

# RS-485 Communications

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## 1. Over view

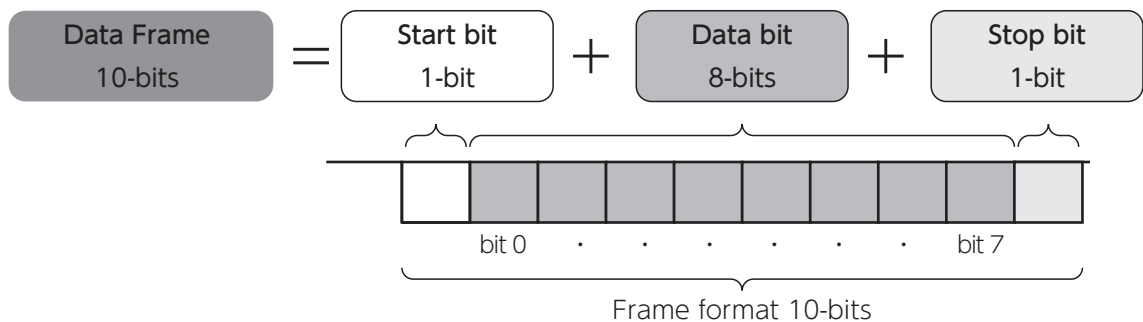
### 1. Overview

RS-485 interface enables the amplifier to be connected to the host controller

Items	Specifications
Electric Specification	RS-485
Communication method	Asynchronous serial communication (half-duplex)
Transmission speed	Select one of the following: 2,400 bps, 4,800 bps, 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps
Data bits	8
Parity bit	None, Even, or Odd
Stop bits	1, or 2
Error detection scheme	CRC16-CCITT
Data representation	8-bit binary code
Communications data length	35 bytes or less

### Data Frame

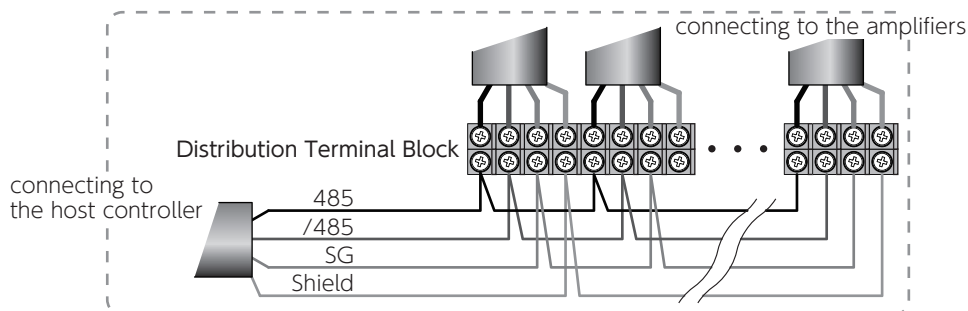
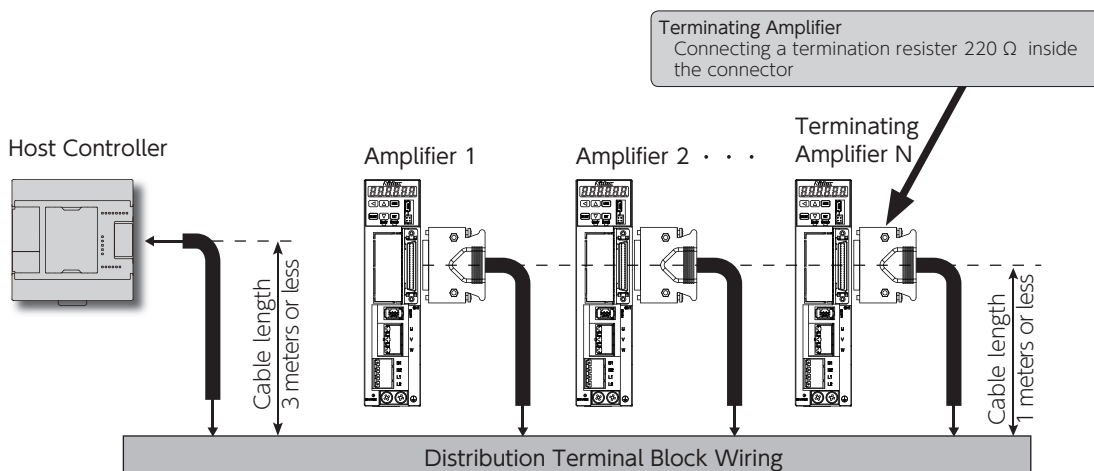
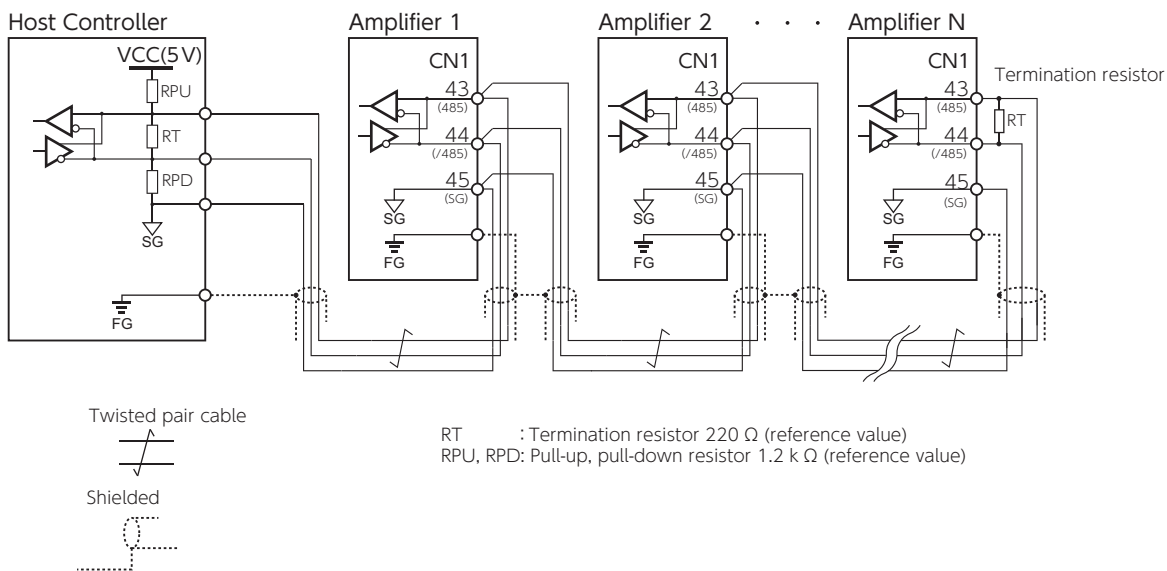
The frame format is 10-bit long.



# 1. Overview

## 2. Wiring

The diagram below illustrates wiring RS-485 to I/O connectors of amplifiers. This example shows multi-drop connections.



To make wiring of connectors quick and easy, use a terminal block for signal distribution as shown above.

## 2. Setup

### 1. Parameters

Set the communications address and communications parameters to the amplifier according to the host controller.

You must set the following parameters.

#### Parameters related to RS-485 communications

Parameter No.	Parameter	Setting
4.0	RS-485 communication: <b>Address</b>	Range : 1...32 Default : 1
6.0	RS-485 transmission: <b>Speed</b>	0 : 2,400 bps 1 : 4,800 bps 2 : 9,600 bps 3 : 19,200 bps 4 : 38,400 bps 5 : 57,600 bps (default)
6.1	RS-485 communication: <b>Stop bit</b>	0 : 1 bit (default) 1 : 2 bits
6.2	RS-485 communication: <b>Parity</b>	0 : None (default) 1 : Even 2 : Odd
8.0	RS-485 communication: <b>Switch</b>	<u>Set to 1</u> 0 : Disable (default) 1 : Enable
11.0	RS-485 communication: <b>Minimum response time</b>	Range : 0...255 ms Default : 3 ms

#### Setting the parameters



Use the Setup Panel on the amplifier front.

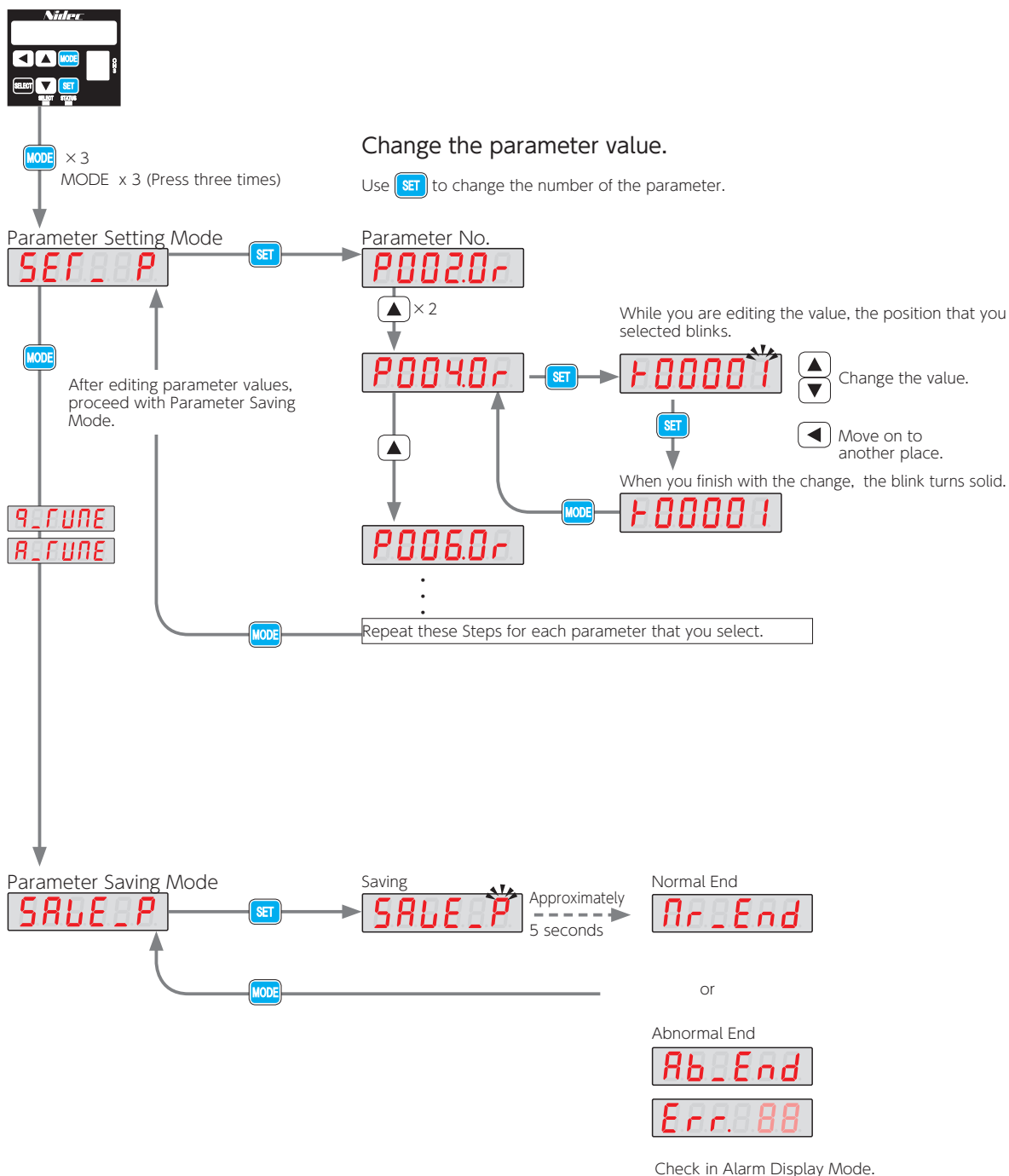


Use the setup software S-TUNE for tuning.  
Install it on the user-supplied computer.

## 2. Setup

### 2. Setting the Parameters

#### Using the Setup Panel




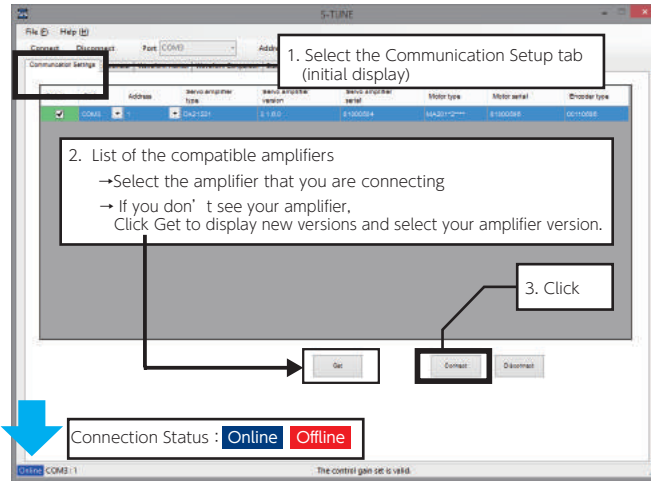
Save the parameter settings in Parameter Saving mode to the amplifier. If you shut down the amplifier without saving them, the changes will not take effect.

## 2. Setup

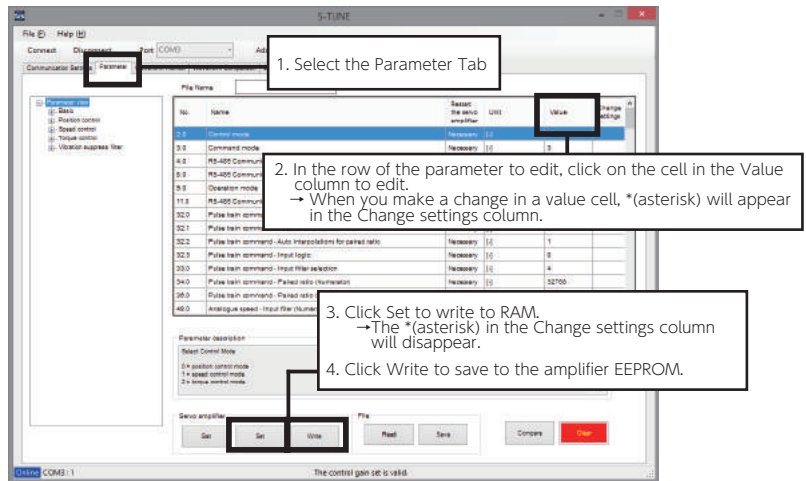
### Using S-TUNE

#### Step 1 Start

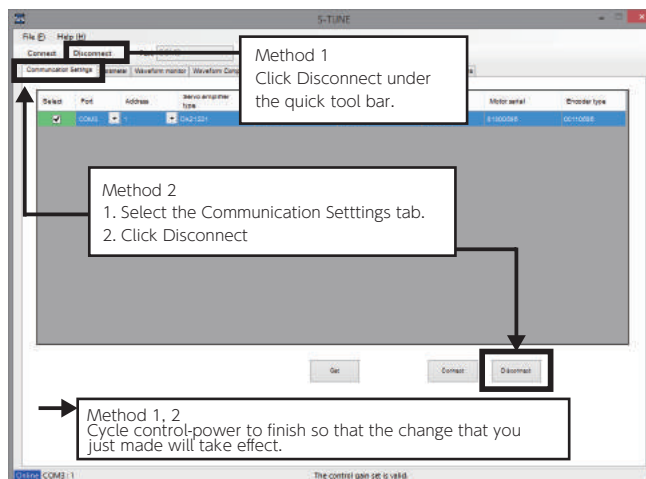
Double-click on 



#### Step 2 Set parameters



#### Step 3 Finish



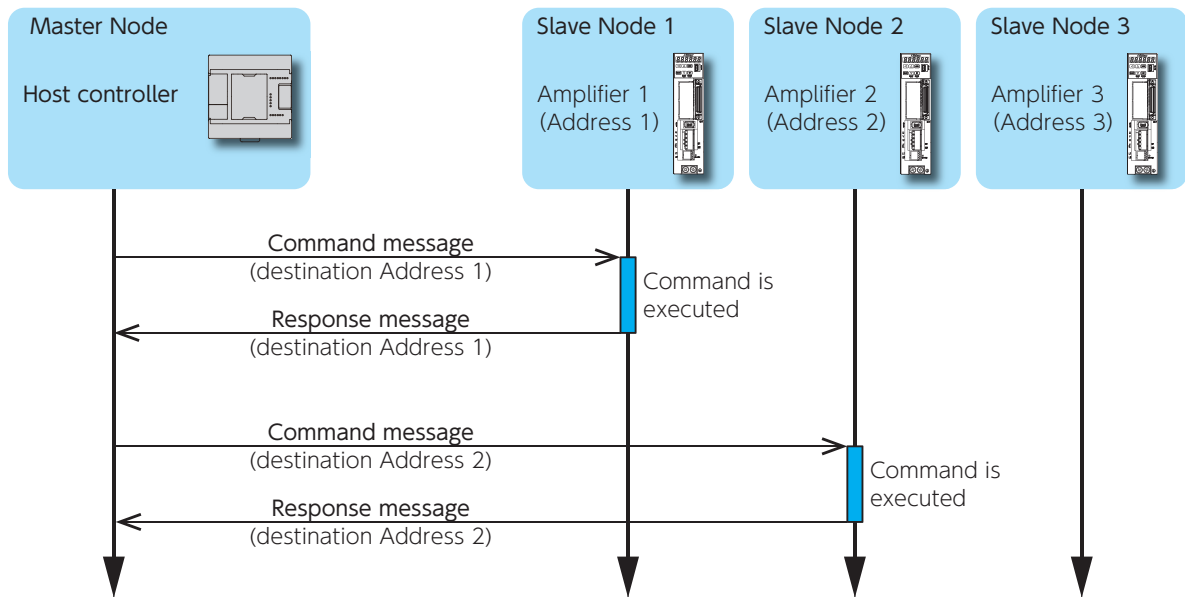
### 3. Communications Procedure

#### Unicast Communications

Point-to-point communications between the host controller (master node) and a servo amplifier (slave node) specified by a destination address.

**Step 1** : A master node transmits a command message.

**Step 2** : A slave node returns a corresponding response message.

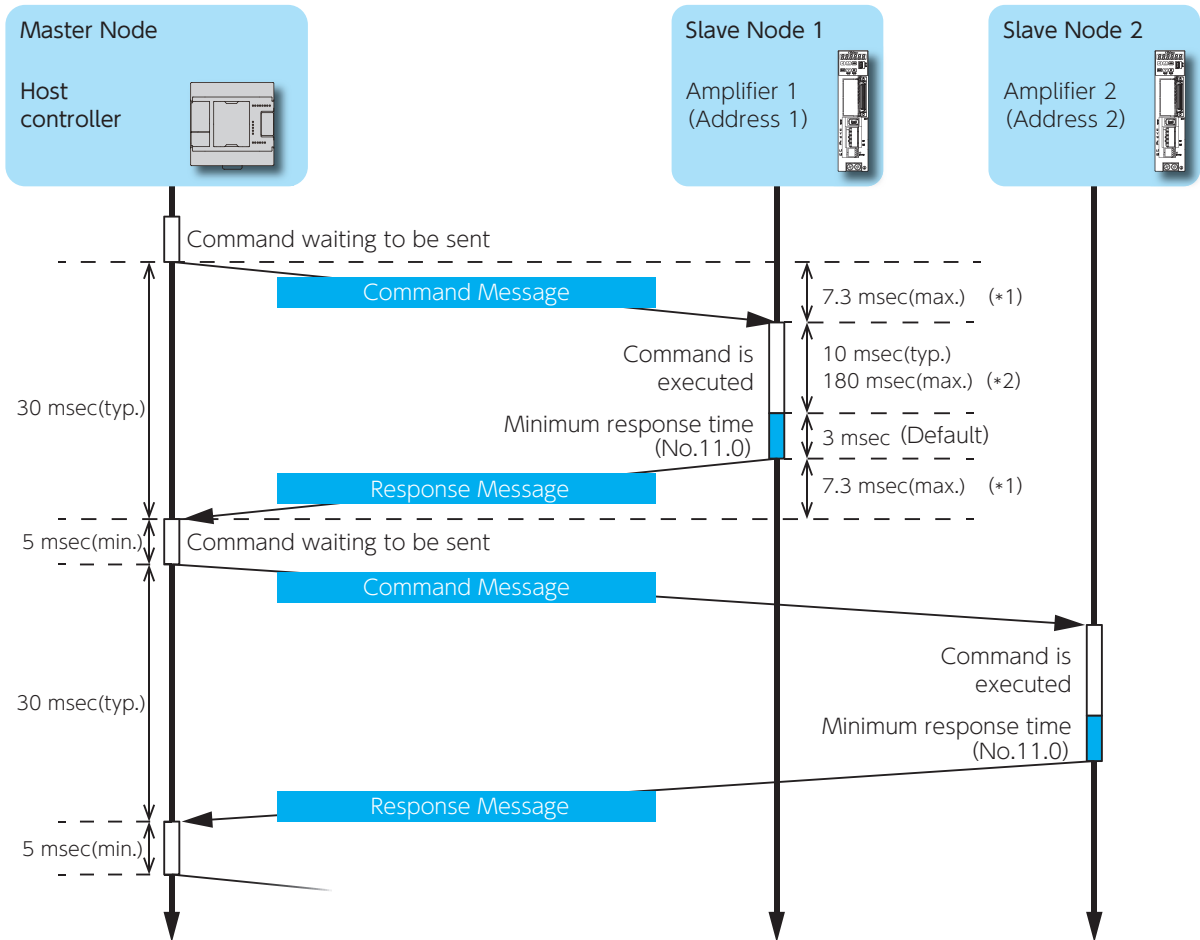


### 3. Communications Procedure

#### 1. Communications Timing

When receiving normal command message

After receiving a response from the amplifier, wait for 5 ms before sending the next command.



\*1) Formula to calculate command response time  
 Command transmission time = Command length / Transmission speed

For example, where Message Length = 420 bits (max) and Transmission Speed=57,600 bps.  
 Command transmission time = 420 / 57,600 = 7.29 ms (max.)

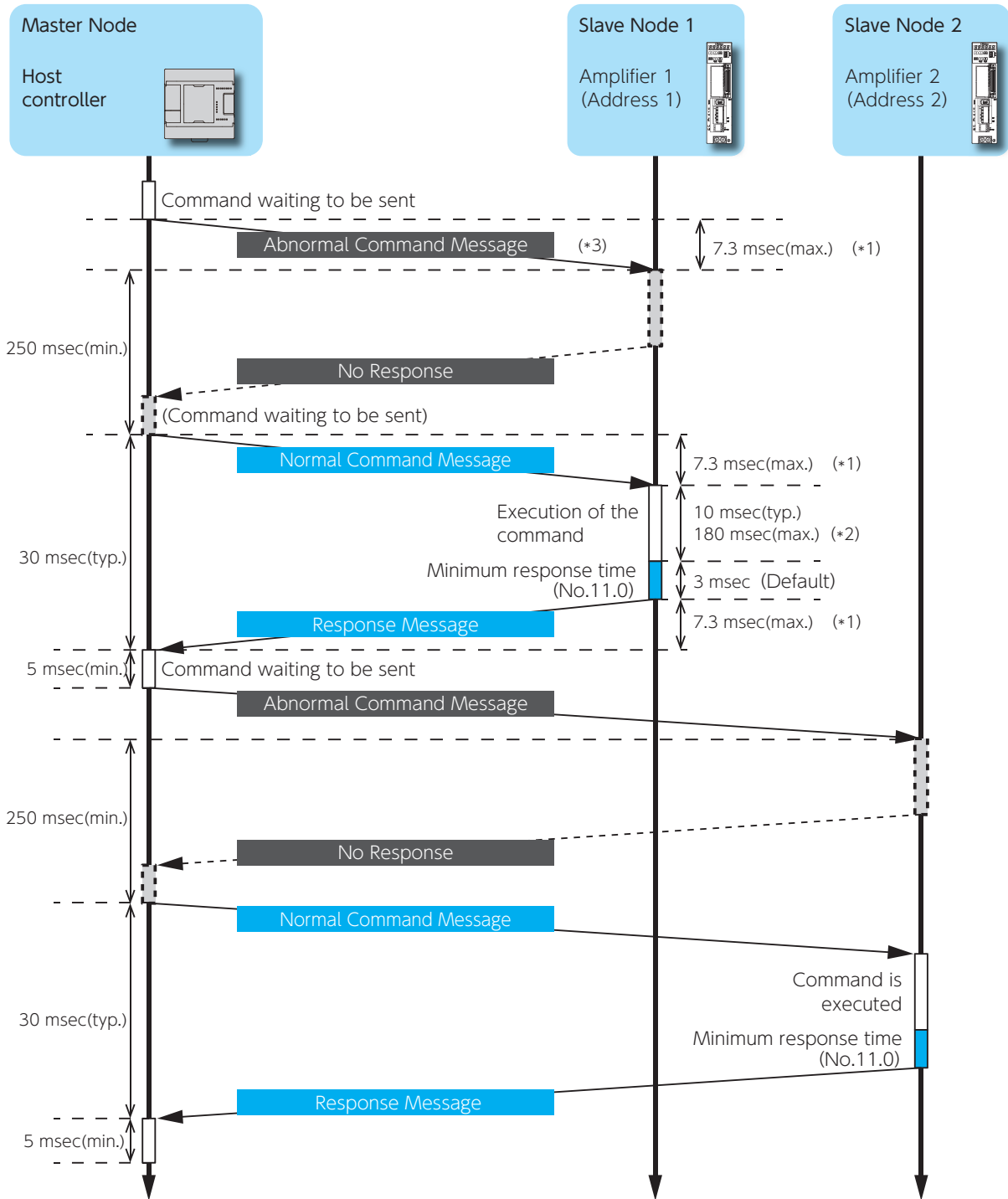
\*2) When executing a command related to Write or Clear the amplifier ROM.



### 3. Communications Procedure

When receiving an abnormal command message

If there is no response from the amplifier, wait at least 250 ms before sending the next command.



\*1), \*2) These timings are the same as those for normal command messages mentioned in page 10.

\*3) This indicates that a bad command message was sent from the host controller or the amplifier was unable to receive a correct command because of noise interference.

# 4. Communication Commands

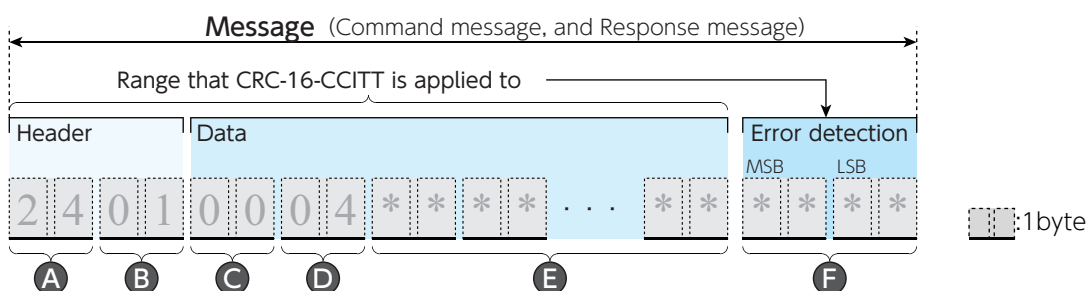
This section describes the format of messages transmitted between the host controller and the amplifier. A message comprises three fields: header, data, and error detection. The same format is used for both command messages sent from the host controller to the amplifier, and response messages in the reverse direction.

## 1. The explanation of a message

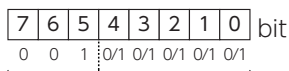
### The construction of the message

**Message** = **Header field** + **Data field** + **Error detection field**

Command message  
Response message



### A Protocol Header



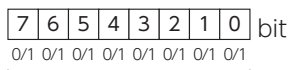
**Data Length Code**

Enter the data length in the byte unit.  
The data is 2 - 31 bytes long.  
The data length is command-dependent.

**Protocol ID code**

Specify the communication protocol.  
1 : Single Master Protocol (fixed)  
0, 2-7 : (Reserved)

### B Destination Address



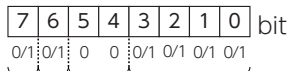
**Destination Address**

The address of the amplifier that the command message is sent to.

1-31 : Unicast communications address  
0, 32-255 : (Reserved)

# 4. Communication Commands

## C Control Code



### Error code

Represents the result of command execution.

#### Command message

0 : (Fixed value)

#### Response message

- 0 : Normal end
- 1 : Abnormal end
- 2 : Undefined command number was received
- 3 : Incorrect message format
- 4 : Invalid operation mode
- 5 : Invalid Internal status
- 6 : Parameter value not in the range
- 7 : Access denied
- 8 : Unlock Failed
- 9-15 : (Reserved)

(Reserved)

### Toggle bit

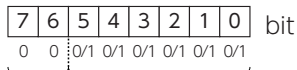
Identifies transmission duplicates and loss of command messages. Sets 0 and 1 alternatively every time the host controller sends a command message. The amplifier sends back the same value in the response message.

### Direction bit

Distinguishes between command message and response message.

- 0 : Command Message
- 1 : Response Message

## D Command Code



### Command Code

Enter the hexadecimal code for a command.

0-63 : Command code Pages 12- List of Commands, Command Details

### Command Group

- 0 : amplifier communications command (Fixed)
- 1-3 : (Reserved)

## E Parameter Code & Response Data

### Command message

Enter the following four parameter codes (in hexadecimal) corresponding to the command code you select.

Parameter No., Value to set, Status No., and Unlock code

The data is 0 to 29 bytes long.

The data length is command-dependent.

Pages 12- List of Commands, Command Details

### Response data

The amplifier returns response data corresponding to the executed command.

## F Error detection field


### Error detection specifications

Algorithm	: CRC-16-CCITT
Calculation range	: Header field + Data field
Data size	: 2 bytes
Polynomial	: 0x1021
Initial value	: 0xFFFF
Output CRC	: Not reflected
Shift direction	: MSB first

The amplifier determines the message received is correct only when the error detection field data received and the value derived from the received data agree.

## 4. Communication Commands

### 2. List of Commands

Name (Command Code)	Description	
NOP (00)	Executes NOP command	14
GET_PARAM_2 (04)	Reads the parameter value set in the amplifier RAM <u>two bytes</u> at a time.	15
GET_PARAM_4 (05)	Reads the parameter value set in the amplifier RAM <u>four bytes</u> at a time..	16
SET_PARAM_2 (07)	Writes the parameter value to the amplifier RAM <u>two bytes</u> at a time.	17
SET_PARAM_4 (08)	Writes the parameter value to the amplifier RAM <u>four bytes</u> at a time.	18
UNLOCK_PARAM_ALL (0A)	Obtains the unlock code for saving parameter to the amplifier.	19
SAVE_PARAM_ALL (0B)	Saves all parameters set in the amplifier RAM to the non-volatile memory.	20
GET_STATE_VALUE_2 (10)	Reads the status value set in the amplifier <u>two bytes</u> at a time.	21
GET_STATE_VALUE_4 (11)	Reads the status value set in the amplifier <u>four bytes</u> at a time.	22
READ_EA05_DATA (1E)	Reads the encoder data.	23
CLEAR_EA05_DATA (1F)	Clears the encoder data.	24
READ_EA05_DATA_EX (62)	Reads the encoder single-turn data and multi-turn data.	25
SET_STATE_VALUE_WITHMASK_4 (66)	Sets the status value to a logical I/O of the amplifier <u>four bytes</u> at a time.	26

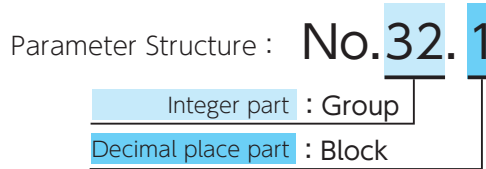
( ) Command codes are presented in hexadecimal.

## 4. Communication Commands

### 3. The construction of the parameter

#### Parameter Structure

The parameter number is "2 byte" data.  
 A parameter comprises **a integer part (Group)** and **a decimal place part (Block)**.  
 Read or rewrite of the parameters are handled group by group.



#### Single Parameter

Belongs to a parameter group which has one parameter (i.e. block 0 only).

#### Compound Parameter





Belongs to a parameter group which have multiple parameters (i.e. more than one block).

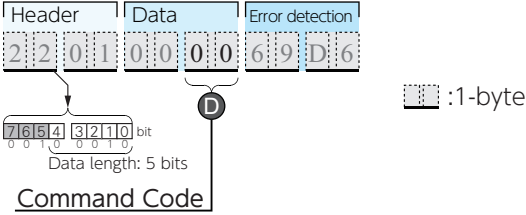
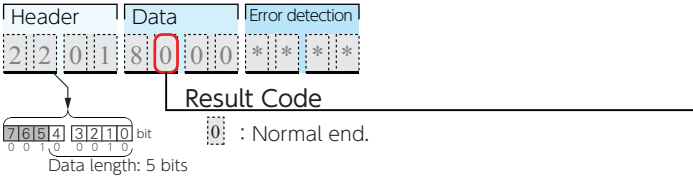
Parameter Group	Parameter Numbers and Bit Assignments			
	Parameter Number code in the E-part: * * * *			
	:1-byte			
	Block 3 15 14 13 12	Block 2 11 10 9 8	Block 1 7 6 5 4	Block 0 3 2 1 0 bit
6	-	No. 6.2	No. 6.1	No. 6.0
32	No. 32.3	No. 32.2	No. 32.1	No. 32.0
62	-	No. 62.2	No. 62.1	No. 62.0
65	-	-	No. 65.1	No. 65.0
66	No. 66.3	-	No. 66.1	No. 66.0
67	No. 67.3	No. 67.2	No. 67.1	No. 67.0
82	-	-	No. 82.1	No. 82.0
110	-	-	No.110.1	No.110.0
113	-	No.113.1	No.113.0	
120	-	No.120.1		No.120.0
144	-	-	No.144.1	No.144.0
160	-	No.160.2	No.160.1	No.160.0
224	No.224.3	No.224.2	No.224.1	No.224.0
225	-	No.225.2	No.225.1	No.225.0
232	No.232.3	No.232.2	No.232.1	-
233	No.233.3	-	-	No.233.0
259	-	-	No.259.1	No.259.0
272	-	-	No.272.1	-
302	-	No.302.2	No.302.1	No.302.0
645	No.645.3	-	No.645.1	No.645.0
646	No.646.3	No.646.2	No.646.1	No.646.0
647	-	-	No.647.1	No.647.0
720	No.720.3	-	No.720.1	No.720.0

## 4. Communication Commands



### 4. Command Details

Data is represented in the following format.

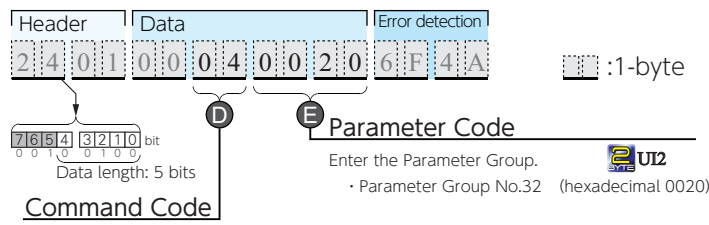
Notation	Description
 UI2	Unsigned two-byte integer data
 I2	Signed two-byte integer data
 UI4	Unsigned four-byte integer data
 I4	Signed four-byte integer data

Name	NOP
Description	Executes NOP (No Operation) command
Command Code	00
Parameter Code	None
Command Message Example	
Response Message Example	<p>None (Receiving the result code)</p> 



# 4. Communication Commands

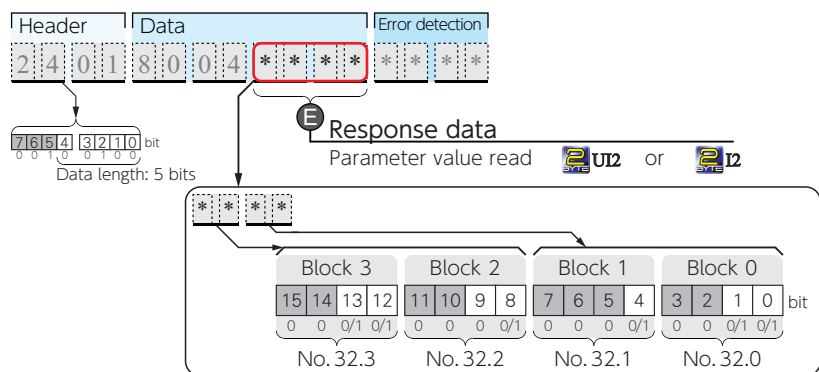
Name	GET_PARAM_2
Description	Reads the parameter value, which is set in the amplifier RAM, <u>two bytes at a time</u> .
Command Code	04
Parameter Code	Enter the Parameter Group number (  ) that you want to read.  S-FLAG Instruction Manual <b>5</b> Setting List of Parameters

To read the value of Parameter No.32.0 (Pulse train command: Input pulse form):



**Command Message Example**




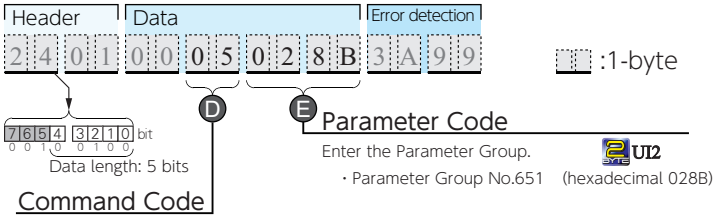


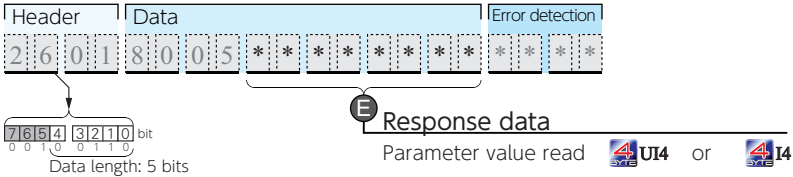
Parameter value (  or  )



**Response Message Example**





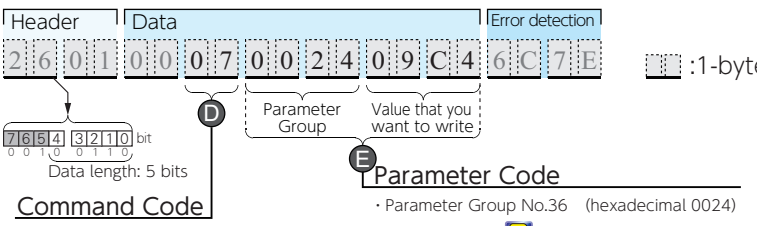



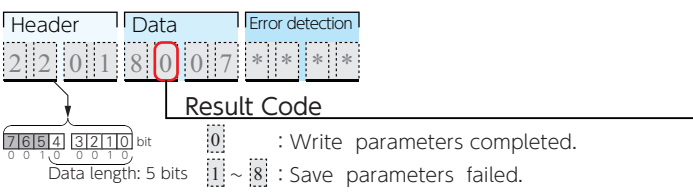
Returns values of parameters No.32.0, No.32.1, No.32.2, and No.32.3 in Parameter Group No.32. Block0 represents the value of No.32.0. Some of parameter values are negative numbers. If necessary, convert the sign of the data returned.

## 4. Communication Commands





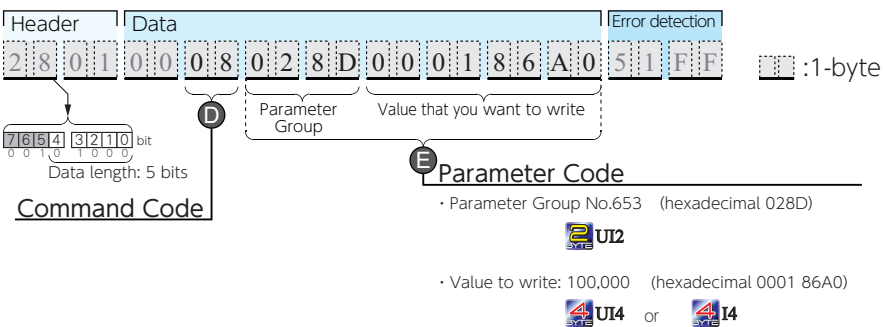



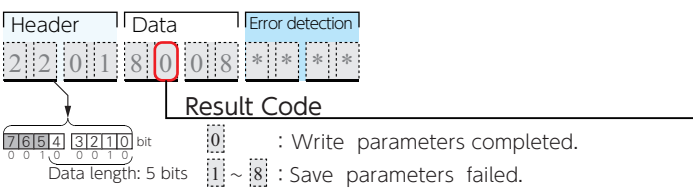
Name	GET_PARAM_4
Description	Reads the parameter value set in the amplifier RAM <u>four bytes at a time</u> .
Command Code	05
Parameter Code	Enter the Parameter Group number (  UI2 ) that you want to read.  S-FLAG Instruction Manual  Setting List of Parameters
Command Message Example	<p>To read the value of No.651.0 (Homing - Amount of Position Shift from Home):</p> 
Response Message Example	<p>Parameter value (  UI4 or  I4 )</p>  <p>Some of parameter values are negative numbers. If necessary, convert the sign of the data returned.</p>



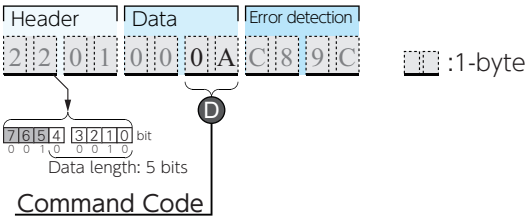

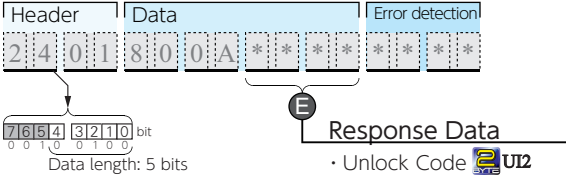

# 4. Communication Commands

Name	SET_PARAM_2
Description	Writes the parameter value to the amplifier RAM <u>two bytes at a time</u> .
Command Code	07
Parameter Code	Enter Parameter Group No. (  UI2 ) and the value to write (  UI2 or  I2 ) .  S-FLAG Instruction Manual <b>5</b> Setting List of Parameters
Command Message Example	<p>To write 2,500 as the value of Parameter No.36.0 (Pulse train command - denominator of pulse paired ratio)</p>  <p><b>Command Code</b></p> <ul style="list-style-type: none"> <li>Parameter Group No.36 (hexadecimal 0024) </li> <li>Value that you want to write: 2,500 (hexadecimal 09C4)  or </li> </ul>
Response Message Example	<p>None (Receiving the result code)</p>  <p><b>Result Code</b></p> <ul style="list-style-type: none"> <li>0 : Write parameters completed.</li> <li>1 ~ 8 : Save parameters failed.</li> </ul>


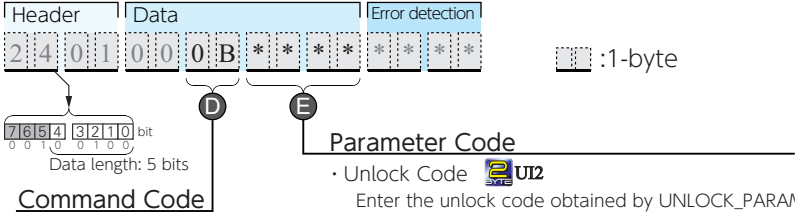
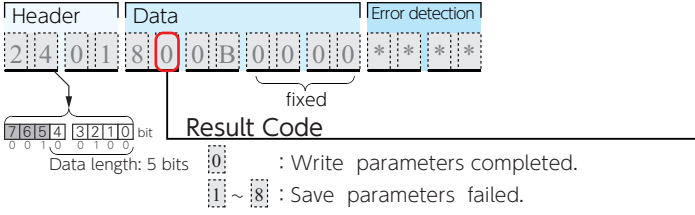




## 4. Communication Commands

Name	SET_PARAM_4
Description	Writes the parameter value to the amplifier RAM <b>four bytes at a time</b> .
Command Code	08
Parameter Code	Enter Parameter Group No. (  UI2 ) and the value to write (  UI4 or  I4 ).  S-FLAG Instruction Manual <b>5</b> Setting List of Parameters
Command Message Example	<p>To write 100,000 as the value of Parameter No.653.0 (Homing - Home position data)</p>  <p>Header: 2 8 0 1   Data: 0 0 0 8 0 2 8 D   Error detection: 0 0 0 1 8 6 A 0 5 1 F F</p> <p>Bit positions: 7 6 5 4   3 2 1 0 bit</p> <p>Data length: 5 bits</p> <p>Parameter Group: 0 2 8 D</p> <p>Value that you want to write: 0 0 0 1 8 6 A 0</p> <p><b>E Parameter Code</b></p> <ul style="list-style-type: none"> <li>Parameter Group No.653 (hexadecimal 028D) </li> <li>Value to write: 100,000 (hexadecimal 0001 86A0)  or </li> </ul>
Response Message Example	<p>None (Receiving the result code)</p>  <p>Header: 2 2 0 1   Data: 8 0 0 8   Error detection: * * * *</p> <p>Bit positions: 7 6 5 4   3 2 1 0 bit</p> <p>Data length: 5 bits</p> <p><b>Result Code</b></p> <ul style="list-style-type: none"> <li>0: Write parameters completed.</li> <li>1 ~ 8: Save parameters failed.</li> </ul>

## 4. Communication Commands

Name	UNLOCK_PARAM_ALL
Description	Obtains the unlock code for saving parameter to the amplifier.
Command Code	0A
Parameter Code	None
Command Message Example	 <p>Header: 2 2 0   Data: 0 0 0 A   Error detection: C 8 9 C</p> <p>Bit diagram: 7 6 5 4   3 2 1 0 bit 0 0 1 0 0 Data length: 5 bits</p> <p>Command Code</p>
Response Message Example	<p><b>Unlock Code (  UI2 )</b></p> <p>The amplifier returns the following unlock message.</p>  <p>Header: 2 4 0   Data: 8 0 0 A   Error detection: * * * * *</p> <p>Bit diagram: 7 6 5 4   3 2 1 0 bit 0 0 1 0 0 Data length: 5 bits</p> <p>Response Data</p> <ul style="list-style-type: none"> <li>• Unlock Code  UI2</li> </ul> <p>Enter the unlock code obtained to the parameter field in the command SAVE_PARAM_ALL.</p>




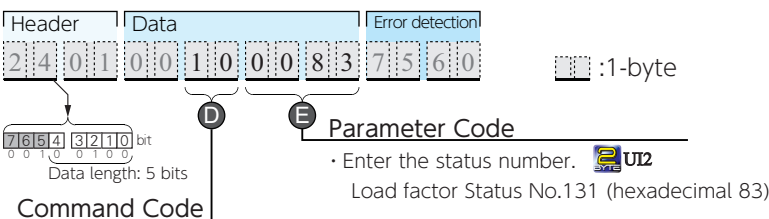



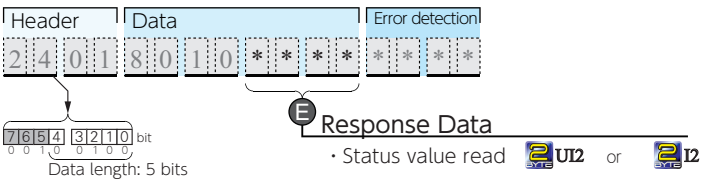


## 4. Communication Commands

Name	SAVE_PARAM_ALL
Description	Saves all parameters set in the amplifier RAM to the non-volatile memory. Before turning off the control power, always execute this command after making changes to parameters. Otherwise, unsaved parameters will not take effect after cycling the control power.
Command Code	0B
Parameter Code	Enter the unlock code (  UI2 ) . Set the unlock code obtained by executing UNLOCK_PARAM_ALL. The unlock code is different each time. Before transmitting SAVE_PARAM_ALL, execute UNLOCK_PARAM_ALL to obtain the unlock code.
Command Message Example	 <p>Fixed value (00 00)</p>  <p>Check the result code to see whether parameter saving was successful.</p> <p> Page 11  Control Code</p>
Response Message Example	<p>Check the result code to see whether parameter saving was successful.</p> <p> Page 11  Control Code</p>



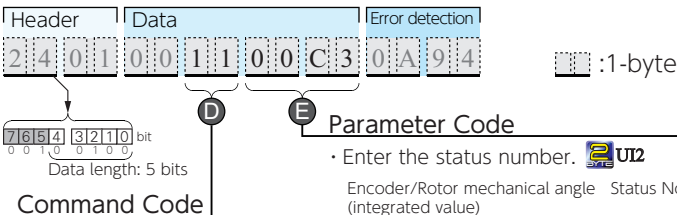



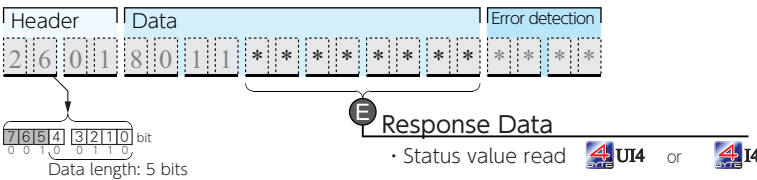


To save parameters, use the unlock code read by UNLOCK\_PARAM\_ALL.

 Page 27 Saving the Parameters

## 4. Communication Commands

Name	GET_STATE_VALUE_2
Description	Reads the status value of the amplifier <u>two bytes at a time</u> .
Command Code	10
Parameter Code	Enter the Status number (  ) that you want to read.  S-FLAG Instruction Manual  Appendices Status List
Command Message Example	<p>To read Status No.131 “load factor” :</p>  <p>Header: 2:4 0:1   Data: 0:0 1:0 0:0 8:3   Error detection: 7:5 6:0</p> <p>Bit positions: 7 6 5 4   3 2 1 0 bit</p> <p>Data length: 5 bits</p> <p>Command Code</p> <p>Parameter Code</p> <ul style="list-style-type: none"> <li>Enter the status number. </li> <li>Load factor Status No.131 (hexadecimal 83)</li> </ul>
Response Message Example	<p>Status value (  or  ) .</p> <p>The amplifier returns the following response message. For the above command example, the load factor read is returned in the response data field.</p>  <p>Header: 2:4 0:1   Data: 8:0 1:0 *:*:*:   Error detection: *:*:*:</p> <p>Bit positions: 7 6 5 4   3 2 1 0 bit</p> <p>Data length: 5 bits</p> <p>Response Data</p> <ul style="list-style-type: none"> <li>Status value read  or </li> </ul>


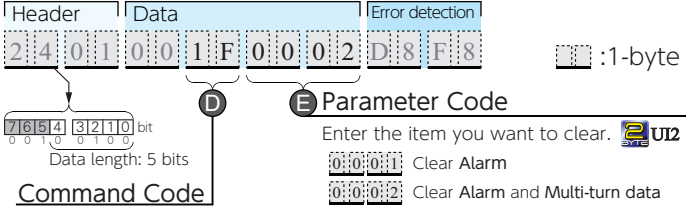

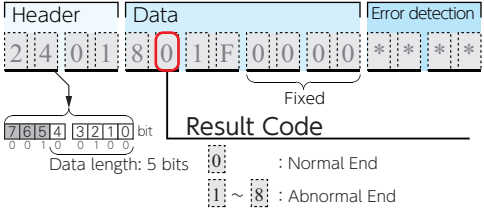
## 4. Communication Commands

Name	GET_STATE_VALUE_4
Description	Reads the status value of the amplifier <u>four bytes at a time</u> .
Command Code	11
Parameter Code	Enter the Status number (  UI2 ) that you want to read.  S-FLAG Instruction Manual <b>9</b> Appendices Status Display
Command Message Example	<p>To read Status No.195 “Encoder/Rotor Mechanical angle (integrated value)” :</p>  <p><b>Parameter Code</b></p> <ul style="list-style-type: none"> <li>Enter the status number.  UI2</li> <li>Encoder/Rotor mechanical angle Status No.195 (hexadecimal C3) (integrated value)</li> </ul>
Response Message Example	<p>Status value (  UI4 or  I4 ) .</p> <p>The amplifier returns the following response message. For the above command example, the encoder/rotor mechanical angle (integrated value) will be returned in the response data field.</p>  <p><b>Response Data</b></p> <ul style="list-style-type: none"> <li>Status value read  UI4 or  I4</li> </ul>

# 4. Communication Commands

Name	READ_EA05_DATA
Description	Reads the encoder alarm data.
Command Code	1E
Parameter Code	00 01 00 00 ( fixed value )
Command Message Example	<p>Header: 2 6 0 1   Data: 0 0 1 E 0 0 0 1 0 0 0 0   Error detection: 8 E 3 E</p> <p>Alarm Information fixed</p> <p>Parameter Code</p> <p>Use the above (fixed setting) to read.</p> <ul style="list-style-type: none"> <li>Alarm Information </li> <li>Fixed Setting </li> </ul>
Response Message Example	<p>Execution result (  ), alarm data (  ) .</p> <p>Header: 2 6 0 1   Data: 8 0 1 E * * * * * * * *   Error detection: * * * *</p> <p>Execution results</p> <p>Alarm Information</p> <p>Response data</p> <ul style="list-style-type: none"> <li>Execution results </li> <li>Alarm Information </li> </ul> <p>Normal End: 0:0:0:0</p> <p>Abnormal End: 0:0:0:1</p> <p><b>For Incremental Encoder</b></p> <p>Alarm Information: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 bit</p> <ul style="list-style-type: none"> <li>0 Speed error</li> <li>1 MR sensor output amplitude error</li> <li>2 (Reserved)</li> <li>3 Position error</li> <li>4 Voltage drop error</li> <li>5 EEPROM error</li> <li>6...15 (Reserved)</li> </ul> <p><b>For Absolute Encoder</b></p> <p>Alarm Information: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 bit</p> <ul style="list-style-type: none"> <li>0 Speed error</li> <li>1 MR sensor output amplitude error</li> <li>2 Multi-turn absolute sensor communication error</li> <li>3 Position error</li> <li>4 Voltage drop error</li> <li>5 EEPROM error</li> <li>6 Overheat warning</li> <li>7 Battery voltage drop warning</li> <li>8...15 (Reserved)</li> </ul>

## 4. Communication Commands







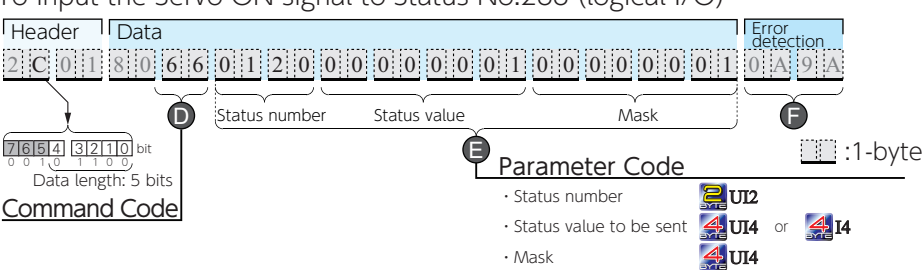



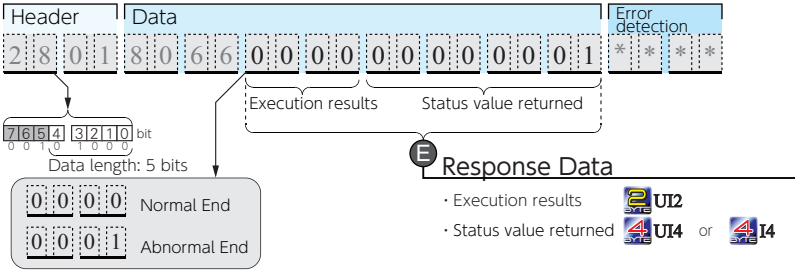
Name	CLEAR_EA05_DATA
Description	Clears the encoder data.
Command Code	1F
Parameter Code	Select the item you want to clear. (  ) <b>01</b> : Clear Alarm <b>02</b> : Clear Alarm and Multi-turn data. ( Normally, select <b>02</b> )
Command Message Example	 <p>Header   Data   Error detection</p> <p>2 4 0 1 F 0 0 0 2 D 8 F 8</p> <p>7 6 5 4 3 2 1 0 bit Data length: 5 bits</p> <p><b>D</b> Command Code      <b>E</b> Parameter Code</p> <p>Enter the item you want to clear. </p> <p>01:00:01 Clear Alarm 02:00:02 Clear Alarm and Multi-turn data</p>
Response Message Example	<p>None (Receiving the result code)</p> <p>The amplifier returns the response message as follows.</p>  <p>Header   Data   Error detection</p> <p>2 4 0 8 0 1 F 0 0 0 0 * * * *</p> <p>7 6 5 4 3 2 1 0 bit Data length: 5 bits</p> <p>Fixed <b>Result Code</b></p> <p>0 : Normal End 1 ~ 8 : Abnormal End</p> <p>In the case of abnormal end, check the details of the result code.</p>



# 4. Communication Commands

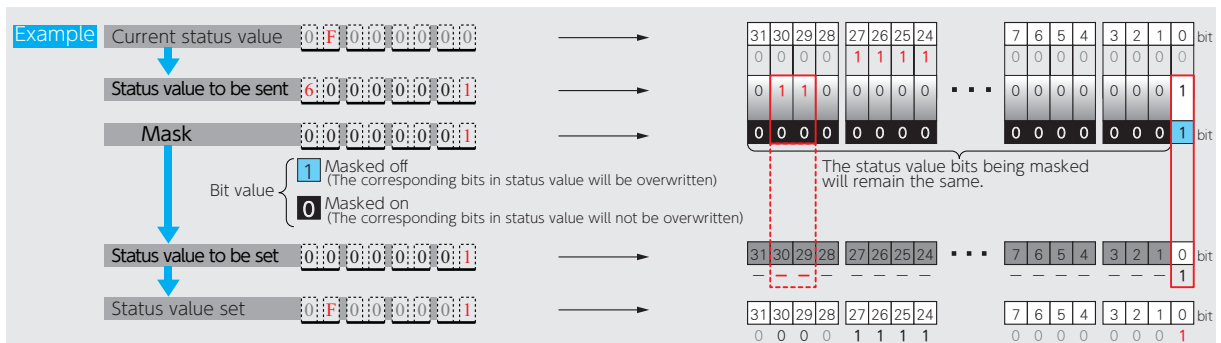
Name	READ_EA05_DATA_EX
Description	Reads encoder single-turn data and multi-turn data. You cannot use this command during Servo ON.
Command Code	62
Parameter Code	00 01 00 00 00 00 ( fixed value )
Command Message Example	<p><b>Command Code</b></p> <ul style="list-style-type: none"> <li>Alarm Information </li> <li>Single-turn data </li> <li>Multi-turn data </li> </ul>
Response Message Example	<p>Execution result (  ), single-turn data (  ), multi-turn data (  )</p> <p><b>Response Data</b></p> <ul style="list-style-type: none"> <li>Execution results </li> <li>Alarm Information </li> <li>Single-turn data </li> <li>Multi-turn data </li> </ul> <p><b>For Incremental Encoder</b></p> <p>Alarm Information: * * * *</p> <p>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 bit</p> <ul style="list-style-type: none"> <li>0 Speed error</li> <li>1 MR sensor output amplitude error</li> <li>2 (Reserved)</li> <li>3 Position error</li> <li>4 Voltage drop error</li> <li>5 EEPROM error</li> <li>6...15 (Reserved)</li> </ul> <p><b>For Absolute Encoder</b></p> <p>Alarm Information: * * * *</p> <p>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 bit</p> <ul style="list-style-type: none"> <li>0 Speed error</li> <li>1 MR sensor output amplitude error</li> <li>2 Multi-turn absolute sensor communication error</li> <li>3 Position error</li> <li>4 Voltage drop error</li> <li>5 EEPROM error</li> <li>6 Overheat warning</li> <li>7 Battery voltage drop warning</li> <li>8...15 (Reserved)</li> </ul> <p>Normal End: 0:0:0:0 Abnormal End: 0:0:0:1</p>

# 4. Communication Commands

Name	SET_STATE_VALUE_WITHMASK_4
Description	Sets the status value of the amplifier four bytes at a time. Use this command for point table operations in Internal Position mode by the host controller through RS-485 communications. The mask field allows you to select any target bits that you want to mask.
Command Code	66
Parameter Code	Enter the status No. (  , and its value (  or  ) that you want to set and set the mask (  ) to select bits to write. This can be used only for Status No.288.  S-FLAG Instruction Manual  Appendices Status Display
Command Message Example	To input the Servo ON signal to Status No.288 (logical I/O) 
Response Message Example	Execution result (  , and Status value that has been set (  or  ). 

## Mask Explanation

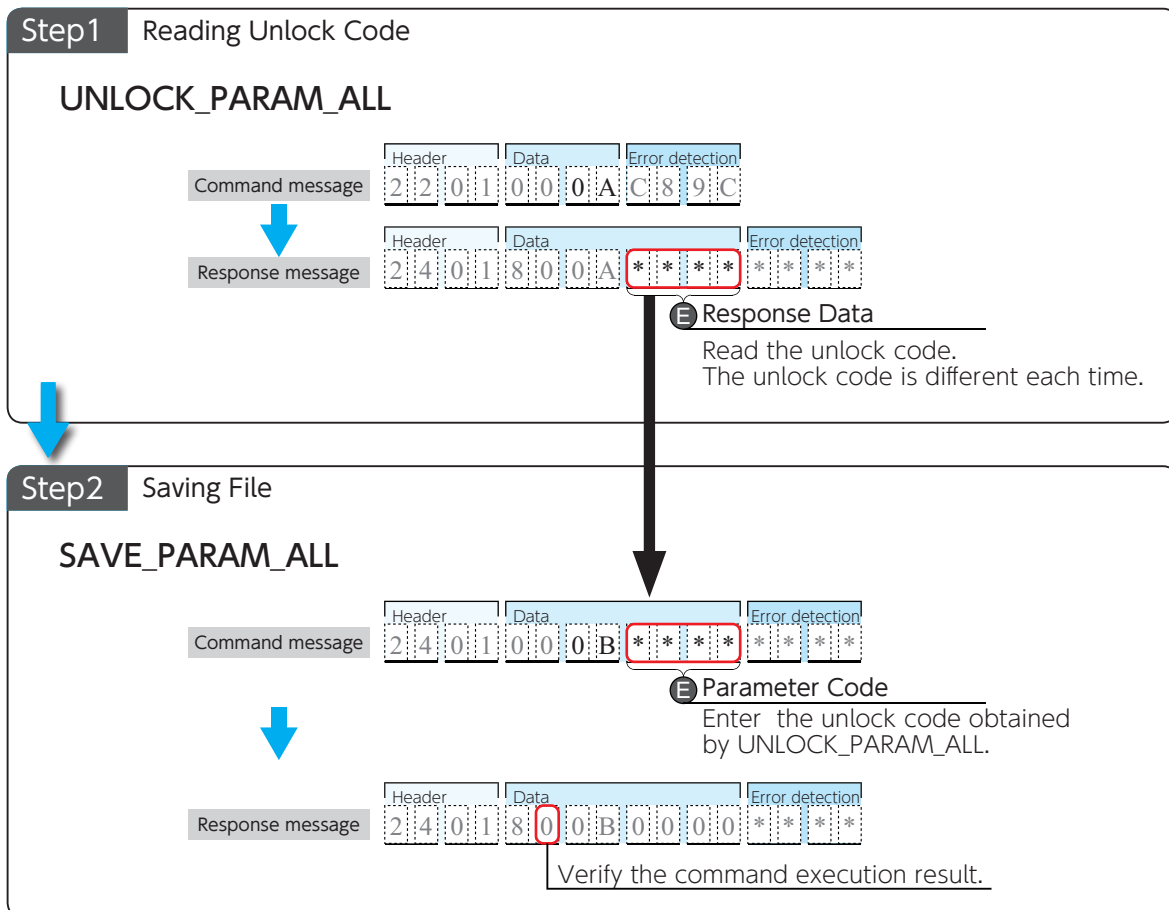
A mask is a parameter to access status value bitwise. The status value to be sent will overwrite the current status value only at the bit(s) where the corresponding bit is masked off (=1). The current status value will not be overwritten where the corresponding bit is masked on (=0).



## 4. Communication Commands

## 5. Saving the Parameters

If you made any changes to parameters, always save the parameters before turning off the control power. Otherwise, unsaved parameters will not take effect after cycling the control power.

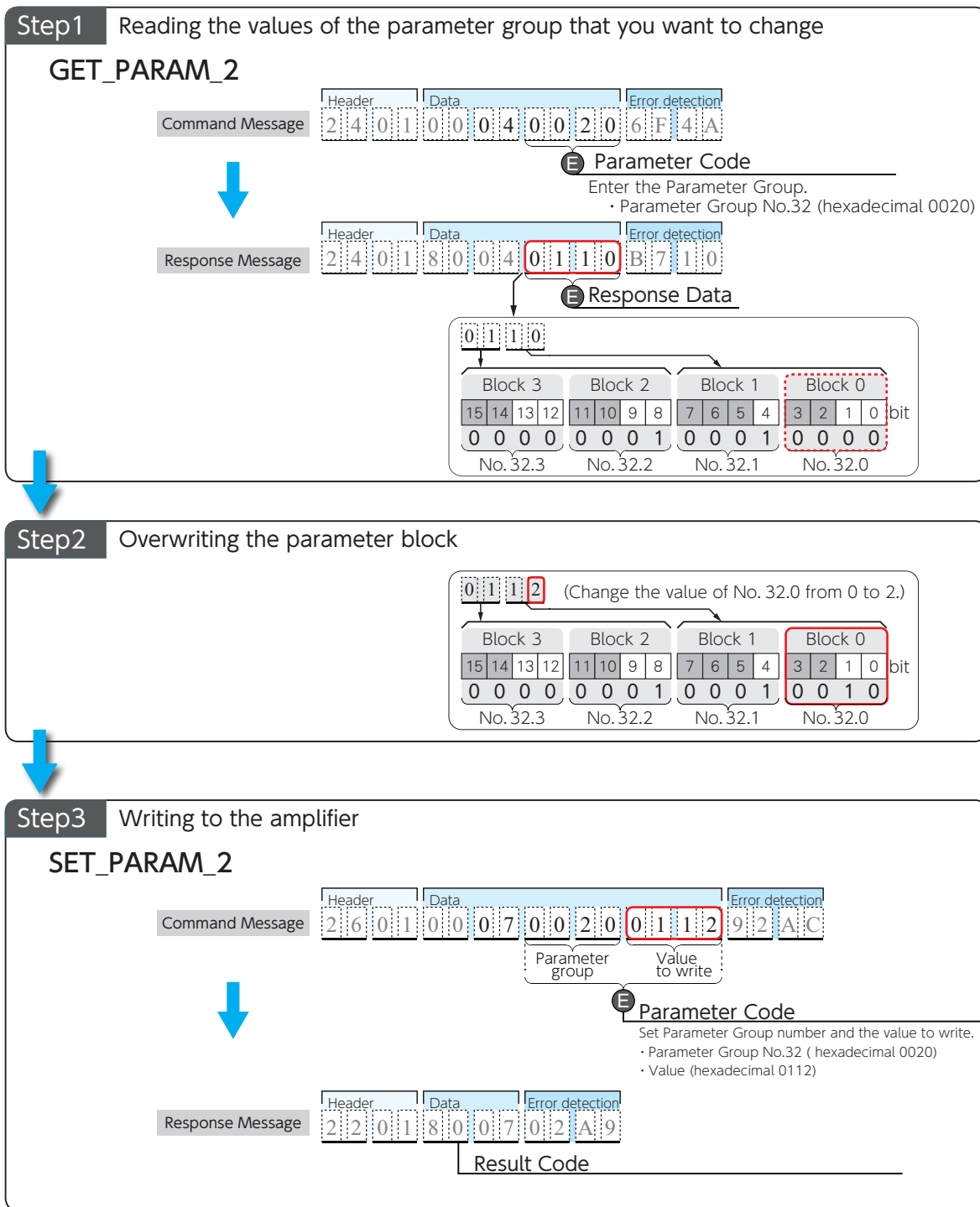


## 4. Communication Commands

### 6. Overwriting Compound Parameters

Read or overwrite parameters are handled group by group.  
To overwrite compound parameter values, follow these Steps below.

The following is the example which changes the value of parameter No. 32.0 to 2 from 0.



To save a parameter to the amplifier, execute "UNLOCK\_PARAM\_ALL" command and "SAVE\_PARAM\_ALL" command.

## 4. Communication Commands


### 7. Point Table Operations by the Host Controller

RS-485 interface enables the host controller to perform the point table operations of the amplifier that the motion parameters of the point table has been set to in advance.  
To enable point table operations, set Status No.288 (logical I/O input, HEX 0120).

 Pages 39–41 Status Variables

Set the following operation parameters.

Parameter No.	Name	Setting
2.0	Control Mode	0 ( Position Control )
3.0	Command ModeCommand Mode	3 ( Internal Command )
8.0	RS-485 Communications Switch	1 ( Enable )
9.0 (*)	Operation mode	1 ( communications )
642.0	Internal position: Operation mode	0 ( Point Table )

\*) This parameter is reset to default “0 (I/O)” when the control power is disconnected to the amplifier.  
Set it to “1 (Communications)” every time you turn on the control power to the amplifier to start communications.  
 S-FLAG Instruction Manual **5** Setting List of Parameters

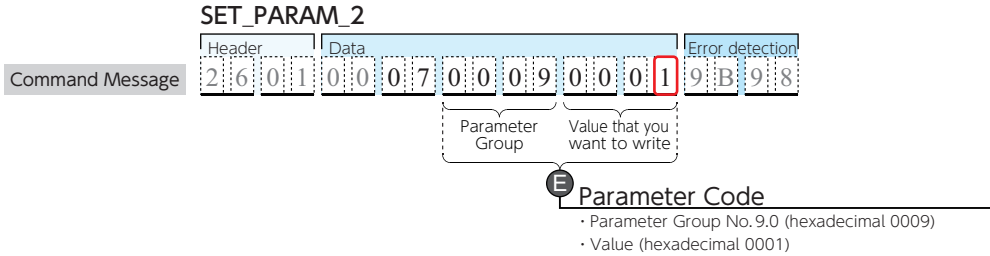
To perform point table operation with the host controller, see the page listed below for each operation method.

Operation	Refer to
1. Setting operation parameters	Page 30
2. Servo ON	Page 30
3. Servo OFF	Page 30
4. Homing	Page 30
5. Setting Start Point No.	Page 31
6. Starting the motion	Page 31
7. Pausing the motion	Page 31
8. Resuming the motion	Page 31
9. Stopping the motion	Page 32

# 4. Communication Commands

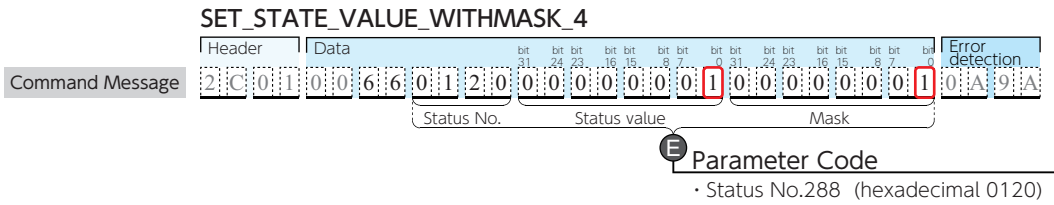
## 1. Setting operation parameters

Change the Operation Mode (No.9.0) setting to 1 (Communications).



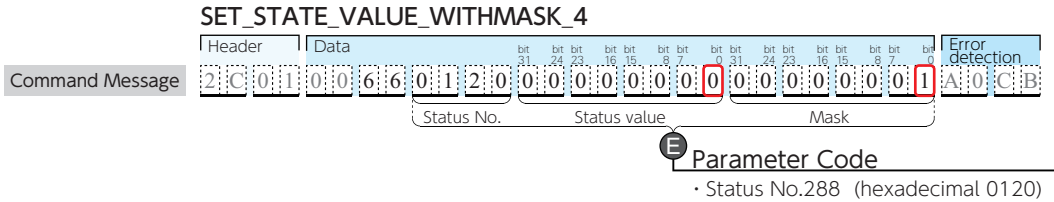
## 2. Servo ON

Set the status value of Bit0 in Logical I/O input (Status No.288) to 1.



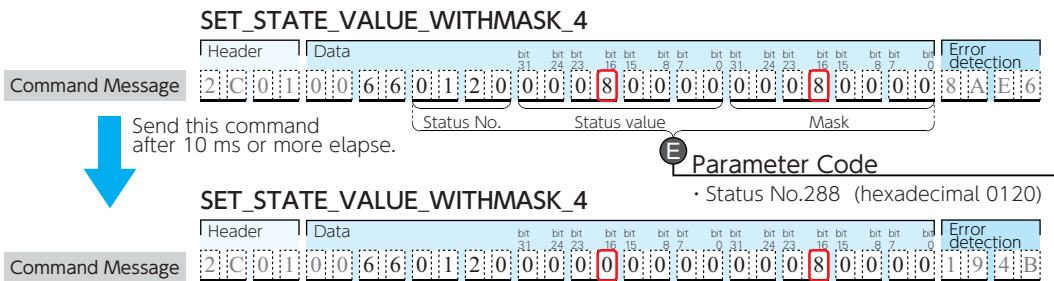
## 3. Servo OFF

Set the status value of Bit0 of Logical I/O input (Status No.288) to 0.



## 4. Homing

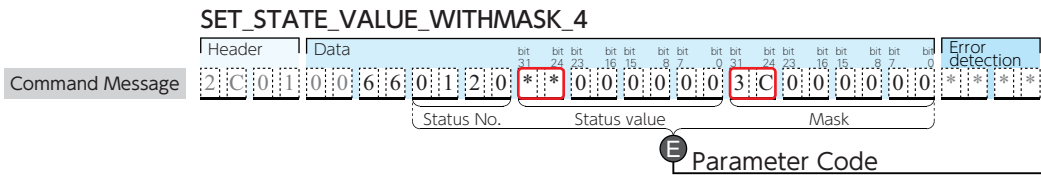
Set the status value of Bit 19 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



# 4. Communication Commands

## 5. Setting Start Point No.

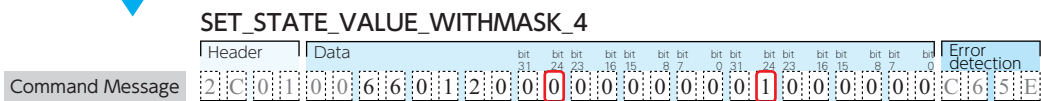
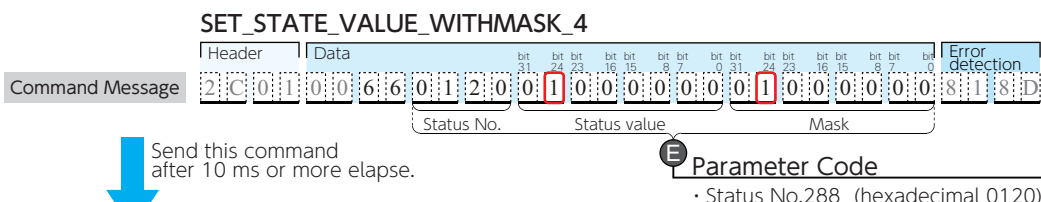
To set the status values of Bit26-29 in Logical I/O input (Status No.288):



In this example, to prevent a misconfiguration, mask bits corresponding to the point number are "masked on".

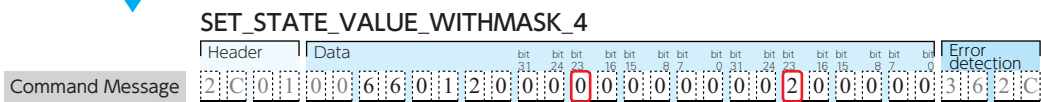
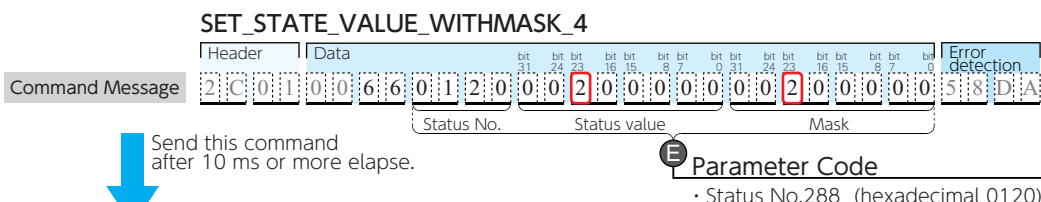
## 6. Starting the motion

Set the status value of Bit24 in Logical I/O input (Status No.288) to 1. After 10ms or more elapse, set it to 0.



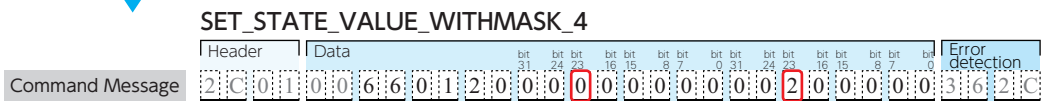
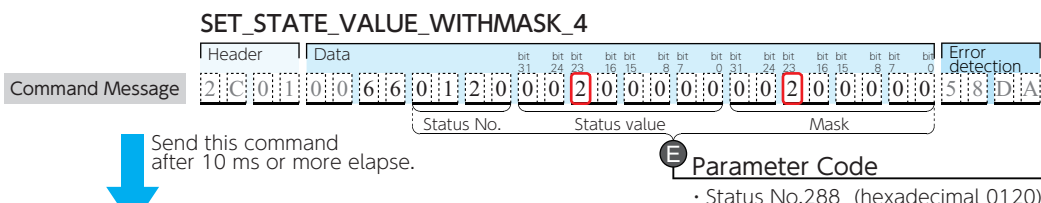
## 7. Pausing the motion

Set the status value of Bit21 in Logical I/O input (Status No.288) to 1. After 10ms or more elapse, set it to 0.



## 8. Resuming the motion

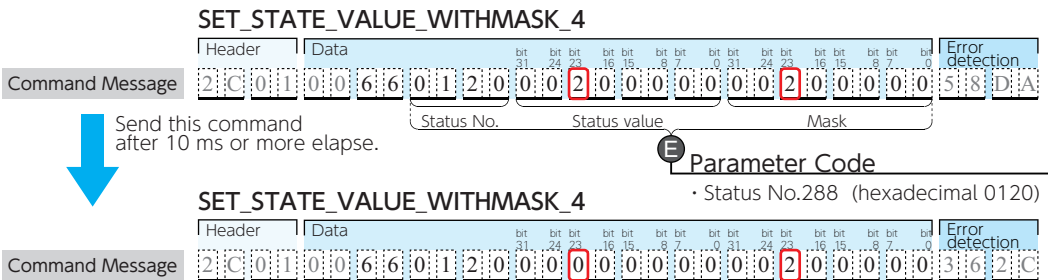
Set the status value of Bit21 in Logical I/O input (Status No.288) to 1.



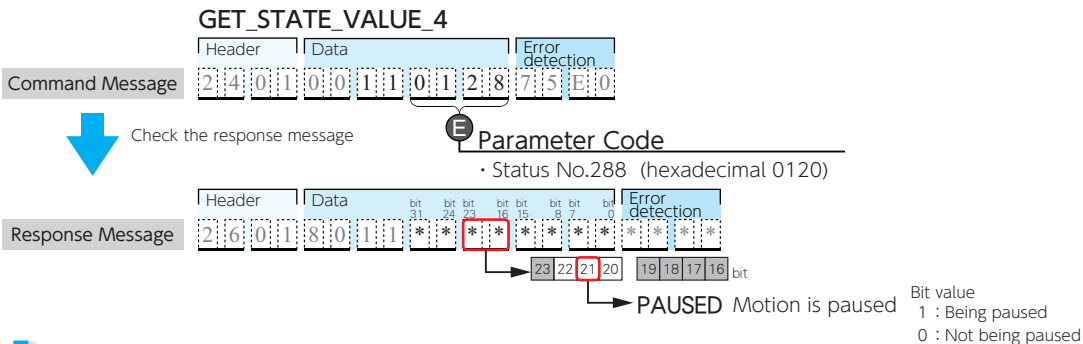
# 4. Communication Commands

## 9. Stopping the motion

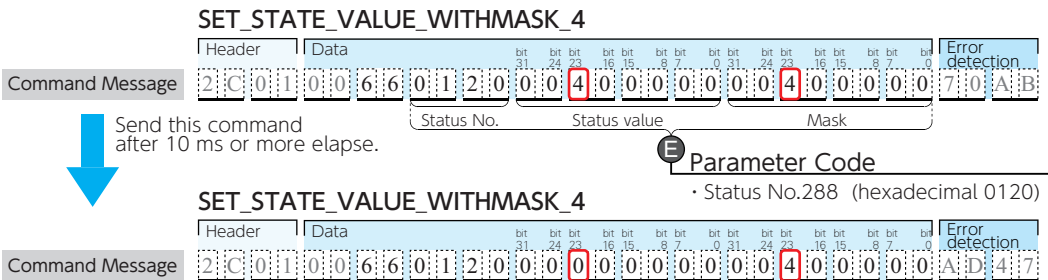
**Step 1** Set the status value of Bit21 of Logical I/O input (Status No.288) to 1 during motion. After 10 ms or more elapse, set it to 0.



**Step 2** Verify that the status value of Bit21 of Logical I/O output (Status No.296) is 1. (Verify that the motion is paused.)



**Step 3** Set the status value of Bit22 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



Execute ③ to stop the motion during pause.  
 Pages 39-41 Status Variables



## 4. Communication Commands






### 8. List of Point Table Parameters

When you want to set the point table data by using RS-485, refer to the following table.

Point No.	Position [command pulse]	Rotational speed [r/min]	Acceleration time [ms]	Deceleration time [ms]	Command method [-]	Dwell time [ms]	Operation [-]	Positioning completion [encoder pulse]	Enable /Disable [-]
1	742.0	744.0	746.0	747.0	740.0	748.0	740.1	749.0	740.3
2	762.0	764.0	766.0	767.0	760.0	768.0	760.1	769.0	760.3
3	782.0	784.0	786.0	787.0	780.0	788.0	780.1	789.0	780.3
4	802.0	804.0	806.0	807.0	800.0	808.0	800.1	809.0	800.3
5	822.0	824.0	826.0	827.0	820.0	828.0	820.1	829.0	820.3
6	842.0	844.0	846.0	847.0	840.0	848.0	840.1	849.0	840.3
7	862.0	864.0	866.0	867.0	860.0	868.0	860.1	869.0	860.3
8	882.0	884.0	886.0	887.0	880.0	888.0	880.1	889.0	880.3
9	902.0	904.0	906.0	907.0	900.0	908.0	900.1	909.0	900.3
10	922.0	924.0	926.0	927.0	920.0	928.0	920.1	929.0	920.3
11	942.0	944.0	946.0	947.0	940.0	948.0	940.1	949.0	940.3
12	962.0	964.0	966.0	967.0	960.0	968.0	960.1	969.0	960.3
13	982.0	984.0	986.0	987.0	980.0	988.0	980.1	989.0	980.3
14	1002.0	1004.0	1006.0	1007.0	1000.0	1008.0	1000.1	1009.0	1000.3
15	1022.0	1024.0	1026.0	1027.0	1020.0	1028.0	1020.1	1029.0	1020.3



## 4. Communication Commands

No. 722.0 No. 742.0 to No. 1022.0	Internal Position: Point table Position	Range - 1,073,741,823 to +1,073,741,823	Default 0 [command pulse]	Characteristics 									
Function Use	<p>Set the <u>target position</u> in Point Table.</p> <p>(1) If <u>Relative Value</u> is selected as the Command method, position data will determine the shift amount. Enter a positive value for CCW rotation or a negative value for CW rotation.</p> <p>(2) If <u>Absolute Value</u> is selected as the Command method, position data will determine the target position. This value corresponds to ABS Position Command value (Status No.74).</p> <p>Related parameter: Internal position- Overflow detection (643.0)</p>												
No. 724.0 No. 744.0 to No. 1024.0	Internal Position: Point table Rotational speed	Range 0 to Maximum Rotational Speed of Motor	Default 0 [r/min]	Characteristics 									
Function Use	<p>Set the <u>motor rotational speed</u> for the Point Table.</p> <p>Set this to a speed no higher than the max rotational speed of the motor.</p>												
No. 726.0 No. 746.0 to No. 1026.0	Internal Position: Point table Acceleration time	Range 0 to 5,000	Default 30 [ms]	Characteristics 									
Function Use	<p>Set the <u>acceleration time</u> for the Point table.</p> <p>This item indicates the amount of time for a speed command to change from 0 [r/min] to 1,000 [r/min]. In the default setting, it takes 90 [ms] for the rotational speed to change from 0 [r/min] to 3,000 [r/min].</p>												
No. 727.0 No. 747.0 to No. 1027.0	Internal Position: Point table Deceleration time	Range 0 to 5,000	Default 30 [ms]	Characteristics 									
Function Use	<p>Set the <u>deceleration time</u> for the Point Table.</p> <p>This item indicates the amount of time for a speed command to change from 1,000 [r/min] to 0 [r/min]. In the default setting, it takes 90 [ms] for the rotational speed to change from 3,000 [r/min] to 0 [r/min].</p>												
No. 720.0 No. 740.0 to No. 1020.0	Internal Position: Point table Command method	Settings 0, 1	Default 0	Characteristics 									
Function Use	<p>Select the <u>command method</u> for point table.</p> <table border="1" data-bbox="387 1839 1425 1944"> <thead> <tr> <th>Settings</th> <th>Command Method</th> <th>Position to be set</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Absolute value</td> <td>Target position</td> </tr> <tr> <td>1</td> <td>Relative value</td> <td>Shift amount from the current position to the target position</td> </tr> </tbody> </table>				Settings	Command Method	Position to be set	0	Absolute value	Target position	1	Relative value	Shift amount from the current position to the target position
Settings	Command Method	Position to be set											
0	Absolute value	Target position											
1	Relative value	Shift amount from the current position to the target position											

## 4. Communication Commands

No. 728.0 No. 748.0 to No. 1028.0	Internal Position: Point table Dwell time	Range	Default	Characteristics
Function Use	Set the <u>dwell time</u> for the Point Table.			
	<p>Dwell time is the wait time for the next Point-Table motion to be executed after a Point-Table motion is complete.</p> <p>Motion after the dwell time elapses:                      Single motion: MEND will be ON.                      Continuous motions: the motion commanded by the next point number will start.</p> <p>If Running Motion is "Continuous" and the dwell time is set to 0, the motion will be according to the speed assigned by point numbers -one after another continuously. If the dwell time is set to 0, the acceleration/deceleration setting in the first point number selected upon CW start PCSTART1 ON will be applied, and the settings of subsequent point numbers will be discarded.</p>			

 Page 37 Positioning Complete

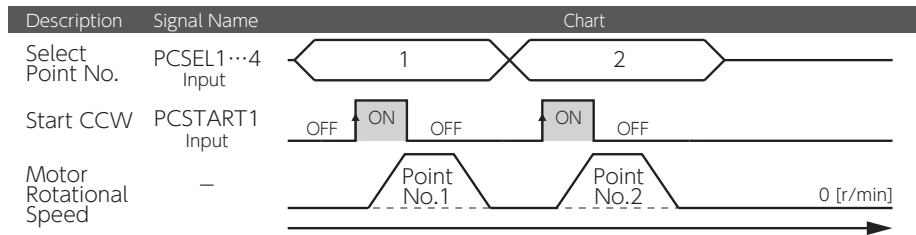
# 4. Communication Commands

No. 720.1 No. 740.1 - No. 1020.1	Internal Position: Point table Operation	Settings	Default	Characteristics
		0, 1	0	

Select the Running Motion of Point Table

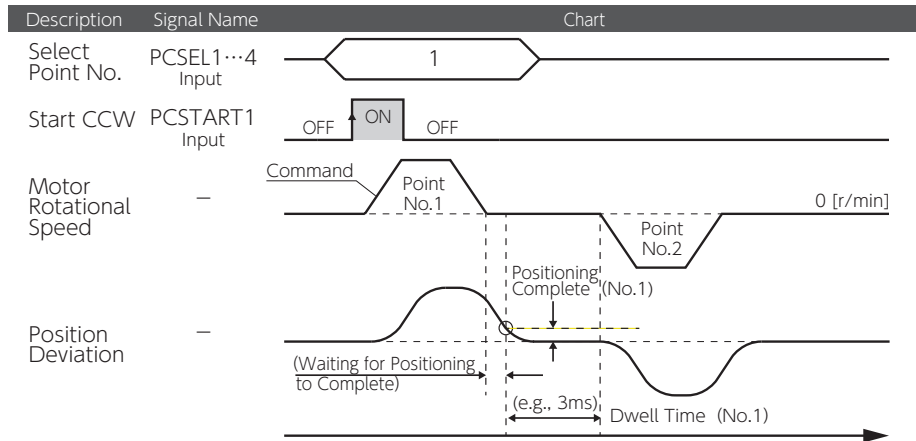
Settings	Running Motion
0	Single
1	Continuous

Single: After the motion commanded by this point number is complete, the subsequent point numbers will not be executed.  
Example: Point No.1 and 2 are set to "Single" .

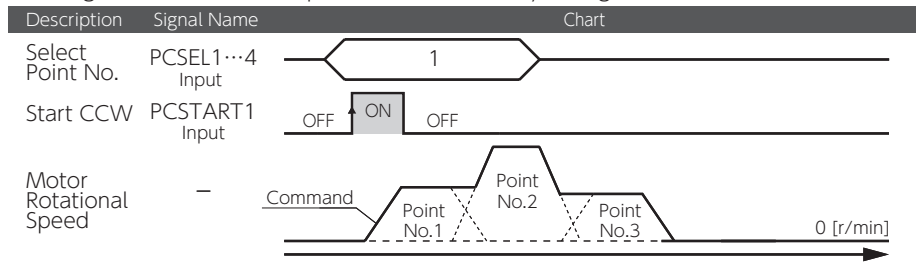


Continuous: The subsequent point number(s) will be executed one after another.  
Example: If Running Motion is "continuous" and the dwell time is set to 1 or above (for example, 3ms), then positioning will be executed according to each point. After the positioning is determined to be completed, the the next motion will not start until the dwell time elapses.


Function Use



Example: If Running Motion is "continuous" and the dwell time is set to 0, the motor will keep rotating and the rotational speed will continuously change.



# 4. Communication Commands

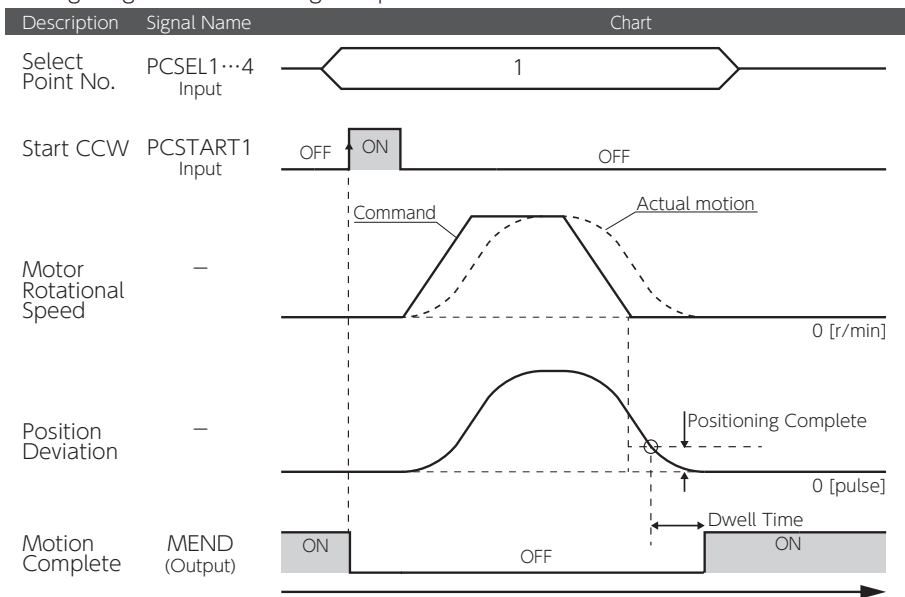
No. 729.0 No. 749.0 - No. 1029.0	Internal Position: <b>Point table                  Positioning completion</b>	Range  0 to 32,767	Default  20 [encoder pulse]	Characteristics  
---	--	--------------------------	--------------------------------------	--

Set the range for positioning complete by the Point table.

After the motion specified by a point number is completed and the position deviation reaches the threshold set by this item, MEND will not turn ON until the dwell time elapses.

Timing Diagram of Positioning Complete and Dwell Time

Function Use



## 4. Communication Commands

No. 720.3 No. 740.3 - No. 1020.3	Internal Position: Point table Enable/Disable	Settings	Default	Characteristics
		0, 1	0	

### Enable/Disable Point Table.

Settings	Enable/Disable
0	<b>Disable</b> The point number will not be executed and any subsequent point numbers with "enable" will be executed.
1	<b>Enable</b> The point number will be executed

If the point number with the "disable" setting is specified, among the subsequent point numbers, the first one with "enable" will be executed.

If there is a "disabled" point number during a series of "continuous" motions, that "disabled" point number will not be executed and the first "enabled" subsequent point number will be executed.

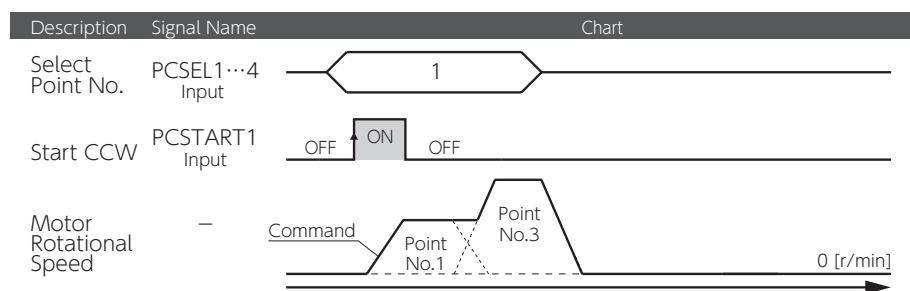
If point number with "continuous" motion and "0" dwell time, motions before and after that point number will be executed one after the other and the speed will change continuously.

#### Example

If Point No.1 is specified and Start signal is input were the following Point number settings are as follows, Point No.2 will not be executed and Point No.1 and No.3 will be executed continuously.

Function Use

Point No.	Motion	Dwell time	Enable/Disable
1	continuous	0	enable
2	continuous	(any value)	disable
3	single	(any value)	enable



#### TIP

For the last point number set to "enable" (i.e. last to be executed), set its Running Motion to "single".

If you set "continuous" to the last enabled point number, Operation Complete output (MEND) will remain off and the next motion will be not be started. If that happens, perform the following.

#### User I/O operation


Turn the servo off or input Clear Deviation Counter.

#### S-TUNE operation

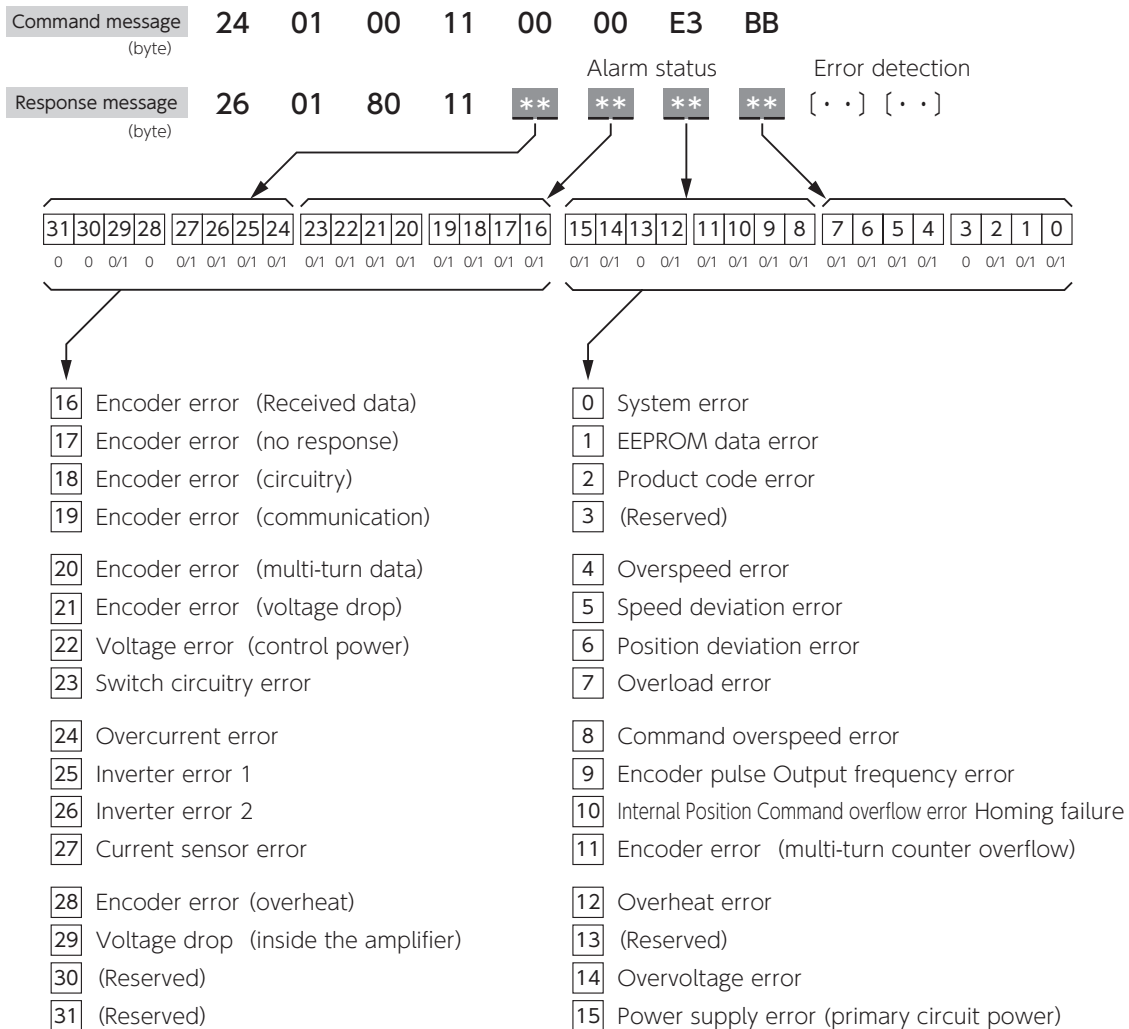
Turn the servo off or click the STOP button.

# 4. Communication Commands


## 9. Status Variables

Status	Alarm	Units	Bytes	Signed
Status No. (Hexadecimal number)	0 (00)	-		none
Description	This item indicates the status of the alarm occurring inside of the amplifier.			
Transmit data	24 01 00 11 00 00 E3 BB			

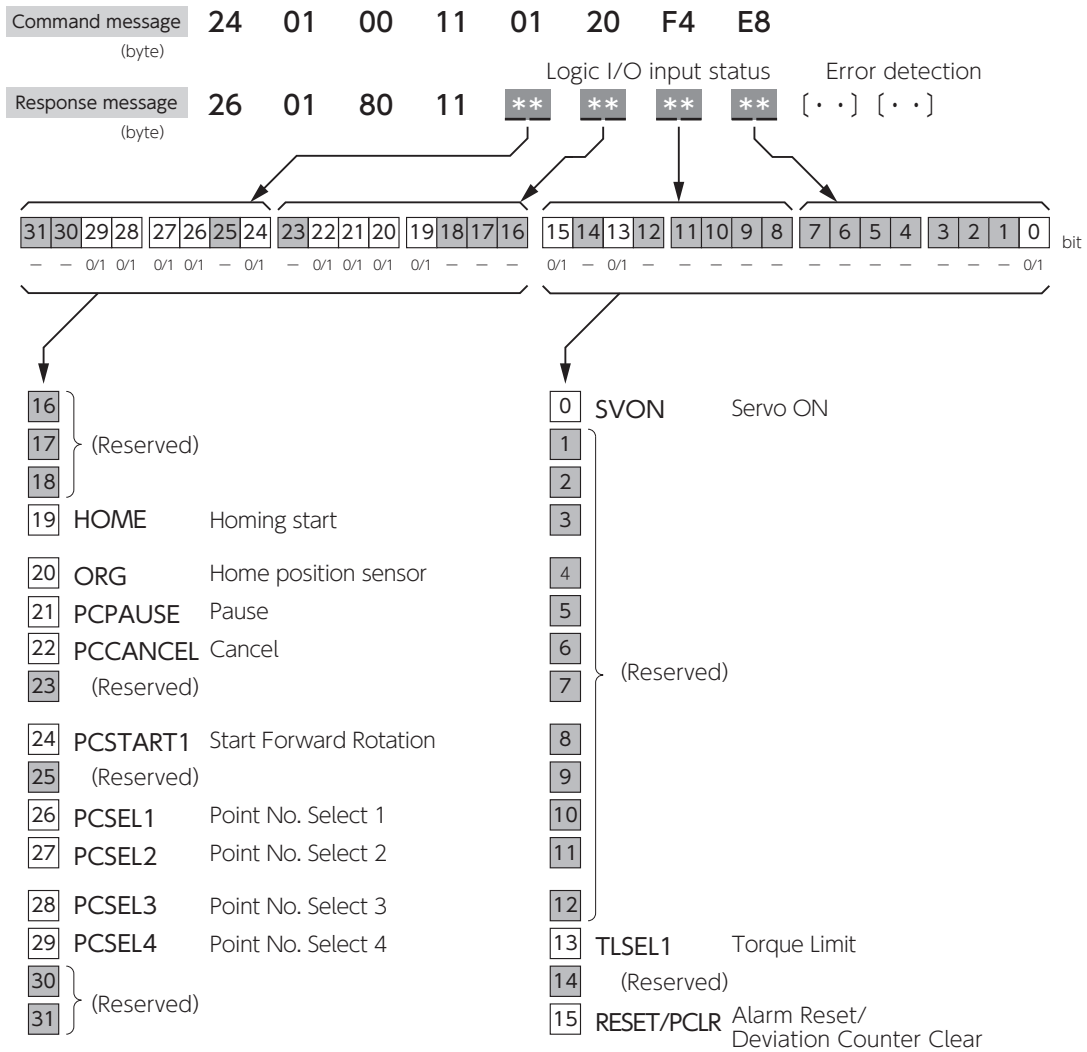
### Relations between RS-485 Communication Command and Bit Tables



## 4. Communication Commands


Status	Logic I/O input	Units	Bytes	Signed
Status No. (Hexadecimal number)	288 (120)	-		none
Description	<p>This item indicates logic I/O input status within the amplifier. (RS-485 Communication only)</p> <p>Use this item during the point table operation in Internal Position Command mode performed by the host controller through RS-485 communications.</p>			
Transmit data	<b>24 01 00 11 01 20 F4 E8</b>			

### Relations between Logic I/O input command and Bit Tables





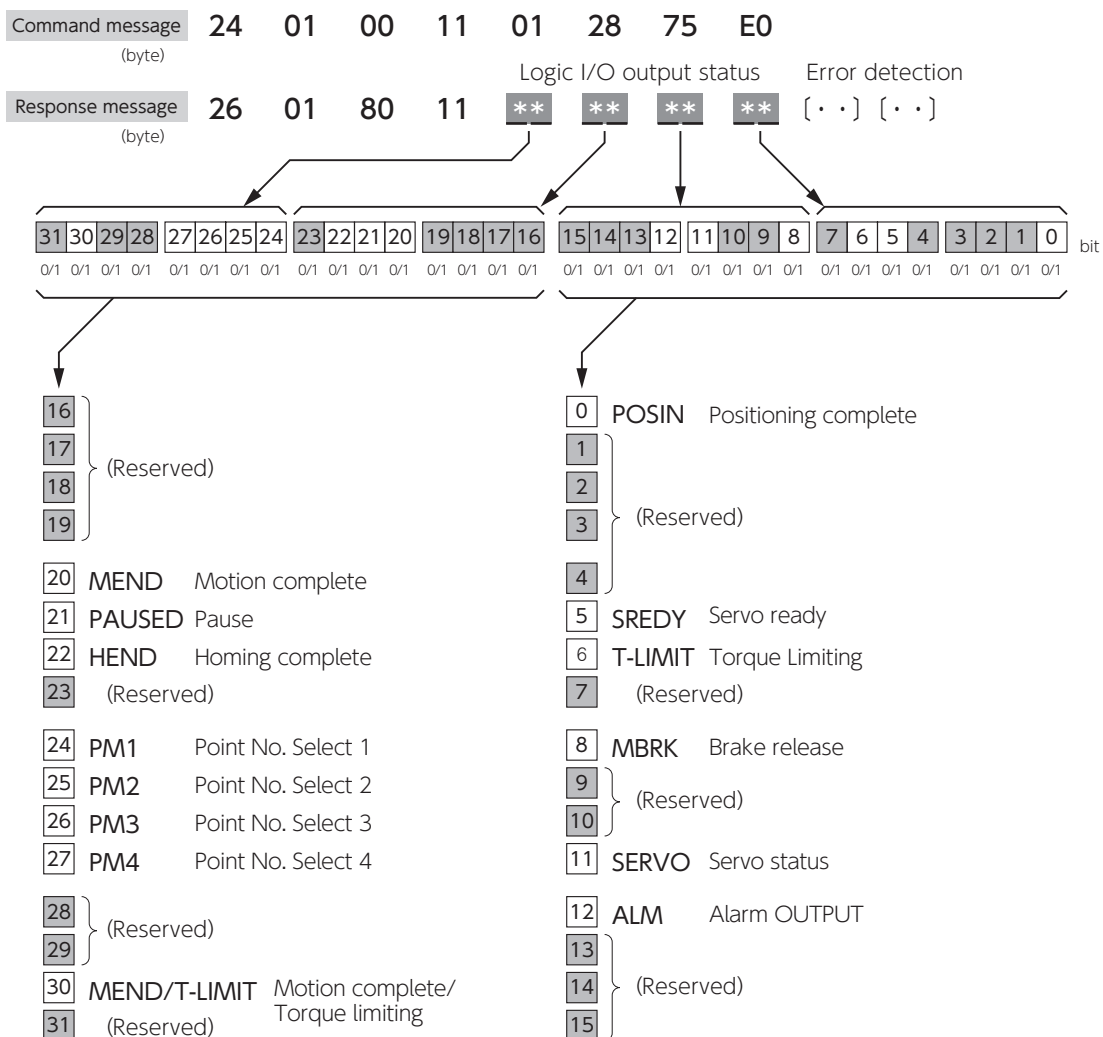
# 4. Communication Commands

Status	Logic I/O output	Units	Bytes	Signed
Status No. (Hexadecimal number)	296 (128)	-		none
Description	<p>Indicates the logic I/O output status within the amplifier. (RS-485 Communication only)</p> <p>Use this item during the point table operation in Internal Position Command mode performed by the host controller through RS-485 communications.</p>			
Transmit data	24 01 00 11 01 28 75 E0			

RS-485 Communications

4. Communication Commands

## Relations between Logic I/O output command and Bit Tables



MEMO

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