx xxx0 x00x 0111 | Quick stop active |
| x0xx xxx0 x0xx 1111 | Fault reaction active |
| x0xx xxx0 x0xx 1000 | Fault |

*1 Statusword is not sent when in the "Not ready to switch on" state.

■ Bit definition of Status DO

With the communication function, the on/off state of the output device can be checked by reading the following objects.

• Status DO 1

| Bit | Symbol | Description | Reference |
|-----|-----------|--|--|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | S_SA | Speed reached | Refer to "Signal (device) explanations" in the following manual. |
| 3 | S_MBR | Electromagnetic brake interlock | |
| 4 | S_CDPS | Variable gain enabled | IMR-JET User's Manual (Hardware) |
| 5 | S_CLDS *1 | Fully closed loop control in progress | |
| 6 | — | The value at reading is undefined. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | S_INP | In-position | Refer to "Signal (device) explanations" in the following manual. |
| 13 | S_TLC | Limiting torque | |
| 14 | S_ABSV | Absolute position erased 1: Absolute position is erased | IMR-JET User's Manual (Hardware) |
| 15 | S_BWNG | Battery warning | |

*1 Available on servo amplifiers with firmware version C4 or later.

• Status DO 2

| Bit | Symbol | Description | Reference |
|-----|---------|---|---|
| 0 | S_ZPASS | Z-phase already passed After the Z-phase is passed, S_ZPASS turns on. | — |
| 1 | — | The value at reading is undefined. | — |
| 2 | — | | — |
| 3 | S_ZSP | Zero speed detection | Refer to "Signal (device) explanation" in the following manual. IMR-JET User's Manual (Hardware) |
| 4 | S_VLC | Limiting speed | |
| 5 | — | The value at reading is undefined. | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | S_PC | | Proportional control in progress S_PC is turned on under proportional control. |
| 9 | — | The value at reading is undefined. | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | S_ZP2 | Homing completion 2 When homing finishes successfully, S_ZP2 turns on. | — |

• Status DO 3

| Bit | Symbol | Description | Reference |
|-----|----------|---|---|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | S_STO *1 | In STO state S_STO turns on in STO state. | Refer to "Monitor signal (digital)" in the following manual. MR-JET User's Manual (Function) |
| 6 | — | The value at reading is undefined. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | S_RSTP | During forced stop deceleration During forced stop deceleration, S_RSTP is on. | — |
| 10 | — | The value at reading is undefined. | — |
| 11 | S_MTTR | Tough drive in progress | Refer to "Tough drive function" in the following manual. MR-JET User's Manual (Function) |
| 12 | — | The value at reading is undefined. | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 This function is available only on the MR-JET-G-HS.

• Status DO 4

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | — | |

• Status DO 5

| Bit | Symbol | Description | Reference |
|-----|-----------|--|--|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | S_CDPS2 | Variable gain enabled 2 | Refer to "GAIN SWITCHING FUNCTION" in the following manual. MR-JET User's Manual (Adjustment) |
| 5 | S_CPO *2 | Rough match When the command remaining distance is less than the value of the rough match output range set in [Pr. PT12], S_CPO is on. This is not output during base circuit shut-off. When the servo amplifier is switched to the servo-on state, S_CPO switches on. | — |
| 6 | S_MEND *3 | Traveling completion If droop pulses are within the in-position output range set in [Pr. PA10] and the command remaining distance is "0", S_MEND turns on. S_MEND turns on at servo-on. S_MEND is off in the servo-off status. | — |
| 7 | — | The value at reading is undefined. | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*2 Available on servo amplifiers with firmware version B2 or later.

*3 Available on servo amplifiers with firmware version B8 or later.

• Status DO 6

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 7

| Bit | Symbol | Description | Reference |
|-----|----------|---|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | S_POT *1 | Position range When the actual current position is within the range set in [Pr. PT19] and [Pr. PT21], S_POT is on. When homing is not complete or base circuit shut-off is in progress, S_POT is off. | — |
| 3 | — | The value at reading is undefined. | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Available on servo amplifiers with firmware version B2 or later.

• Status DO 8

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Status DO 9

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Status DO 10

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

Control mode

Point

- In the initial setting, the cyclic synchronous position mode is set. When using the mode in the cyclic synchronous position mode, perform follow-up the position with the controller at servo-on.
- When using the mode in the profile mode, switch the mode from the control mode to the profile mode at servo-off and then turn on the servo.
- Switching the control mode without update of the position may cause an unexpected operation of the servo motor such as sudden acceleration.

■ Motion mode

For the list of control modes, refer to the "Function List" in the following manual.

📖 MR-JET User's Manual (Function)

■ Selecting control mode (Modes of operation)

Specify a control mode with [Modes of operation (Obj. 6060h)]. [Modes of operation (Obj. 6060h)] can be rewritten with a PDO or an SDO. The available control modes are limited as follows depending on the setting value of [Pr. PT01.2].

○: Supported, —: Not supported

| [Pr. PA01.0] | [Pr. PT01.2] | pp ^{*2} | pv ^{*2} | tq ^{*2} | hm | csp | csv | cst | jg ^{*4} | pt ^{*4} | ct ^{*1} | 6061h Initial value |
|--------------|--------------------------|------------------|------------------|------------------|----|-----|-----|-----|------------------|------------------|------------------|---------------------|
| 0 | 0 (mm) ^{*6} | — | — | — | — | — | — | — | — | — | — | 8 (csp) |
| | 1 (inch) ^{*6} | — | — | — | — | — | — | — | — | — | — | |
| | 2 (degree) ^{*3} | ○ | ○ | ○ | ○ | — | — | — | — | — | — | 1 (pp) |
| | 3 (pulse) | ○ | ○ | ○ | ○ | ○ | ○ | ○ | — | — | ○ ^{*5} | 8 (csp) |
| 6 | 0 (mm) | — | — | — | ○ | — | — | — | ○ | ○ | — | -101 (pt) |
| | 1 (inch) | — | — | — | ○ | — | — | — | ○ | ○ | — | |
| | 2 (degree) | — | — | — | ○ | — | — | — | ○ | ○ | — | |
| | 3 (pulse) | — | — | — | ○ | — | — | — | ○ | ○ | — | |

*1 Available on servo amplifiers with firmware version B0 or later.

*2 Available on servo amplifiers with firmware version B2 or later.

*3 Available on servo amplifiers with firmware version B6 or later.

*4 Available on servo amplifiers with firmware version B8 or later.

*5 To switch to continuous operation to the torque control mode (ct), the switching must be performed from the cyclic synchronous position mode (csp) or cyclic synchronous velocity mode (csv).

*6 Setting "0" or "1" in [Pr. PT01.2] triggers [AL. 037 Parameter error].

• Related objects

| Index | Sub Index | Object | Name | Data Type | Access | Default value | Description |
|-------|-----------|--------|----------------------------|-----------|--------|---------------|--|
| 6060h | 0 | VAR | Modes of operation | I8 | rw | 0h | 📖 MR-JET-G User's Manual (Object Dictionary) |
| 6061h | 0 | VAR | Modes of operation display | I8 | ro | — | |
| 6502h | 0 | VAR | Supported drive mode | U32 | ro | 000003A0h | |

- Control switching between position/speed/torque modes

Point

Changes to the OMS Bit of [Controlword (Obj. 6040h)] are not accepted until control switching finishes. Before inputting commands, check that the control mode has been switched by referring to [Modes of operation display (Obj. 6061h)]. In addition, switch the control modes when the start command is turned off. (For example, when "Homing operation start" is turned off in hm mode.)

As there is a time lag when switching between control modes, the controller needs to keep sending the command values of the corresponding control modes until the mode is completely switched. After the completion of the control mode switching is confirmed by [Modes of operation display (Obj. 6061h)], the controller can stop sending the command value relative to the control mode before switching.

Before switching to or from the position mode, check that the servo motor is in zero speed state. Data of whether the servo motor is in zero speed state can be obtained by Bit 3 (S_ZSP) of [Status DO 2 (Obj. 2D12h)]. If the motor is not in the zero speed state, the control will not be switched and therefore [Modes of operation display (Obj. 6061h)] will not change. To switch the control mode regardless of the zero speed state, set [Pr. PC76.1 ZSP disabled selection at control switching] to "1" to disable the monitoring of zero speed state. Note that a shock may occur at control switching if the monitoring of zero speed state is disabled.

- Control switching between cyclic mode (csp, csv, and cst) and profile mode (pp, pv, and tq)

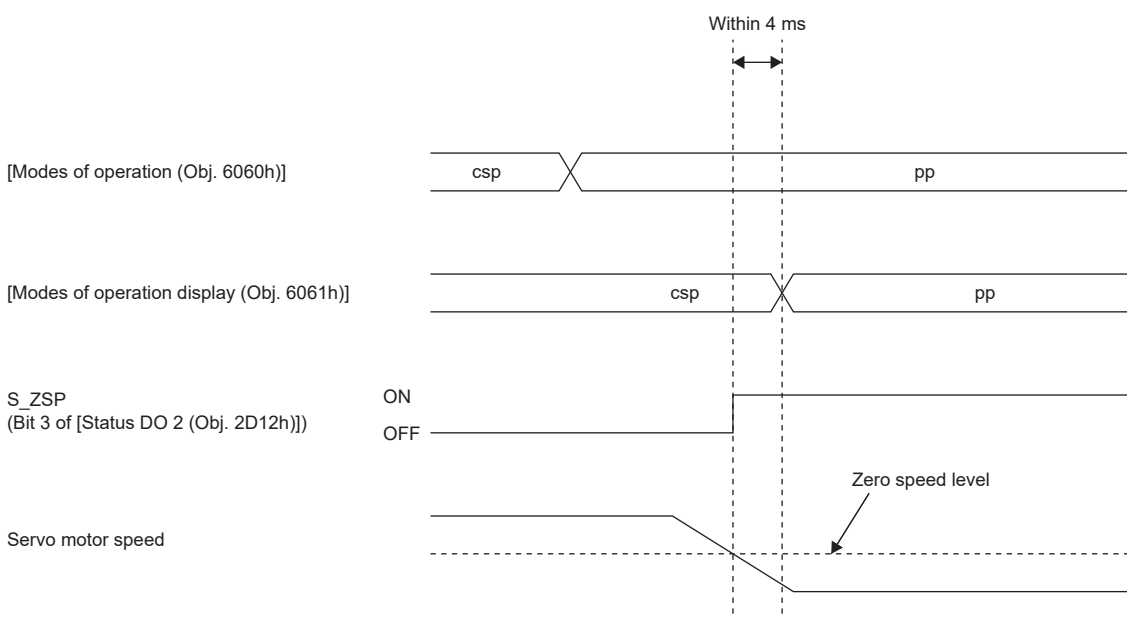
The control mode is switched between the cyclic mode (csp, csv, and cst) and the profile mode (pp, pv, and tq) only if the condition for control switching is met, following which [Modes of operation display (Obj. 6061h)] is changed. If the condition for control switching is not met, the control mode will not be switched and the value in [Modes of operation display (Obj. 6061h)] will not be changed. The condition for control switching is "Motor being stopped".

"Motor being stopped" means that S_ZSP (Bit 3 of [Status DO 2 (Obj. 2D12h)]) is on.

(servo motor speed being less than zero speed set in [Pr. PC07])

Setting "1" (disabled (control switching is performed regardless of the range of ZSP)) to [Pr. PC76.1] enables the control mode to be switched without checking the condition "Motor being stopped" on the servo amplifier. Set "1" to [Pr. PC76.1] only if switching the control mode without waiting for the motor to stop. Switching the control mode without waiting for the motor to stop may cause a shock.

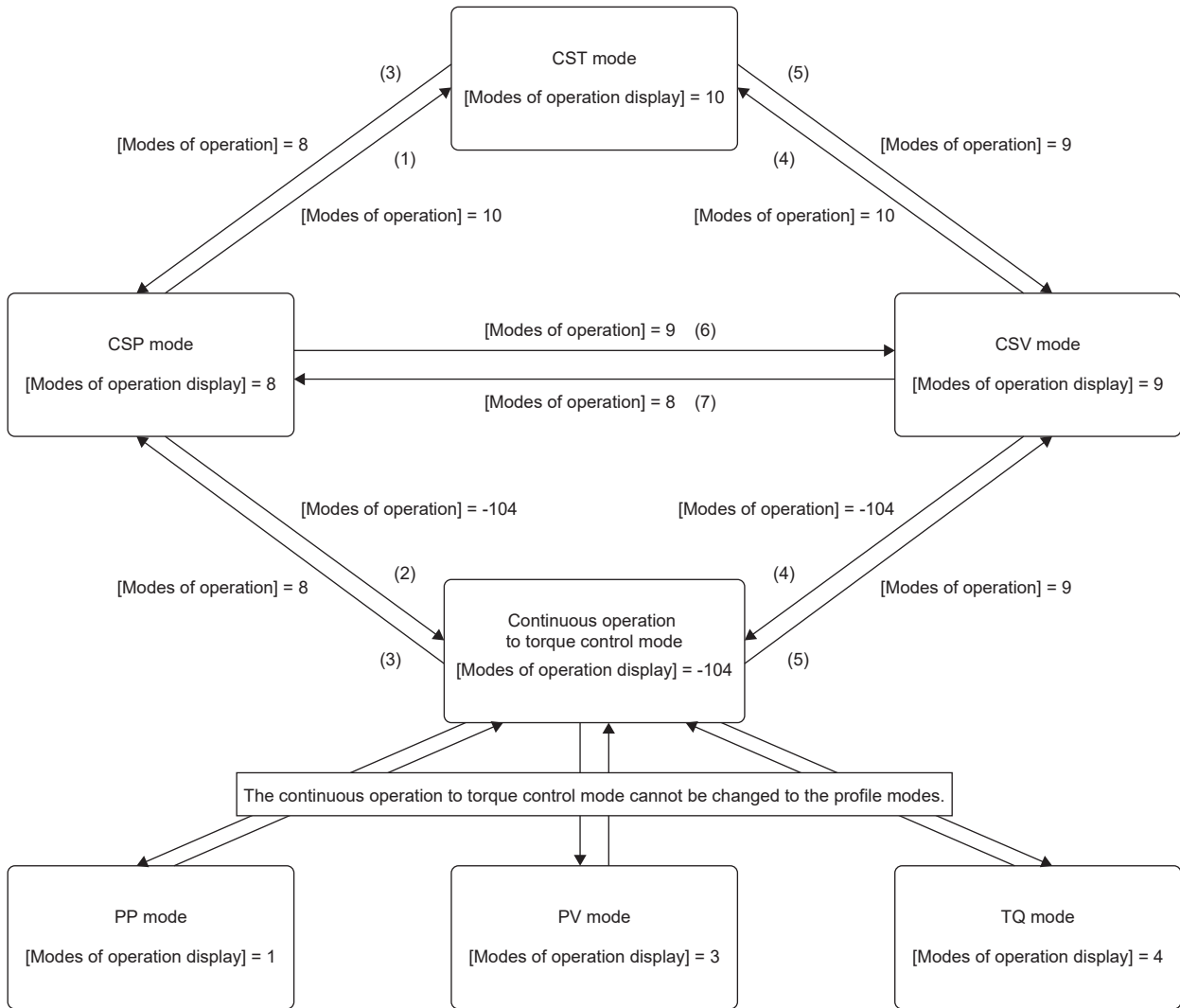
The following shows a timing chart of control switching between the cyclic mode (csp, csv, and cst) and the profile mode (pp, pv, and tq).



• Control switching for continuous operation to torque control mode (ct)

To switch to continuous operation to the torque control mode (ct), the switching must be performed from the cyclic synchronous position mode (csp) or cyclic synchronous velocity mode (csv). Only the "csp" and "csv" control modes switch to "ct". To switch to "ct", set [Modes of operation (Obj. 6060h)] to "-104" while in the "csp" or "csv" control mode. Once the condition for control switching is met, the control mode will switch to "ct", following which [Modes of operation display (Obj. 6061h)] is changed to "-104". If the condition is not met, the control mode will not be switched and the value in [Modes of operation display] will not be changed.

Continuous operation to torque control cannot be changed to "cst", "hm", etc. Refer to the following table for details.




| Switching operation | | Switching condition |
|---------------------|--|---|
| (1) | Cyclic synchronous position mode → Cyclic synchronous torque mode | Servo motor being stopped ^{*1} |
| (2) | Cyclic synchronous position mode → Continuous operation to torque control mode | No condition |
| (3) | Cyclic synchronous torque mode, Continuous operation to torque control mode → Cyclic synchronous position mode | Servo motor being stopped ^{*1} |
| (4) | Cyclic synchronous velocity mode → Cyclic synchronous torque mode, Continuous operation to torque control mode | No condition |
| (5) | Cyclic synchronous torque mode, Continuous operation to torque control mode → Cyclic synchronous velocity mode | |
| (6) | Cyclic synchronous position mode → Cyclic synchronous velocity mode | Servo motor being stopped ^{*1} |
| (7) | Cyclic synchronous velocity mode → Cyclic synchronous position mode | Servo motor being stopped ^{*1} |

*1 The state where S_ZSP (Bit 3 of [Status DO 2 (Obj. 2D12h)]) is turned on. (servo motor speed being less than zero speed set in [Pr. PC07])

Setting [Pr. PC76.1_ZSP disabled selection at control switching] to "1" (disabled (control switching is performed regardless of the range of ZSP)) enables switching of the control mode without checking for switching condition "Servo motor being stopped" on the servo amplifier. Set [Pr. PC76.1] to "1" only if switching the control mode without waiting for the servo motor to stop. Note that switching the control mode without waiting for the servo motor to stop may cause a shock.

- Control switching in positioning mode


Refer to "Control switching in positioning mode" in the following manual.

 MR-JET User's Manual (Function)

Setting of positioning data

Point table access method

Use MR Configurator2 or the object dictionary via a controller to set the point table. Refer to "Setting method of point table" in the following manual.

 MR-JET User's Manual (Function)

2 CC-Link IE Field Network Basic

2.1 Functions and configuration

This manual describes communication with the MR-JET-_G servo amplifiers using CC-Link IE Field Network Basic communication protocol. Refer to the following manual when using CC-Link IE Field Network Basic.

📖 MR-JET-G User's Manual (Object Dictionary)

Outline

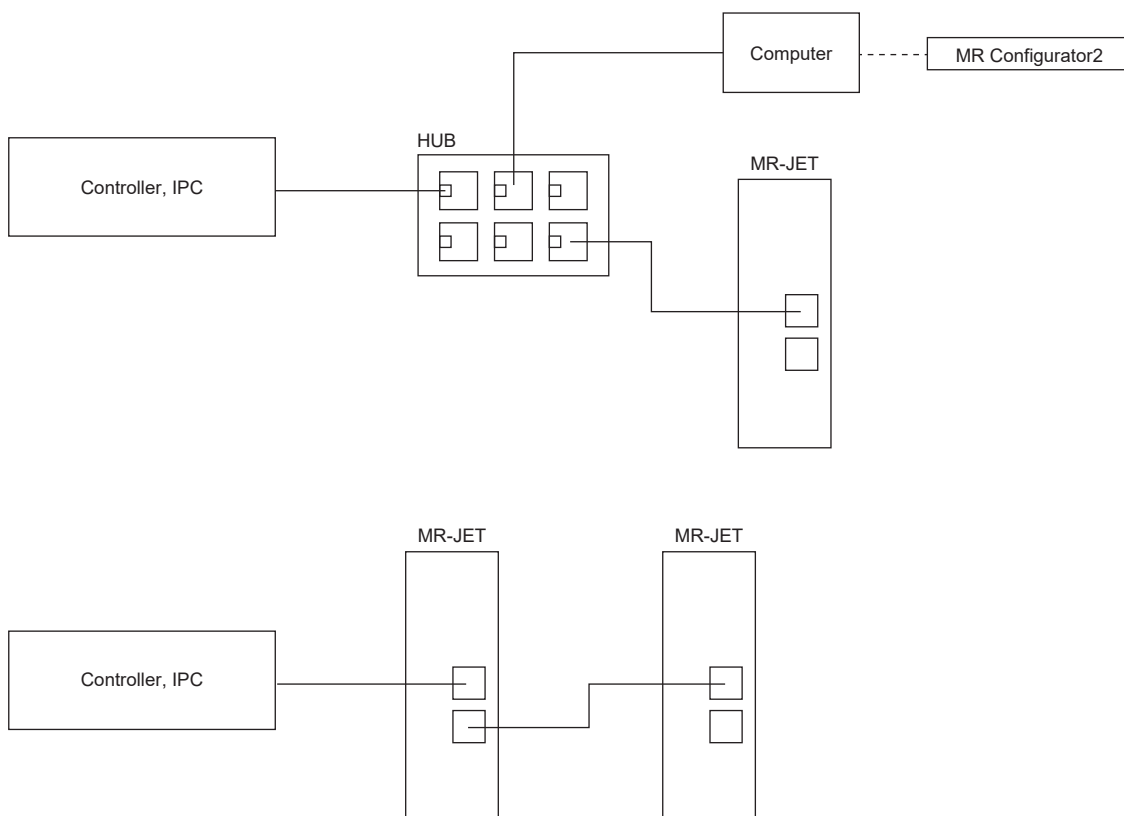
CC-Link IE Field Network Basic is a protocol that utilizes 100 Mbps for general-purpose Ethernet communications. By taking advantage of using general-purpose Ethernet, TCP/IP communications (HTTP, FTP, and the like) can also be used together, allowing for a high flexibility system configuration.

The servo amplifier can be connected to a programmable controller CPU or IPC that supports the CC-Link IE Field Network Basic master station. Positioning operation is possible in profile position mode and point table mode, in which position data (target position) is given via the controller to perform positioning operation.

System architecture

A configuration example is as follows.

A controller can control up to 16 axes per group, for a total of 64 axes of servo amplifiers.




Function list

Communication-related function list (Application)

| Category | Subcategory | Functions | Description | Detailed explanation |
|----------------------|---------------------|---|--|--|
| Network | Open network | CC-Link IE Field Network Basic protocol | This function supports CC-Link IE Field Network Basic. | ☞ Page 76 Cyclic transmission |
| | | CC-Link IE Field Network Basic communication settings | Network configuration settings are performed by using GX Works2, GX Works3, and MR Configurator2. | ☞ Page 71 Startup |
| | Common protocol | SLMP | This function supports SLMP (SeamLess Message Protocol). Parameter settings and monitoring are available. | ☞ Page 95 SLMP |
| | Profile | CSP+ | File for describing the necessary information for startup, operation, and maintenance of CC-Link family connected products. | ☞ Page 72 Profile (CSP+ file) settings |
| Application function | Cyclic transmission | Hold/Clear of output at CPU STOP and CPU stop error | When the CPU module of the cyclic master is at STOP, when the stop error occurs, Hold/Clear is automatically set on the refresh device output. The servo amplifier stops regardless of the setting of Hold/Clear of the cyclic master. | ☞ Page 75 Hold/Clear of output at CPU STOP and at CPU stop error |
| | Setting change | Remote reset | This is a function to reset a servo amplifier via the network. Servo parameters to be enabled at power cycle are reflected by resetting the servo amplifier. | ☞ Page 75 Remote reset |
| | | IP address setting | IP addresses are delivered from the controller to servo amplifiers via CC-Link IE Field Network Basic. | ☞ Page 74 IP address setting function |

Communication specifications

CC-Link IE Field Network Basic communication

| Item | Description |
|--|---|
| Communication protocol | UDP |
| Physical layer | 100BASE-TX (100 Mbps/100 m) |
| Communication connector | RJ-45 × 2 |
| Communication cable | CAT5e, shielded twisted pair, shield twisted 4 pair, straight cable |
| Network topology | Line, tree, star, or hybrid of these three topology types |
| Communication speed | 100 Mbps |
| Transmission distance between stations | Max. 100 m |
| Number of connection nodes | Maximum 64 stations (Maximum number of connected stations per group: 16 stations) MR-JET-_G_ (Number of usable stations: 1 station per MR-JET-_G_) |
| Cyclic transmission | 32 points (64 bytes) |
| Port number | 61450 (cyclic data) 61451 (NodeSearch, IPAddressSet for CC-Link IE Field Network Basic) |
| IP address | IPv4 range: 0.0.0.1 to 223.255.255.254 Use the same network address for the master station and remote station. Network address default value (recommended): 192.168.3.1 |
| Subnet mask | Subnet mask default value (recommended): 255.255.255.0 |
| Message format |  Page 76 Message format |
| Reference response time *1 (Link scan time/timeout time *2*3) | 10 ms |

*1 The reference response time is the time it takes for the servo amplifier to receive a command from the master station and respond to the master station.

*2 The link scan time is calculated by the following formula. Use the reference response time for N_s.


For MELSEC iQ-R/MELSEC-Q/L: $L_s = N_s + N_m$

For MELSEC iQ-F: $L_s = SM + \{(N_s + N_m)/SM\}$

L_s: Link scan time, N_s: Remote station response time, N_m: Master station request time, SM: Sequence scan time

*3 Check the current link scan time (when all remote stations are normal) with CC-Link IE Field Network Basic diagnostics, and set the timeout time to about 5 times the link scan time (50 ms if the current link scan time is 10 ms).

SLMP communication specifications

| Functions | Description |
|------------------------|--|
| Communication protocol | UDP |
| Port number | 5010 (SLMP communication port) 45237 (iQSS) |
| Message format |  Page 96 Message format |

Establishing and disconnecting the communication

Establishing the communication

Configure the system and set the parameters or rotary switches that are required for startup of the CC-Link IE Field Network Basic master station and the servo amplifier. The communication will be established if the settings of the master station and the servo amplifiers are made correctly.

Disconnecting the communication

■ Procedure for disconnecting the communication

When shutting off the system power or disconnecting the servo amplifier from the network, be sure to set RY (n + 3) F of the master station (controller) to "0" (turn off the cyclic communication ready command) after servo-off. Failing to do so may trigger [AL. 086.1].

Summary of object dictionary (OD)

The data that a device holds, such as control parameters, command values, and feedback values, is handled as an object composed of an Index, object name, object type, R/W attribute, and other elements. The data is exchanged between the master and remote stations. The aggregate of these objects is called an object dictionary (OD).

Section definition of object dictionary

The following shows the structure of an object dictionary.

| Index | Description | Reference |
|----------------|--|--|
| 1000h to 1FFFh | Communication profile | MR-JET-G User's Manual (Object Dictionary) |
| 2000h to 5FFFh | Objects group defined by Mitsubishi Electric | |
| 6000h to 9FFFh | CiA 402 drive profile | |

The classification of the objects defined by Mitsubishi Electric is as follows.

| Index | Description | Reference |
|----------------|------------------------------|--|
| 2000h to 27FFh | Servo parameter | MR-JET-G User's Manual (Object Dictionary) |
| 2800h to 29FFh | Point table | |
| 2A00h to 2A7Fh | Alarm | |
| 2B00h to 2BFFh | Monitor | |
| 2C00h to 2C7Fh | Diagnostics | |
| 2D00h to 2DFFh | Manufacturer defined control | Page 106 Controlword/Control DI Page 112 Statusword/Status DO |

Saving object dictionary data

Some of object dictionary data is stored in a non-volatile memory and some is not. Use [Store parameters (Obj. 1010h)] for storing the object dictionary data in the non-volatile memory.

For details about objects that can be stored in the non-volatile memory, refer to the following manual.

 MR-JET-G User's Manual (Object Dictionary)

■Store parameters

Writing "65766173h" (= reverse order of the ASCII code "save") to [Save all parameters (Obj. 1010h: 01h)] enables the setting value of an object to be stored in the non-volatile memory of the servo amplifier.

It can take up to around 25 s for [Save all parameters (Obj. 1010h: 01h)] to write all the parameters. Do not shut off the power supply during writing.

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|---------------------|-----------|--------|-----------------------|
| 1010h | 0 | ARRAY | Store parameters | U8 | ro | Number of entries |
| | 1 | | Save all parameters | U32 | rw | Saves all parameters. |

Reading [Save all parameters (Obj. 1010h: 01h)] returns any of the following values. Bit 0 is "0" during saving and "1" when not saving.

| Bit | Description |
|-----|---|
| 0 | 0: Object cannot be saved by the command (save in progress) 1: Object can be saved by the command (save not in progress) |
| 1 | 0: Not automatically saved |

Point

To shut off the power supply after executing Store parameters, make sure that a save is not in progress (Bit 0 is on), then shut off the power.

■Restore default parameters

Objects can be reset to the factory setting.

To initialize objects, write "64616F6Ch" (= reverse order of the ASCII code "load") to [Restore all default parameters (Obj. 1011h: 01h)], then cycle the power. Writing a value other than "load" (= 64616F6Ch) triggers an error. Initialization can take up to around 25 s.

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|--------------------------------|-----------|--------|------------------------------|
| 1011h | 0 | ARRAY | Restore default parameters | U8 | ro | Number of entries |
| | 1 | | Restore all default parameters | U32 | rw | All parameter initialization |

Reading [Restore all default parameters (Obj. 1011h: 01h)] displays "00000001h" (initializing values).

Engineering software

The following explains the main purposes of the engineering software used in CC-Link IE Field Network Basic communication. For specific usages, refer to the manuals of the engineering software and controller.

Engineering software list


This list shows engineering software used in CC-Link IE Field Network Basic.

| Engineering software | Description |
|----------------------|--|
| MR Configurator2 | This is a software that has the following functions: servo amplifier adjustment, monitor display, diagnosis, reading/writing of servo parameters, and test operation. These functions are performed using a personal computer. This tool is used to set the IP address and subnet mask in the network parameters. |
| GX Works2, GX Works3 | This is a software that comprehensively supports the design and maintenance of the programmable controllers. The software performs settings such as servo amplifier profile (CSP+) registration, network configuration setting (station specific mode, link device setting, etc.), refresh setting, and network synchronization setting. |

2.2 Startup

Outline

This chapter describes the setting procedure for CC-Link IE Field Network Basic. Refer to the following manual for startup of the servo amplifier.

 MR-JET-G User's Manual (Introduction)

2

Point

- To ensure the safety of the system against unauthorized network access, take security measures such as using a firewall.
- When the value of [Pr. PN02 Communication error - Detection time] is small, [AL. 086 Network communication error] may occur when the power of the servo amplifier is cycled or an instantaneous power failure occurs during CC-Link IE Field Network Basic communication.

Network setting

Point

- [Pr. PN13.0-3 Network protocol setting] is set to "0000h" (CC-Link IE TSN) at the factory setting. When using with CC-Link IE Field Network Basic, set [Pr. PN13.0-3] to "0004h".
- The communication speed is set to 1 Gbps at the factory setting. Since CC-Link IE Field Network Basic communicates at 100 Mbps, communication will not be established if a device whose communication speed is 1 Gbps is also connected. In such cases, rewrite [Pr. PN13.0-3] from the engineering software with a USB connection, or connect a device set with the same communication speed and rewrite [Pr. PN13.0-3] via the network.


Set the parameters of GX Works2 or GX Works3 as required for the servo amplifier network settings, and then configure the network settings of the master station and servo amplifier. Set the network settings of the master station and servo amplifier of CC-Link IE Field Network Basic according to the following procedure.

If an alarm has occurred, refer to the following manual.

 MR-JET User's Manual (Troubleshooting)

1. Profile (CSP+ file) settings

Set the latest profile (CSP+ file).


 Page 72 Profile (CSP+ file) settings

2. Master station setting


Refer to the GX Works2 or GX Works3 manual.

3. IP address setting

Set the IP address with the rotary switches and parameter.

 MR-JET-G User's Manual (Introduction)


Refer to the following when setting with parameters.

 Page 74 IP address setting function

4. Parameter setting

 Page 72 Parameter setting

5. Network connection procedure

 Page 73 Network connection procedure

6. Cyclic communication establishment procedure

 Page 73 Cyclic communication establishment procedure

Profile (CSP+ file) settings

To connect the master station and servo amplifier correctly, a profile (CSP+ file) must be set in GX Works2 or GX Works3. For the CSP+ file, contact your local sales office.

Parameter setting

Set [Pr. PN13.0-3 Network protocol setting] to "0004h" and switch the network protocol to CC-Link IE Field Network Basic. If necessary, set the following servo parameters in accordance with the controller settings.

| Servo parameter | Name |
|-----------------|--------------------------------------|
| PN02 | Communication error - Detection time |

If necessary, set the following network parameters in accordance with the controller settings.

| Network parameter | Name |
|-------------------|--------------------|
| NPA01 | IP address setting |
| NPA02 | IP address |
| NPA04 | Subnet mask |
| NPA08 | Host name |

Network connection procedure

Follow the procedures below to set up the network.

1. Connect the master station and the servo amplifier with a network cable. There is no difference between CN1A and CN1B.
2. Turn on the power of the master station and the servo amplifier.
3. Open the diagnostic screen of GX Works2 or GX Works3 and make sure that there is no error in the network. If the network is not connected, check the following contents.
 - Check if an alarm has occurred in the servo amplifier. If an alarm occurs, refer to the following manual and cancel the alarm.

 MR-JET User's Manual (Troubleshooting)

- Check that [Pr. PN13.0-3 Network protocol setting] is set to "0004h" (CC-Link IE Field Network Basic).
- Check that the values of the rotary switches and [Pr. NPA02 IP address] match the IP address set in the master station.

Cyclic communication establishment procedure

After connecting to the network, follow the procedure below to establish cyclic communication.

1. Cyclic communication start

Start cyclic communication of the master station (controller).

2. Cyclic communication preparation

Set RY (n + 3) F of the master station (controller) to "1" (turn on the cyclic communication ready command).

The remote stations (servo amplifiers) start importing the word device (RWw) and returns "1" to RX (n + 3) F.

3. Cyclic communication ready

On the master station (controller), check that RX (n + 3) F is set to "1" (Cyclic communication ready is on) before reading the word device (RWr).

Network disconnection procedure

Refer to the following.

 Page 68 Disconnecting the communication

Changing the network configuration

When changing the network configuration such as by adding a remote station, disconnecting a remote station, or adding a hub on the same network as the servo amplifier, follow the procedure below.

1. Turn off servo-on.
2. Set RY (n + 3) F of the master station (controller) to "0" (turn off the cyclic communication ready command).
3. Change the network configuration.

2.3 Application function

CC-Link IE Field Network Basic Diagnostics

The servo amplifier supports the following CC-Link IE Field Network Basic diagnostic functions. CC-Link IE Field Network Basic diagnostics is a function that uses engineering software to check the status of the master station and each remote station. This function can be used to check detailed information such as master station parameter settings and network connection status. Refer to the GX Works2 or GX Works3 manual for details of each function.

| Function | Description |
|---|--|
| Master station status monitor | The number of remote stations set with the master parameters, the IP address of the master station, and the error codes of the master station can be checked. |
| Error details | The error description and corrective actions for the error that occurred can be checked. |
| Network status monitor | The link scan time (current, maximum, and minimum) for each group and the number of error stations/unchecked stations can be checked. |
| Selected group communication status monitor | The details of the module status and the communication status of the selected group are displayed. If an error occurs in the module, the cause of the error and its remedies can be checked. |

IP address setting function

IP addresses are delivered from the controller to servo amplifiers via CC-Link IE Field Network Basic.

Set the IP address required for CC-Link IE Field Network Basic communication from the following items. The IP address range is between 0.0.0.1 and 223.255.255.254. Set the IP address within the range.

| [Pr. NPA01 IP address setting] | Rotary switches (SW1/SW2) | IP address | |
|--|---------------------------|------------|--|
| "00000000h" (The rotary switch is used.) | 00h | 1st octet | Use the value of/for [Pr. NPA02 IP address]. |
| | | 2nd octet | |
| | | 3rd octet | |
| | | 4th octet | |
| | 01h to FEh | 1st octet | Use the 1st to 3rd octet values of [Pr. NPA02 IP address]. |
| | | 2nd octet | |
| | | 3rd octet | |
| | | 4th octet | The setting value of the rotary switch (SW1/SW2) is used. |
| | FFh | — | Not available. |
| "00000001h" (Network parameters are used.) | — | 1st octet | Use the value of/for [Pr. NPA02 IP address]. |
| | | 2nd octet | |
| | | 3rd octet | |
| | | 4th octet | |

The initial value of the IP address is as follows.

| Item | Initial value |
|-------------|---------------|
| IP address | 192.168.3.1 |
| Subnet mask | 255.255.255.0 |

Hold/Clear of output at CPU STOP and at CPU stop error

This function sets Hold/Clear of the auto refresh device output when CPU module operation of the cyclic master is at STOP or at CPU stop error.

The following shows the servo amplifier status at CPU STOP and at stop error.

- At CPU STOP

The servo amplifier behaves in the manner commanded by the controller.

- At stop error

The servo amplifier decelerates the servo motor to a stop.

Remote reset

Resetting can be done by sending the reset command to the specified station.

The reset command can be sent from the Remote Operation window of GX Works2 or GX Works3.

2.4 Appendix

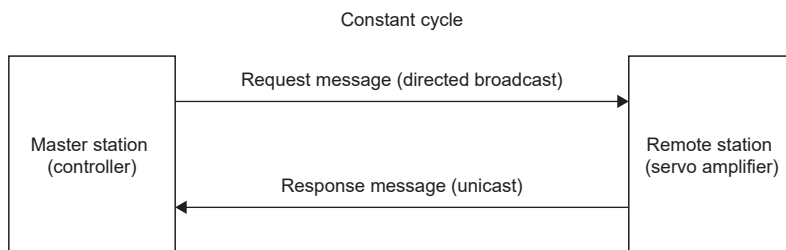
Cyclic transmission

Outline

In CC-Link IE Field Network Basic, the command sent from the master station (controller) to the remote station (servo amplifier) is called a request message, and the command sent from the remote station (servo amplifier) to the master station (controller) is called a response message.

The master station (controller) sends the request message to all remote stations (servo amplifiers) by directed broadcast. When a servo amplifier receives a request message, it acquires the data addressed to its own station and returns the response message to the master station (controller) by unicast after the response time of the servo amplifier has passed. The servo amplifier response time varies depending on the command to be sent.

A link device (RWr, RWw, RX, RY) is used for data communications, and the master station (controller) refreshes the link by sending and receiving request messages and response messages at regular intervals. The servo amplifier uses the received data in the object dictionary to drive the servo motor and return monitor data.



Message format

The request message sent from the master station (controller) and the response message returned from the remote station (servo amplifier) are sent in the following message format.

The message uses UDP/IP.

The PDO uses RWw and RWr. The RPDO (command) uses the request message (RWw), and the TPDO (feedback) uses the response message (RWr).

- Request message format

| | | | | | |
|-----------------|-----------|------------|--------------------|---------------|---|
| Ethernet header | IP header | UDP header | CCIEF Basic header | Command, etc. | Link device (for 16 stations) (RY, RWw) |
|-----------------|-----------|------------|--------------------|---------------|---|

- Response message format

| | | | | | |
|-----------------|-----------|------------|--------------------|---|-----------------------|
| Ethernet header | IP header | UDP header | CCIEF Basic header | Remote station notification information | Link device (RX, RWr) |
|-----------------|-----------|------------|--------------------|---|-----------------------|

PDO mapping

The placement of RPDO and TPDO objects is called PDO mapping. This placement has an initial placement defined and can be changed with variable PDO mapping. The following table shows values for items such as the number of objects that can be mapped to the PDO and the initial size of the PDO.

| Item | Value |
|---------------------------------|---|
| RPDO maximum number of objects | 32 |
| TPDO maximum number of objects | 32 |
| RPDO initial size [byte] | 64 |
| TPDO initial size [byte] | 64 |
| RPDO maximum size [byte] | 64 |
| TPDO maximum size [byte] | 64 |
| Number of RPDO mapping settings | 1 [1st Receive PDO Mapping (Obj. 1600h)] |
| Number of TPDO mapping settings | 1 [1st Transmit PDO Mapping (Obj. 1A00h)] |

Link device (RYn/RXn)

Point

- If a value outside the range is set for the request (RYn and RWwn) from the master station to the servo amplifier in cyclic communication, the setting value may not be reflected. Set the value within the range.

The sent and received data of the request message and response message of cyclic communication is used as the object data (RYn, RXn) of the servo amplifier.

The setting value of the response message can be changed. To change the initial setting value, change the PDO mapping.

Use RY and RX devices to start cyclic communication.

The PDO mapping for RY and RX devices cannot be changed.

■RYn mapping

| Master station → Servo amplifier (RYn) | | |
|--|------------------------------------|--------|
| Device number *1 | Device name | Symbol |
| RYn0 to RY (n + 3) E | Not used | — |
| RY (n + 3) F | Cyclic communication ready command | CSR |

*1 "n" is a value determined by the station No. setting.

■RXn mapping

| Servo amplifier → Master station (RXn) | | |
|--|----------------------------|--------|
| Device number *1 | Device name | Symbol |
| RXn0 to RX (n + 3) E | Not used | — |
| RX (n + 3) F | Cyclic communication ready | SSR |

*1 "n" is a value determined by the station No. setting.



Link device (RWwn/RWrn)

Point

If a value outside the range is set for the request (RYn and RWwn) from the master station to the servo amplifier in cyclic communication, the setting value may not be reflected. Set the value within the range.

The sent and received data of the request message and response message of cyclic communication is used as the object data (RWwn, RWrn) of the servo amplifier.

The setting value of the response message can be changed. To change the initial setting value, change the PDO mapping. The initial setting values for RWw and RWr devices are switched by the values of [Pr. PA01.0 Control mode selection] and [Pr. PN22.0 Default mapping mode selection].

| [Pr. PA01.0] | [Pr. PN22.0] | Description | Reference |
|--------------|--------------|--|---|
| 0 | 0 | This is the default mapping for mode 1 in the network standard mode. It corresponds to the profile mode and homing mode. Two touch probes are registered in the link device. |  Page 79 Network standard mode |
| | 1 | This is the default mapping for mode 2 in the network standard mode. It corresponds to the profile mode and homing mode. One touch probe is registered in the link device. | |
| | 2 | This is the default mapping for mode 3 in the network standard mode. It corresponds to the profile mode and homing mode. One touch probe and input device are registered in the link device. | |
| 6 | 0 | This is the default mapping for mode 1 in the positioning mode (point table method). It corresponds to the positioning mode, JOG operation mode, and homing mode. Two touch probes are registered in the link device. |  Page 85 Positioning mode (point table method) |
| | 1 | This is the default mapping for mode 2 in the positioning mode (point table method). It corresponds to the positioning mode, JOG operation mode, and homing mode. One touch probe is registered in the link device. | |
| | 2 | This is the default mapping for mode 3 in the positioning mode (point table method). It corresponds to the positioning mode, JOG operation mode, and homing mode. One touch probe and input device are registered in the link device. | |

■ Network standard mode

This is the PDO mapping when [Pr. PA01.0] is "0" (network standard mode).

- RWwn mapping (mode 1)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-------------------------|
| Device number *1 | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 2D05 | Control DI 5 |
| RWwn06 | 607A | Target position |
| RWwn07 | | |
| RWwn08 | 60FF | Target velocity |
| RWwn09 | | |
| RWwn0A | 2D20 | Velocity limit value |
| RWwn0B | | |
| RWwn0C | 6071 | Target torque |
| RWwn0D | — | — |
| RWwn0E | 6081 | Profile velocity |
| RWwn0F | | |
| RWwn10 | 6083 | Profile acceleration |
| RWwn11 | | |
| RWwn12 | 6084 | Profile deceleration |
| RWwn13 | | |
| RWwn14 | 6087 | Torque slope |
| RWwn15 | | |
| RWwn16 | 60F2 | Positioning option code |
| RWwn17 | 60B8 | Touch probe function |
| RWwn18 | — | — |
| RWwn19 | — | — |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.

• RWrn mapping (mode 1)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number ^{*1} | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | 6041 | Statusword |
| RWrn02 | 2D11 | Status DO 1 |
| RWrn03 | 2D12 | Status DO 2 |
| RWrn04 | 2D13 | Status DO 3 |
| RWrn05 | — | — |
| RWrn06 | 6064 | Position actual value |
| RWrn07 | | |
| RWrn08 | 606C | Velocity actual value |
| RWrn09 | | |
| RWrn0A | 60F4 | Following error actual value |
| RWrn0B | | |
| RWrn0C | 6077 | Torque actual value |
| RWrn0D | — | — |
| RWrn0E | 2A41 | Current alarm |
| RWrn0F | | |
| RWrn10 | 60B9 | Touch probe status |
| RWrn11 | — | — |
| RWrn12 | 60BA | Touch probe 1 positive edge |
| RWrn13 | | |
| RWrn14 | 60BB | Touch probe 1 negative edge |
| RWrn15 | | |
| RWrn16 | 60BC | Touch probe 2 positive edge |
| RWrn17 | | |
| RWrn18 | 60BD | Touch probe 2 negative edge |
| RWrn19 | | |
| RWrn1A | — | — |
| RWrn1B | — | — |
| RWrn1C | — | — |
| RWrn1D | — | — |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

- RWwn mapping (mode 2)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-----------------------------|
| Device number ^{*1} | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 607A | Target position |
| RWwn06 | | |
| RWwn07 | 60FF | Target velocity |
| RWwn08 | | |
| RWwn09 | 2D20 | Velocity limit value |
| RWwn0A | | |
| RWwn0B | 6071 | Target torque |
| RWwn0C | 6081 | Profile velocity |
| RWwn0D | | |
| RWwn0E | 6083 | Profile acceleration |
| RWwn0F | | |
| RWwn10 | 6084 | Profile deceleration |
| RWwn11 | | |
| RWwn12 | 6087 | Torque slope |
| RWwn13 | | |
| RWwn14 | 60E0 | Positive torque limit value |
| RWwn15 | 60E1 | Negative torque limit value |
| RWwn16 | — | — |
| RWwn17 | 60B8 | Touch probe function |
| RWwn18 | 60F2 | Positioning option code |
| RWwn19 | 2D05 | Control DI 5 |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.

• RWrn mapping (mode 2)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number ^{*1} | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | — | — |
| RWrn02 | 6041 | Statusword |
| RWrn03 | 6064 | Position actual value |
| RWrn04 | | |
| RWrn05 | 606C | Velocity actual value |
| RWrn06 | | |
| RWrn07 | 60F4 | Following error actual value |
| RWrn08 | | |
| RWrn09 | 6077 | Torque actual value |
| RWrn0A | 2D11 | Status DO 1 |
| RWrn0B | 2D12 | Status DO 2 |
| RWrn0C | 2D13 | Status DO 3 |
| RWrn0D | 2A42 | Current alarm 2 |
| RWrn0E | 60B9 | Touch probe status |
| RWrn0F | 60BA | Touch probe 1 positive edge |
| RWrn10 | | |
| RWrn11 | 60BB | Touch probe 1 negative edge |
| RWrn12 | | |
| RWrn13 | — | — |
| RWrn14 | — | — |
| RWrn15 | — | — |
| RWrn16 | — | — |
| RWrn17 | — | — |
| RWrn18 | — | — |
| RWrn19 | — | — |
| RWrn1A | — | — |
| RWrn1B | — | — |
| RWrn1C | — | — |
| RWrn1D | — | — |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

- RWwn mapping (mode 3)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-----------------------------|
| Device number ^{*1} | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 607A | Target position |
| RWwn06 | | |
| RWwn07 | 60FF | Target velocity |
| RWwn08 | | |
| RWwn09 | 2D20 | Velocity limit value |
| RWwn0A | | |
| RWwn0B | 6071 | Target torque |
| RWwn0C | 6081 | Profile velocity |
| RWwn0D | | |
| RWwn0E | 6083 | Profile acceleration |
| RWwn0F | | |
| RWwn10 | 6084 | Profile deceleration |
| RWwn11 | | |
| RWwn12 | 6087 | Torque slope |
| RWwn13 | | |
| RWwn14 | 60E0 | Positive torque limit value |
| RWwn15 | 60E1 | Negative torque limit value |
| RWwn16 | — | — |
| RWwn17 | 60B8 | Touch probe function |
| RWwn18 | 60F2 | Positioning option code |
| RWwn19 | 2D05 | Control DI 5 |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.

• RWrn mapping (mode 3)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number ^{*1} | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | — | — |
| RWrn02 | 6041 | Statusword |
| RWrn03 | 6064 | Position actual value |
| RWrn04 | | |
| RWrn05 | 606C | Velocity actual value |
| RWrn06 | | |
| RWrn07 | 60F4 | Following error actual value |
| RWrn08 | | |
| RWrn09 | 6077 | Torque actual value |
| RWrn0A | 2D11 | Status DO 1 |
| RWrn0B | 2D12 | Status DO 2 |
| RWrn0C | 2D13 | Status DO 3 |
| RWrn0D | 2A42 | Current alarm 2 |
| RWrn0E | 60B9 | Touch probe status |
| RWrn0F | 60BA | Touch probe 1 positive edge |
| RWrn10 | | |
| RWrn11 | 60BB | Touch probe 1 negative edge |
| RWrn12 | | |
| RWrn13 | 60FD | Digital inputs |
| RWrn14 | | |
| RWrn15 | — | — |
| RWrn16 | — | — |
| RWrn17 | — | — |
| RWrn18 | — | — |
| RWrn19 | — | — |
| RWrn1A | — | — |
| RWrn1B | — | — |
| RWrn1C | — | — |
| RWrn1D | — | — |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

■ Positioning mode (point table method)

This is the PDO mapping when [Pr. PA01.0] is "6" (positioning mode (point table method)).

- RWwn mapping (mode 1)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-------------------------|
| Device number *1 | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 2D60 | Target point table |
| RWwn06 | 6081 | Profile velocity |
| RWwn07 | | |
| RWwn08 | 6083 | Profile acceleration |
| RWwn09 | | |
| RWwn0A | 6084 | Profile deceleration |
| RWwn0B | | |
| RWwn0C | 60B8 | Touch probe function |
| RWwn0D | — | — |
| RWwn0E | 60F2 | Positioning option code |
| RWwn0F | — | — |
| RWwn10 | — | — |
| RWwn11 | — | — |
| RWwn12 | — | — |
| RWwn13 | — | — |
| RWwn14 | — | — |
| RWwn15 | — | — |
| RWwn16 | — | — |
| RWwn17 | — | — |
| RWwn18 | — | — |
| RWwn19 | — | — |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.

• RWrn mapping (mode 1)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number *1 | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | 6041 | Statusword |
| RWrn02 | 2D11 | Status DO 1 |
| RWrn03 | 2D12 | Status DO 2 |
| RWrn04 | 2D13 | Status DO 3 |
| RWrn05 | 2D15 | Status DO 5 |
| RWrn06 | 2D17 | Status DO 7 |
| RWrn07 | — | — |
| RWrn08 | 6064 | Position actual value |
| RWrn09 | | |
| RWrn0A | 606C | Velocity actual value |
| RWrn0B | | |
| RWrn0C | 60F4 | Following error actual value |
| RWrn0D | | |
| RWrn0E | 6077 | Torque actual value |
| RWrn0F | 2D6A | M code actual value |
| RWrn10 | 2D68 | Point demand value |
| RWrn11 | 2D69 | Point actual value |
| RWrn12 | 2A41 | Current alarm |
| RWrn13 | | |
| RWrn14 | 60B9 | Touch probe status |
| RWrn15 | — | — |
| RWrn16 | 60BA | Touch probe 1 positive edge |
| RWrn17 | | |
| RWrn18 | 60BB | Touch probe 1 negative edge |
| RWrn19 | | |
| RWrn1A | 60BC | Touch probe 2 positive edge |
| RWrn1B | | |
| RWrn1C | 60BD | Touch probe 2 negative edge |
| RWrn1D | | |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

- RWwn mapping (mode 2)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-------------------------|
| Device number ^{*1} | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 2D60 | Target point table |
| RWwn06 | 6081 | Profile velocity |
| RWwn07 | | |
| RWwn08 | 6083 | Profile acceleration |
| RWwn09 | | |
| RWwn0A | 6084 | Profile deceleration |
| RWwn0B | | |
| RWwn0C | 60B8 | Touch probe function |
| RWwn0D | — | — |
| RWwn0E | — | — |
| RWwn0F | — | — |
| RWwn10 | 60F2 | Positioning option code |
| RWwn11 | — | — |
| RWwn12 | — | — |
| RWwn13 | — | — |
| RWwn14 | — | — |
| RWwn15 | — | — |
| RWwn16 | — | — |
| RWwn17 | — | — |
| RWwn18 | — | — |
| RWwn19 | — | — |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.

- RWrn mapping (mode 2)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number *1 | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | 6041 | Statusword |
| RWrn02 | 6064 | Position actual value |
| RWrn03 | | |
| RWrn04 | 606C | Velocity actual value |
| RWrn05 | | |
| RWrn06 | 60F4 | Following error actual value |
| RWrn07 | | |
| RWrn08 | 6077 | Torque actual value |
| RWrn09 | 2D11 | Status DO 1 |
| RWrn0A | 2D12 | Status DO 2 |
| RWrn0B | 2D13 | Status DO 3 |
| RWrn0C | 2D15 | Status DO 5 |
| RWrn0D | 2D17 | Status DO 7 |
| RWrn0E | 2D68 | Point demand value |
| RWrn0F | 2D69 | Point actual value |
| RWrn10 | 2D6A | M code actual value |
| RWrn11 | 2A42 | Current alarm 2 |
| RWrn12 | 60B9 | Touch probe status |
| RWrn13 | 60BA | Touch probe 1 positive edge |
| RWrn14 | | |
| RWrn15 | 60BB | Touch probe 1 negative edge |
| RWrn16 | | |
| RWrn17 | — | — |
| RWrn18 | — | — |
| RWrn19 | — | — |
| RWrn1A | — | — |
| RWrn1B | — | — |
| RWrn1C | — | — |
| RWrn1D | — | — |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

- RWwn mapping (mode 3)

| Master station → Servo amplifier (RWwn) | | |
|---|-------|-------------------------|
| Device number ^{*1} | Index | Device name |
| RWwn00 | 6060 | Modes of operation |
| RWwn01 | 6040 | Controlword |
| RWwn02 | 2D01 | Control DI 1 |
| RWwn03 | 2D02 | Control DI 2 |
| RWwn04 | 2D03 | Control DI 3 |
| RWwn05 | 2D60 | Target point table |
| RWwn06 | 6081 | Profile velocity |
| RWwn07 | | |
| RWwn08 | 6083 | Profile acceleration |
| RWwn09 | | |
| RWwn0A | 6084 | Profile deceleration |
| RWwn0B | | |
| RWwn0C | 60B8 | Touch probe function |
| RWwn0D | — | — |
| RWwn0E | — | — |
| RWwn0F | — | — |
| RWwn10 | 60F2 | Positioning option code |
| RWwn11 | — | — |
| RWwn12 | — | — |
| RWwn13 | — | — |
| RWwn14 | — | — |
| RWwn15 | — | — |
| RWwn16 | — | — |
| RWwn17 | — | — |
| RWwn18 | — | — |
| RWwn19 | — | — |
| RWwn1A | — | — |
| RWwn1B | — | — |
| RWwn1C | — | — |
| RWwn1D | — | — |
| RWwn1E | — | — |
| RWwn1F | — | — |

*1 "n" is a value determined by the station No. setting.


- RWrn mapping (mode 3)

| Servo amplifier → Master station (RWrn) | | |
|---|-------|------------------------------|
| Device number ^{*1} | Index | Device name |
| RWrn00 | 6061 | Modes of operation display |
| RWrn01 | 6041 | Statusword |
| RWrn02 | 6064 | Position actual value |
| RWrn03 | | |
| RWrn04 | 606C | Velocity actual value |
| RWrn05 | | |
| RWrn06 | 60F4 | Following error actual value |
| RWrn07 | | |
| RWrn08 | 6077 | Torque actual value |
| RWrn09 | 2D11 | Status DO 1 |
| RWrn0A | 2D12 | Status DO 2 |
| RWrn0B | 2D13 | Status DO 3 |
| RWrn0C | 2D15 | Status DO 5 |
| RWrn0D | 2D17 | Status DO 7 |
| RWrn0E | 2D68 | Point demand value |
| RWrn0F | 2D69 | Point actual value |
| RWrn10 | 2D6A | M code actual value |
| RWrn11 | 2A42 | Current alarm 2 |
| RWrn12 | 60B9 | Touch probe status |
| RWrn13 | 60BA | Touch probe 1 positive edge |
| RWrn14 | | |
| RWrn15 | 60BB | Touch probe 1 negative edge |
| RWrn16 | | |
| RWrn17 | 60FD | Digital inputs |
| RWrn18 | | |
| RWrn19 | — | — |
| RWrn1A | — | — |
| RWrn1B | — | — |
| RWrn1C | — | — |
| RWrn1D | — | — |
| RWrn1E | — | — |
| RWrn1F | — | — |

*1 "n" is a value determined by the station No. setting.

Variable PDO mapping function for PDO communication data



The servo amplifier supports the variable PDO mapping function, which can arrange desired objects in any array for the data sent and received with RPDO and TPDO. For the SDO end code, refer to "End code" below.

 Page 101 End code



The variable PDO mapping is as follows.

■Default mapping



- Network standard mode (mode 1)

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 12h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 13h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |

- Network standard mode (mode 2)

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 14h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 0Fh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |

- Network standard mode (mode 3)

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 14h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 10h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings.  Page 79 Network standard mode |

• Positioning mode (point table method) (mode 1)

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 0Dh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 18h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |

• Positioning mode (point table method) (mode 2)

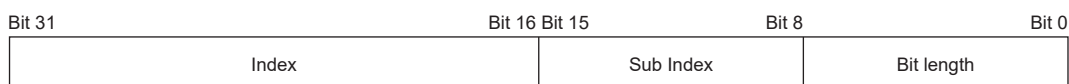
| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 0Eh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 14h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |

• Positioning mode (point table method) (mode 3)

| Index | Sub | Object | Name | Data Type | Access | Default | Description |
|-------|---------|--------|-------------------------------------|-----------|--------|---------|---|
| 1600h | 0 | ARRAY | 1st Receive PDO Mapping | U8 | rw | 0Eh | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |
| 1A00h | 0 | ARRAY | 1st Transmit PDO Mapping | U8 | rw | 15h | Number of entries |
| | 1 to 32 | | Mapped Object 1 to Mapped Object 32 | U32 | rw | — | Refer to the following for default mappings. ☞ Page 85 Positioning mode (point table method) |

• Setting contents of PDO mapping objects

The setting contents of PDO mapping objects (Sub Index 1 or later) are as follows.



Bit 0 to Bit 7: Bit length of the object to be mapped

Bit 8 to Bit 15: Sub Index of the object to be mapped

Bit 16 to Bit 31: Index of the object to be mapped

If placing [Modes of operation (Obj. 6060h: 00h)] (bit length 8) at the start address of [1st Receive PDO Mapping (Obj. 1600h)], set "60600008h" to [Mapped Object 001 (Obj. 1600h: 01h)].

■PDO mapping setting procedure

The PDO mapping can be changed by using the PDO mapping object.

- How to use PDO mapping objects

The usage is shown using [1st Receive PDO Mapping (Obj. 1600h)] and [1st Transmit PDO Mapping (Obj. 1A00h)] as examples.

Use SLMP to send the PDO mapping to the servo amplifier.

Point

The PDO mapping for response message can be set when CC-Link IE Field Network Basic communication is stopped (RX (n + 3) F is "0").

Follow these procedures to change the PDO mapping.

- 1.** Stop CC-Link IE Field Network Basic communication.
Set RY (n + 3) F to "0" (turn off the cyclic communication ready command).
- 2.** Initialize the number of PDO mapping configurations with SLMP.
[Mapped Object 000 (Obj. 1600h: 00h)] = 0 (number of configurations = 0)
[Mapped Object 000 (Obj. 1A00h: 00h)] = 0 (number of configurations = 0)
- 3.** Set PDO mapping with SLMP.
[Mapped Object 001 (Obj. 1600h: 01h)] - [Mapped Object 032 (Obj. 1600h: 20h)]
[Mapped Object 001 (Obj. 1A00h: 01h)] - [Mapped Object 032 (Obj. 1A00h: 20h)]
- 4.** Set the number of PDO mapping configurations with SLMP.
[Mapped Object 000 (Obj. 1600h: 00h)] = n (number of configurations = n)
[Mapped Object 000 (Obj. 1A00h: 00h)] = n (number of configurations = n)
- 5.** Start CC-Link IE Field Network Basic communication.
Set RY (n + 3) F to "1" (turn on the cyclic communication ready command).

Objects that require PDO mapping

- Objects that require RPDO mapping, categorized by control mode and function

⊙: PDO mapping required ○: PDO mapping recommended —: PDO mapping not required

| Object name (Index) | Mode | | | | | |
|--|------|-----|-----|-----|-----|-----|
| | pp | pv | tq | hm | pt | jg |
| [Controlword (Obj. 6040h)] | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| [Control DI 1 (Obj. 2D01h)] | ○ | ○ | — | —*1 | ○ | ○ |
| [Control DI 2 (Obj. 2D02h)] | ○ | — | — | ○ | ○ | ○ |
| [Control DI 3 (Obj. 2D03h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Touch probe function (Obj. 60B8h)] *3 | —*2 | —*2 | —*2 | —*2 | —*2 | —*2 |
| [Target position (Obj. 607Ah)] | ⊙ | — | — | — | — | — |
| [Target velocity (Obj. 60FFh)] | — | ⊙ | — | — | — | — |
| [Target torque (Obj. 6071h)] | — | — | ⊙ | — | — | — |
| [Profile velocity (Obj. 6081h)] | ○ | — | — | — | — | ○ |
| [Profile acceleration (Obj. 6083h)] | ○ | ○ | — | — | — | ○ |
| [Profile deceleration (Obj. 6084h)] | ○ | ○ | — | — | — | ○ |
| [Torque slope (Obj. 6087h)] | — | — | ○ | — | — | — |
| [Velocity limit value (Obj. 2D20h)] | — | — | ○ | — | — | — |
| [Positive torque limit value (Obj. 60E0h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Negative torque limit value (Obj. 60E1h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Target point table (Obj. 2D60h)] | — | — | — | — | ⊙ | — |

*1 It is "○" when the positioning mode (point table method) is used.

*2 It is "⊙" when the touch probe function is used.

*3 Available on servo amplifiers with firmware version C4 or later.

- Objects that require TPDO mapping, categorized by control mode and function

⊙: PDO mapping required ○: PDO mapping recommended —: PDO mapping not required

| Object name (Index) | Mode | | | | | |
|---|------|-----|-----|-----|-----|-----|
| | pp | pv | tq | hm | pt | jg |
| [Statusword (Obj. 6041h)] | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ | ⊙ |
| [Status DO 1 (Obj. 2D11h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 2 (Obj. 2D12h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 3 (Obj. 2D13h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Status DO 5 (Obj. 2D15h)] | — | — | — | —*1 | ○ | ○ |
| [Status DO 7 (Obj. 2D17h)] | — | — | — | — | ○ | ○ |
| [Touch probe status (Obj. 60B9h)] *5 | —*3 | —*3 | —*3 | —*3 | —*3 | —*3 |
| [Position actual value (Obj. 6064h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Velocity actual value (Obj. 606Ch)] | ○ | ○ | ○ | ○*2 | ○ | ○ |
| [Following error actual value (Obj. 60F4h)] | ○ | — | — | — | ○ | ○ |
| [Torque actual value (Obj. 6077h)] | ○ | ○ | ○ | ○ | ○ | ○ |
| [Digital Inputs (Obj. 60FDh)] | — | — | — | — | ○ | ○ |
| [Touch probe 1 positive edge (Obj. 60BAh)] *5 | —*4 | —*4 | —*4 | —*4 | —*4 | —*4 |
| [Touch probe 1 negative edge (Obj. 60BBh)] *5 | —*4 | —*4 | —*4 | —*4 | —*4 | —*4 |
| [Touch probe 2 positive edge (Obj. 60BCh)] *5 | —*4 | —*4 | —*4 | —*4 | —*4 | —*4 |
| [Touch probe 2 negative edge (Obj. 60BDh)] *5 | —*4 | —*4 | —*4 | —*4 | —*4 | —*4 |
| [Point actual value (Obj. 2D69h)] | — | — | — | — | ○ | — |
| [M code actual value (Obj. 2D6Ah)] | — | — | — | — | ○ | — |
| [Point demand value (Obj. 2D68h)] | — | — | — | — | ○ | — |

*1 It is "○" when the positioning mode (point table method) is used.

*2 It is "—" when the positioning mode (point table method) is used.

*3 It is "⊙" when the touch probe function is used.

*4 It is "○" when the touch probe function is used.

*5 Available on servo amplifiers with firmware version C4 or later.

SLMP

Outline

Point

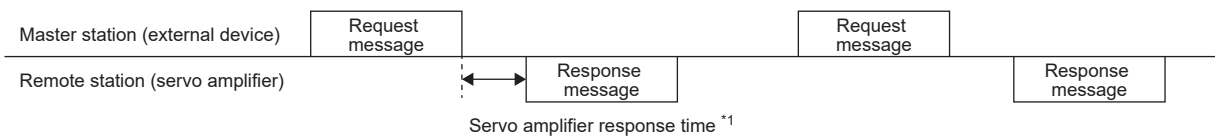
- When sending commands from multiple master stations to one servo amplifier, some commands may not be received if the command transmission interval is too short. If there is no command response, increase the command transmission interval.

SLMP (SeamLess Message Protocol) is a common protocol for seamless inter-application communication that does not consider network hierarchies and boundaries. SLMP communication is possible if the connection is made to an external device such as a programmable controller, personal computer, or display that can send and receive messages using the SLMP control procedure. Servo amplifiers only support binary codes. ASCII codes are not supported.

In SLMP, the command sent from the master station (external device) to the remote station (servo amplifier) is called a request message, and the command sent from the remote station (servo amplifier) to the master station (external device) is called a response message.

When a servo amplifier receives a request message, it returns the response message to the external device after the response time of the servo amplifier has passed.

The external device cannot send the next request message until the response message has been received.



*1 The servo amplifier response time varies depending on the command to be sent.

Message format

The request message sent from the master station (external device) and the response message returned from the remote station (servo amplifier) are sent in the following message format.

Request message format

The data length of request messages is 2047 bytes max.

| | | | | | | | | | | | |
|-----------------|-----------|------------|-----------|---------------------------------|---------------------------------|------------------------------------|--|---------------------|------------------|--------------|--------|
| Ethernet header | IP header | UDP header | SLMP | | | | | | | | Footer |
| | | | Subheader | Request destination network No. | Request destination station No. | Request destination module I/O No. | Request destination multi-drop station No. | Request data length | Monitoring timer | Request data | |

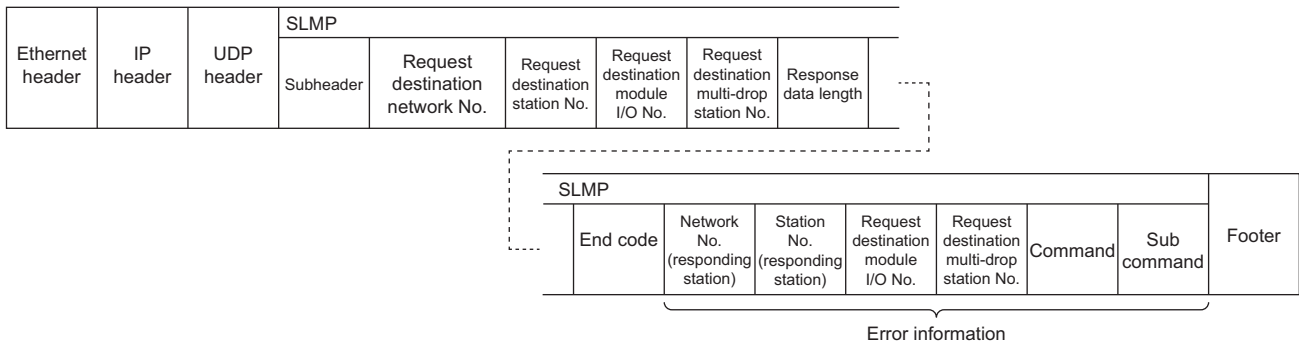
Response message format

There are two types of response messages, one for normal termination and one for abnormal termination. The data length of response messages is 2048 bytes max.

- At normal termination

| | | | | | | | | | | | |
|-----------------|-----------|------------|-----------|---------------------------------|---------------------------------|------------------------------------|--|----------------------|----------|---------------|--------|
| Ethernet header | IP header | UDP header | SLMP | | | | | | | | Footer |
| | | | Subheader | Request destination network No. | Request destination station No. | Request destination module I/O No. | Request destination multi-drop station No. | Response data length | End code | Response data | |

- At abnormal termination



SLMP command

The following commands can be used.

| Name | Command | Sub command | Description | Detailed explanation |
|---|---------|-------------|---|--|
| Read Object (Object read) | 4020h | 0001h | Reads the data specified by the object from the servo amplifier to the external device. | ☞ Page 97 Read Object (object read) |
| Write Object (Object writing) | | 0002h | Writes the data specified by the object from the external device to the servo amplifier. | ☞ Page 98 Write Object (object write) |
| Object SubID Read Block (Object Sub Index continuous read) | | 0005h | Reads the data of the continuous subcommand specified by the object from the servo amplifier to the external device. | ☞ Page 99 Object SubID Read Block (object sub-ID continuous read) |
| Object SubID Write Block (Object Sub Index continuous write) | | 0006h | Writes the data of the continuous subcommand specified by the object from the external device to the servo amplifier. | ☞ Page 100 Object SubID Write Block (object sub-ID continuous write) |
| NodeSearch | 0E30h | 0000h | Detects server devices in the network. | — |
| IPAddressSet | 0E31h | 0000h | Sets the IP addresses of the server devices in the network. | — |

■Read Object (object read)

This command returns the value of the object corresponding to Index and Sub Index specified by the master station (external device).

- Request message (after the command)

| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | L | H | — | — | L | H |
| 20h | 40h | 01h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at normal termination (after the end code))

| End code | | Index | | Sub Index | Reserved | Number of data value | | Read data |
|----------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | — | — | L | H | L variable H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

☞ Page 96 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|--|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0001h |
| Index | 2 bytes | Little | Specify Index of the object. (☞ MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. (☞ MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Read data: 00h (fixed) |
| Read data | Variable | Little | The return data of the object is stored. |

■Write Object (object write)

This command writes the specified value to the object corresponding to Index and Sub Index specified by the master station (external device).

- Request message (after the command)

| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | | Write data |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | L | H | — | — | L | H | L variable H |
| 20h | 40h | 02h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | |
|----------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | — | — | L | H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 96 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0002h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Write data: Specify the size in hexadecimal. (Unit: byte) |
| Write data | Variable | Little | Specify the write data of the object. |

■ Object SubID Read Block (object sub-ID continuous read)

When an object sub ID continuous read request is given by the master station (external device), the value of the object corresponding to the specified Index and the continuous Sub Index is returned.

- Request message (after the command)


| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | L | H | — | — | L | H |
| 20h | 40h | 05h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | | Read data |
|----------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | — | — | L | H | L variable H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 96 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0005h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Read data: Data size In the request message, it is 00h (fixed). |
| Read data | Variable | Little | The return data of the object is stored. |

■Object SubID Write Block (object sub-ID continuous write)

When an object sub-ID continuous write request is given by the master station (external device), the specified value is written to the object corresponding to the specified Index and the continuous Sub Index.

- Request message (after the command)

| Command | | Sub command | | Index | | Sub Index | Reserved | Number of data value | | Write data |
|---------|-----|-------------|-----|---|---|-----------|----------|----------------------|---|--------------|
| L | H | L | H | L | H | — | — | L | H | L variable H |
| 20h | 40h | 06h | 00h | Refer to "Item list" below for details. | | | | | | |

- Response message (at normal termination (after the end code))



| End code | | Index | | Sub Index | Reserved | Number of data value | |
|----------|-----|---|---|-----------|----------|----------------------|---|
| L | H | L | H | — | — | L | H |
| 00h | 00h | Refer to "Item list" below for details. | | | | | |

- Response message (at abnormal termination)

It is the same as "At abnormal termination" in the reference below.

 Page 96 Response message format

- Item list

| Item | Size | Endian | Description |
|----------------------|----------|--------|---|
| Command | 2 bytes | Little | 4020h |
| Sub command | 2 bytes | Little | 0006h |
| Index | 2 bytes | Little | Specify Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Sub Index | 1 byte | Little | Specify Sub Index of the object. ( MR-JET-G User's Manual (Object Dictionary)) The response message stores the value specified in the request message. |
| Reserved | 1 byte | — | 00h (fixed) |
| Number of data value | 2 bytes | Little | Write data: Specify the size in hexadecimal. (Unit: byte) |
| Write data | Variable | Little | Specify the write data of the object. |

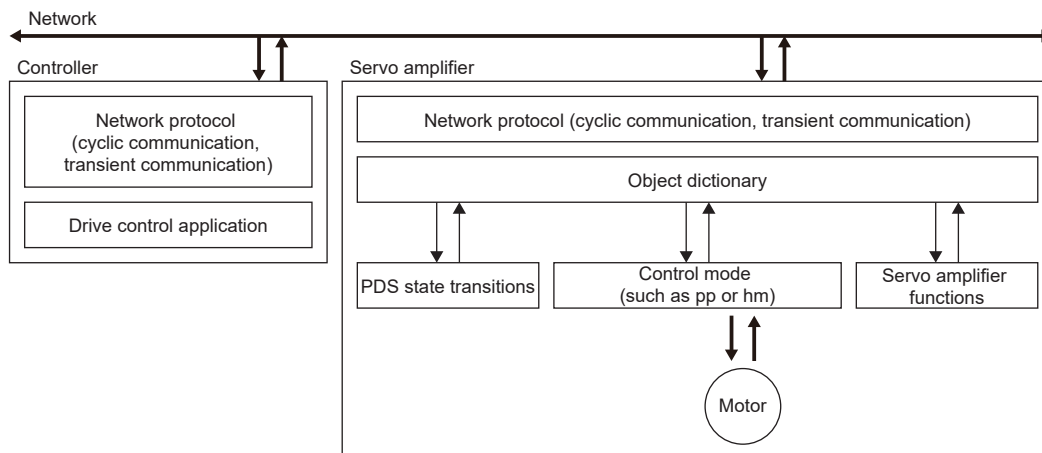
End code

The following shows end codes that are stored by the servo amplifier for SLMP.

| End code | Cause |
|----------|--|
| 0000h | The request was processed normally. |
| C059h | <ul style="list-style-type: none">• There is an error in the command or subcommand specification.• A command that is not prescribed is received. |
| C05Ch | There is an error in the request message. |
| C061h | The requested data length does not match the number of data. |
| CEE0h | The request cannot be processed because another request is in progress. |
| CEE1h | The requested message size has exceeded the processable range. |
| CEE2h | The response message size has exceeded the processable range. |
| CCCAh | A non-existent Index was specified. |
| CCD0h | The data size is different from the specified value. |
| CCD1h | The data size is larger than the specified value. |
| CCD2h | The data size is smaller than the specified value. |
| CCD3h | A non-existent Sub Index was specified. |
| CCC8h | Read operation was performed to a write only object. |
| CCC9h | <ul style="list-style-type: none">• Write operation was performed to a read only object.• The object is not read only for all AL states, but it was written to an object that cannot be written in the current AL state. |
| CCC7h | Write operation was performed to a response message mapped object. The following were written when the response message mapped object was not in the state where change is permitted. <ul style="list-style-type: none">• Anything other than "0" was written to Sub Index 0.• Write operation was performed to the corresponding Sub Index 1 to 32. |
| CCCBh | An object for which the response message mapping cannot be performed was written to the response message mapped object. |
| CCCCh | The total size of the response message mapped objects exceeds 64 bytes. |
| CCD4h | A value outside the parameter range was written. |
| CCD5h | A value larger than the parameter range was written. |
| CCD6h | A value smaller than the parameter range was written. |

Drive profile

This section explains the CiA 402 drive profile specification as well as the unique functions of servo amplifiers. Each function can be controlled by using the object dictionary via the network.

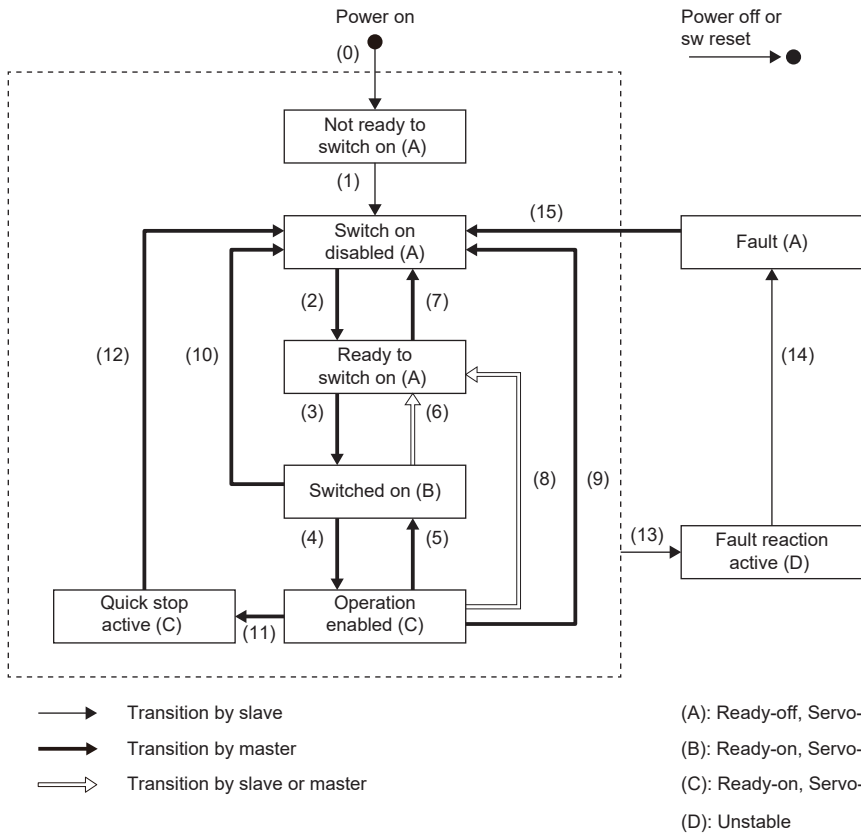


A list of drive profile specifications is as follows.

| Function name | Description | Reference |
|------------------------|--|-----------------------------------|
| Control mode | Control such as the position mode, speed mode, and torque mode | ☞ Page 119 Control mode |
| PDS state transitions | Control method until the servo motor starts to operate | ☞ Page 103 PDS state transitions |
| Controlword/Control DI | Control of each function | ☞ Page 106 Controlword/Control DI |
| Statusword/Status DO | Monitor of each function | ☞ Page 112 Statusword/Status DO |

PDS state transitions

The internal state of the servo amplifier is managed by the PDS state defined in the CiA 402 drive profile specification. The servo motor can be operated immediately after turning on the power supply by shifting from the "Not ready to switch on" state to the "Operation enabled" state with the predetermined procedure.



Events and PDS state transitions

Setting Controlword enables control of the state transitions.

After the PDO communication is established (after the AL state has reached "Operational"), the status is controlled by the master station transmitting commands (by setting Controlword) in accordance with the following table.

The following shows the PDS state transition events and operations.

| Transition No. | Event | Operation |
|----------------|--|---|
| (0) | Power supply is turned on | Initialization |
| (1) | Transitions automatically when the power supply is turned on | Communication setting |
| (2) | Transitions with the "Shutdown" command from the master station | None |
| (3) | Transitions with the "Switch On" command from the master station | The dynamic brake is released. |
| (4) | Transitions with the "Enable Operation" command from the master station | The operation becomes ready after servo-on. |
| (5) | Transitions with the "Disable Operation" command from the master station | The operation is disabled after servo-off. |
| (6) | Transitions with the "Shutdown" command from the master station | The dynamic brake operates. |
| (7) | Transitions with the "Disable Voltage" command or "Quick Stop" command from the master station | None |
| (8) | (A) Transitions with the "Shutdown" command from the master station (B) Transitions when the power supply is turned off | The operation is disabled after servo-off or dynamic braking. |
| (9) | Transitions with the "Disable Voltage" command from the master station | The operation is disabled after servo-off or dynamic braking. |
| (10) | Transitions with the "Disable Voltage" command or "Quick Stop" command from the master station | The dynamic brake operates. |
| (11) | (A) Transitions with the "Quick Stop" command from the master station (B) Transitions when the forced stop signal is turned off *1 | Quick Stop starts. |
| (12) | Transitions automatically after the completion of Quick Stop (when the value of [Quick stop option code (Obj. 605Ah)] is any of "1", "2", "3", or "4") | The operation is disabled after servo-off or dynamic braking. |
| (13) | Alarm occurrence | Processing against the alarm is executed. |
| (14) | Automatic transition | After the completion of the alarm occurrence processing, the operation is disabled by servo-off or the dynamic brake. |
| (15) | Transitions with the "Fault Reset" command from the master station | An alarm reset is performed. Resettable alarms are cleared. |

*1 This event occurs when "1" (Quick stop active) is selected in [Pr. PF29.1 State selection with forced stop in progress].

The following shows the related correspondence between the command bit setting and the PDS state. In order to avoid missing the command at the time of communication error, maintain the state of Bit 7 = 1 on the Fault Reset command for at least 10 ms when the communication cycle is 4 ms or less, or at least 20 ms when the communication cycle is 8 ms.

0: Off 1: On ×: Neither on/off has an influence on the process

| Command | Command Bit setting of Controlword | | | | | Transition No. |
|-------------------|------------------------------------|------------------------------|------------------------|----------------------------|-----------------------|----------------------|
| | Bit 7 Fault Reset | Bit 3 Enable Operation | Bit 2 Quick Stop | Bit 1 Enable Voltage | Bit 0 Switch On | |
| Shutdown | 0 | × | 1 | 1 | 0 | (2), (6), (8) |
| Switch On | 0 | 0 | 1 | 1 | 1 | (3) |
| Disable Voltage | 0 | × | × | 0 | × | (7), (9), (10), (12) |
| Quick Stop | 0 | × | 0 | 1 | × | (7), (10), (11) |
| Disable Operation | 0 | 0 | 1 | 1 | 1 | (5) |
| Enable Operation | 0 | 1 | 1 | 1 | 1 | (4), (16) |
| Fault Reset | 0 to 1 | × | × | × | × | (15) |

In order to transition from the "Switch on disabled" state to the "Operation enabled" state, it is necessary to give each command of the "Shutdown", "Switch On", and "Enable Operation" sequentially. However, it is also possible to transit directly from the ongoing state to the target state with one command.

| Current state | Command | Status after transition |
|--------------------|------------------|-------------------------|
| Switch on disabled | Switch On | Switched on |
| Switch on disabled | Enable Operation | Operation enabled |
| Ready to switch on | Enable Operation | Operation enabled |

Controlword/Control DI

By rewriting the Controlword and Control DI x objects from the master station, the PDS state can be switched and control instructions for various drive-provided functions can be given. [Controlword (Obj. 6040h)] is used for the control commands defined by CiA 402, and [Control DI 1 (Obj. 2D01h)] to [Control DI 10 (Obj. 2D0Ah)] are used for the control commands defined by Mitsubishi Electric.

The correspondence information of Control DI can be checked with [Supported Control DI (Obj. 2D00h)].

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|-------------------------|-----------|--------|--|
| 6040h | — | VAR | Controlword | U16 | rw | — |
| 2D00h | 0 | ARRAY | Supported Control DI | U8 | ro | Correspondence information of Control DI |
| 2D00h | 1 | ARRAY | Supported Control DI 1 | U16 | ro | Correspondence information for Control DI 1 When the signal is unsupported, the corresponding bit is "0". When the signal is supported, the corresponding bit is "1". When the signals corresponding to Control DI are Bit 4 and Bit 5, "0030h" is displayed. |
| : | | | | | | |
| 2D00h | 10 | ARRAY | Supported Control DI 10 | U16 | ro | Correspondence information for Control DI 10 |
| 2D01h | — | VAR | Control DI 1 | U16 | rw | Objects defined by Mitsubishi Electric |
| : | | | | | | |
| 2D0Ah | — | VAR | Control DI 10 | U16 | rw | Objects defined by Mitsubishi Electric |

Bit definition of Controlword


| Bit *1 | Symbol | Description | Reference |
|--------|--------|--|---|
| 0 | SO | Switch On | ☞ Page 104 Events and PDS state transitions |
| 1 | EV | Enable Voltage | |
| 2 | QS | Quick Stop | |
| 3 | EO | Enable Operation | |
| 4 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 5 | | | |
| 6 | | | |
| 7 | FR | Fault Reset | ☞ Page 104 Events and PDS state transitions |
| 8 | HALT | 0: Operation ready 1: Temporary stop | Refer to "Halt" in the following manual. 📖 MR-JET User's Manual (Function) |
| 9 | OMS | The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. 📖 MR-JET User's Manual (Function) |
| 10 | — | The value at reading is undefined. Set "0" when writing. | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Bit 0 to 3 and 7 are used for PDS state switching.

■ Bit definition of Control DI


With the communication function, reading the following objects enables reading of the on/off state of the input device. In addition, the input device can be set to on/off by writing to the following objects.

• Control DI 1

| Bit | Symbol | Description | Reference |
|-----|----------|--|---|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | C_CDP | Gain switching | Refer to "Signal (device) explanations" in the following manual.  MR-JET User's Manual (Hardware) |
| 5 | C_CLD *1 | Fully closed loop selection | |
| 6 | — | The value at reading is undefined. Set "0" when writing. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Available on servo amplifiers with firmware version C4 or later.

• Control DI 2

| Bit | Symbol | Description | Reference |
|-----|--------|--|--|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | C_PC | Proportional control | Refer to "Signal (device) explanation" in the following manual.  MR-JET User's Manual (Hardware) |
| 9 | — | The value at reading is undefined. Set "0" when writing. | |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | C_ORST | Operation alarm reset | — |

• Control DI 3

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 4

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |


• Control DI 5

| Bit | Symbol | Description | Reference |
|-----|--------|--|--|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | C_CDP2 | Gain switching 2 | Refer to "Signal (device) explanation" in the following manual. MR-JET User's Manual (Hardware) |
| 5 | — | The value at reading is undefined. Set "0" when writing. | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | C_FLS | Input of upper stroke limit | Refer to "Stroke limit function" in the following manual. MR-JET User's Manual (Function) |
| 10 | C_RLS | Input of lower stroke limit | |
| 11 | C_DOG | Proximity dog | Refer to "Signal (device) explanation" in the following manual. MR-JET User's Manual (Hardware) |
| 12 | — | The value at reading is undefined. Set "0" when writing. | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 6

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Control DI 7

| Bit | Symbol | Description | Reference |
|-----|----------|--|---|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | C_OVR *1 | Override selection | Refer to "Override function" in the following manual.  User's Manual (Function) |
| 8 | — | The value at reading is undefined. Set "0" when writing. | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 Available on servo amplifiers with firmware version D4 or later.

• Control DI 8

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Control DI 9

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

- Control DI 10

| Bit | Symbol | Description | Reference |
|-----|--------|--|-----------|
| 0 | — | The value at reading is undefined. Set "0" when writing. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

Statusword/Status DO

The Statusword objects and the Status DO x objects notify the master station of the PDS state and other drive states. States defined by CiA 402 are notified by using [Statusword (Obj. 6041h)], and other states defined by Mitsubishi Electric are notified by using [Status DO 1 (Obj. 2D11h)] to [Status DO 10 (Obj. 2D1Ah)].

| Index | Sub | Object | Name | Data Type | Access | Description |
|-------|-----|--------|--------------|-----------|--------|--|
| 6041h | — | VAR | Statusword | U16 | ro | — |
| 2D11h | — | VAR | Status DO 1 | U16 | ro | Objects defined by Mitsubishi Electric |
| : | | | | | | |
| 2D17h | — | VAR | Status DO 7 | U16 | ro | Objects defined by Mitsubishi Electric |
| 2D1Ah | — | VAR | Status DO 10 | U16 | ro | Objects defined by Mitsubishi Electric |

Bit definition of Statusword

| Bit | Symbol | Description | Reference |
|-----|--------|--|---|
| 0 | RTSO | Ready-to-switch-on | ☞ Page 104 Events and PDS state transitions |
| 1 | SO | Switch-on | |
| 2 | OE | Operation-enabled | |
| 3 | F | Fault | |
| 4 | VE | Voltage-enabled 0: The bus voltage is lower than the specified (RA) level. 1: The bus voltage is equal to or higher than the specified level. | — |
| 5 | QS | Quick stop 0: In a Quick stop 1: Not in a Quick stop (including in the test mode) | ☞ Page 104 Events and PDS state transitions |
| 6 | SOD | Switch on disabled | |
| 7 | W | Warning 0: No warning has occurred. 1: A warning has occurred. | — |
| 8 | — | Reserved The value at reading is undefined. | — |
| 9 | RM | Remote 0: When not following the Controlword command 1: Operating in accordance with the Controlword command | — |
| 10 | OMS | Target reached The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. ☞ MR-JET User's Manual (Function) |
| 11 | ILA | Internal limit active 0: The forward rotation stroke end, reverse rotation stroke end, and software position limit have not been reached. 1: The forward rotation stroke end, reverse rotation stroke end, or software position limit has been reached. (Enabled in pp, pv, hm, pt, or jg mode) | — |
| 12 | OMS | Operation Mode Specific The contents differ depending on the setting of [Modes of operation (Obj. 6060h)]. | Refer to "Control mode" in the following manual. ☞ MR-JET User's Manual (Function) |
| 13 | | | |
| 14 | — | Reserved | — |
| 15 | — | The value at reading is undefined. | — |

- State coding

Bit 0 to Bit 3, Bit 5, and Bit 6 are switched depending on the PDS state (servo amplifier internal state). Details are as follows:

| Statusword (bin) | PDS state |
|---------------------|--------------------------------------|
| x0xx xxx0 x0xx 0000 | Not ready to switch on ^{*1} |
| x0xx xxx0 x1xx 0000 | Switch on disabled |
| x0xx xxx0 x01x 0001 | Ready to switch on |
| x0xx xxx0 x01x 0011 | Switched on |
| x0xx xxx0 x01x 0111 | Operation enabled |
| x0xx xxx0 x00x 0111 | Quick stop active |
| x0xx xxx0 x0xx 1111 | Fault reaction active |
| x0xx xxx0 x0xx 1000 | Fault |

*1 Statusword is not sent when in the "Not ready to switch on" state.

■ Bit definition of Status DO

With the communication function, the on/off state of the output device can be checked by reading the following objects.

• Status DO 1

| Bit | Symbol | Description | Reference |
|-----|-----------|--|--|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | S_SA | Speed reached | Refer to "Signal (device) explanations" in the following manual. |
| 3 | S_MBR | Electromagnetic brake interlock | |
| 4 | S_CDPS | Variable gain enabled | IMR-JET User's Manual (Hardware) |
| 5 | S_CLDS *1 | Fully closed loop control in progress | |
| 6 | — | The value at reading is undefined. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | S_INP | In-position | Refer to "Signal (device) explanations" in the following manual. |
| 13 | S_TLC | Limiting torque | |
| 14 | S_ABSV | Absolute position erased 1: Absolute position is erased | IMR-JET User's Manual (Hardware) |
| 15 | S_BWNG | Battery warning | |

*1 Available on servo amplifiers with firmware version C4 or later.

• Status DO 2

| Bit | Symbol | Description | Reference |
|-----|---------|---|---|
| 0 | S_ZPASS | Z-phase already passed After the Z-phase is passed, S_ZPASS turns on. | — |
| 1 | — | The value at reading is undefined. | — |
| 2 | — | | — |
| 3 | S_ZSP | Zero speed detection | Refer to "Signal (device) explanation" in the following manual. IMR-JET User's Manual (Hardware) |
| 4 | S_VLC | Limiting speed | |
| 5 | — | The value at reading is undefined. | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | S_PC | Proportional control in progress S_PC is turned on under proportional control. | — |
| 9 | — | The value at reading is undefined. | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | S_ZP2 | Homing completion 2 When homing finishes successfully, S_ZP2 turns on. | — |

• Status DO 3

| Bit | Symbol | Description | Reference |
|-----|----------|---|---|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | S_STO *1 | In STO state S_STO turns on in STO state. | Refer to "Monitor signal (digital)" in the following manual. MR-JET User's Manual (Function) |
| 6 | — | The value at reading is undefined. | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | S_RSTP | During forced stop deceleration During forced stop deceleration, S_RSTP is on. | — |
| 10 | — | The value at reading is undefined. | — |
| 11 | S_MTTR | Tough drive in progress | Refer to "Tough drive function" in the following manual. MR-JET User's Manual (Function) |
| 12 | — | The value at reading is undefined. | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

*1 This function is available only on the MR-JET-G-HS.

• Status DO 4

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | — | |

• Status DO 5

| Bit | Symbol | Description | Reference |
|-----|---------|--|--|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | S_CDPS2 | Variable gain enabled 2 | Refer to "GAIN SWITCHING FUNCTION" in the following manual. MR-JET User's Manual (Adjustment) |
| 5 | S_CPO | Rough match When the command remaining distance is less than the value of the rough match output range set in [Pr. PT12], S_CPO is on. This is not output during base circuit shut-off. When the servo amplifier is switched to the servo-on state, S_CPO switches on. | — |
| 6 | S_MEND | Traveling completion If droop pulses are within the in-position output range set in [Pr. PA10] and the command remaining distance is "0", S_MEND turns on. S_MEND turns on at servo-on. S_MEND is off in the servo-off status. | — |
| 7 | — | The value at reading is undefined. | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 6

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 7

| Bit | Symbol | Description | Reference |
|-----|--------|---|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | S_POT | Position range When the actual current position is within the range set in [Pr. PT19] and [Pr. PT21], S_POT is on. When homing is not complete or base circuit shut-off is in progress, S_POT is off. | — |
| 3 | — | The value at reading is undefined. | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 8

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 9


| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

• Status DO 10

| Bit | Symbol | Description | Reference |
|-----|--------|------------------------------------|-----------|
| 0 | — | The value at reading is undefined. | — |
| 1 | — | | — |
| 2 | — | | — |
| 3 | — | | — |
| 4 | — | | — |
| 5 | — | | — |
| 6 | — | | — |
| 7 | — | | — |
| 8 | — | | — |
| 9 | — | | — |
| 10 | — | | — |
| 11 | — | | — |
| 12 | — | | — |
| 13 | — | | — |
| 14 | — | | — |
| 15 | — | | — |

Control mode

For the list of control modes, refer to the "Function explanation" in the following manual.

 MR-JET User's Manual (Function)

■ Selecting control mode (Modes of operation)


Specify a control mode with [Modes of operation (Obj. 6060h)]. [Modes of operation (Obj. 6060h)] can be rewritten with a PDO or an SDO. The available control modes are limited as follows depending on the setting value of [Pr. PT01.2].

○: Supported, —: Not supported

| [Pr. PA01.0] | [Pr. PT01.2] | pp | pv | tq | hm | kg | pt | 6061h Initial value |
|--------------|--------------|----|----|----|----|----|----|------------------------|
| 0 | 0 (mm) *1 | — | — | — | — | — | — | 8 (csp) |
| | 1 (inch) *1 | — | — | — | — | — | — | |
| | 2 (degree) | ○ | ○ | ○ | ○ | — | — | 1 (pp) |
| | 3 (pulse) | ○ | ○ | ○ | ○ | — | — | 8 (csp) |
| 6 | 0 (mm) | — | — | — | ○ | ○ | ○ | -101 (pt) |
| | 1 (inch) | — | — | — | ○ | ○ | ○ | |
| | 2 (degree) | — | — | — | ○ | ○ | ○ | |
| | 3 (pulse) | — | — | — | ○ | ○ | ○ | |

*1 Setting "0" or "1" in [Pr. PT01.2] triggers [AL. 037 Parameter error].

• Related objects

| Index | Sub Index | Object | Name | Data Type | Access | Default value | Description |
|-------|-----------|--------|----------------------------|-----------|--------|---------------|--|
| 6060h | 0 | VAR | Modes of operation | I8 | rw | 0h |  MR-JET-G User's Manual (Object Dictionary) |
| 6061h | 0 | VAR | Modes of operation display | I8 | ro | — | |
| 6502h | 0 | VAR | Supported drive mode | U32 | ro | 000003A0h | |

REVISIONS

*The manual number is given on the bottom left of the back cover.

| Revision date | *Manual number | Description |
|---------------|---------------------|---|
| November 2019 | IB(NA)-0300463ENG-A | First edition |
| July 2020 | IB(NA)-0300463ENG-B | <p>■The following functions are added: Profile mode, continuous operation to torque control mode</p> <p>■Edited: Section 1.3, Section 1.3, Section 2.1</p> |
| November 2020 | IB(NA)-0300463ENG-C | <p>■The following functions are added: Degree unit, communication speed of 100 Mbps, PDO mapping for the profile mode</p> <p>■Edited: Section 1.1, Section 1.2, Section 2.1</p> |
| March 2021 | IB(NA)-0300463ENG-D | <p>■The following function is added: Positioning mode (point table method)</p> <p>■Edited: Section 1.1, Section 2.1</p> |
| July 2021 | IB(NA)-0300463ENG-E | <p>■The following function is added: CC-Link IE Field Network Basic</p> <p>■Added/edited: Section 1.1, Section 1.2, Section 1.4, Chapter 2</p> |
| July 2022 | IB(NA)-0300463ENG-F | <p>■The following functions are added and changed: Fully closed loop system, touch probe, Quick Stop</p> <p>■Added/edited: Chapter 1, Section 2.4</p> |
| January 2023 | IB(NA)-0300463ENG-G | <p>■The following function is added and changed: Override function</p> <p>■Added/edited: Section 1.1, Section 1.3, Section 1.4, Section 2.4</p> |
| July 2023 | IB(NA)-0300463ENG-H | <p>■The following function is added: Ring topology</p> <p>■Edited: Section 1.1</p> |
| January 2024 | IB(NA)-0300463ENG-J | <p>■The following function is added: IP address setting function via the master station</p> <p>■Edited: Section 1.1, Section 1.2, Section 1.3, Section 1.4</p> |
| October 2024 | IB(NA)-0300463ENG-K | <p>■The following function is added: MR-JET_G_HS</p> <p>■Edited: Section 1.1, Section 1.2, Section 1.4, Section 2.4</p> |

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WARRANTY

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.

It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;

1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
2. a failure caused by any alteration, etc. to the Product made on your side without our approval
3. a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
6. a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
7. a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
8. any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

- (1) For the use of our AC Servo, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in AC Servo, and a backup or fail-safe function should operate on an external system to AC Servo when any failure or malfunction occurs.
- (2) Our AC Servo is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.
- (3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

TRADEMARKS

MELSERVO is a trademark or registered trademark of Mitsubishi Electric Corporation in Japan and/or other countries. All other product names and company names are trademarks or registered trademarks of their respective companies.

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MODEL:

MODEL CODE:

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5-CHOME, HIGASHI-KU, NAGOYA 461-8670, JAPAN

When exported from Japan, this manual does not require application to the
Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.

Compliance with the indicated global standards and regulations is current as of the release date of this manual.