

COMMUNICATIONS MANUAL

EasySpeed

3G3JE

Compact Simplified Inverters

Preface

Thank you for choosing this 3G3JE-series Compact Simplified Inverter. This Communications Manual describes Inverter communications specifications and communications setting methods.

Serial communications using the CompoWay/F communications format are supported by 3G3JE Inverters with Communications. This Communications Manual describes Inverter communications. For information on 3G3JE installation, wiring, and operating methods, refer to the *3G3JE User's Manual*.

- This manual is to be delivered to the final end user of the product.
- After reading the manual, always keep it close at hand for reference when operating the Inverter.
- Every effort has been made to provide detailed specifications, information on functions, and interrelationships between them. Assume that anything not described in this manual cannot be performed.
- This manual is intended for the following personnel, who are assumed to have sufficient knowledge of electrical systems (i.e., an electrical engineer or the equivalent).
 - Personnel in charge of introducing control devices
 - Personnel designing the control system
 - Personnel installing and connecting control devices
 - Personnel managing the site where the Inverter is used

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Safety Precautions

● Indications and Meanings of Safety Information

The following precautions and signal words are used to provide information to ensure the safe use of the 3G3JE Inverter. The information provided here is vital to safety. Always observe the precautions provided.

Meanings of Signal Words

The following signal words are used in this manual.



DANGER

Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.

(There are no alert statements with “DANGER” contained in this manual.)



WARNING

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

(There are no alert statements with “WARNING” contained in this manual.)








CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.








Meanings of Alert Symbols

The following alert symbols are used in this manual.

Symbol		Meaning
Caution		General Caution Indicates non-specific general cautions, warnings, and dangers.
		Electrical Shock Caution Indicates possibility of electric shock under specific conditions.
		High Temperature Caution Indicates possibility of burns due to high temperatures under specific conditions.
Prohibition		Disassembly Prohibition Indicates prohibitions when there is a possibility of injury, such as from electric shock, as the result of disassembly.
Mandatory Caution		General Caution Indicates non-specific general cautions, warnings, and dangers.

Alert Statements in this Manual

The following alert statements apply to the products in this manual. Each alert statement also appears at the locations needed in this manual to attract your attention.

 Caution	
<p>Be sure to use the specified Braking Resistor or Braking Resistor Unit. Not doing so may occasionally result in moderate burns due to heating of the Braking Resistor or Braking Resistor Unit.</p> <p>When using a Braking Resistor or Braking Resistor Unit, be sure to install a thermal relay to monitor the resistor temperature.</p> <p>Include a sequence to turn OFF the power supply to the Inverter if the Braking Resistor or Braking Resistor Unit overheats.</p>	
<p>Terminals B1 and B2 are for connecting an optional Braking Resistor or Braking Resistor Unit. Do not connect any device other than a Braking Resistor or Braking Resistor Unit to these terminals.</p> <p>Doing so may occasionally result in moderate fire, heating, or equipment damage.</p>	
<p>Do not open terminal covers while the power is being supplied or for at least one minute after the power has been turned OFF.</p> <p>Doing so may occasionally result in minor injury from electrical shock.</p>	
<p>Do not remove the fan cover except when replacing the fan. Before replacing the fan, first turn OFF the power and disconnect the wiring.</p> <p>Doing so may occasionally result in minor injury from electrical shock.</p>	
<p>Install external breakers (MCCB) suitable for the Inverter capacity on the power supply side of the Inverter and take other safety measures against short-circuiting in load wiring.</p> <p>Not doing so may occasionally result in property damage from short-circuiting in load wiring.</p>	
<p>Cover the Inverter or take other measures to prevent filings or lead clippings from entering the Inverter during installation and wiring.</p> <p>The Inverter contains high-voltage components and Inverter damage or property damage may occasionally occur if the high-voltage components are short-circuited.</p>	

Precautions for Safe Use

■ Installation and Storage Environment

- Do not store, install, or operate the product in any of the following locations.
 - Locations subject to direct sunlight.
 - Locations subject to temperatures outside the range specified in the specifications.
 - Locations subject to humidity outside the range specified in the specifications.
 - Locations subject to condensation resulting from severe changes in temperature.
 - Locations subject to corrosive or flammable gases.
 - Locations subject to exposure to combustibles.
 - Locations subject to dust (especially iron dust) or salts.
 - Locations subject to exposure to water, oil, or chemicals.
 - Locations subject to shock or vibration.

■ Transporting, Installation, and Wiring

- Always use the original shipping box when transporting the Inverter.
- Do not apply excessive shock to the Inverter or drop the Inverter. The Inverter may malfunction or may be damaged.
- Do not connect an AC power supply voltage to the U, V, and W output terminals. Doing so will damage the Inverter.
- Do not connect any load other than a three-phase inductive motor to the U, V, and W output terminals.
- Do not connect an AC power supply voltage to the control I/O terminals. Doing so will damage the Inverter.
- Use 600-V polyvinyl chloride (PVC) cable with a wire size of 0.75 to 2 mm² to wire the main circuit terminals. Also, tighten the terminal screws on the terminal block to a torque of 0.8 to 1.0 N·m.
- Take appropriate and sufficient shielding countermeasures when installing systems in the following locations. Not doing so may result in malfunction or equipment damage.
 - Locations subject to static electricity or other forms of noise.
 - Locations subject to strong electromagnetic fields and magnetic fields.
 - Locations close to power lines.

■ Operation and Maintenance

- This Inverter can be set to operate from low speed to high speed. Operate the Inverter only after sufficiently confirming the allowable range for the motor installation being used.
- Take measures to assure safety before performing maintenance or inspection, or replacing components.

Precautions for Correct Use

■ Installation

- Mount the product vertically on a wall or on a DIN Track. Leave the prescribed space between this product and the control panel surface and other devices.

■ Main Circuit Power Supply

- Use a three-phase, 200 to 230 V, 50/60 Hz power supply.

■ Operation after Power Interruptions

- If continuing operation is selected for the momentary power interruption restart selection parameter (P09), the system may unexpectedly start operation after a momentary power interruption is reset. Exercise suitable caution.

■ Operation Command Selection

- If the operation command selection parameter (P10) is set to “PLC” to enable using the control circuit terminal inputs (STF and STR), the motor may start operation when the power supply is turned ON or an alarm is reset if the control circuit terminals are left ON. Exercise suitable caution. Also, if signals are checked during operation and a voltage is incorrectly applied to the control circuit terminals, the motor may start moving unexpectedly. Always check safety before performing signal checks.

■ Motor Overheating Protection (Electronic Thermal)

- The Inverter uses an electronic thermal to protect the motor from overheating. Set the rated current of the motor in the rated motor current parameter (P01). If more than one motor is operated with one Inverter, set the rated motor current parameter (P01) to 0.0 to disable motor overload detection, and install a thermal relay between the Inverter and each motor. Set the thermal relay to the nameplate current at 50 Hz and to 1.1 times the nameplate current at 60 Hz.

■ EEPROM Life

- The EEPROM has a limited life. Use RAM mode when using communications or other methods to frequently write data.

■ Disposing of the Inverter

- Observe all applicable legal requirements when disposing of the Inverter.

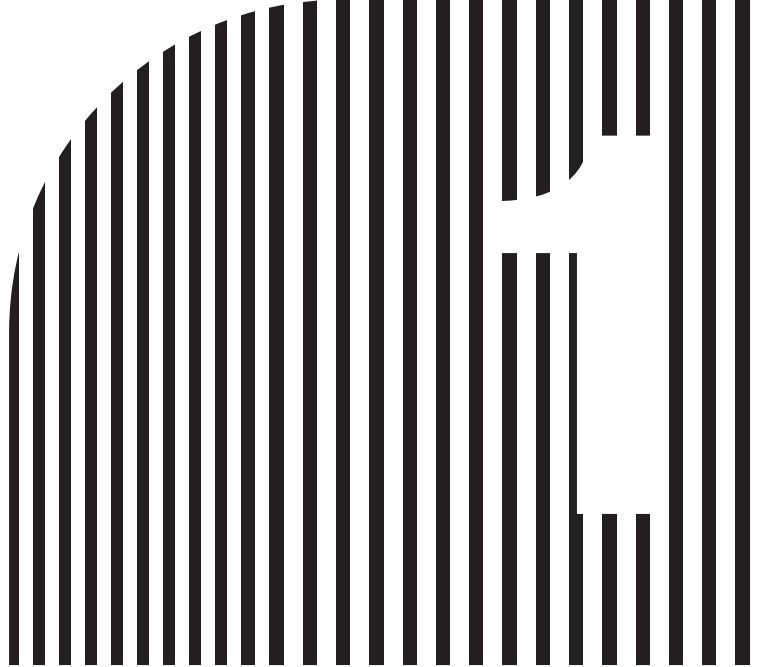
About this Manual

This manual is divided into the chapters described in the following table. Understanding how information is organized will enable you to use the manual more efficiently.

Chapter	Contents
Chapter 1 Communications Methods	Provides an overview of the communications methods used for the 3G3JE.
Chapter 2 CompoWay/F Communications Procedures	Describes the procedures required to use the CompoWay/F communications protocol.
Chapter 3 Communications Data	Provides tables of data used in CompoWay/F communications.
Chapter 4 Appendix	Provides a table of ASCII characters.

Table of Contents

Chapter 1. Communications Methods	1-1
1-1 Overview of Communications Methods	1-2
■Introduction	1-2
■Communications Specifications	1-2
■Transmission Procedure	1-3
■Interface	1-3
■Connections and Wiring	1-3
■Communications Parameters	1-4
Chapter 2. CompoWay/F Communications Procedures	2-1
2-1 Data Format	2-2
■Command Frame	2-2
■BCC Calculation Example	2-3
■Communications Data	2-3
■Response Frame	2-4
■End Code Examples	2-5
2-2 Structure of Command Text	2-7
■PDU Structure	2-7
■Area Definitions	2-7
■Type Code (Variable Type)	2-7
■Addresses	2-8
■Number of Elements	2-8
■List of Services	2-8
2-3 Detailed Description of Services	2-9
■Read Variable Area	2-9
■Write Variable Area	2-10
■Read Controller Attributes	2-11
■Read Controller Status	2-11
■Echoback Test	2-12
■Operation Command	2-13
2-4 Response Code List	2-16
Chapter 3. Communications Data	3-1
3-1 Variable Area Setting Range List	3-2
3-2 Status	3-4
Chapter 4. Appendix	4-1
4-1 ASCII List	4-2
Index	I-1
Revision History	R-1



Chapter 1

Communications Methods

1-1 Overview of Communications Methods

1-1 Overview of Communications Methods

■ Introduction

3G3JE Inverters with Communications (referred to as “Communications Models”) use communications to monitor set values and make settings. In addition, programs for communications are created at the Inverter's host computer (e.g., a personal computer), and the host computer is used to read and write data, send operation commands, and change the setup area. Therefore the description provided here is from the viewpoint of the host computer.

CompoWay/F is OMRON's standard communications protocol for general serial communications. This protocol uses a standard frame format, as well as commands conforming to the well-established FINS* commands used for OMRON PLCs. This simplifies communications between the host computer and components.

*FINS (Factory Interface Network Service)

The FINS protocol provides message communications between controllers in OMRON FA networks.

● The 3G3JE supports the following communications functions.

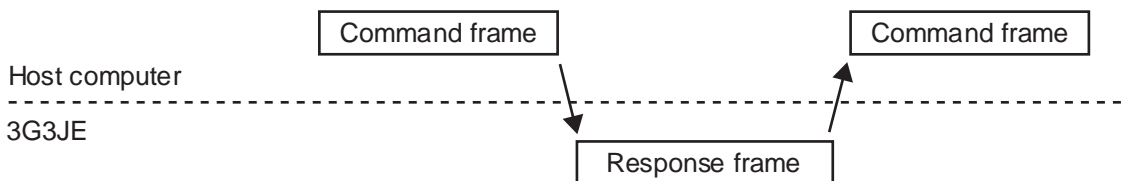
- Reading/writing parameters
- Operation commands
- Changing the setup area

■ Communications Specifications

Item	Specifications	Default
Transmission line connection	Multidrop	---
Communications method	RS-485 (2-wire, half-duplex)	---
Synchronization method	Start-stop synchronization	---
Communications baud rate	2.4, 4.8, 9.6, or 19.2 kbps	9.6 kbps
Communications code	ASCII	---
Communications data bits	7 or 8 bits	7 bits
Communications stop bits	1 or 2 bits	2 bits
Error detection	Vertical parity (none, even, or odd) and BCC (Block Check Character)	Even
Flow control	---	---
Interface	RS-485	---
Retry function	---	---
Communications buffer	40 bytes	---

■ Transmission Procedure

When the host computer transmits a command frame, the 3G3JE transmits a response frame that corresponds to the command frame. A single response frame is returned for each command frame. The following diagram shows the operation of the command and response frames.



Note Allow a wait time of at least 2 ms before the next command is sent after the host computer receives a response from the 3G3JE.

■ Interface

A K3SC Interface Converter is recommended for RS-485/RS-232C (or USB) interface conversion.

Name	Model	Description
K3SC Interface Converter (OMRON)	K3SC	This Converter is used to convert RS-232C (or USB) to RS-485.

■ Connections and Wiring

● Connections

- Make the connections according to the host computer and 3G3JE communications specifications.
- The connection format can be either 1:1 or 1:N.
- Up to 32 nodes including the host computer can be connected in a 1:N system.
- When connecting in a 1:N system, make sure that the communications specifications are the same for all the nodes that are connected. In addition, set a communications unit number for each node. (For details, refer to the communications setting items for the communications unit number setting.)
- Use shielded twisted-pair cable for RS-485 signal wires.

● Wiring

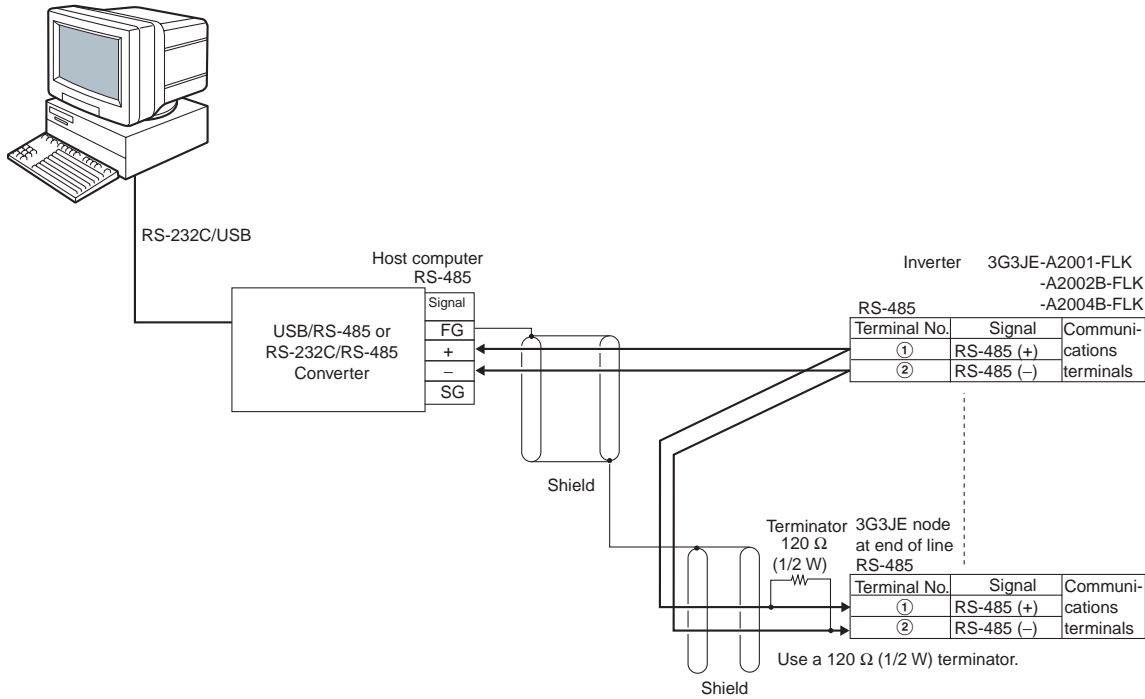
- The total cable length is 500 m max.
- Use shielded twisted-pair cable with a wires size of AWG24 to AWG16.
- Do not solder the ends of power lines. Doing so may result in faulty contact.
- For ease of wiring and enhanced reliability, it is recommended that solderless terminals be crimped to the control circuit wires.
- When solderless terminals are not used, the end of each wire for the control lines must be stripped for approximately 6 mm.
- Cover the shield with tape so that the shield will not come into contact with other signal wires or machines.

● Applicable Line Wire Size, Terminal Screws, and Torque

Terminal screw size	Torque	Wire type	Wire size	Recommended wire size	Cable
M3	0.5 to 0.6 N·m	Stranded wire	0.2 to 1.5 mm ² (AWG24 to AWG16)	0.75 mm ² (AWG18)	Shielded twisted-pair cable

Note For details on solderless terminal sizes and wiring methods, refer to the *User's Manual*.

● Wiring Diagram



Note For information on wiring between the USB/RS-485 or RS-232C/RS-485 Converter and the host computer, refer to the manual for the Converter.

■ Communications Parameters

With 3G3JE Communications Models (RS-485), communications parameters (communications unit number, baud rate, data length, stop bits, and parity) can be set. The following table shows the communications parameters and their setting ranges.

Item	Parameter No.	Settings	Default
Communications unit number	P15	0 to 99	1
Communications baud rate	P16	2.4, 4.8, 9.6, or 19.2 kbps	9.6 kbps
Communications data length	P17	7 or 8 bits	7 bits
Communications stop bits	P18	1 or 2 bits	2 bits
Communications parity	P19	None, even, or odd	Even

● **Communications Unit Number**

P15	Communications unit number	Changes during operation	No
Setting range	0 to 99	Default setting	1

To communicate with the host computer, set a unit number for each Inverter so that the Inverters can be recognized by the host computer. The unit number can be set to an integer value between 0 and 99.

Note When communicating with multiple Inverters, do not set the same unit number for more than one Inverter. If the same unit number is set for more than one node, the system will not operate correctly.

- Up to 32 nodes including the host computer can be connected in a 1:N system.
- When connecting a 1:N system, make sure that the communications specifications are the same for all the node that are connected. In addition, set a unique communications unit number for each node.

● **Communications Baud Rate**

P16	Communications baud rate	Changes during operation	No
Setting range	2.4/4.8/9.6/19.2 (kbps)	Default setting	9.6

This parameter sets the baud rate for communications with the host computer. The communications baud rate settings are as follows:

2.4 (2,400 bps), 4.8 (4,800 bps), 9.6 (9,600 bps), and 19.2 (19,200 bps).

● **Communications Data Length**

P17	Communications data length	Changes during operation	No
Setting range	7/8 (bits)	Default setting	7

This parameter sets the number of communications data bits. Set either “7 bits” or “8 bits.”

● **Communications Stop Bits**

P18	Communications stop bits	Changes during operation	No
Setting range	1/2 (bits)	Default setting	2

This parameter sets the number of communications stop bits. Set either “1 bit” or “2 bits.”

● **Communications Parity**

P19	Communications parity	Changes during operation	No
Selected item	None/even/odd	Default setting	Even

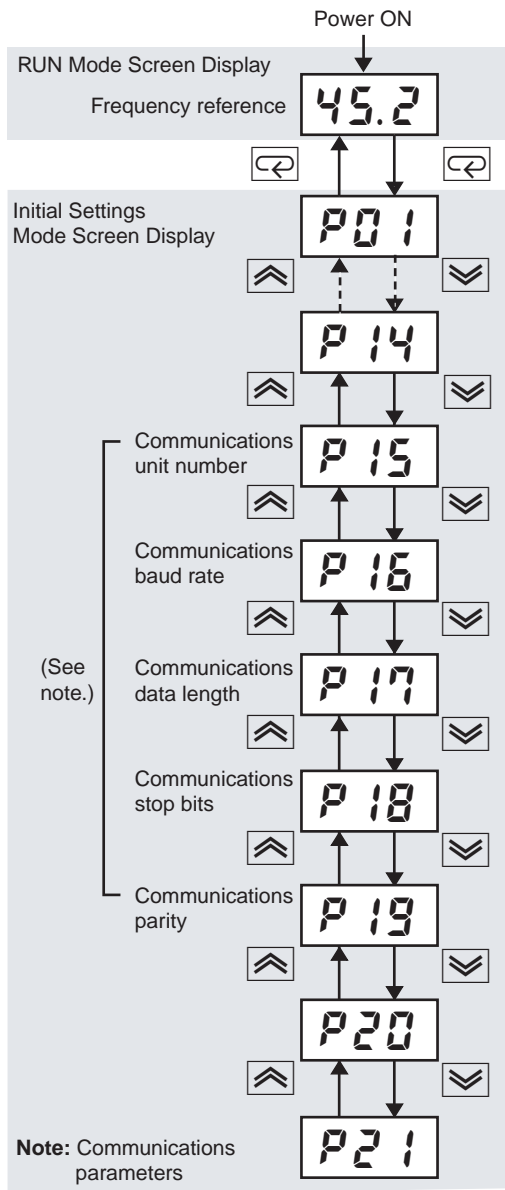
This parameter sets the communications parity. Set the parity to “none,” “even,” or “odd.”

● Communications Settings and Operation

With 3G3JE Communications Models, communications parameters are set in the initial settings mode. Before communicating with the 3G3JE, use the Digital Operator keys to set all of the parameters. For details on making settings other than communications parameters, refer to the *3G3JE User's Manual*.

- While the motor is stopped, the mode can be changed from RUN mode or adjustment mode to initial settings mode at any time by pressing the Mode Key for one second or longer.
- The mode can be changed from initial settings mode to RUN mode by pressing the Mode Key for one second or longer while a parameter name (P01 to P21) is displayed. (To display a parameter name, press the Enter Key while the set value is displayed.)
- After a set value has been changed, it goes into effect when the mode is changed to RUN mode. If the power is turned OFF while a parameter is being set and before RUN mode is entered, the changed set value will be lost.

Moving to Communications Parameters

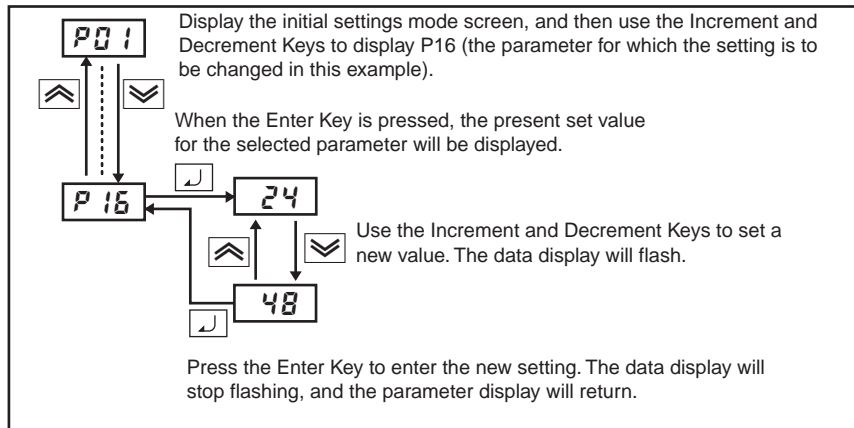


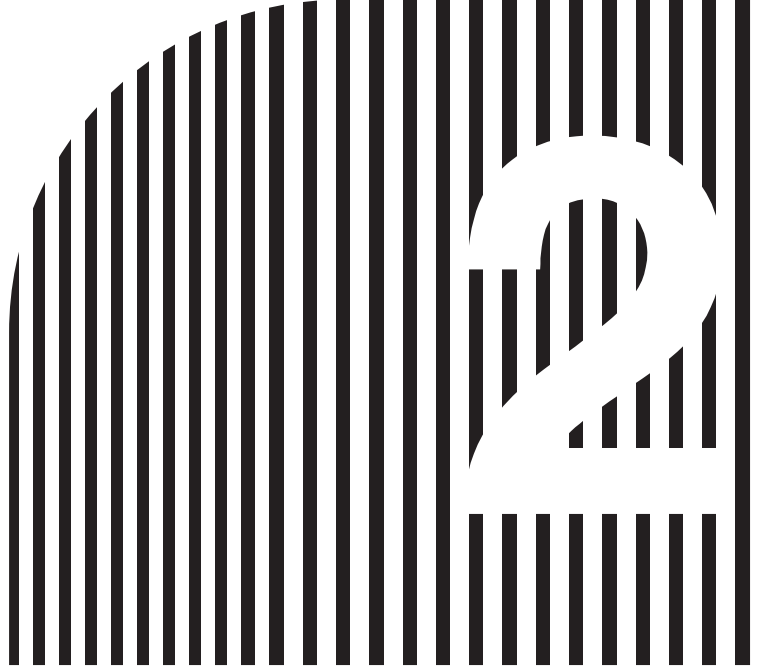
When the power is turned ON, the data display and indicators (setting and monitoring indicators) will all light, and then the present frequency reference be displayed on the data display.

When the Mode Key is pressed for 1 s or longer, the mode will change from RUN mode to initial settings mode, and P01 will appear on the data display.

Use the Increment and Decrement Keys to move to parameters P15 to P19. (The parameter that is to be set will be displayed.)

Example: Setting Communications Parameters





Chapter 2

CompoWay/F Communications Procedures

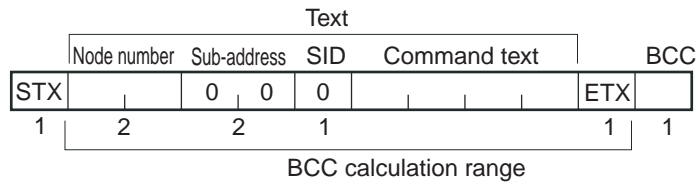
- 2-1 Data Format
- 2-2 Structure of Command Text
- 2-3 Detailed Description of Services
- 2-4 Response Code List

2-1 Data Format

This section describes the procedures for communications according to the CompoWay/F protocol.

- Hexadecimal values are expressed by adding the prefix H' before the number, e.g., H'02.
- Numbers shown without the H' prefix are ASCII characters. (For a table of ASCII codes, refer to the appendix.)
- The number underneath each item in a frame indicates the number of bytes.

■ Command Frame



Name	Description
STX	<ul style="list-style-type: none"> • This code (H'02) indicates the beginning of the communications frame (text). • Always set this character in the first byte. • If STX is received again during reception, reception is carried out again from the point where STX was received.
Node number	<ul style="list-style-type: none"> • This number specifies the transmission's destination. • Specify the 3G3JE's communications unit number. • A BCD value between 00 and 99 or ASCII "XX" can be set. • Specify "XX" for a broadcast transmission. No responses will be returned for broadcast transmissions. • No responses will be returned from node numbers other than the ones in the above range.
Sub-address	<ul style="list-style-type: none"> • The sub-address is not used with the 3G3JE. • Always set the sub-address to "00."
SID	<ul style="list-style-type: none"> • This is the service ID. • The service ID is not used with the 3G3JE. • Always set the service ID to "0."
Command text	This is the command text area. For details, refer to 2-2 <i>Structure of Command Text</i> .
ETX	This code (H'03) indicates the end of the text.
BCC	<ul style="list-style-type: none"> • This is the Block Check Character. • The BCC result is found by calculating the exclusive OR of all bytes from the node number through ETX.

■ BCC Calculation Example

The BCC (Block Check Character) is determined by calculating the exclusive OR of the bytes from the node number through ETX. The 8-bit result is written to the BCC byte at the end of the frame.

STX	Node number		Sub-address		SID	Command text			ETX	BCC	
H'02	0 (H'30)	0 (H'30)	0 (H'30)	0 (H'30)	0 (H'30)	0 (H'30)	5 (H'35)	0 (H'30)	3 (H'33)	H'03	H'35

$$BCC = H'30 \oplus H'30 \oplus H'30 \oplus H'30 \oplus H'30 \oplus H'30 \oplus H'30 \oplus H'35 \oplus H'30 \oplus H'33 \oplus H'03 = H'35$$

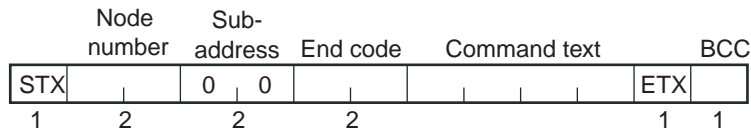
The result of the calculation (H'35) is written to the BCC byte.

The ⊕ symbols indicate exclusive OR operations.

■ Communications Data

Communications protocol	Set values	Negative values	Data
Compoway/F	8-digit hexadecimal	2's complement	The decimal point is removed and the result is converted to hexadecimal. Example conversion: 105.0 → 1050 → H'0000041A

■ Response Frame



Normal Completion

End code	Name	Description	Error detection priority
00	Normal completion	The command ended normally without error.	None

Error Completion

End code	Name	Description	Error detection priority
0F	FINS command error	<ul style="list-style-type: none"> • The specified FINS command could not be executed. • The FINS response code should indicate why the command could not be executed. 	8
10	Parity error	The sum total of bits whose received data is "1" does not match the set value of the communications parity bit.	2
11	Framing error	Stop bit is "0."	1
12	Overrun error	An attempt was made to transfer new data when the reception data buffer was already full.	3
13	BCC error	The calculated BCC value is different from the received BCC value.	5
14	Format error	<ul style="list-style-type: none"> • The command text contains characters other than 0 to 9 and A to F. This error does not apply to Echoback Tests. (Refer to <i>Echoback Test</i> on page 2-12 for details.) • There was no SID and command text. • "MRC/SRC" not included in command text. 	7
16	Sub-address error	<ul style="list-style-type: none"> • Illegal (unsupported) sub-address. • There was no sub-address, SID, and command text. • The sub-address was less than two characters, and there was no SID and command text. 	6
18	Frame length error	The received frame exceeds the specified (supported) number of bytes.	4

- An end code is returned for each command frame received that was addressed to the local node.
- No response will be returned unless the frame contained all elements up to the ETX and BCC.
- The "Error Detection Priority" indicates the priority when two or more errors occur simultaneously.

■ End Code Examples

The following examples show the end code when a command did not end normally.

Example 1: Illegal Sub-address, No SID, and No Command Text

- If there is an illegal sub-address, and no SID or command text, the response end code will be 16 (sub-address error). (If the sub-address is received, the response end code is 16 because a sub-address error has a higher error detection priority than a format error.)

Command

	Node number	Sub- address	BCC
STX		0 A	ETX

Response

	Node number	Sub- address	End code	BCC
STX		0 A	1 6	ETX

End code is "16" (sub-address error).

Example 2: No Command Text

- If there is no command text, the response end code will be 14 (format error).

Command

	Node number	Sub- address	SID	BCC
STX		0 0	0	ETX

Response

	Node number	Sub- address	End code	BCC
STX		0 0	1 4	ETX

The end code is "14" (format error).

2-2 Structure of Command Text

■ PDU Structure

- An MRC (Main Request Code) and SRC (Sub-Request Code) followed by the various required data are transferred in the command text field.

Service Request PDU

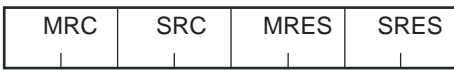


- The MRES (Main Response Code) and SRES (Sub-Response Code) are transferred in the response frame following the MRC and SRC. Data is then transferred following the MRES and SRES.

Service Response PDU (Normal Response)



- If the specified command text could not be executed, the service response PDU will contain only the MRC, SRC, MRES, and SRES.



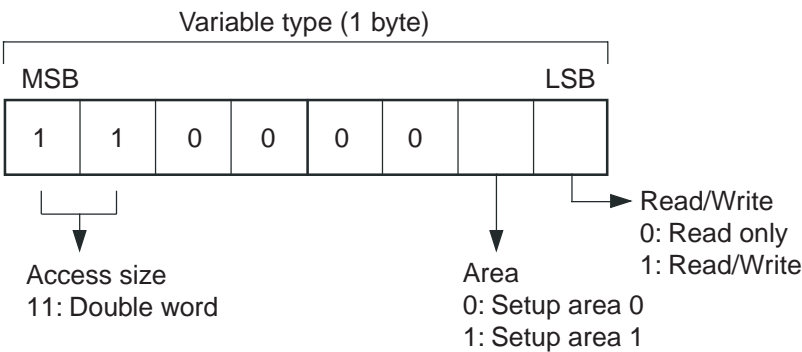
MRES and SRES will provide a response code other than a code for normal completion.

■ Area Definitions

Only the variable area is used.

■ Type Code (Variable Type)

The following tables show the variable area type codes.



The following table summarizes setup areas 0 and 1.

Area	Description
Setup area 0	This area groups together the RUN Mode and Adjustment Mode.
Setup area 1	This is the area for the Initial Settings Mode.

The variable type is converted to 2-byte ASCII and appended to the frame.

The following table shows the available variable types.

Variable type	Description
C0	Double-word data. R/O (read only) parameters for setup area 0.
C1	Double-word data. R/W (read/write) parameters for setup area 0.
C3	Double-word data. R/W parameters for setup area 1.

Note Setup area 1 has no read-only parameters, so there is no variable type “C2.”

■ Addresses

An address is appended to the variable type. Express addresses in 2-byte hexadecimal and append them for each specified access size.

■ Number of Elements

Specify the number of elements within the range “0000 to 0002.” The number of elements is expressed in 2-byte hexadecimal.

■ List of Services

MRC	SRC	Name of service	Processing
01	01	Read Variable Area	This service reads from the variable area.
01	02	Write Variable Area	This service writes to the variable area.
05	03	Read Controller Attributes	This service reads the model number and communications buffer size.
06	01	Read Controller Status	This service reads the operating status.
08	01	Echoback Test	This service performs an echoback test.
30	05	Operation Command	This service performs operations such as resets and moving to Setup Area 0 or 1.

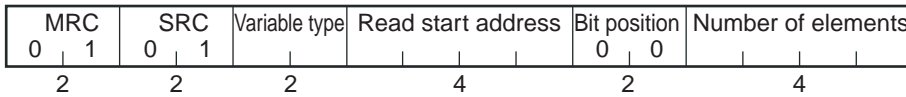
Note No services will be accepted and no responses will be returned when a memory error occurs or during initial status (until normal operation begins after the power is turned ON).

2-3 Detailed Description of Services

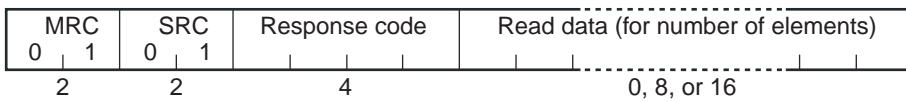
■ Read Variable Area

This service reads data from the variable area.

Service Request PDU



Service Response PDU



1. Variable Type and Read Start Address

For details on variable types and read start addresses, refer to *Chapter 3 Communications Data*.

2. Bit Position

Always "00." The 3G3JE does not support bit access.

3. Number of Elements

Number of elements	Processing
0000	The read operation is not performed (read data is not appended to the service response PDU), and processing ends in a normal completion.
0001 or 0002	The read operation is performed, and processing ends in a normal completion.

4. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

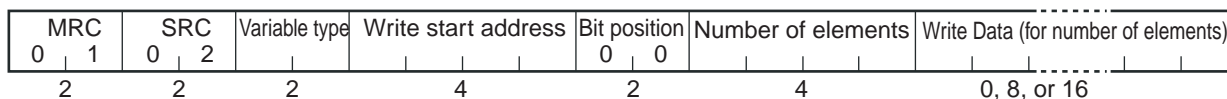
Error Completion

Response code	Error name	Description
1001	Command too long	The command is too long.
1002	Command too short	The command is too short.
1101	Area type error	The variable type is wrong.
1103	Start address out-of-range error	The read start address is out of range.
110B	Response too long	The number of elements is larger than 0002. (Number of elements > 0002)
1100	Parameter error	Bit position is not 00.
2203	Operation error	CPU or EEPROM error

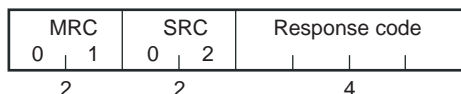
■ Write Variable Area

This service writes data to the variable area.

Service Request PDU



Service Response PDU



1. Variable Type and Write Start Address

For details on variable types and write start addresses, refer to *Chapter 3 Communications Data*.

2. Bit Position

Always “00.” The 3G3JE does not support bit access.

3. Number of Elements

Number of elements	Processing
0000	The write operation is not performed and processing ends in a normal completion. (Do not append write data to the service request PDU.)
0001 to 0002	The write operation is performed and processing ends in a normal completion.

4. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

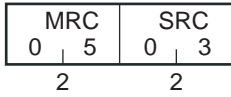
Error Completion

Response code	Error name	Description
1002	Command too short	The command is too short.
1101	Area type error	The variable type is wrong.
1103	Start address out-of-range error	The write start address is out of range.
1104	End address out-of-range error	The write end address (write start address + number of elements) exceeds the final address of the variable area.
1003	Number of elements/data mismatch	The number of data does not match the number of elements.
1100	Parameter error	<ul style="list-style-type: none"> • Bit position is not 00. • The write data is out of the setting range.
3003	Read-only error	An attempt was made to write to variable type “C0.”
2203	Operation error	<ul style="list-style-type: none"> • Attempted to write to a parameter in setup area 1 from setup area 0. • CPU or EEPROM error

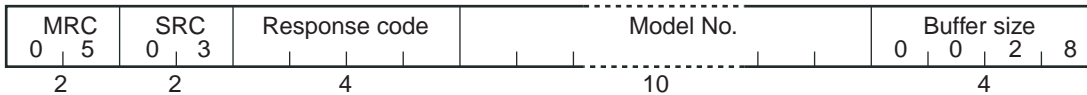
■ Read Controller Attributes

This service reads the model number and communications buffer size.

Service Request PDU



Service Response PDU

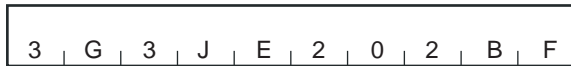


1. Model Number

The model number is expressed in 10-byte ASCII. When 10 bytes are not required, the remaining bytes are filled with spaces.

Example of the Model Number:

The model number will be given as follows for the 3G3JE-A2002B-FLK (maximum motor capacity: 0.2 kW, braking resistance control, RS-485 communications).



2. Buffer Size

The communications buffer size is expressed in 2-byte hexadecimal, and read after being converted to 4-byte ASCII.

Buffer size: 40 bytes (= H'0028)

3. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

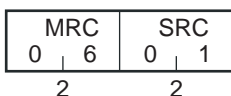
Error Completion

Response code	Error name	Description
1001	Command too long	The command is too long.
2203	Operation error	CPU or EEPROM error

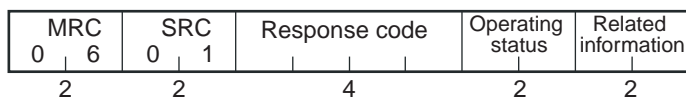
■ Read Controller Status

This service reads the operating status and error status.

Service Request PDU



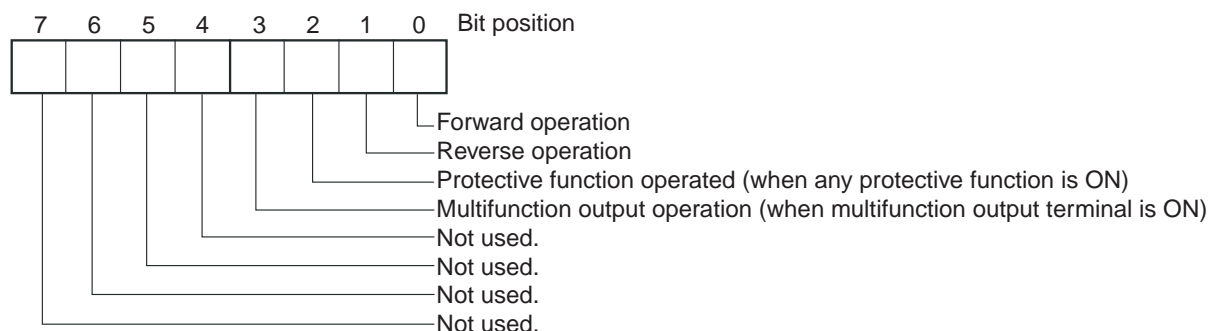
Service Response PDU



1. Operating Status

Operating status	Description
00	Operation is being performed (including when operation has stopped automatically because a protective function has operated).
01	Operation is not being performed.

2. Related Information



3. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

Error Completion

Response code	Error name	Description
1001	Command too long	The command is too long.
2203	Operation error	CPU or EEPROM error

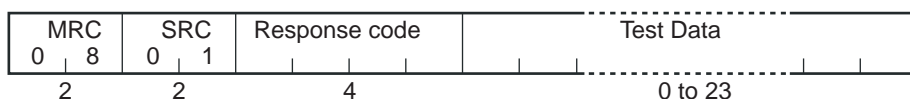
■ **Echoback Test**

This service performs an echoback test.

Service Request PDU



Service Response PDU



1. Test Data

Set between 0 and 23 bytes of user-defined test data.

Set a value for the test data within the ranges shown below according to the communications data length.

Communications data length	Test Data
8 bits	ASCII data: H'20 to H'7E or H'A1 to H'FE
7 bits	ASCII data: H'20 to H'7E

Note Do not set the value H'40. No response will be returned if this value is included.

2. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

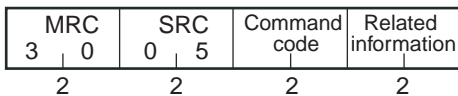
Error Completion

Response code	Error name	Description
1001	Command too long	The command is too long.
2203	Operation error	CPU or EEPROM error

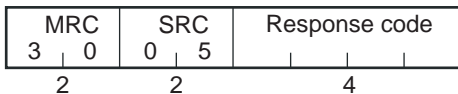
■ **Operation Command**

The commands supported by the 3G3JE are listed in the following table. Refer to this table for command codes and related information.

Service Request PDU



Service Response PDU



1. Command Codes and Related Information

Command code	Command	Related information
01	RUN/STOP	00: Run 01: Stop/Reset protective function
02	Frequency References 1 to 4	00: Frequency reference 1 01: Frequency reference 2 02: Frequency reference 3 03: Frequency reference 4
03	Forward/Reverse Operation	00: Forward operation 01: Reverse operation
04	Write Mode	00: Backup 01: RAM
05	Save RAM Data	00
06	Parameter Initialization	00
07	Software Reset	00
08	Move to Setup Area	00: Move to setup area 0 01: Move to setup area 1
09	Accumulated Operating Time Clear	00

2. Operation Commands and Precautions

- **RUN/STOP**
Command code 01 is used to start and stop operation. It is also used to clear errors when an error has occurred or a protective function has operated. RUN/STOP can be used only in setup area 0.
- **Frequency References 1 to 4**
Command code 02 is used to switch between four frequency references that are set in advance. All four frequency references can be recorded in the Inverter. Frequency References 1 to 4 can be used only in setup area 0.
- **Forward/Reverse Operation**
Command code 03 is used to change the direction of motor rotation and can be used regardless of the RUN/STOP status. The direction will return to forward rotation whenever the power supply is turned ON or setup area 1 is entered. An operation error will occur if reverse operation is set in the related information when reverse operation is prohibited. The Forward/Reverse Operation can be used only in setup area 0.
- **Write Mode**
Command code 04 is used to set the mode for writing frequency references using communications. The Write Mode can be used only in setup area 0. (The default setting for the write mode is Backup Mode.)
 - Backup Mode: The frequency reference is written to EEPROM using communications.
 - RAM Mode: The frequency reference cannot be written to EEPROM using communications. Changes to the frequency reference made with key operations are written each time to EEPROM. When frequently changing the frequency reference, use RAM Mode.
- **Save RAM Data**
Command code 05 is used to write the frequency reference to EEPROM using communications. RAM data can be saved in setup area 0 or 1. The write mode will not be changed.
- **Parameter Initialization**
Command code 06 is used to initialize all parameters except for the Accumulate Operating Time to their default values. Parameters can be initialized only in setup area 1.

- **Software Reset**
Command code 07 is used to start the processing that occurs when the power is turned ON. A software reset can be performed in setup area 0 or 1. (There is no response to this command.)
- **Move to Setup Area**
Command code 08 is used to change the setup area under the following conditions. Changing the setup area can be performed in setup area 0 or 1.
 - Operation must be stopped to move from setup area 0 to 1.
 - Moving from setup area 1 to 0 is possible at any time.
- **Accumulated Operating Time Clear**
Command code 09 is used to clear the Accumulated Operating Time of the motor to 0.0 (0 h). The Accumulated Operating Time can be cleared only in setup area 1.

3. Response Code

Normal Completion

Response code	Name	Description
0000	Normal completion	No errors were found.

Error Completion

Response code	Error name	Description
1001	Command too long	The command is too long.
1002	Command too short	The command is too short.
1100	Parameter error	The write data is out of the setting range.
2203	Operation error	<ul style="list-style-type: none"> • A RUN/STOP command was sent in Initial Settings Mode. • A Parameter Initialization command was sent in RUN Mode or Adjustment Mode. • EEPROM error or initialization has not been performed. • A RUN/STOP command was output when the Operation Command Selection was set to use the PLC (i.e., operation according to the STF/STR control inputs). • Reverse operation was specified even though reverse operation is prohibited.

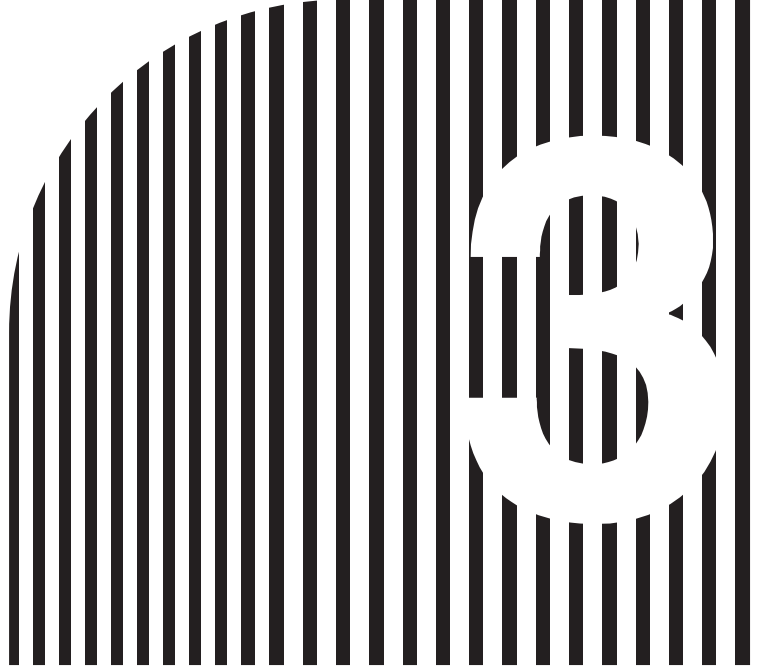
2-4 Response Code List

Normal Completion

Response code	Name	Description	Error detection priority
0000	Normal completion	No errors were found.	None

Error Completion

Response code	Name	Description	Error detection priority
0401	Unsupported command	The service function for the relevant command is not supported.	1
1001	Command too long	The command is too long.	2
1002	Command too short	The command is too short.	3
1101	Area type error	Wrong variable type	4
1103	Start address out-of-range error	The read/write start address is out of range.	5
1104	End address out-of-range error	The write end address (write start address + number of elements) exceeds the final address of the variable area.	6
1003	Number of elements/data mismatch	The amount of data does not match the number of elements.	7
110B	Response too long	The response exceeds the communications buffer size (when the number of elements is larger than 0002).	8
1100	Parameter error	<ul style="list-style-type: none"> • Bit position is not "00." • The write data is out of the setting range. • The command code or related information in the operation command is wrong. 	9
3003	Read-only error	An attempt was made to write to variable type "C0."	10
2203	Operation error	<ul style="list-style-type: none"> • Attempted to write to a parameter in setup area 1 from setup area 0. • CPU or EEPROM error 	11



Chapter 3

Communications Data

3-1 Variable Area Setting Range List

3-2 Status

3-1 Variable Area Setting Range List

The following table lists the data ranges for each type of variable. Refer to the individual items for details.

● Variable Type C0

Address	Name	Setting range	Communications notation	Default	Unit
0000	Frequency reference	0.0 to 120	H'00000000 to H'000004B0	10.0	Hz
0001	Output frequency	---	H'00000000 to H'000004B0	---	Hz
0002	Output current	---	H'00000000 to H'00000032	---	A
0003	Accumulated operating time	---	H'00000000 to H'000003E7	---	kh
0004	Status	---	---	---	---

● Variable Type C1

Address	Name	Setting range	Communications notation	Default	Unit
0000	Frequency reference	0.0 to 120	H'00000000 to H'000004B0	10.0	Hz
0001	Frequency reference 1		H'00000000 to H'000004B0	10.0	Hz
0002	Frequency reference 2		H'00000000 to H'000004B0	0.0	Hz
0003	Frequency reference 3		H'00000000 to H'000004B0	0.0	Hz
0004	Frequency reference 4		H'00000000 to H'000004B0	0.0	Hz
0005	Acceleration time	0.1 to 999	H'00000001 to H'00002706	10.0	s
0006	Deceleration time	0.1 to 999	H'00000001 to H'00002706	10.0	s
0007	Application selection	0: Fan application or pump application 1: Conveyor application	H'00000000 H'00000001	1	---

- The unit for the frequency reference, output frequency, output current, accumulated operating time, frequency references 1 to 4, acceleration time, and deceleration time is 0.1.

Examples:

0.7 → H'00000007
 50.0 → H'000001F4
 120 (120.0) → H'000004B0

- The frequency reference range depends on the frequency reference upper limit and the frequency reference lower limit.
- The acceleration time, deceleration time, and application selection cannot be written during operation. (They can be read during operation.)
- 1 kh = 1,000 hours

● Variable Type C3

Address	Name	Setting range	Communications notation	Default	Unit
0000	Rated motor current	0.0 to 2.5	H'00000000 to H'00000019	0.1 kW: 0.6 0.2 kW: 1.0 0.4 kW: 2.0	A
0001	Accumulated operating time standard	0.0 to 99.9	H'00000000 to H'0000003E7	20.0	kh
0002	DC injection braking frequency	0.0 to 5.0	H'00000000 to H'00000032	3.0	Hz
0003	Startup DC injection braking time	0.0 to 10.0	H'00000000 to H'00000064	0.0	s
0004	DC injection braking-to-stop time	0.0 to 10.0	H'00000000 to H'00000064	0.5	s
0005	Maximum output frequency	50.0 to 120	H'000001F4 to H'000004B0	60.0	Hz
0006	Frequency reference upper limit	0.1 to 120	H'00000001 to H'000004B0	60.0	Hz
0007	Frequency reference lower limit	0.0 to 120	H'00000000 to H'000004B0	0.0	Hz
0008	Momentary power interruption restart selection	0: Do not continue operation. 1: Continue operation if power interruption is 0.5 s or less. 2: Always continue operation.	H'00000000 H'00000001 H'00000002	0	---
0009	Operation command selection	0: Operate using Digital Operator key operations. 1: Operate using the STF/SFR control inputs. (RUN/STOP commands sent via communications will be disabled.)	H'00000000 H'00000001	0	---
000A	Frequency reference selection	The communications type is always 0. (The frequency references set by Digital Operator keys and by communications are enabled).	H'00000000	0	
000B	Multi-function output selection	000: Not assigned. 001: Zero speed (Output turned ON when the output frequency is 0 Hz or operation is stopped.) 002: Frequency matching (Output turned ON when the output frequency and the frequency reference are the same.) 003: Reverse operation (Output turned ON when the direction of rotation is set for reverse operation.)	H'00000000 H'00000001 H'00000002 H'00000003	0	---
000C	Reverse rotation prohibit selection	0: Reverse rotation enabled. 1: Reverse operation prohibited (i.e., reverse operation not possible).	H'00000000 H'00000001	1	---
000D	Carrier frequency selection	0: 4 KHz 1: 7 KHz	H'00000000 H'00000001	0	---
000E	Communications unit number	0 to 99	H'00000000 to H'00000063	1	---
000F	Communications baud rate	0: 2.4 Kbps 1: 4.8 Kbps 2: 9.6 Kbps 3: 19.2 Kbps	H'00000000 H'00000001 H'00000002 H'00000003	2	---
10	Communications data length	0: 7 bits 1: 8 bits	H'00000000 H'00000001	0	---
11	Communications stop bit	0: 1 bit 1: 2 bits	H'00000000 H'00000001	1	---
12	Communications parity	0: None 1: Even 2: Odd	H'00000000 H'00000001 H'00000002	1	---

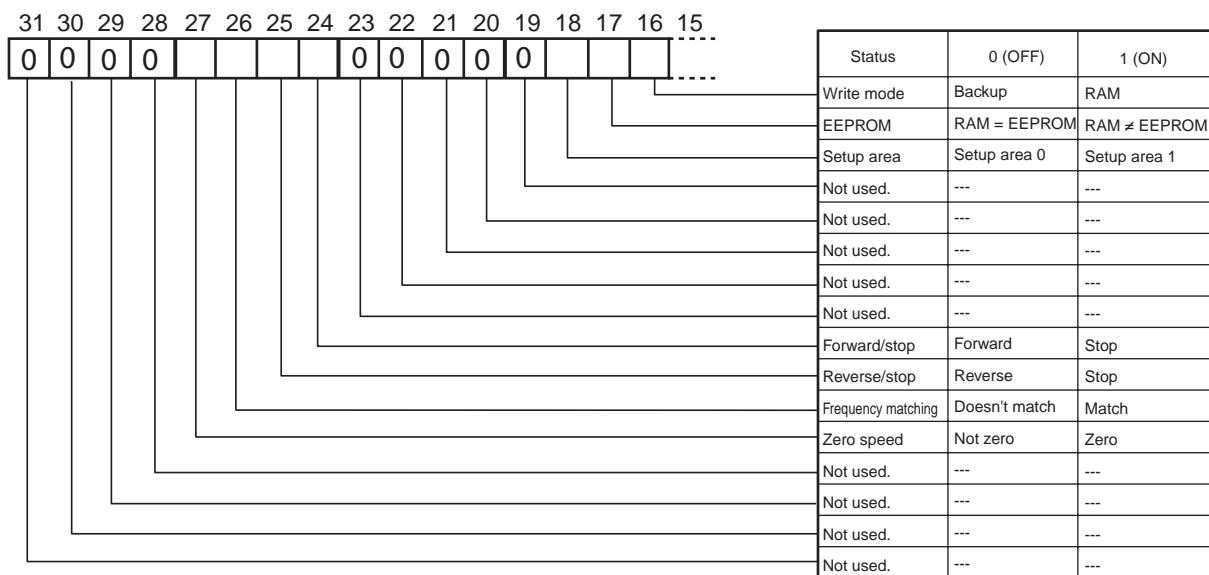
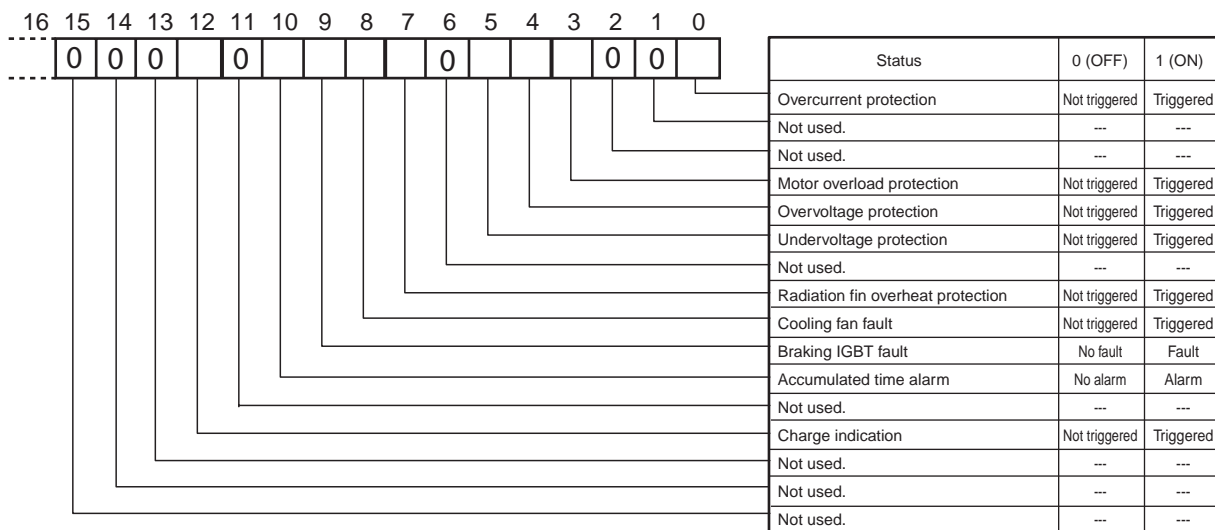
- The unit for the rated motor current, accumulated operating time standard, DC injection braking frequency, startup DC injection braking time, DC injection braking-to-stop time, maximum output frequency, frequency reference upper limit, and frequency reference lower limit is 0.1.

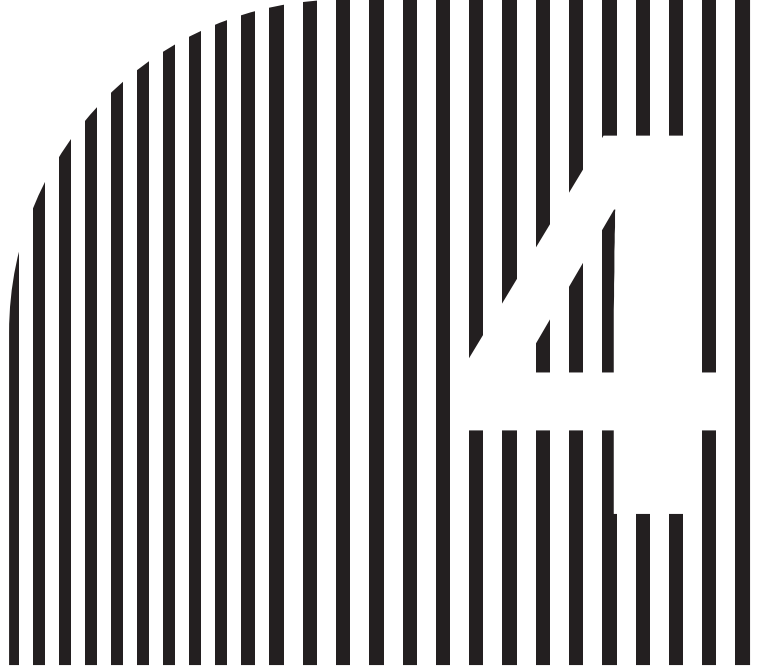
Examples:

0.7 → H'00000007
 50.0 → H'000001F4
 120 (120.0) → H'000004B0

3-2 Status

The figure below shows the structure of the status data.



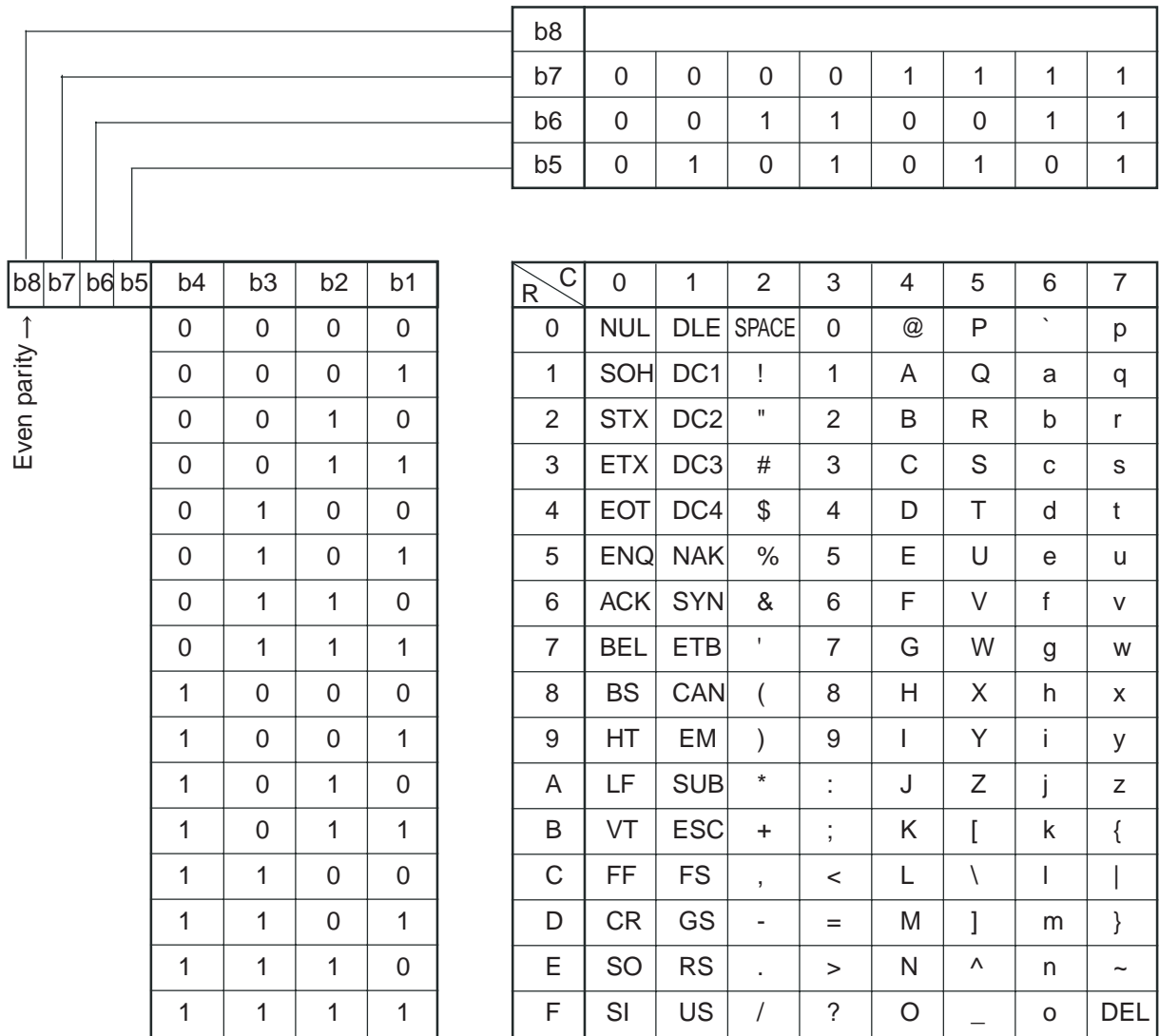


Chapter 4

Appendix

4-1 ASCII List

4-1 ASCII List



Index

A

addresses, 2-8
area definitions, 2-7
ASCII list, 4-2

B

BCC, 2-2

C

command frame, 2-2
command text, 2-2
 structure, 2-7
communications baud rate, 1-4
communications data, 2-3
communications data length, 1-4
communications functions, 1-2
communications methods, 1-2
communications parity, 1-4
communications specifications, 1-2
communications stop bits, 1-4
communications unit number, 1-4
connections, 1-3
controller attributes
 reading, 2-11
controller status
 reading, 2-11

D

data format, 2-2
data ranges, 3-2

E

Echoback Test, 2-12
EEPROM, X, 2-14
electronic thermal, X
elements, number of, 2-8
end codes, 2-4
ETX, 2-2

I

interface, 1-3

M

motor overheating protection, X

N

node number, 2-2

number of elements, 2-8

O

Operation Command, 2-13

P

parameters
 P15 (communications unit number), 1-4
 P16 (communications baud rate), 1-4
 P17 (communications data length), 1-4
 P18 (communications stop bits), 1-4
 P19 (communications parity), 1-4
PDU structure, 2-7

R

Read Controller Attributes, 2-11
Read Controller Status, 2-11
Read Variable Area, 2-9
response codes, 2-16
response frame, 2-4

S

services
 details, 2-9
 list, 2-8
SID, 2-2
status, 3-4
STX, 2-2
sub-address, 2-2

T

transmission procedure, 1-3
type codes, 2-7

V

variable area, 3-2
 reading, 2-9
 writing, 2-10

W

wire size, 1-4
wiring, 1-3
wiring diagram, 1-4

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. I548-E1-01



Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	June 2006	Original production