



MECHATROLINK-I/II

Communication Command Specifications for Inverter



MECHATROLINK Members Association

Manual No. MMA TDEP 015A

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1 Introduction

This manual describes the specifications for commands used for the Inverter connected to MECHATROLINK.

2 Command Implementation Requirements

There are requirements that must be observed for command implementation as the Inverter. These are given in the following section.

2.1 Required Communication Specifications

The communication specifications of the Inverter being developed must meet the specifications given in the following table.

The supported number of transmission bytes, the transmission cycle, and the communication cycle must operate in any combination.

Additional specifications may be added to the specifications given in the following table.

| Number of Transmission Bytes | Communication mode | Transmission Cycle | Communication Cycle | M-I Mode |
|--|--|-------------------------------|---|----------|
| 17 bytes: Required 32 bytes: Required | 1. Synchronous: Required; Asynchronous: Required 2. Single transmission: Required; Consecutive transmission: Optional | 1.0, 2.0, and 4.0 Unit: ms | Transmission cycle × 1 (for synchronous communication) | Optional |

2.2 Required Command Specifications


1. It must be possible to use the required main commands regardless of the number of transfer bytes (i.e., 17 bytes or 32 bytes).
2. It must be possible to use the required commands with all supported transmission cycles.
3. It must be possible to use asynchronous commands for required commands with all supported communication modes.

3 Commands

3.1 Main Commands

Both 17-byte and 32-byte modes must be supported.

| Command Code (Hex) | Command Abbreviation | Command Name | Processing Type | Synchronization Type | Phase |
|--------------------|----------------------|---|-----------------|----------------------|--------------------|
| 00 | NOP | No Operation command | N | A | P2 and P3 |
| 01 | PRM_RD | Read Parameter command | D | A | P2 and P3 |
| 02 | PRM_WR | Write Parameter command | D | A | P2 and P3 |
| 03 | ID_RD | Read ID command | D | A | P2 and P3 |
| 04 | CONFIG | Setup Device command | C | A | P2 and P3 |
| 05 | ALM_RD | Read Alarm or Warning command | D | A | P2 and P3 |
| 06 | ALM_CLR | Clear Alarm or Warning command | C | A | P2 and P3 |
| 0D | SYNC_SET | Start Synchronous Communication command | N | A | P2 and P3 |
| 0E | CONNECT | Establish Connection command | N | A | P1 |
| 0F | DISCONNECT | Release Connection command | N | A | P1, P2, P3, and P4 |
| 1B | PPRM_RD | Read Stored Parameter command | D | A | P2 and P3 |
| 1C | PPRM_WR | Write Stored Parameter command | D | A | P2 and P3 |
| 40 | INV_CTL | Inverter Operation Control Command | C | A | P2 and P3 |

 Shaded commands require implementation.


* N, D, C, A, P1, P2, P3, and P4: Refer to Chapter 4.

3.2 Subcommands

The specified subcommands must be implemented for 32-byte mode.

Whether or not the subcommands can be used with each main command depends on the product specifications.

| Command Code (Hex) | Command Abbreviation | Command Name | Processing Type | Synchronization Type | Phase |
|--------------------|----------------------|-----------------------------------|-----------------|----------------------|-----------|
| 00 | NOP | No Operation subcommand | N | A | P2 and P3 |
| 01 | PRM_RD | Read Parameter subcommand | D | A | P2 and P3 |
| 02 | PRM_WR | Write Parameter subcommand | D | A | P2 and P3 |
| 05 | ALM_RD | Read Alarm or Warning subcommand | D | A | P2 and P3 |
| 1B | PPRM_RD | Read Stored Parameter subcommand | D | A | P2 and P3 |
| 1C | PPRM_WR | Write Stored Parameter subcommand | D | A | P2 and P3 |
| 41 | INV_I/O | Inverter I/O Control Command | C | A | P2 and P3 |

 Shaded subcommands require implementation.

* N, D, C, A, P2, and P3: Refer to Chapter 4.

4 Terminology

This section defines the terminology used in this manual.

4.1 Processing Type

MECHATROLINK commands are classified functionally into the following groups.

| Processing Type | Symbol | Description |
|-----------------------------|--------|--|
| Network commands | N | Commands used to manage networks. Includes commands to establish connections, synchronize communication, etc. |
| Data communication commands | D | Commands used to send and receive data. Includes commands that handle parameters, variables, and ID information. |
| Control commands | C | Commands that control device status. Includes commands to turn a Servo ON and OFF. |
| Motion commands | M | Commands used to control motion. |

4.2 Synchronization Type

MECHATROLINK commands include both synchronous and asynchronous commands.

Synchronous Commands (Type S):

For commands of this type, commands are sent and responses are received every communication cycle.

A response to a command that has been sent is received the next communication cycle.

The WDT (watchdog timer) in the frames are refreshed and checked every communication cycle.

Asynchronous Commands (Type A):

For commands of this type, commands are sent asynchronously to the communication cycle.

A response to a command that has been sent is not required the next communication cycle.

The WDT (watchdog timer) in the frames are not checked.

4.3 Communication Type (Command Processing Type)

MECHATROLINK communication includes both synchronous and asynchronous communication. Refer to the MECHATROLINK system user's manual for details.

Synchronous Communication:

For commands of this type, commands are sent and responses are received every communication cycle (see below).

Asynchronous Communication:

For commands of this type, commands are sent without synchronizing to the communication cycle in the event driven.

Command/response communication is synchronous with the transmission cycle.

Transmission Cycle

The transmission cycle is the cycle in the MAC (media access control) layer. It is the communication cycle for physically sending the data to the transmission path.

Communication Cycle

The communication cycle is the cycle in the application layer. The communication cycle is set to an integral multiple of the transmission cycle.

With synchronous communication, commands are sent and responses are received synchronized with the communication cycle.

4.4 Phases

MECHATROLINK communication is separated into the following phases. Refer to the MECHATROLINK system user's manual for details.

| Phase | Abbreviation | Description |
|-------|--------------|--|
| 0 | P0 | Power supply turned ON. P1 entered immediately. |
| 1 | P1 | Waiting to establish Connection |
| 2 | P2 | Asynchronous communication enabled. Only asynchronous commands can be used. |
| 3 | P3 | Synchronous communication enabled. Synchronous commands and asynchronous commands can be used. |
| 4 | P4 | Communication stopped. Connection released. |
| 5 | P5 | Power supply turned OFF. |

5 MECHATROLINK-II Command Specifications

5.1 Main Command Specifications

This chapter describes the details of the data formats of MECHATROLINK-II commands.

5.1.1 No Operation Command (NOP: 00 Hex)

| | |
|---|--|
| No Operation command (NOP: 00 Hex) | No Operation command. Nothing is performed. This command is used for network management. The slave station will return the current status (ALARM and STATUS) as the response. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = NOP and STATUS.CMDRDY = 1. |
| Command classification | Device group: Common command group Function group: Network command group Synchronization type: Asynchronous command |

NOP Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 1 | NOP (00 Hex) | NOP (00 Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | 0 | 0 | |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | See <i>Note 1</i> . |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

Note: 1. WDT and RWDT

| | | | | | |
|------|---|----|--|----|---|
| | D7 | D4 | D3 | D0 | |
| WDT | SN: Copy of RSN in RWDT | | MN: Incremented by 1 every communication cycle | | MN: Master station watchdog timer count |
| | D7 | D4 | D3 | D0 | |
| RWDT | RSN: Incremented by 1 every communication cycle | | RMN: Copy of MN in WDT | | RSN: Slave station watchdog timer count |

The watchdog timer is checked after a synchronous communication has been established.

The watchdog timer can be updated even if a synchronous communication has not been established.

5.1.2 Read Parameter Command (PRM_RD: 01 Hex)

| | |
|---|--|
| Read Parameter command (PRM_RD: 01 Hex) | Reads out the parameter number and data size of the Inverter. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = PRM_RD, STATUS.CMDRDY = 1, NO and SIZE. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PRM_RD Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 1 | PRM_RD (01 Hex) | PRM_RD (01 Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | NO | NO | Parameter number The Vendor defined parameter starts from 2001 Hex. |
| 6 | | | |
| 7 | SIZE | SIZE | The parameter data size in bytes. |
| 8 | 0 | PARAMETER | Parameter data |
| 9 | 0 | | |
| 10 | 0 | | |
| 11 | 0 | | |
| 12 | 0 | | |
| 13 | 0 | | |
| 14 | 0 | | |
| 15 | 0 | | |
| 16 | WDT | RWDT | Refer to NOP. |

5.1.3 Write Parameter Command (PRM_WR: 02 Hex)

| | |
|--|--|
| Write Parameter command (PRM_WR: 02 Hex) | Writes the parameter number, data size, and parameter data of the Inverter. If the system must be set up again to enable the written parameter, send the CONFIG command after writing the parameter. The command will be ignored and not executed, and an ALARM code will be returned if the command parameter number (NO), size (SIZE), or parameter data (PARAMETER) is out of range. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = PRM_WR, STATUS.CMDRDY = 1, NO, SIZE, and DATA. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PRM_WR Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 1 | PRM_WR (02 Hex) | PRM_WR (02 Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | NO | NO | Parameter number |
| 6 | | | The Vendor defined parameter starts from 2001 Hex. |
| 7 | SIZE | SIZE | The parameter data size in bytes. |
| 8 | PARAMETER | PARAMETER | Parameter data. |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | WDT | RWDT | Refer to NOP. |

5.1.4 Read ID Command (ID_RD: 03 Hex)

| | |
|---|---|
| Read ID command (ID_RD: 03 Hex) | Reads out the device ID. This command reads product information as ID data. Details of the ID data are specified with the DEVICE_CODE. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = ID_RD, STATUS.CMDRDY = 1, DEVICE_CODE, OFFSET, and SIZE. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

ID_RD Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 1 | ID_RD (03 Hex) | ID_RD (03 Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | DEVICE_CODE | DEVICE_CODE | Specifies the device code. |
| 6 | OFFSET | OFFSET | Indicates where to start reading the device code specified. |
| 7 | SIZE | SIZE | Number of bytes to be read (Max. 8 bytes) |
| 8 | 0 | ID | See <i>Note 1</i> . |
| 9 | 0 | | |
| 10 | 0 | | |
| 11 | 0 | | |
| 12 | 0 | | |
| 13 | 0 | | |
| 14 | 0 | | |
| 15 | 0 | | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

Note: 1. ID Definitions

Product Model: Device Code = 00 Hex

This ID information must be implemented.

Data size: 32 characters, Data end delimiter: Null code (00)

Example: CIMR-G7 27P5

| | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| OFFSET | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| ASCII | C | I | M | R | - | G | 7 | | 2 | 7 | P | 5 | 00 | | | |
| OFFSET | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F |
| ASCII | | | | | | | | | | | | | | | | |

Manufacturer's Serial Number: Device Code = 01 Hex

Implementation of this ID information is optional.

Data size: 32 characters, Data end delimiter: Null code (00)

Data format: Optional (ASCII/Binary). If Inverter support this device code, manufacturer's serial numbers must be specified in product specifications or manuals.

| | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| OFFSET | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| ASCII/BINARY | 00 | | | | | | | | | | | | | | | |
| OFFSET | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F |
| ASCII/BINARY | | | | | | | | | | | | | | | | |

Version: Device Code = 02 Hex

Implementation of this ID information is optional.

Data size: 32 characters, Data end delimiter: Null code (00)

Data format: Optional (ASCII/Binary) If Inverter support this device code, version must be specified in product specifications or manuals.

| | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| OFFSET | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| ASCII/BINARY | 00 | | | | | | | | | | | | | | | |
| OFFSET | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F |
| ASCII/BINARY | | | | | | | | | | | | | | | | |

Vendor Code: Device Code = 0F Hex

This ID information must be implemented.

Data size: 48 characters

VendorID is binary data (2 byte).

Vendor name is ASCII code (Max 32 bytes).

Data end delimiter: Null code (00)

Example: Vendor code = 0001, Vendor name = YASKAWA

| | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|
| OFFSET | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F | Vendor ID |
| BINARY | 01 | 00 | | | | | | | | | | | | | | | |
| OFFSET | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F | Vendor name |
| ASCII | Y | A | S | K | A | W | A | 00 | | | | | | | | | |
| OFFSET | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 2A | 2B | 2C | 2D | 2E | 2F | |
| ASCII | | | | | | | | | | | | | | | | | |

5.1.5 Setup Device Command (CONFIG: 04 Hex)

| | |
|--|---|
| Setup Device command (CONFIG: 04 Hex) | Enables the current parameter settings. Send this command after changing parameters with the PRM_WR command. Depending on the product specifications of the slave station, this command may or may not be necessary. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = CONFIG and STATUS.CMDRDY = 1, and CONFIG_MOD. |
| Command classification | Device group: Common command group Function group: Control command group Synchronization type: Asynchronous command |

CONFIG Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 1 | CONFIG (04 Hex) | CONFIG (04 Hex) | |
| 2 | 0 | ALARM | See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | CONFIG_MOD | CONFIG_MOD | 0: Enable the setting. 1: Enable the setting and stores EEPROM. Use of 1 depends on the product specification. |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

5.1.6 Read Alarm or Warning Command (ALM_RD: 05 Hex)

| | |
|--|---|
| Read Alarm or Warning command (ALM_RD: 05 Hex) | Requests to read out the alarm and warning code. This command reads out the current alarm and warning status using alarm and warning codes. Some codes are the same as for ALARM in byte 2. The alarm history depends on the product specifications of the slave station. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = ALM_RD and STATUS.CMDRDY = 1. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

ALM_RD Data Formats

| Byte | Command | Response | Remarks | |
|------|-----------------|-----------------|--|---|
| 1 | ALM_RD (05 Hex) | ALM_RD (05 Hex) | | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . | |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . | |
| 4 | 0 | | | |
| 5 | ALM_RD_MODE | ALM_RD_MODE | 0 | Read the current alarm or warning code. |
| | | | 1 | Read the alarm history. |
| 6 | 0 | ALM_DATA | 10 records maximum Whether the fault history can be used depends on the product specification of the slave station. | |
| 7 | 0 | | Whether warnings are saved in the alarm history depends on the product specifications of the slave station. | |
| 8 | 0 | | | |
| 9 | 0 | | | |
| 10 | 0 | | | |
| 11 | 0 | | | |
| 12 | 0 | | | |
| 13 | 0 | | | |
| 14 | 0 | | | |
| 15 | 0 | | | |
| 16 | WDT | RWDT | Refer to NOP. | |

5.1.7 Clear Alarm or Warning Command (ALM_CLR: 06 Hex)

| | |
|--|---|
| Clear Alarm or Warning command (ALM_CLR: 06 Hex) | Clears the alarm and warning status from the slave station. This command only clears status from the slave station and does not clear the cause of alarms and warnings. Use this command to clear alarm or warning status only after removing the cause of the alarm or warning. The alarm history depends on the product specifications of the slave station. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = ALM_CLR and STATUS.CMDRDY = 1. |
| Command classification | Device group: Common command group Function group: Control command group Synchronization type: Asynchronous command |

ALM_CLR Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|------------------|--|
| 1 | ALM_CLR (06 Hex) | ALM_CLR (06 Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | ALM_CLR_MOD | ALM_CLR_MOD | 0 Clear the current alarm or warning status. |
| | | | 1 Clear the alarm history. (Option) |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |

Note: Whether the alarm of the Inverter can be reset depends on the product specification.

The product specification should be described in the manual of the Inverter.

5.1.8 Start Synchronous Communication Command (SYNC_SET: 0D Hex)

| | |
|--|--|
| Start Synchronous Communication command (SYNC_SET: 0D Hex) | <p>Starts synchronous communication. (The phase will change from phase 2 (asynchronous communication) to phase 3 (synchronous communication).)</p> <p>Synchronous communication will be performed after processing has been completed using this command.</p> <p>C1 master station will hold this command until command processing has been completed (i.e., until a synchronous communication is established with the slave station).</p> <p>The slave station will confirm a change (+1) in the watchdog timer (WDT) and then establish a synchronization communication.</p> <p>Watchdog timer monitoring will start after the command has been completed.</p> |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = SYNC_SET and STATUS.CMDRDY = 1. |
| Command classification | <p>Device group: Common command group</p> <p>Function group: Network command group</p> <p>Synchronization type: Asynchronous command</p> |

SYNC_SET Data Formats

| Byte | Command | Response | Remarks |
|------|-------------------|-------------------|--|
| 1 | SYNC_SET (0D Hex) | SYNC_SET (0D Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | 0 | 0 | |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

5.1.9 Establish Connection Command (CONNECT: 0E Hex)

| | |
|--|--|
| <p>Establish Connection command (CONNECT: 0E Hex)</p> | <p>Requests to establish a MECHATROLINK connection. After completion of this command, phase 2 or 3 will be entered and communication will be enabled between the C1 master station and the slave station.</p> <p>This command also sets the communication mode (asynchronous/synchronous) and communication cycle.</p> <p>A connection is established between the C1 master station and the slave station.</p> |
| <p>Completion of the command operation (master processing)</p> | <p>The completion of the command execution is confirmed by the response byte 1 = CONNECT, STATUS.CMDRDY = 1, and setting data (VER, COM_MODE, and COM_TIME).</p> |
| <p>Command classification</p> | <p>Device group: Common command group Function group: Network command group Synchronization type: Asynchronous command</p> |

CONNECT Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|------------------|--|
| 1 | CONNECT (0E Hex) | CONNECT (0E Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | VER | VER | 21 Hex: MECHATROLINK-II, 10 Hex: MECHATROLINK-I |
| 6 | COM_MODE | COM_MODE | Refer to <i>Note 1</i> . |
| 7 | COM_TIME | COM_TIME | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

Note: 1.

<When the MECHATROLINK-II is used.>

■ COM_MODE

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------|----|----|----|-------|----|---------|----|
| SUBCMD | 0 | 0 | 0 | DTMOD | | SYNCMOD | 0 |

| | | | |
|---------|----------------------|----|---|
| SUBCMD | Subcommand Setting | 0 | Subcommand not used. |
| | | 1 | Subcommand used. |
| DTMOD | Communication Method | 00 | Single transmission |
| | | 01 | Consecutive transmission |
| SYNCMOD | Synchronization Mode | 0 | Performs asynchronous communication. The watchdog check is disabled. Synchronous commands cannot be used. |
| | | 1 | Performs synchronous communication. The watchdog check is enabled. Synchronous commands can be used. |

■ COM_TIME

Sets multiples of transmission cycle as the communication cycle.

Example: When the transmission cycle is 0.5 [ms] and the communication cycle is 2 [ms],

COM_TIME: $2/0.5 = 4$.

<When the MECHATROLINK-I is used.>

■ COM_MODE

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|----|----|----|----|-------|----|---------|-------|
| 0 | 0 | 0 | 0 | DTMOD | | SYNCMOD | EXMOD |

| | | | |
|---------|---|----|--|
| DTMOD | Communication Method | 00 | Single transmission |
| | | 01 | Consecutive transmission |
| SYNCMOD | Synchronization Mode | 0 | Performs asynchronous communication. The watchdog check is disabled. Synchronous commands cannot be used. |
| | | 1 | Performs synchronous communication. The watchdog check is enabled. Synchronous commands can be used. |
| EXMOD | Expansion / standard establish connection command | 0 | Standard type connection |
| | | 1 | Expansion type connection Disregards SYNCMOD = 1 (performing synchronous communication) to execute SYNCMOD=0 (performing asynchronous communication). |

■ COM_TIME

The unit of COM_TIME is 1=1 [msec] and the communication cycle is fixed to 2 [ms]; therefore, COM_TIME is set to a multiple of two.

For example, set COM_TIME to 2 and 4 when the communication cycle is 2 [ms] and 4 [ms], respectively.

5.1.10 Release Connection Command (DISCONNECT: 0F Hex)

| | |
|---|---|
| Release Connection command (DISCONNECT: 0F Hex) | <p>Requests to release a connection. The connection between the C1 master station and the slave station specified in the command is closed. This command takes priority over other command processing. Even if previously received commands are being processed, current command processing in the slave station will be stopped quickly and the connection will be released as soon as this command is sent. Then, moves to phase 1.</p> <p>To re-establish the connection, initializes settings including operation signal, clearing control references such as frequency setting, and same processing of the ALM_CLR.</p> <p>This command can be received in any phase. This command can be received despite the status of the CMDRDY of STATUS.</p> |
| Completion of the command operation (master processing) | <p>The completion confirmation is not required, however, the slave returns response. The master will send this command for at least two communication cycles.</p> <p>The completion of the command execution is confirmed by the response byte 1 = DISCONNECT and STATUS.CMDRDY = 1. Confirmation is not always necessary.</p> |
| Command classification | <p>Device group: Common command group</p> <p>Function group: Network command group</p> <p>Synchronization type: Asynchronous command</p> |

DISCONNECT Data Formats

| Byte | Command | Response | Remarks |
|------|---------------------|---------------------|--|
| 1 | DISCONNECT (0F Hex) | DISCONNECT (0F Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | 0 | 0 | |
| 6 | 0 | 0 | |
| 7 | 0 | 0 | |
| 8 | 0 | 0 | |
| 9 | 0 | 0 | |
| 10 | 0 | 0 | |
| 11 | 0 | 0 | |
| 12 | 0 | 0 | |
| 13 | 0 | 0 | |
| 14 | 0 | 0 | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

5.1.11 Read Stored Parameter Command (PPRM_RD: 1B Hex)

| | |
|--|--|
| Read Stored Parameter command (PPRM_RD: 1B Hex) | Reads out stored parameters in the retentive memory for the specified parameter number and data size of the Inverter. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = PPRM_RD, STATUS.CMDRDY = 1, NO, and SIZE. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PPRM_RD Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|------------------|--|
| 1 | PPRM_RD (1B Hex) | PPRM_RD (1B Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | NO | NO | Parameter number |
| 6 | | | Specifies the parameter to be read. |
| 7 | SIZE | SIZE | The parameter size in bytes |
| 8 | 0 | PARAMETER | Parameter data Refer to PPRM_RD. |
| 9 | 0 | | |
| 10 | 0 | | |
| 11 | 0 | | |
| 12 | 0 | | |
| 13 | 0 | | |
| 14 | 0 | | |
| 15 | 0 | | |
| 16 | WDT | RWDT | Refer to NOP. |

5.1.12 Write Stored Parameter Command (PPRM_WR: 1C Hex)

| | |
|---|---|
| Write Stored Parameter command (PPRM_WR: 1C Hex) | Writes stored parameters in the retentive memory for the specified parameter number, data size, and parameter data. Issues the CONFIG command to enable the written retentive memory. The command will be ignored and an ALARM code will be returned if the command parameter number (NO), size (SIZE), or parameter data (PARAMETER) is out of range. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = PPRM_WR, STATUS.CMDRDY = 1, NO, SIZE, and PARAMETER. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PPRM_WR Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|---|--|
| 1 | PPRM_WR (1C Hex) | PPRM_WR (1C Hex) | |
| 2 | 0 | ALARM | Alarm of the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | 0 | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | 0 | | |
| 5 | NO | NO | Parameter number The vendor defined parameter starts from 2001 Hex. |
| 6 | | | |
| 7 | SIZE | SIZE | The parameter size in bytes |
| 8 | PARAMETER | PARAMETER (copy of the command data) | Parameter data Refer to PRM_RD. |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | WDT | RWDT | Refer to NOP. |

5.1.13 Inverter Operation Control Command (INV_CTL: 40 Hex)

| | |
|--|---|
| Inverter Operation Control command (INV_CTL: 40 Hex) | Used to set Inverter run operations and frequency references. Also used to select monitor functions and to monitor items. |
| Completion confirmation (processing at master) | Completion can be confirmed with the following response data: CMD = CONNECT, STATUS.CMDRDY = 1, and the set data (SEL REF 1 and SEL MON 1/2). |
| Command type | Device group: Common command group Function group: Control command group Synchronization type: Asynchronous command |

Data Format (INV_CTL)

| Byte | Command | Response | Remarks |
|------|-----------------------------------|--------------------------------------|--|
| 1 | INV_CTL (40 Hex) | INV_CTL (40 Hex) | |
| 2 | 0 | ALARM | Alarm status in the response data. See <i>Chapter 6 Protective Functions</i> . |
| 3 | Run operation signals | STATUS | See <i>5.3.1 STATUS Field</i> . |
| 4 | | | |
| 5 | Speed reference | Output frequency | Unit: 0.01 Hz The unit depends on slave station product specifications. |
| 6 | | | |
| 7 | Torque reference (torque limit) | Output current | Torque reference (optional), Unit: $\pm 0.1\%$ Output current monitor unit: 0.1 A |
| 8 | | | |
| 9 | SEL REF 1/2 | SEL REF 1/2 | Selects references. |
| 10 | SEL MON 1/2 | SEL MON 1/2 | Selects monitor items. |
| 11 | Reference selected with SEL REF 1 | Monitor item selected with SEL MON 1 | |
| 12 | | | |
| 13 | Reference selected with SEL REF 2 | Monitor item selected with SEL MON 2 | |
| 14 | | | |
| 15 | 0 | 0 | |
| 16 | WDT | RWDT | Refer to NOP. |
| 17 | Subcommand area | Subcommand area | |
| 18 | | | |
| 19 | | | |
| 20 | | | |
| 21 | | | |
| 22 | | | |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

The slave station product specifications determine if data is to be set for each scan.

Refer to *Table 5.1*, *Table 5.2*, and *Table 5.3* for details on the Run Operation Signals.

Table 5.1 Run Operation Signal Details

| Bit | Inverter | Remarks |
|-----|-------------|--|
| 0 | Forward run | – |
| 1 | Reverse run | – |
| 2 | Not used. | Depends on slave station product specifications. |
| 3 | Not used. | Depends on slave station product specifications. |
| 4 | Not used. | Depends on slave station product specifications. |
| 5 | Not used. | Depends on slave station product specifications. |
| 6 | Not used. | Depends on slave station product specifications. |
| 7 | Not used. | Depends on slave station product specifications. |
| 8 | Not used. | Depends on slave station product specifications. |
| 9 | Fault reset | – |
| A | Not used. | Depends on slave station product specifications. |
| B | Not used. | Depends on slave station product specifications. |
| C | Not used. | Depends on slave station product specifications. |
| D | Not used. | Depends on slave station product specifications. |
| E | Not used. | Depends on slave station product specifications. |
| F | Not used. | Depends on slave station product specifications. |

- Note: 1. Confirm completion of the fault reset using the RESET bit in STATUS. The RESET bit will turn OFF when the fault reset has been completed.
2. Fault information will not be updated while the fault signal is ON.

Table 5.2 Setting Range for SEL REF 1/2

| REF 1/2 | Function | Remarks |
|---------|---------------------------|--|
| 0 | Nothing selected. | – |
| 1 | Torque compensation, 0.1% | 0.1% |
| 2 | Terminal analog output | Depends on slave station product specifications. |
| 3 | Terminal analog output | Depends on slave station product specifications. |
| 4 | Terminal DI output | Depends on slave station product specifications. |
| 5 to F | Not used. | Not used. |

Table 5.3 Setting Range for SEL MON 1/2

| MON 1/2 | Function | Remarks |
|---------|--|---|
| 0 | Nothing selected. | – |
| 1 | Motor speed | Unit: 0.01 Hz The unit depends on slave station product specifications. |
| 2 | Torque reference | Unit: 0.1% |
| 3 | Speed detection PG counter value | Depends on slave station product specifications. |
| 4 | Frequency reference | Unit: 0.01 Hz The unit depends on slave station product specifications. |
| 5 | Analog input terminal 1 | 0.1% Depends on slave station product specifications. |
| 6 | Main circuit DC voltage | Unit: 1 V |
| 7 | Inverter alarm | Refer to table of Inverter alarm codes. |
| 8 | Inverter warning | Refer to table of Inverter warning codes. |
| 9 | Not used. | – |
| A | Analog input terminal A2 | Unit: 0.1% |
| B | Terminal DI input Bits 0 to 7: Input terminals S1 to S8 | Status of terminal DI input Depends on slave station product specifications. |
| C | Analog input terminal 2 | 0.1% Depends on slave station product specifications. |
| D | PG counter value | Depends on slave station product specifications. |
| E and F | Not used. | Always 0. |

5.2 Subcommand Specifications

5.2.1 No Operation Command (NOP: 00 Hex)

| | |
|---|--|
| No Operation command (NOP: 00 Hex) | No Operation command. Nothing is performed. This command is used for network management. The slave station will return the current status (ALARM and STATUS) as the response. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = NOP and SUBSTATUS.SBCMDRDY = 1. |
| Command classification | Device group: Common command group Function group: Network command group Synchronization type: Asynchronous command |

NOP Data Formats

| Byte | Command | Response | Remarks |
|------|--------------|--------------|--|
| 17 | NOP (00 Hex) | NOP (00 Hex) | |
| 18 | 0 | SUBSTATUS | Refer to 5.3.2 <i>SUBSTATUS</i> Field. |
| 19 | 0 | 0 | |
| 20 | 0 | 0 | |
| 21 | 0 | 0 | |
| 22 | 0 | 0 | |
| 23 | 0 | 0 | |
| 24 | 0 | 0 | |
| 25 | 0 | 0 | |
| 26 | 0 | 0 | |
| 27 | 0 | 0 | |
| 28 | 0 | 0 | |
| 29 | 0 | 0 | |
| 30 | 0 | 0 | |
| 31 | 0 | 0 | |

5.2.2 Read Parameter Command (PRM_RD: 01 Hex)

| | |
|---|--|
| Read Parameter command (PRM_RD: 01 Hex) | Specifies the parameter number and data size of the Inverter, and reads out the specified parameter. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response byte 1 = PRM_RD, SUBSTATUS.SBCMDRDY = 1, NO and SIZE. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PRM_RD Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 17 | PRM_RD (01 Hex) | PRM_RD (01 Hex) | |
| 18 | 0 | SUBSTATUS | See 5.3.2 <i>SUBSTATUS Field</i> . |
| 19 | NO | NO | Parameter number Specifies the parameter to be written. |
| 20 | | | |
| 21 | SIZE | SIZE | The parameter data size in bytes. |
| 22 | 0 | PARAMETER | Parameter data |
| 23 | 0 | | |
| 24 | 0 | | |
| 25 | 0 | | |
| 26 | 0 | | |
| 27 | 0 | | |
| 28 | 0 | | |
| 29 | 0 | | |
| 30 | 0 | | |
| 31 | 0 | | |

5.2.3 Write Parameter Command (PRM_WR: 02 Hex)

| | |
|--|---|
| Write Parameter command (PRM_WR: 02 Hex) | Specifies the parameter number, data size, and parameter data of the Inverter and writes the set data. If the CONFIG command needs to be issued to enable the written data, this should be described in the product specification. If the value of any command (NO, SIZE, PARAMETER) is out of range, the command will be ignored and ALARM = 94 Hex will be returned as the response. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response SUBCMD = PRM_WR, SUBSTATUS.SBCMDRDY = 1, ALARM, NO, SIZE, and PARAMETER. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PRM_WR Data Formats

| Byte | Command | Response | Remarks |
|------|-----------------|-----------------|--|
| 17 | PRM_WR (02 Hex) | PRM_WR (02 Hex) | |
| 18 | 0 | SUBSTATUS | See 5.3.2 <i>SUBSTATUS</i> Field. |
| 19 | NO | NO | Parameter number Specifies the parameter to be written. |
| 20 | | | |
| 21 | SIZE | SIZE | The parameter data size in bytes. |
| 22 | PARAMETER | PARAMETER | The parameter data to be set. |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

5.2.4 Read Alarm or Warning Command (ALM_RD: 05 Hex)

| | |
|--|---|
| Read Alarm or Warning command (ALM_RD: 05 Hex) | Requests to read out the alarm and warning code. This command reads out the current alarm and warning status using alarm and warning codes. Some codes are the same as for ALARM in byte 2. The alarm history depends on the product specifications of the slave station. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response SUBCMD = ALM_RD and SUBSTATUS.SBCMDRDY = 1. |
| Command classification | Device group: Common command group Function group: Control command group Synchronization type: Asynchronous command |

ALM_RD Data Formats

| Byte | Command | Response | Remarks | |
|------|-----------------|-----------------|--|---|
| 17 | ALM_RD (05 Hex) | ALM_RD (05 Hex) | | |
| 18 | 0 | SUBSTATUS | See 5.3.2 <i>SUBSTATUS Field</i> . | |
| 19 | ALM_RD_MODE | ALM_RD_MODE | 0 | Read the current alarm or warning code. |
| | | | 1 | Read the alarm history. (Option) |
| 20 | 0 | ALM_DATA | 10 records maximum Whether the fault history can be used depends on the product specification of the slave station. | |
| 21 | 0 | | Whether warnings are saved in the alarm history depends on the product specifications of the slave station. | |
| 22 | 0 | | | |
| 23 | 0 | | | |
| 24 | 0 | | | |
| 25 | 0 | | | |
| 26 | 0 | | | |
| 27 | 0 | | | |
| 28 | 0 | | | |
| 29 | 0 | | | |
| 30 | 0 | | | |
| 31 | 0 | | | |

5.2.5 Read Stored Parameter Command (PPRM_RD: 1B Hex)

| | |
|--|--|
| Read Stored Parameter command (PPRM_RD: 1B Hex) | Specifies the parameter number and data size of the Inverter and reads out the parameters in the retentive memory. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response SUBCMD = PPRM_RD, SUBSTATUS.SBCMDRDY = 1, NO, and SIZE. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PPRM_RD Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|------------------------------------|---|
| 17 | PPRM_RD (1B Hex) | PPRM_RD (1B Hex) | |
| 18 | 0 | SUBSTATUS | See 5.3.2 <i>SUBSTATUS Field</i> . |
| 19 | NO | NO | Parameter number Specifies the parameter to be read. |
| 20 | | (copy of the command data) | |
| 21 | SIZE | SIZE (copy of the command data) | The parameter size in bytes |
| 22 | 0 | PARAMETER | Parameter data |
| 23 | 0 | | |
| 24 | 0 | | |
| 25 | 0 | | |
| 26 | 0 | | |
| 27 | 0 | | |
| 28 | 0 | | |
| 29 | 0 | | |
| 30 | 0 | | |
| 31 | 0 | | |

5.2.6 Write Stored Parameter Command (PPRM_WR: 1C Hex)

| | |
|---|---|
| Write Stored Parameter command (PPRM_WR: 1C Hex) | Specifies the parameter number, data size, and parameter data of the Inverter and writes the retentive memory. Then issues the CONFIG command to enable the written retentive parameters. If the value of any command (NO, SIZE, PARAMETER) is out of range, the command will be ignored and ALARM = 94 Hex will be returned as the response. |
| Completion of the command operation (master processing) | The completion of the command execution is confirmed by the response SUBCMD = PPRM_WR, SUBSTATUS.SBCMDRDY = 1, NO, SIZE, DATA, and ALARM. |
| Command classification | Device group: Common command group Function group: Data communication command group Synchronization type: Asynchronous command |

PPRM_WR Data Formats

| Byte | Command | Response | Remarks |
|------|------------------|---|--|
| 17 | PPRM_WR (1C Hex) | PPRM_WR (1C Hex) | |
| 18 | 0 | STATUS | See 5.3.2 SUBSTATUS Field. |
| 19 | NO | NO (copy of the command data) | Parameter number Specifies the parameter to be written. |
| 20 | | | |
| 21 | SIZE | SIZE (copy of the command data) | The parameter size in bytes |
| 22 | PARAMETER | PARAMETER (copy of the command data) | Parameter data |
| 23 | | | |
| 24 | | | |
| 25 | | | |
| 26 | | | |
| 27 | | | |
| 28 | | | |
| 29 | | | |
| 30 | | | |
| 31 | | | |

5.2.7 Inverter I/O Control Command (INV_I/O: 41 Hex)

| | |
|--|---|
| Inverter I/O Control command (INV_I/O: 41 Hex) | Used to select references to output to the Inverter and monitor items. |
| Completion confirmation (processing at master) | Completion can be confirmed with the following response data: SUBCMD = INV_I/O, SUBSTATUS.SBCMDRDY = 1, SEL REF 3/4, SEL REF 5/6, SEL MON 3/4, and SEL MON 5/6. |
| Command type | Device group: Inverter command group Function group: General-purpose Inverter command group Synchronization type: Asynchronous command |

Subcommand Data Format (INV_I/O)

| Byte | Command | Response | Remarks |
|------|-----------------------------------|--------------------------------------|--|
| 17 | INV_I/O (41 Hex) | INV_I/O (41 Hex) | – |
| 18 | | SUBSTATUS | Refer to 5.3.2 <i>SUBSTATUS Field</i> . |
| 19 | SEL REF 3/4 ^{*1} | SEL REF 3/4 | Refer to the following table. |
| 20 | SEL REF 5/6 ^{*2} | SEL REF 5/6 | Refer to the following table. |
| 21 | SEL MON 3/4 ^{*3} | SEL MON 3/4 | Refer to the following table. |
| 22 | SEL MON 5/6 ^{*4} | SEL MON 5/6 | Refer to the following table. |
| 23 | Reference selected with SEL REF 3 | Monitor item selected with SEL MON 3 | Command: This is the set data for the reference selected with SEL REF 3. |
| 24 | | | Response: This is the monitor item selected with SEL MON 3. |
| 25 | Reference selected with SEL REF 4 | Monitor item selected with SEL MON 4 | Command: This is the set data for the reference selected with SEL REF 4. |
| 26 | | | Response: This is the monitor item selected with SEL MON 4. |
| 27 | Reference selected with SEL REF 5 | Monitor item selected with SEL MON 5 | Command: This is the set data for the reference selected with SEL REF 5. |
| 28 | | | Response: This is the monitor item selected with SEL MON 5. |
| 29 | Reference selected with SEL REF 4 | Monitor item selected with SEL MON 6 | Command: This is the set data for the reference selected with SEL REF 4. |
| 30 | | | Response: This is the monitor item selected with SEL MON 6. |

*1. Bits 0 to 3 of SEL REF 3/4 set the contents of REF 3 and bits 4 to 7 set the contents of REF 4.

*2. Bits 0 to 3 of SEL REF 5/6 set the contents of REF 5 and bits 4 to 7 set the contents of REF 6.

*3. Bits 0 to 3 of SEL MON 3/4 set the contents of MON 3 and bits 4 to 7 set the contents of MON 4.

*4. Bits 0 to 3 of SEL MON 5/6 set the contents of MON 5 and bits 4 to 7 set the contents of MON 6

Table 5.4 Setting Range for SEL REF 3/4 and 5/6

| SEL REF 3/4, 5/6 | Function | Remarks |
|---------------------|--------------------------|--|
| 0 | Nothing selected. | – |
| 1 | Torque compensation 0.1% | 0.1% |
| 2 | Terminal analog output | Depends on slave station product specifications. |
| 3 | Terminal analog output | Depends on slave station product specifications. |
| 4 | Terminal DI output | Depends on slave station product specifications. |
| 5 to F | Not used. | Not used. |

Table 5.5 Setting Range for SEL MON 3/4 and 5/6

| SEL MON 3/4, 5/6 | Function | Remarks |
|---------------------|--|---|
| 0 | Nothing selected. | – |
| 1 | Motor speed | Unit: 0.01 Hz The unit depends on slave station product specifications. |
| 2 | Torque reference | Unit: 0.1% |
| 3 | Speed detection PG counter value | Depends on slave station product specifications. |
| 4 | Frequency reference | Unit: 0.01 Hz The unit depends on slave station product specifications. |
| 5 | Analog input terminal 1 | 0.1% Depends on slave station product specifications. |
| 6 | Main circuit DC voltage | Unit: 1 V |
| 7 | Inverter alarm | Refer to table of Inverter alarm codes. |
| 8 | Inverter warning | Refer to table of Inverter warning codes. |
| 9 | Not used. | – |
| A | Analog input terminal A2 | Unit: 0.1% |
| B | Terminal DI input Bits 0 to 7: Input terminals S1 to S8 | Status of terminal DI input Depends on slave station product specifications. |
| C | Analog input terminal 2 | 0.1% Depends on slave station product specifications. |
| D | PG counter value | Depends on slave station product specifications. |
| E and F | Not used. | Always 0. |

5.3 Status Details

This section describes the STATUS field in the main command and the SUBSTATUS field in the subcommand.

5.3.1 STATUS Field

Byte 3

| | | | | | | | |
|-----|-----|------|-----|--------|--------|-------|-----|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| REV | OSP | RUNX | PON | BB OFF | CMDRDY | WARNG | ALM |

Byte 4

| | | | | | | | |
|---------|-------|--------|------|-----|-----------|-------|-------|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 |
| O_SERVO | SEL_M | REMOTE | UV_R | OPE | INV_READY | AGREE | RESET |

| Bit | Name | Description | Value | Meaning |
|-----|-----------|---|-------|---------------------------------------|
| 0 | ALM | Alarm | 0 | No alarm |
| | | | 1 | Alarm (fault) |
| 1 | WARNG | Warning (minor failure) | 0 | No warning |
| | | | 1 | Warning (minor failure) |
| 2 | CMDRDY | Command ready (command reception possible) | 0 | Busy |
| | | | 1 | Ready |
| 3 | BB OFF | Baseblock clear (Output voltage from Inverter is OFF.) | 0 | Baseblock in effect |
| | | | 1 | Baseblock cleared |
| 4 | PON | Main power supply is ON (Reverse of UV.) | 0 | Main power supply is OFF. |
| | | | 1 | Main power supply is ON. |
| 5 | RUNX | Operating (Voltage being output from Inverter.) | 0 | – |
| | | | 1 | Operating |
| 6 | OSP | Zero-speed level (Zero-speed level or lower.) | 0 | – |
| | | | 1 | Zero-speed |
| 7 | REV | Reverse operation (Reverse operation in progress.) | 0 | Forward operation |
| | | | 1 | Reverse operation |
| 8 | RESET | Fault reset signal input | 0 | – |
| | | | 1 | Fault reset signal is being input |
| 9 | AGREE | Speed agreement (Actual speed matches reference speed.) | 0 | – |
| | | | 1 | Speed agreement |
| A | INV_READY | Inverter startup complete Preparation for Inverter operation has been completed. | 0 | – |
| | | | 1 | Inverter ready |
| B | OPE | OPE fault (There is an error in consistency between parameters.) | 0 | – |
| | | | 1 | OPE fault |
| C | UV_R | Power interruption recovery/momentary power interruption recovery (optional) (Momentary interruption: 0, Momentary interruption recovery: 1) | 0 | Momentary power interruption |
| | | | 1 | Momentary power interruption recovery |
| D | REMOTE | Local/remote Local (operation from Operator) | 0 | Local |
| | | | 1 | Remote (transmission) |
| E | SEL_M | Motor selection (optional) | 0 | Motor 1 |
| | | | 1 | Motor 2 |
| F | O_SERVO | Zero-servo completion (optional) | 0 | – |
| | | | 1 | Zero-servo completion |

5.3.2 SUBSTATUS Field

Byte 18

| | | | | | | | |
|----|----|----|----|----|----------|---------|-------|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| – | – | – | – | – | SBCMDRDY | SBWARNG | SBALM |

| Bit | Name | Description | Value | Meaning |
|-----|----------|--|-------|------------|
| D0 | SBALM | Subcommand alarm | 0 | No alarm |
| | | | 1 | Alarm |
| D1 | SBWARNG | Subcommand warning | 0 | No warning |
| | | | 1 | Warning |
| D2 | SBCMDRDY | Subcommand ready status (subcommand reception possible) | 0 | Busy |
| | | | 1 | Ready |

6 Protective Functions

6.1 Fault Detection

The following four types of faults are detected. A different operation is performed depending on which type of fault is detected.

| Fault Type | | Description |
|------------|-----------------------|--|
| Alarm | Inverter alarm | Serious failures that may result in Inverter or machine damage |
| | Communication alarm | Faults related to MECHATROLINK-II communication |
| Warning | Inverter warning | Improper operation or minor failures |
| | Communication warning | Warnings related to MECHATROLINK-II communication error |

- If alarms occur consecutively, the MECHATROLINK response data must provide notification of the most recent alarm.
- If warnings occur consecutively, notification of the smallest warning code must be provided.
- If an alarm and warning occur at the same time, notification of the alarm must take priority over notification of the warning.

Table 6.1 shows the operation process when alarms and warnings occur consecutively.

Table 6.1 Response Data for Consecutive Alarms/Warnings

| Fault Detection | | MECHATROLINK-II Response Data Contents | | |
|-----------------|---------------|--|--------|-----|
| Previous Value | Current Value | ALARM | STATUS | |
| | | | WARNG | ALM |
| Alarm | Alarm | Most recent alarm code | 0 | 1 |
| Alarm | Warning | Most recent alarm code | 1 | 1 |
| Warning | Alarm | Most recent alarm code | 1 | 1 |
| Warning | Warning | Smallest warning code | 1 | 0 |

6.2 Processing Alarms

6.2.1 Communication-related Errors

The communication-related errors and detection conditions are as follows.

| Communication Phase | Reception Failure | | Transmission Cycle Error |
|---------------------|-------------------|-------------------|--------------------------|
| | 1st | 2nd (Consecutive) | |
| Phase 1 | – | – | – |
| Phase 2 | 96 | E6 | E6 |
| Phase 3 | 96 | E6 | E6 |

* Alarm Codes (MECHATROLINK-II Response Alarm Values)

| Alarm Code | Description | Fault Type |
|------------|---|-----------------------|
| 96 | Warning of MECHATROLINK-II communication error | Communication warning |
| E5 | MECHATROLINK-II WDT error | Communication alarm |
| E6 | MECHATROLINK-II communication error (bus error) | Communication alarm |

* Communication Errors

| Error | Description |
|--------------------------|---|
| Reception failure | The transmission LSI detected a data reception failure. |
| Transmission cycle error | A timing error was detected for synchronous frames in a transmission cycle. |
| Watchdog timer error | A WDT count error was detected in synchronous frames. |

6.2.2 Other Communication Errors

Other communication errors are listed in the following table. If a warning occurs, the previous reference command is still valid.

| Alarm | Description | Fault Type | Operation When Error Occurs |
|-------|----------------------|-----------------------|----------------------------------|
| 94 | Data setting warning | Communication warning | The received command is ignored. |
| 95 | Command warning | Communication warning | The received command is ignored. |

The relationship between the communication phase and the command for which the warning occurred is shown in the following table.

| Current Status | Command for Which Warning Occurred |
|----------------|---|
| Any status | Unsupported command was received. |
| Phase 1 | A command other than one of the following was received: read command, NOP, CONNECT, DISCONNECT. |

6.2.3 Inverter Fault Notification

If a fault is detected in the Inverter, an alarm code or warning code is stored in ALARM in the MECHATROLINK-II response and the corresponding bit in STATUS is turned ON.

The alarms and warnings for which notification is provided for fault detection in the Inverter are listed in *Table 6.2* and *Table 6.3*.

Table 6.2 Inverter Alarm Codes

| Alarm Code | Description | Remarks |
|------------|-------------------------------------|--|
| 01H | Blown fuse | Depends on slave station product specifications. |
| 02H | Main circuit undervoltage | Required. |
| 03H | Control power supply undervoltage | Depends on slave station product specifications. |
| 04H | Main circuit MC failure | Depends on slave station product specifications. |
| 05H | Output short-circuit | Depends on slave station product specifications. |
| 06H | Ground fault | Depends on slave station product specifications. |
| 07H | Overcurrent | Required. |
| 08H | Overvoltage | Required. |
| 09H | Inverter overheating pre-alarm | Depends on slave station product specifications. |
| 0AH | Inverter overheated | Depends on slave station product specifications. |
| 0BH | Motor overload | Required. |
| 0CH | Inverter overload | Required. |
| 0DH | Overtorque detection 1 | Depends on slave station product specifications. |
| 0EH | Overtorque detection 2 | Depends on slave station product specifications. |
| 0FH | Control transistor fault | Depends on slave station product specifications. |
| 10H | Braking Resistor overheated | Depends on slave station product specifications. |
| 11H | External fault 3 | Depends on slave station product specifications. |
| 12H | External fault 4 | Depends on slave station product specifications. |
| 13H | External fault 5 | Depends on slave station product specifications. |
| 14H | External fault 6 | Depends on slave station product specifications. |
| 15H | External fault 7 | Depends on slave station product specifications. |
| 16H | External fault 8 | Depends on slave station product specifications. |
| 18H | Overspeed | Depends on slave station product specifications. |
| 19H | Excessive speed deviation | Depends on slave station product specifications. |
| 1AH | PG open circuit | Depends on slave station product specifications. |
| 1BH | Input open-phase | Depends on slave station product specifications. |
| 1CH | Output open-phase | Depends on slave station product specifications. |
| 1DH | Thermistor motor overheat pre-alarm | Depends on slave station product specifications. |
| 1EH | Operator cable broken | Depends on slave station product specifications. |
| 1FH | EEPROM Write Error | Depends on slave station product specifications. |
| 20H | Thermistor motor overheated | Depends on slave station product specifications. |
| 21H | MEMOBUS communication timeout | Depends on slave station product specifications. |
| 25H | Control error | Depends on slave station product specifications. |
| 26H | Zero-servo fault | Depends on slave station product specifications. |
| 28H | PID feedback reference lost | Depends on slave station product specifications. |

| Alarm Code | Description | Remarks |
|------------|---|--|
| 29H | Undertorque detection 1 | Depends on slave station product specifications. |
| 2AH | Undertorque detection 2 | Depends on slave station product specifications. |
| 2CH | External fault 9 | Depends on slave station product specifications. |
| 2DH | External fault 10 | Depends on slave station product specifications. |
| 2EH | External fault 11 | Depends on slave station product specifications. |
| 2FH | External fault 12 | Depends on slave station product specifications. |
| 50H | Emergency stop | Depends on slave station product specifications. |
| 51H | External fault 1 | Depends on slave station product specifications. |
| 52H | External fault 2 | Depends on slave station product specifications. |
| 83H | Baseblock circuit error | Depends on slave station product specifications. |
| 84H | EEPROM error | Depends on slave station product specifications. |
| 85H | CPU internal A/D fault | Depends on slave station product specifications. |
| 86H | CPU external A/D fault | Depends on slave station product specifications. |
| 87H | Option Board error | Depends on slave station product specifications. |
| 88H | ASIC internal RAM error | Depends on slave station product specifications. |
| 89H | Watchdog timer fault | Depends on slave station product specifications. |
| 8AH | CPU-ASIC mutual diagnosis error | Depends on slave station product specifications. |
| 8BH | ASIC version fault | Depends on slave station product specifications. |
| 8CH | Operator control circuit fault | Depends on slave station product specifications. |
| 91H | Communications Option Board error | Depends on slave station product specifications. |
| 92H | Communications Option Board self diagnostic error | Depends on slave station product specifications. |
| 93H | Communications Option Board model code error | Depends on slave station product specifications. |
| 94H | Communications Option Board DPRAM error | Depends on slave station product specifications. |

Table 6.3 Inverter Warning Codes

| Warning Code | Description | Remarks |
|--------------|--------------------------------|--|
| 01H | Main circuit undervoltage | Depends on slave station product specifications. |
| 02H | Overvoltage | Depends on slave station product specifications. |
| 03H | Inverter overheating pre-alarm | Depends on slave station product specifications. |
| 04H | Inverter overheated | Depends on slave station product specifications. |
| 05H | Overtorque detected 1 | Depends on slave station product specifications. |
| 06H | Overtorque detected 2 | Depends on slave station product specifications. |
| 07H | External fault | Depends on slave station product specifications. |
| 08H | External baseblock | Depends on slave station product specifications. |
| 09H | External fault 3 | Depends on slave station product specifications. |
| 0AH | External fault 4 | Depends on slave station product specifications. |
| 0BH | External fault 5 | Depends on slave station product specifications. |
| 0CH | External fault 6 | Depends on slave station product specifications. |
| 0DH | External fault 7 | Depends on slave station product specifications. |
| 0EH | External fault 8 | Depends on slave station product specifications. |
| 0FH | Cooling fan fault | Depends on slave station product specifications. |
| 10H | Overspeed | Depends on slave station product specifications. |
| 11H | Excessive speed deviation | Depends on slave station product specifications. |
| 12H | PG open circuit | Depends on slave station product specifications. |
| 13H | Operator cable broken | Depends on slave station product specifications. |
| 14H | MEMOBUS communication error | Depends on slave station product specifications. |
| 17H | Motor overload | Depends on slave station product specifications. |
| 18H | Inverter overload | Depends on slave station product specifications. |
| 1BH | Motor running | Depends on slave station product specifications. |
| 1CH | PID feedback reference lost | Depends on slave station product specifications. |
| 1DH | Waiting for transmission data | Depends on slave station product specifications. |
| 1EH | Undertorque detection 1 | Depends on slave station product specifications. |
| 1FH | Undertorque detection 2 | Depends on slave station product specifications. |
| 20H | Sequence input fault | Depends on slave station product specifications. |
| 22H | Thermistor motor overheated 1 | Depends on slave station product specifications. |
| 23H | External fault 9 | Depends on slave station product specifications. |
| 24H | External fault 10 | Depends on slave station product specifications. |
| 25H | External fault 11 | Depends on slave station product specifications. |
| 26H | External fault 12 | Depends on slave station product specifications. |
| 41H | Emergency stop | Depends on slave station product specifications. |

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