

RS-485 Communications

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1. Overview

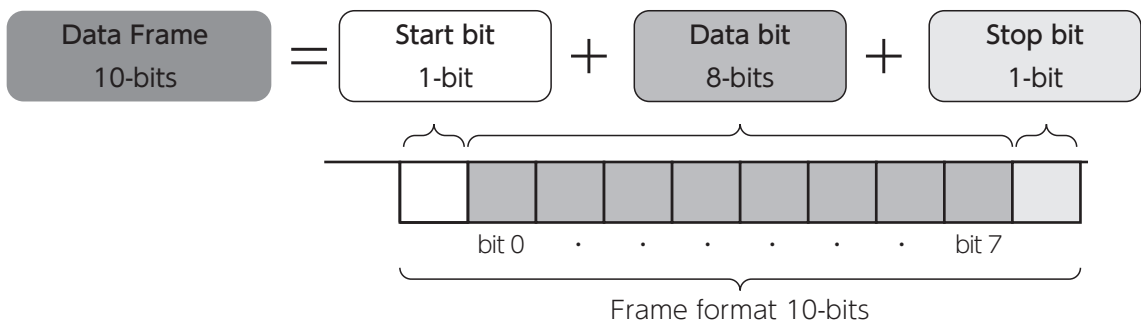
1. Communications Specification

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-bits binary code
Communications data length	35 bytes or less

Data Frame

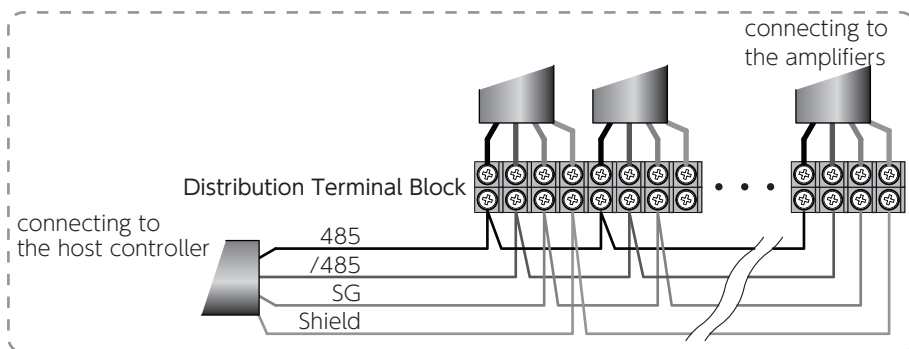
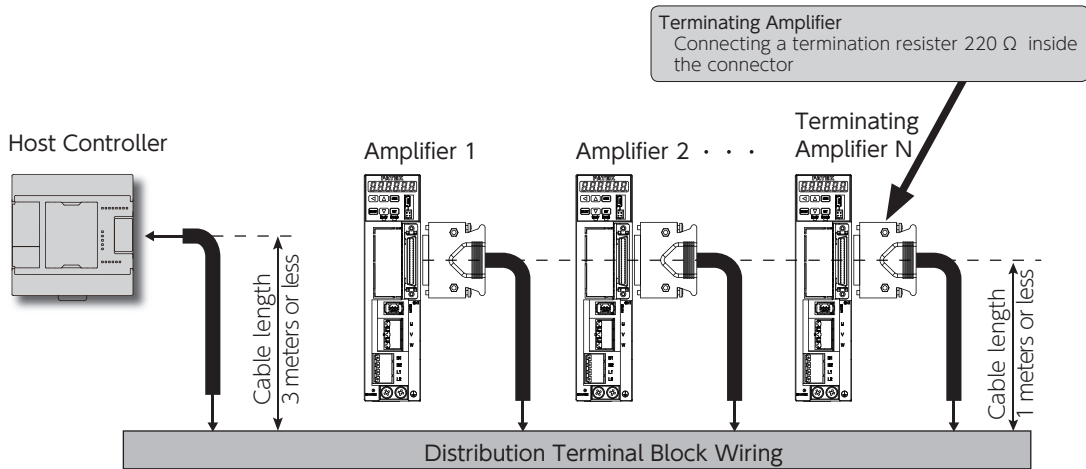
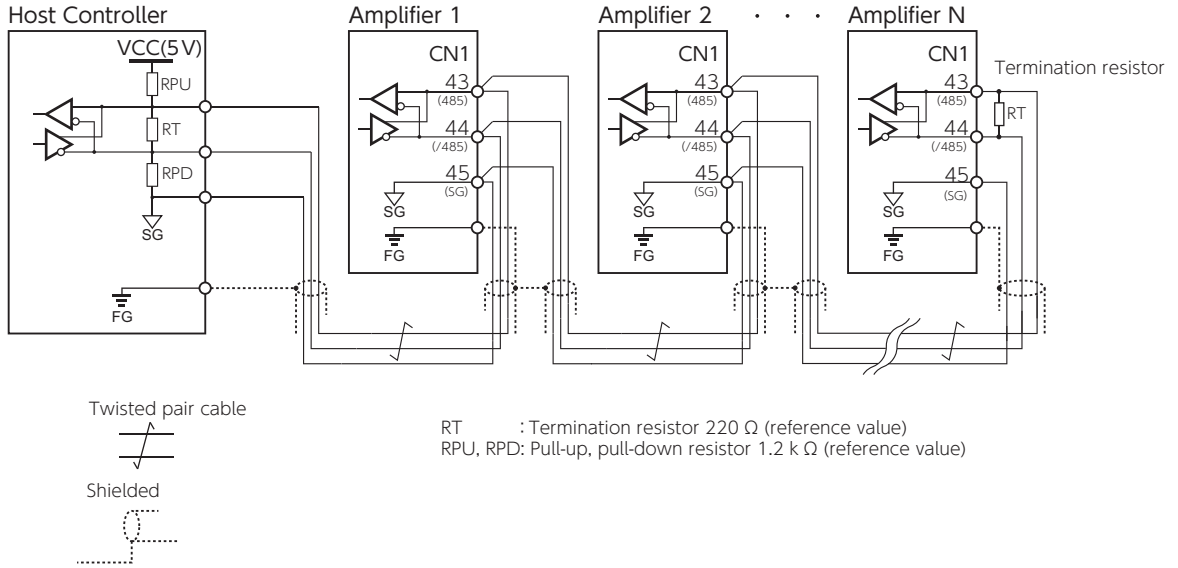
The frame format is 10-bits long.



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

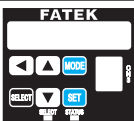
Set the communications address and communications parameters to the amplifier according to the host controller.

You must set the following parameters.

Parameters related to RS-485 communications

Parameter	Setting	Parameter No.
RS-485 communication: Address	Range : 1 to 32 Default : 1	4.0
RS-485 transmission: Speed	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)	6.0
RS-485 communication: Stop bit	0 : 1 bit (default) 1 : 2 bits	6.1
RS-485 communication: Parity	0 : None (default) 1 : Even 2 : Odd	6.2
RS-485 communication: Switch	<u>Set to 1</u> 0 : Disable (default) 1 : Enable	8.0
RS-485 communication: Minimum response time	Range : 0 to 255 ms Default : 3 ms	11.0

Setting the parameters



Use the Setup Panel on the amplifier front.

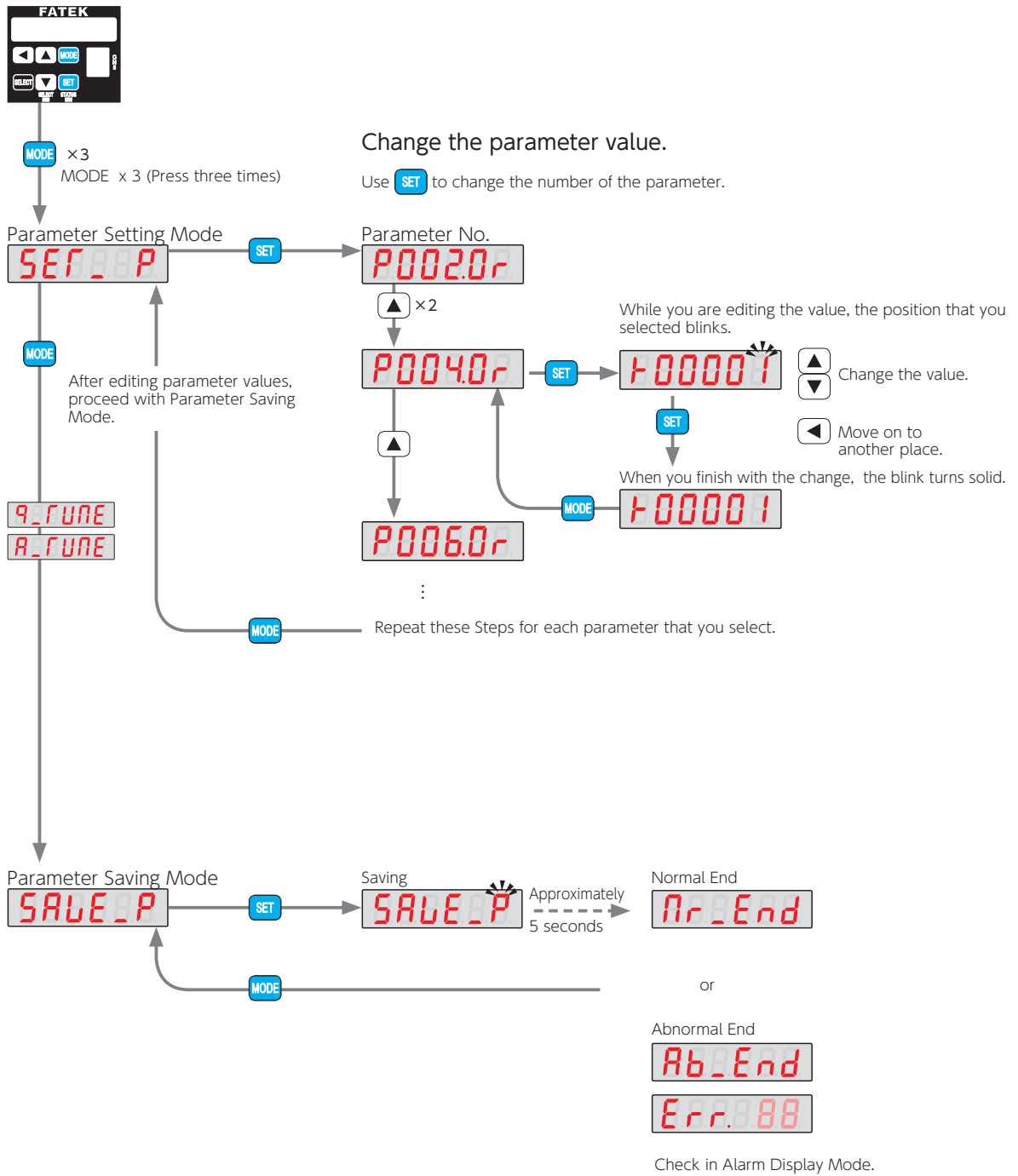


Tuning with the setup software "Servo Studio".
Install it on the user-supplied computer.

2. Setup

2. Setting the Parameters

Using the Setup Panel



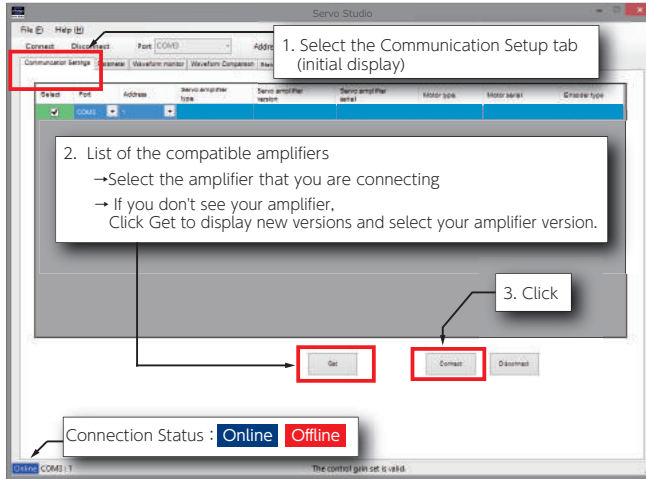
Save the parameter settings in Parameter Saving mode to the amplifier. If you shut down the amplifier without saving them, the changes will not take effect.

2. Setup

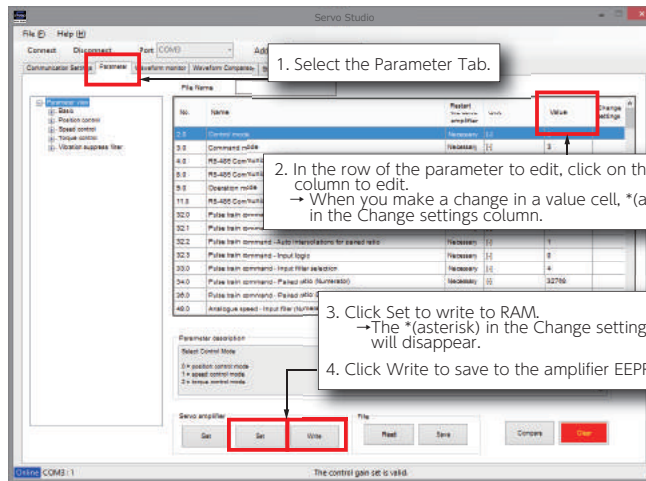
Using "Servo Studio"

Step 1 Start

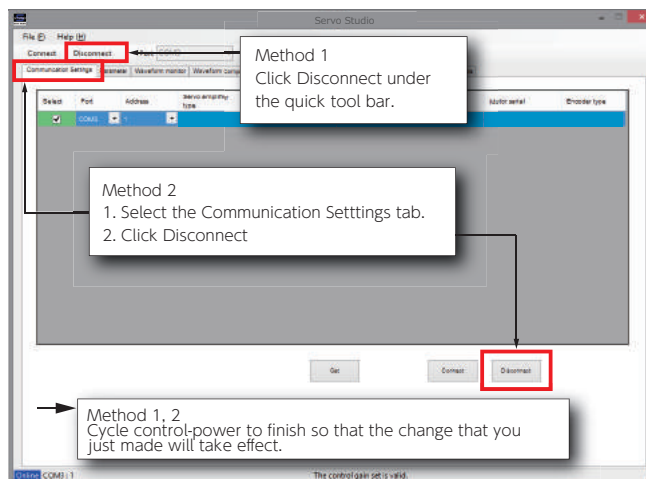
Double-click on 



Step 2 Set parameters



Step 3 Finish

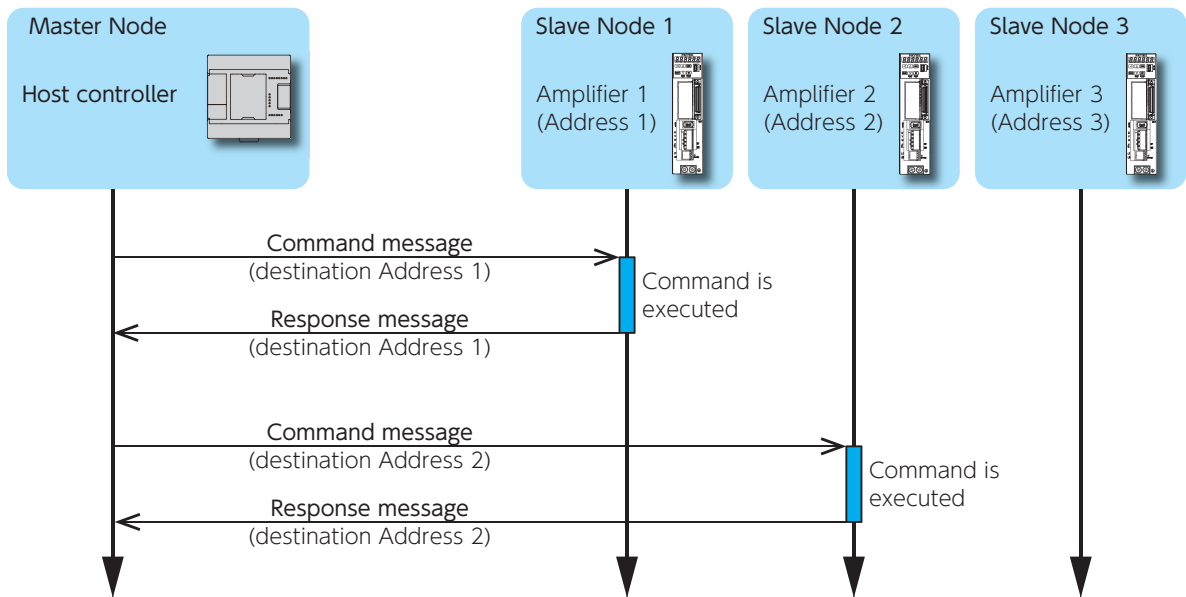


3. Communications Procedure

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.

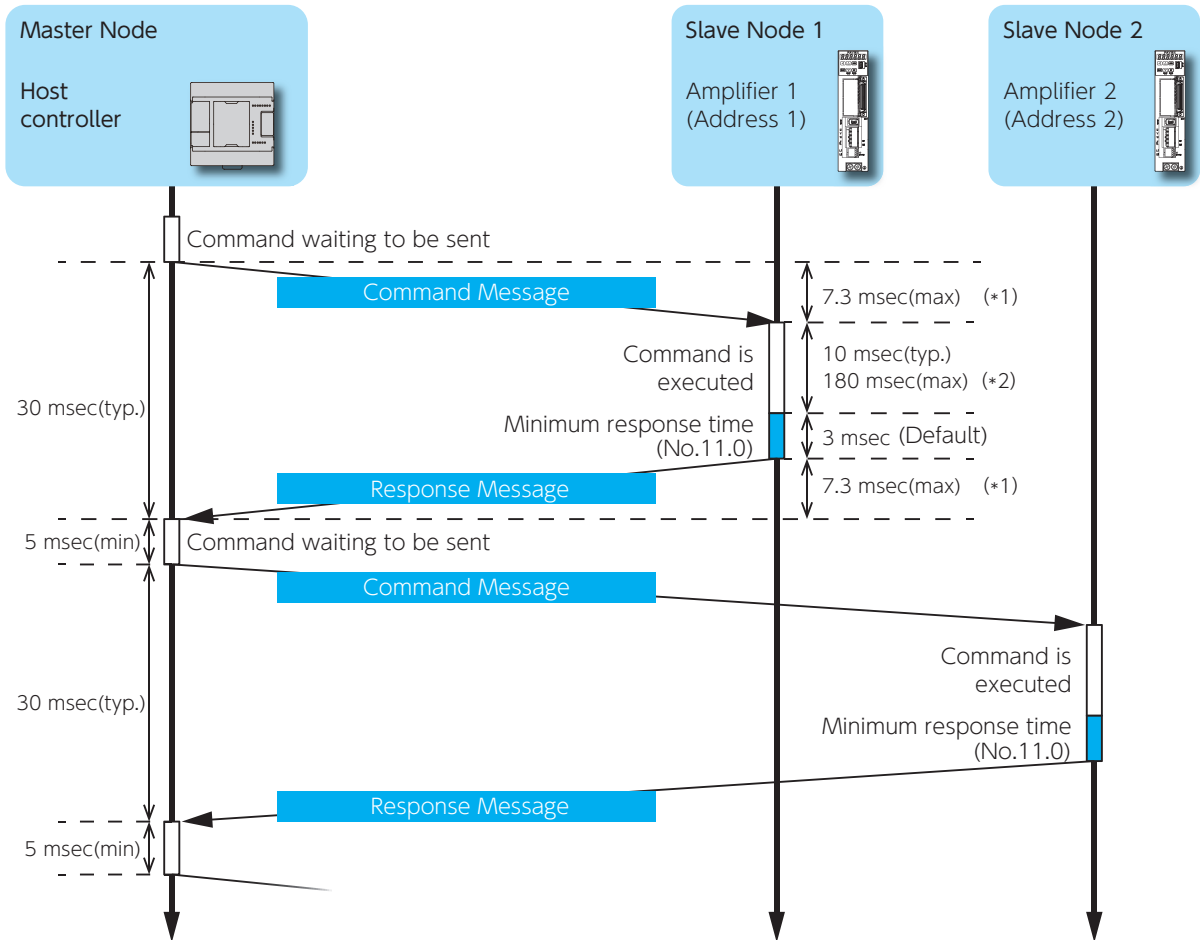


3. Communications Procedure

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

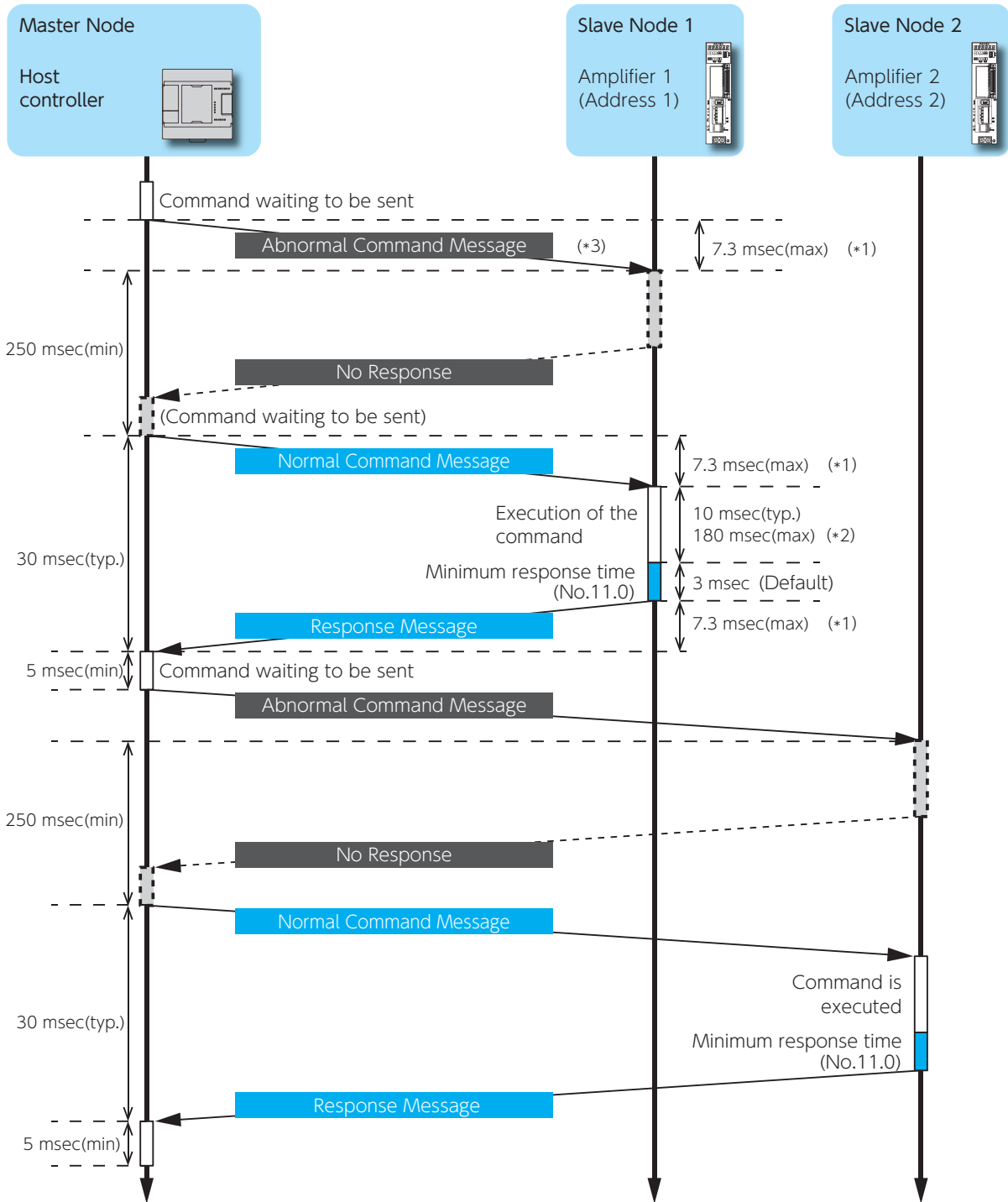
For example, where Message Length = 420 bits (max) and Transmission Speed=57,600 bps.
 Command transmission time = 420 / 57,600 = 7.29 ms (max)

*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.

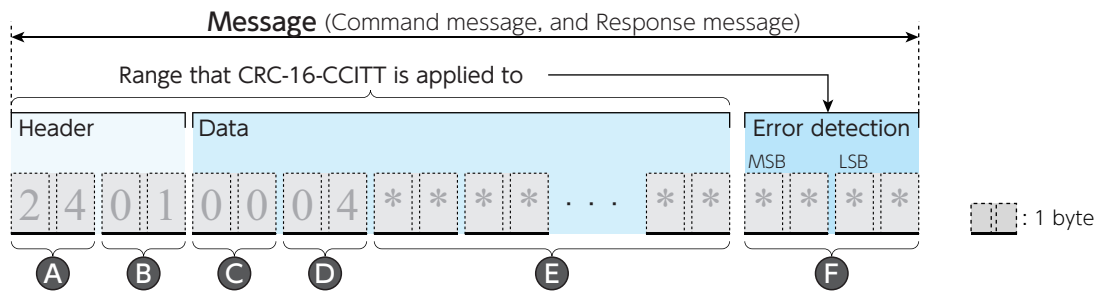
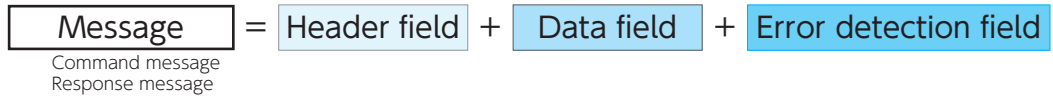
*3) This indicates that a bad command message was sent from the host controller or the amplifier was unable to receive a correct command because of noise interference.

4. Communication Commands

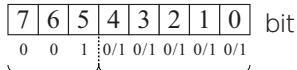
This section describes the format of messages transmitted between the host controller and the amplifier. A message comprises three fields: header, data, and error detection. The same format is used for both command messages sent from the host controller to the amplifier, and response messages in the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

1. The explanation of a message

The construction of the message



A Protocol Header



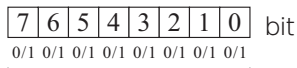
Data Length Code

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

Protocol ID code

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

B Destination Address



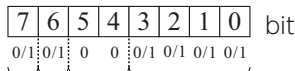
Destination Address

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

1 to 31 : Unicast communications address
0, 32 to 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 to 15 : (Reserved)

(Reserved)

Toggle bit

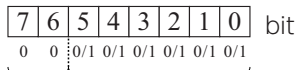
Identifies transmission duplicates and loss of command messages.
Sets 0 and 1 alternatively every time the host controller sends a command message.
The amplifier sends back the same value in the response message.

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 to 63 : Command code

Pages 12- List of Commands, Command Details

Command Group

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

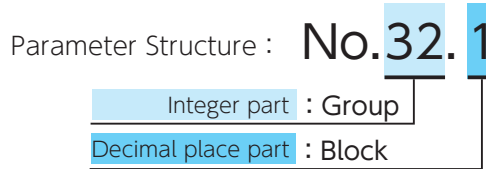
() Command codes are presented in Hexadecimal.

4. Communication Commands

3. The construction of the parameter

Parameter Structure

The parameter number is "2 bytes" 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).

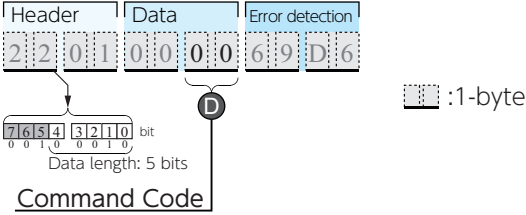
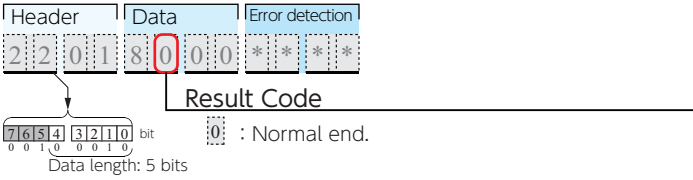
Parameter Group	Parameter Numbers and Bit Assignments			
	Parameter Number code in the E-part: * * * *			
	Block 3 15 14 13 12	Block 2 11 10 9 8	Block 1 7 6 5 4	Block 0 3 2 1 0
	:1-byte bit			
6	-	No. 6.2	No. 6.1	No. 6.0
32	No. 32.3	No. 32.2	No. 32.1	No. 32.0
62	-	No. 62.2	No. 62.1	No. 62.0
65	-	-	No. 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.

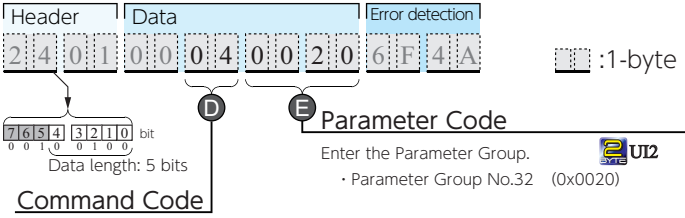
Notation	Description
 UI2	<u>Unsigned two-bytes</u> integer data
 I2	<u>Signed two-bytes</u> integer data
 UI4	<u>Unsigned four-bytes</u> integer data
 I4	<u>Signed four-bytes</u> integer data

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.  SD3 Series Instruction Manual 5 Setting Parameters List of Parameters

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





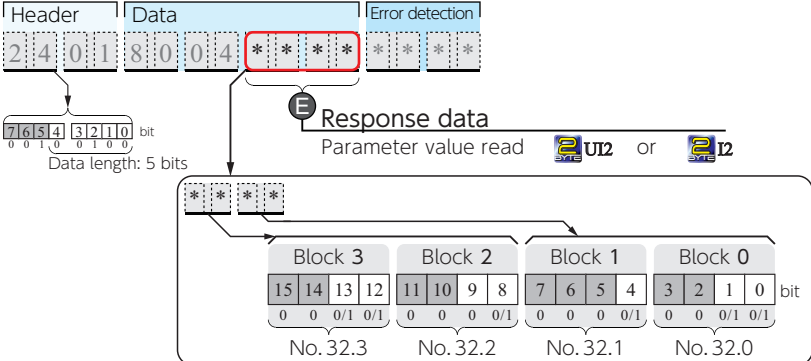
Command Message Example

Header: 2 4 0 1
 Data: 0 0 0 4 0 0 2 0
 Error detection: 6 F 4 A

Parameter Code: Enter the Parameter Group.
 · Parameter Group No.32 (0x0020)



Command Code: 0 0 1 0 0 1 0 0 0 0

Parameter value ( or )



Response Message Example

Header: 2 4 0 1
 Data: 8 0 0 4 * * * *
 Error detection: * * * *

Response data: Parameter value read  or 

Block 3: 15 14 13 12
 0 0 0/1 0/1
 No. 32.3



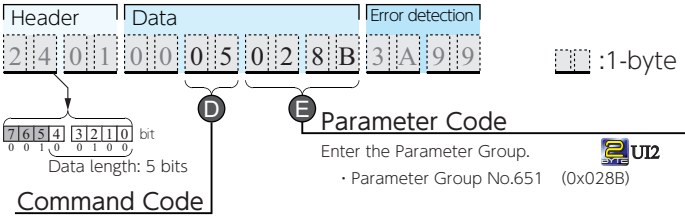


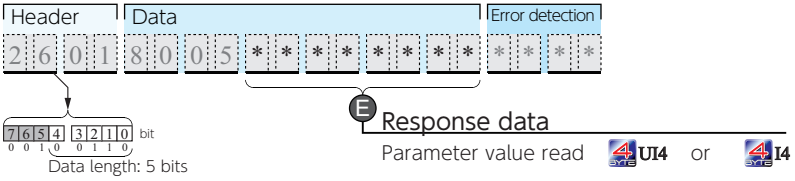
Block 2: 11 10 9 8
 0 0 0 0/1
 No. 32.2

Block 1: 7 6 5 4
 0 0 0 0/1
 No. 32.1





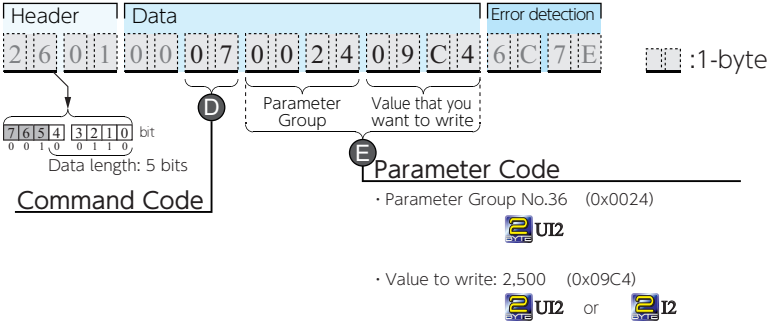



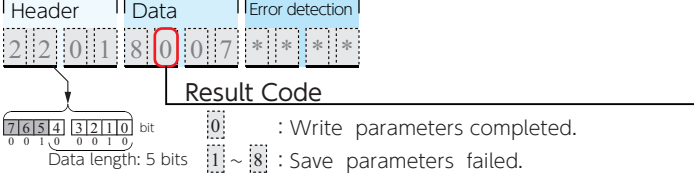
Block 0: 3 2 1 0
 0 0 0/1 0/1
 No. 32.0

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.





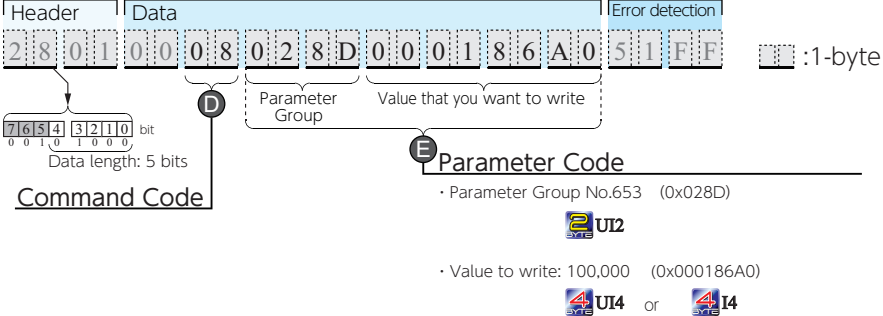



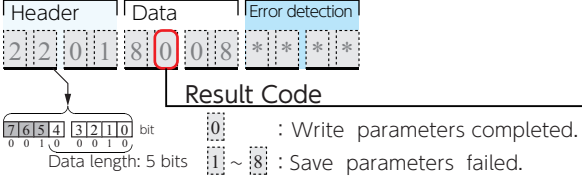
4. Communication Commands

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.  SD3 Series Instruction Manual 5 Setting Parameters 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).  SD3 Series Instruction Manual 5 Setting Parameters 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>Command Code</p> <ul style="list-style-type: none"> Parameter Group No.36 (0x0024)  Value to write: 2,500 (0x09C4)  or 
Response Message Example	<p>None (Receiving the result code)</p>  <p>Result Code</p> <ul style="list-style-type: none"> 0: Write parameters completed. 1 ~ 8: Save parameters failed.



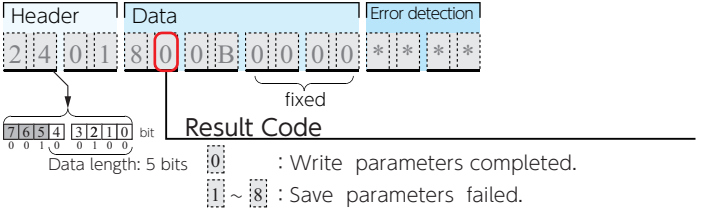


4. Communication Commands

Name	SET_PARAM_4
Description	Writes the parameter value to the amplifier RAM four bytes at a time .
Command Code	08
Parameter Code	Enter Parameter Group No. ( UI2) and the value to write ( UI4 or  I4).  SD3 Series Instruction Manual 5 Setting Parameters 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>Command Code</p> <ul style="list-style-type: none"> Parameter Group No.653 (0x028D)  Value to write: 100,000 (0x000186A0)  or 
Response Message Example	<p>None (Receiving the result code)</p>  <p>Result Code</p> <ul style="list-style-type: none"> 0 : Write parameters completed. 1 ~ 8 : Save parameters failed.

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 Command Code</p>
Response Message Example	<p>Unlock Code (UI2)</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 1 0 0 0 0 Data length: 5 bits Response Data</p> <p>• Unlock Code UI2</p> <p>Enter the unlock code obtained to the parameter field in the command SAVE_PARAM_ALL.</p>



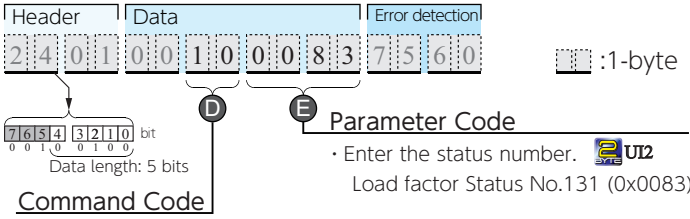


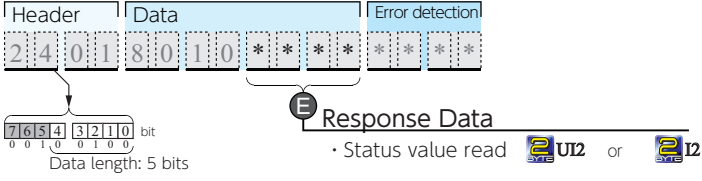
4. Communication Commands

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	 UI2 Enter the unlock code obtained by UNLOCK_PARAM_ALL.'" data-bbox="275 368 775 465"/>
Response 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>



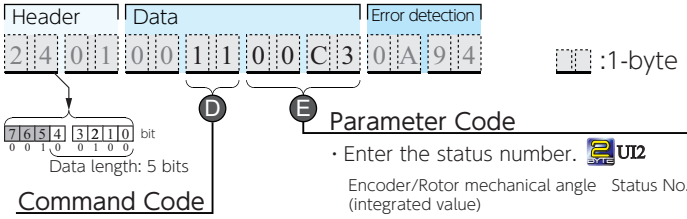



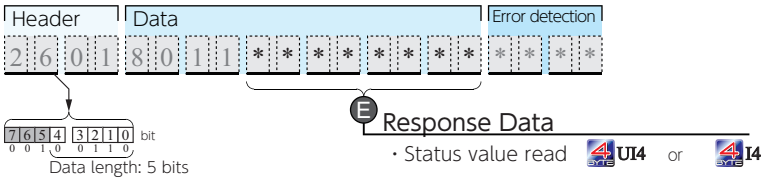


To save parameters, use the unlock code read by UNLOCK_PARAM_ALL.

 Page 27 Saving the Parameters

4. Communication Commands

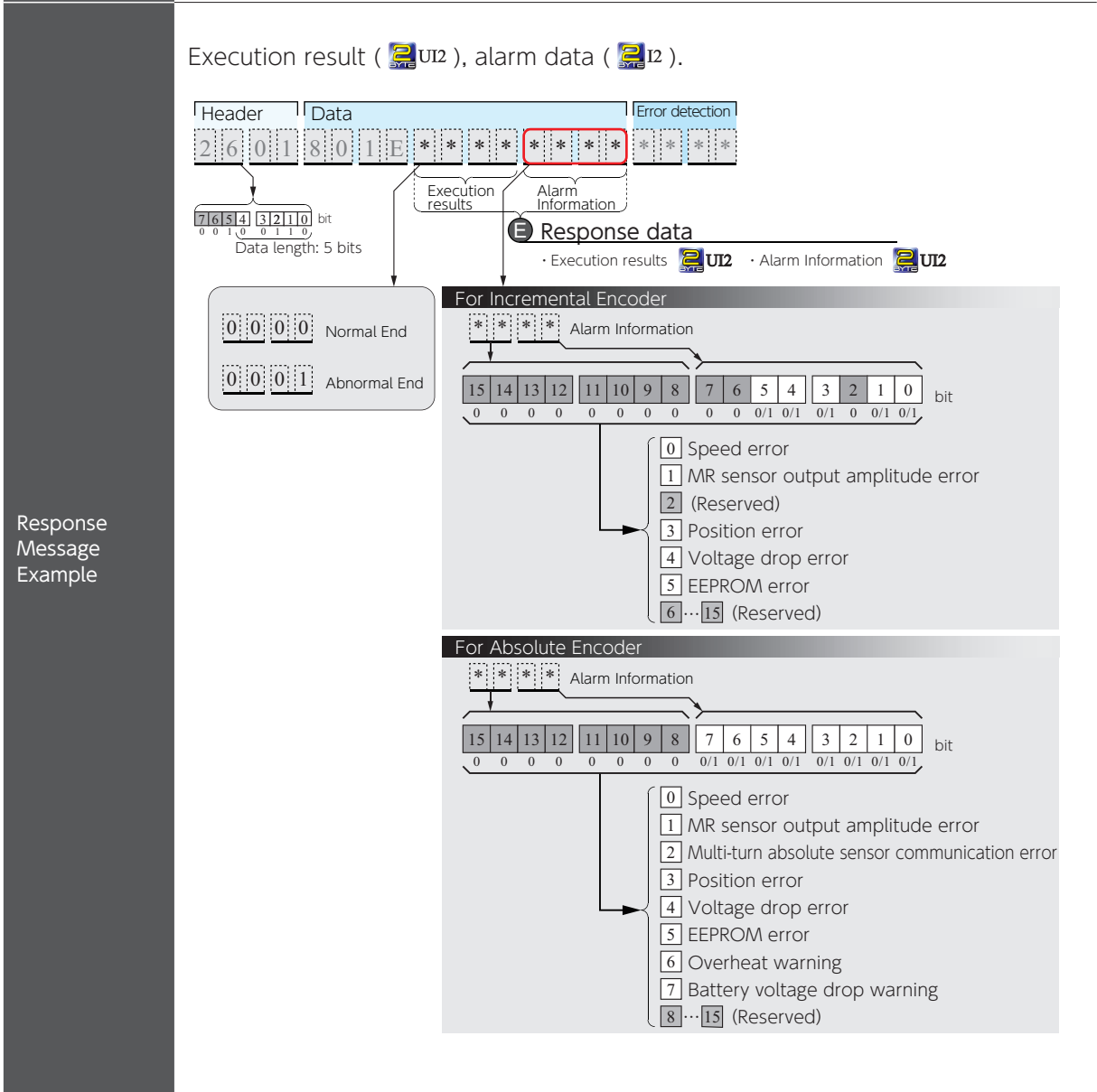
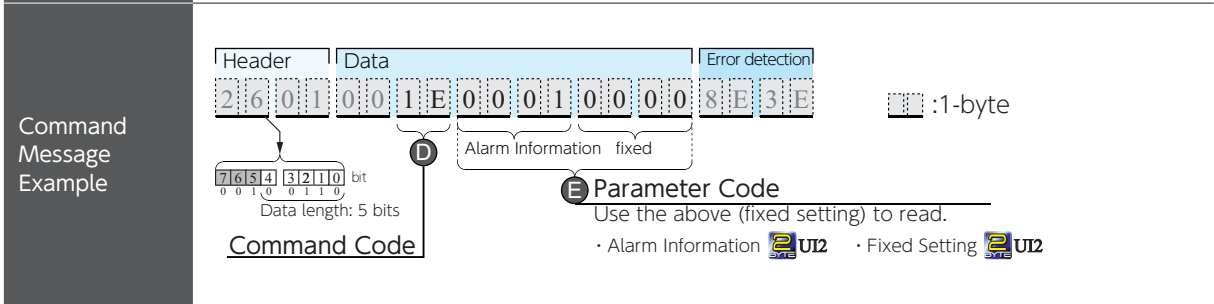
Name	GET_STATE_VALUE_2
Description	Reads the status value of the amplifier <u>two bytes at a time</u> .
Command Code	10
Parameter Code	Enter the Status number ( UI2) that you want to read.  SD3 Series Instruction Manual 9 Appendices Status List
Command Message Example	<p>To read Status No.131 “load factor” :</p> 
Response Message Example	<p>Status value ( UI2 or  I2).</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> 

4. Communication Commands


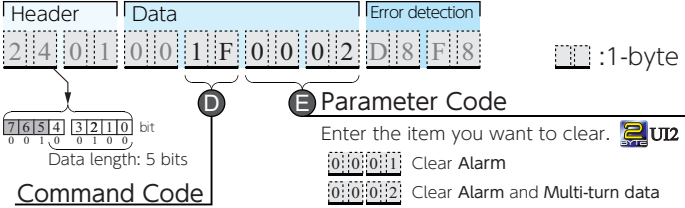

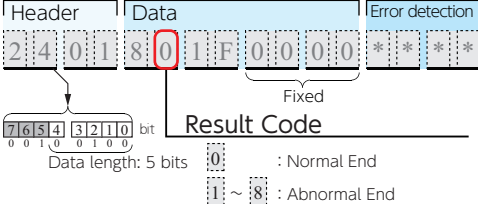
Name	GET_STATE_VALUE_4
Description	Reads the status value of the amplifier four bytes at a time .
Command Code	11
Parameter Code	Enter the Status number ( UI2) that you want to read.  SD3 Series Instruction Manual 9 Appendices Status Display
Command Message Example	<p>To read Status No.195 “Encoder/Rotor Mechanical angle (integrated value)” :</p>  <p>Command Code</p> <ul style="list-style-type: none"> Enter the status number.  UI2 Encoder/Rotor mechanical angle Status No.195 (0x00C3) (integrated value)
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>Response Data</p> <ul style="list-style-type: none"> Status value read  UI4 or  I4

4. Communication Commands

Name	READ_EA05_DATA
Description	Reads the encoder alarm data.
Command Code	1E
Parameter Code	00 01 00 00 (fixed value)








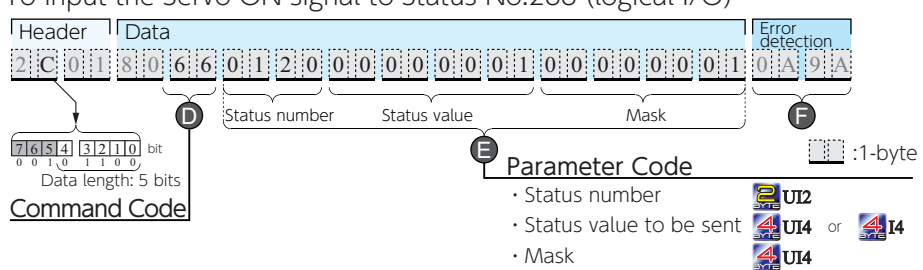



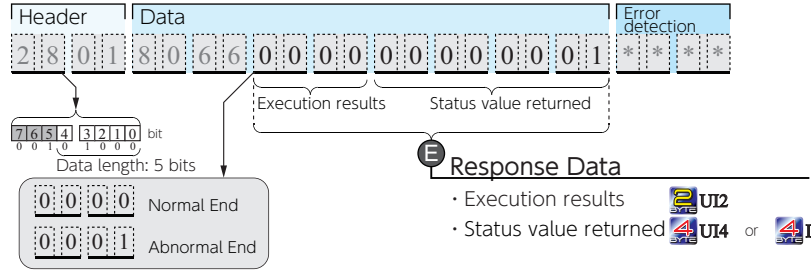
4. Communication Commands

Name	CLEAR_EA05_DATA
Description	Clears the encoder data.
Command Code	1F
Parameter Code	Select the item you want to clear. ( UI2) 01 : Clear Alarm 02 : Clear Alarm and Multi-turn data. (Normally, select 02)
Command Message Example	 <p>Header: 2 4 0 Data: 0 0 1 F 0 0 0 2 Error detection: D 8 F 8</p> <p>Header: 7 6 5 4 3 2 1 1 0 bit 0 0 1 0 0 0 0 0 Data length: 5 bits</p> <p>Command Code: 0 0 1 F Parameter Code: 0</p> <p>Enter the item you want to clear.  UI2</p> <p>0 1 0 1 : Clear Alarm 0 2 0 2 : 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: 2 4 0 Data: 8 0 1 F 0 0 0 0 Error detection: * * *</p> <p>Header: 7 6 5 4 3 2 1 1 0 bit 0 0 1 0 0 0 0 0 Data length: 5 bits</p> <p>Result Code: 8 0 Fixed: 1</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

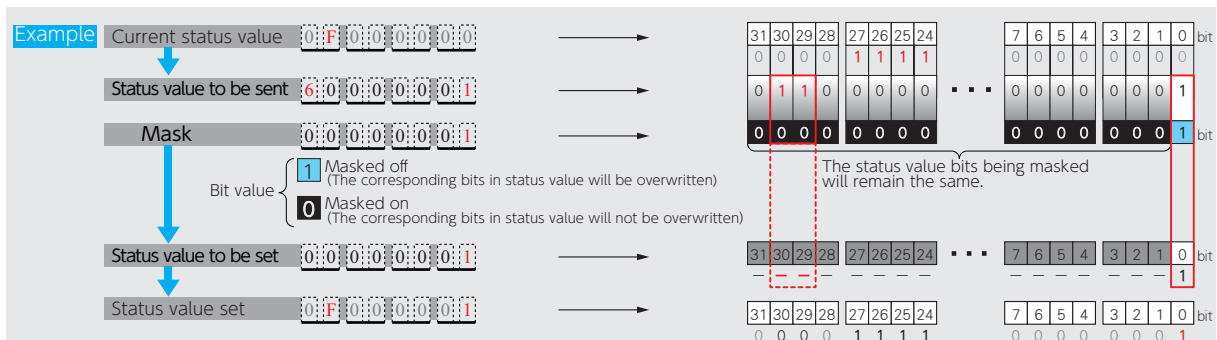
Name	READ_EA05_DATA_EX
Description	Reads encoder single-turn data and multi-turn data. You cannot use this command during Servo ON.
Command Code	62
Parameter Code	00 01 00 00 00 00 (fixed value)
Command Message Example	
Response Message Example	<p>Execution result (), single-turn data (), multi-turn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

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.  SD3 Series Instruction Manual 9 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

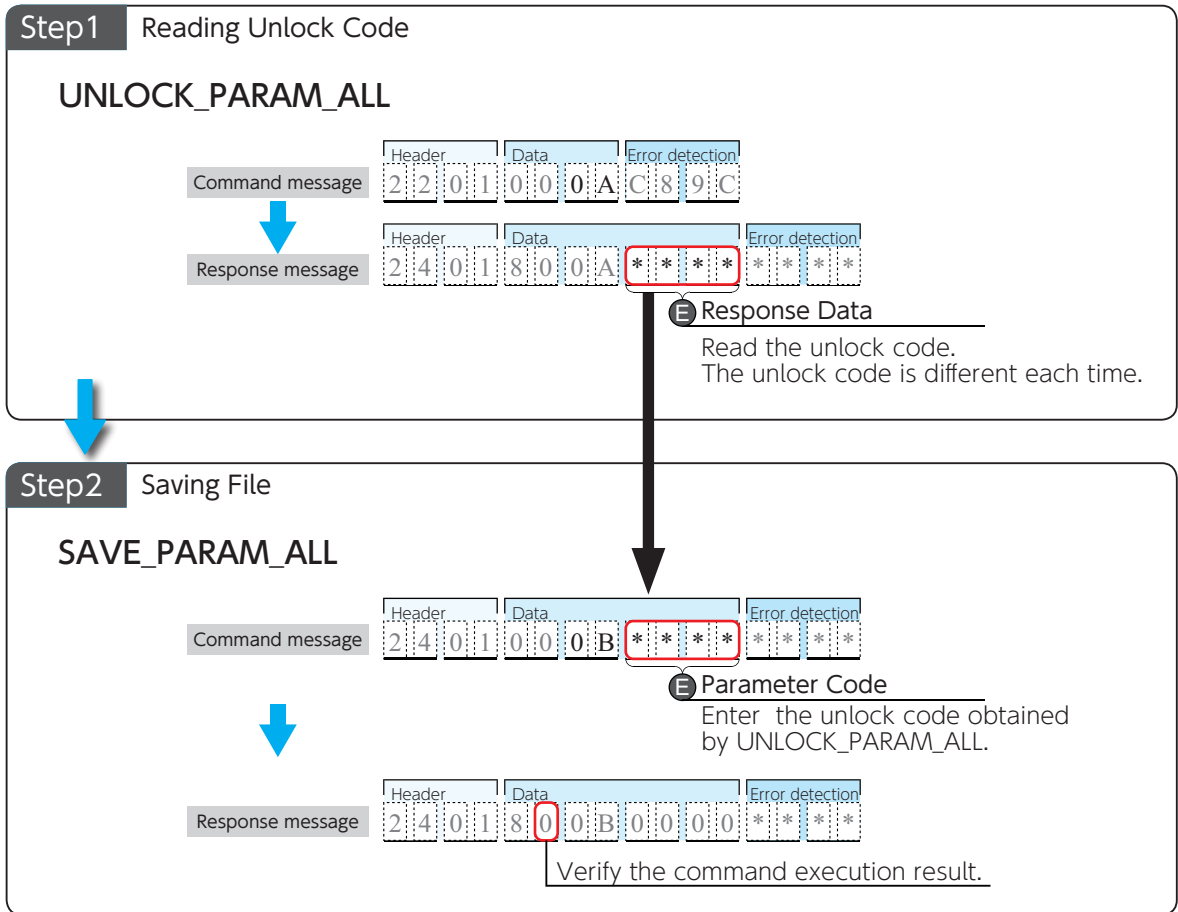
A mask is a parameter to access status value bitwise. The status value to be sent will overwrite the current status value only at the bit(s) where the corresponding bit is masked off (=1). The current status value will not be overwritten where the corresponding bit is masked on (=0).



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.

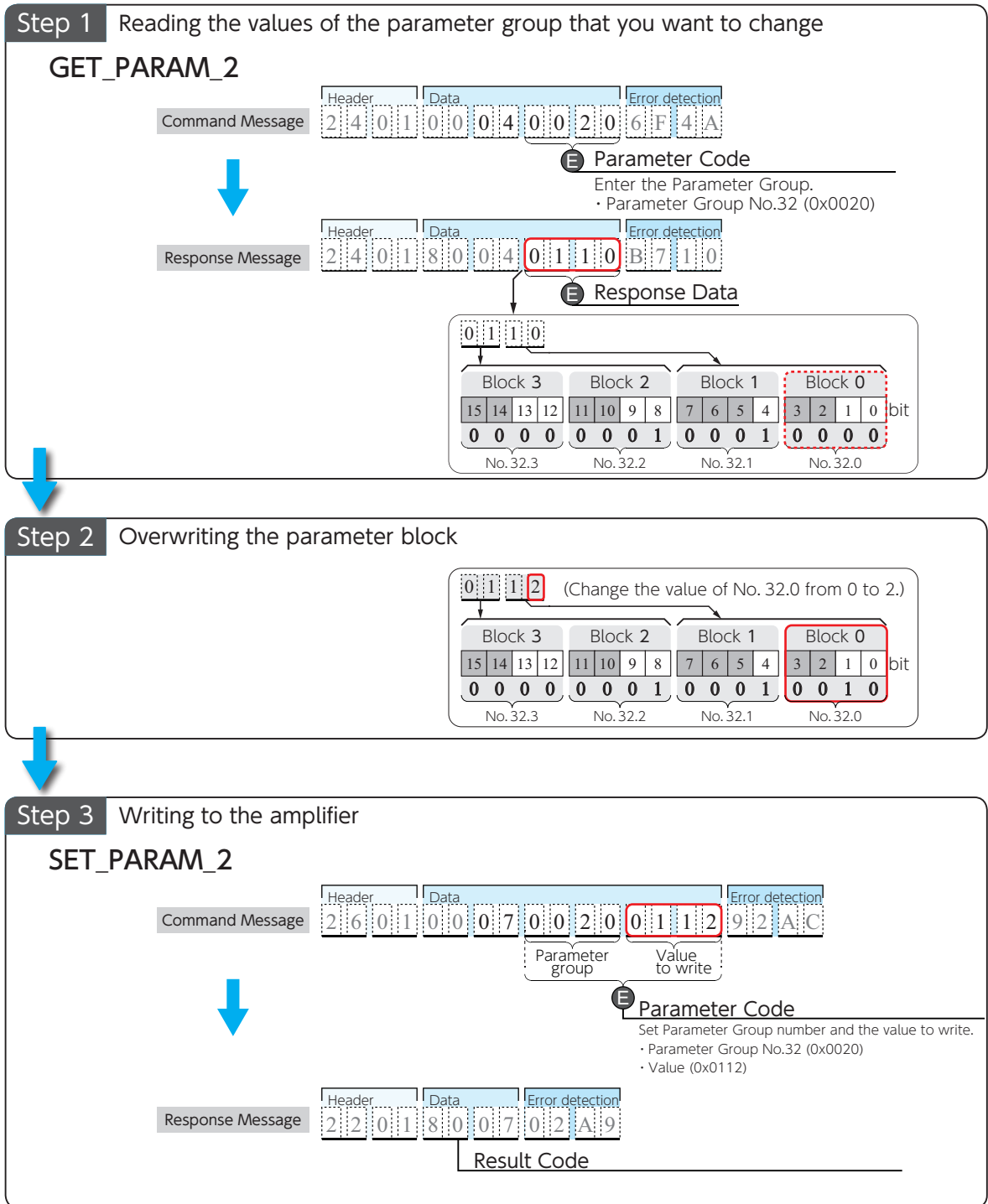


4. Communication Commands

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, Hexadecimal 0120).

 Pages 39 to 41 Status Variables

Set the following operation parameters.

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

*) 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.

 SD3 Series Instruction Manual **5** Setting Parameters List of Parameters

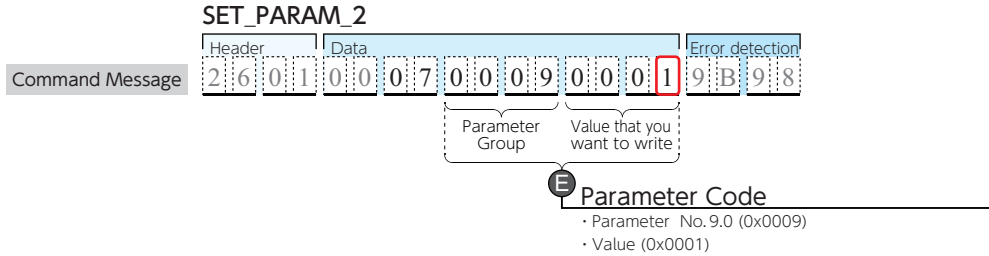
To perform point table operation with the host controller, see the page listed below for each operation method.

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

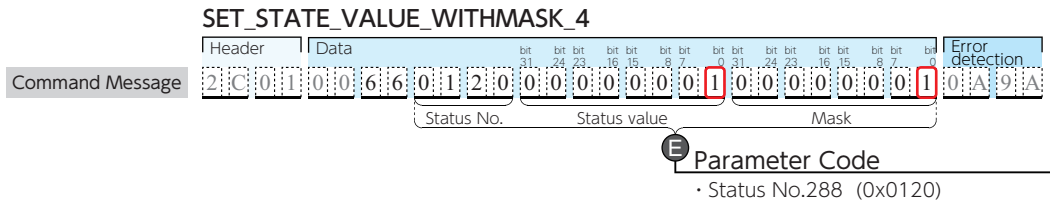
1. Setting operation parameters

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



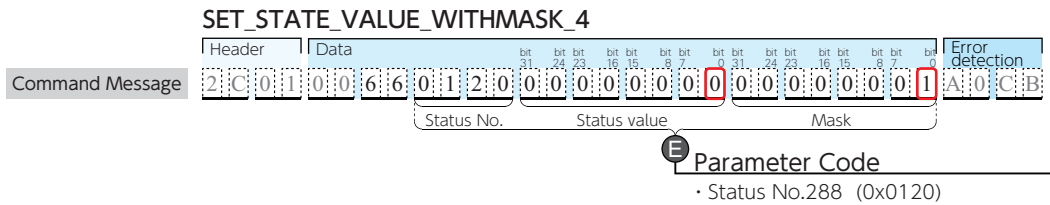
2. Servo ON

Set the status value of bit 0 in Logical I/O input (Status No.288) to 1.



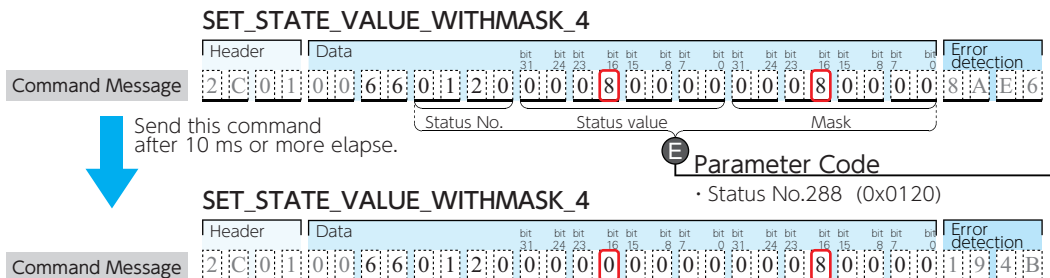
3. Servo OFF

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



4. Homing

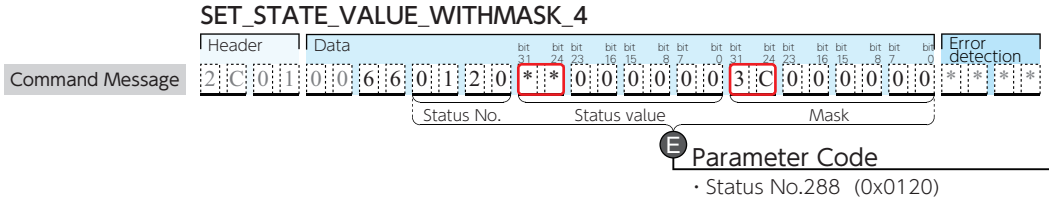
Set the status value of bit 19 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



4. Communication Commands

5. Setting Start Point No.

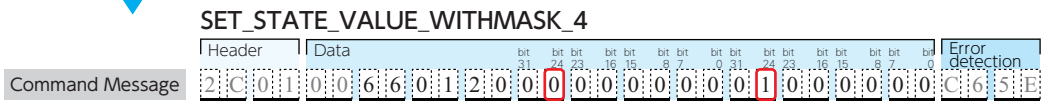
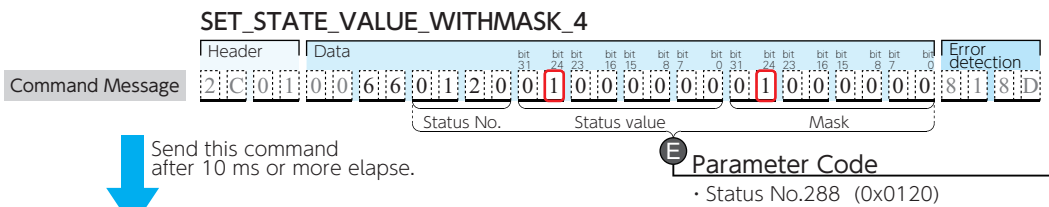
To set the status values of bit 26 to 29 in Logical I/O input (Status No.288):



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

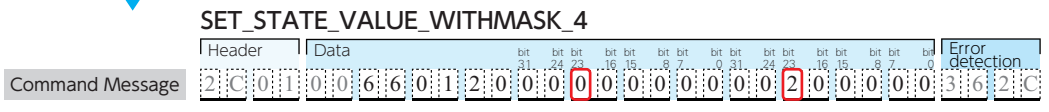
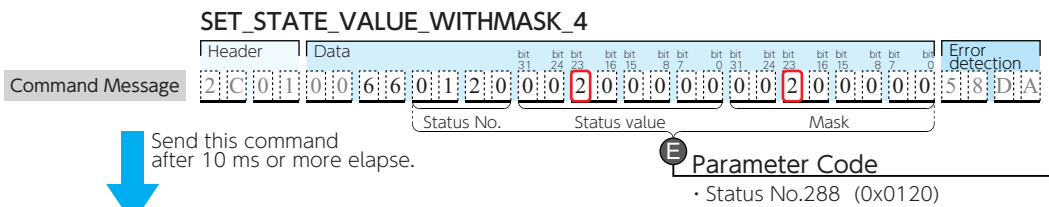
6. Starting the motion

Set the status value of bit 24 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



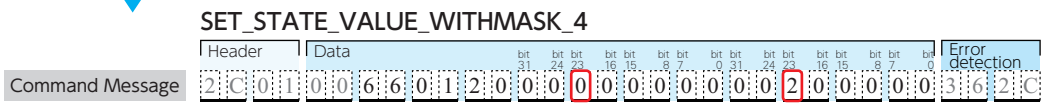
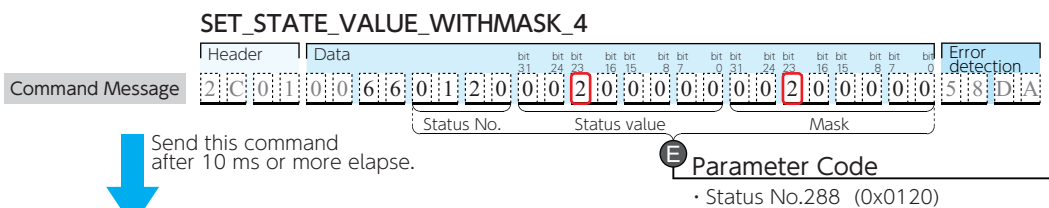
7. Pausing the motion

Set the status value of bit 21 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



8. Resuming the motion

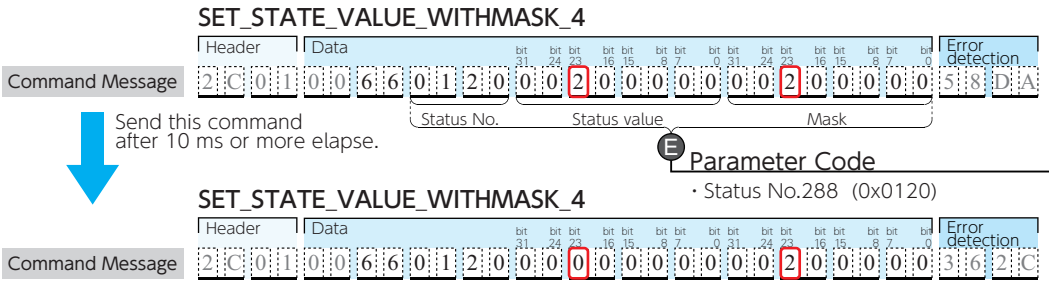
Set the status value of bit 21 in Logical I/O input (Status No.288) to 1 while the motion is paused. After 10 ms or more elapse, set it to 0.



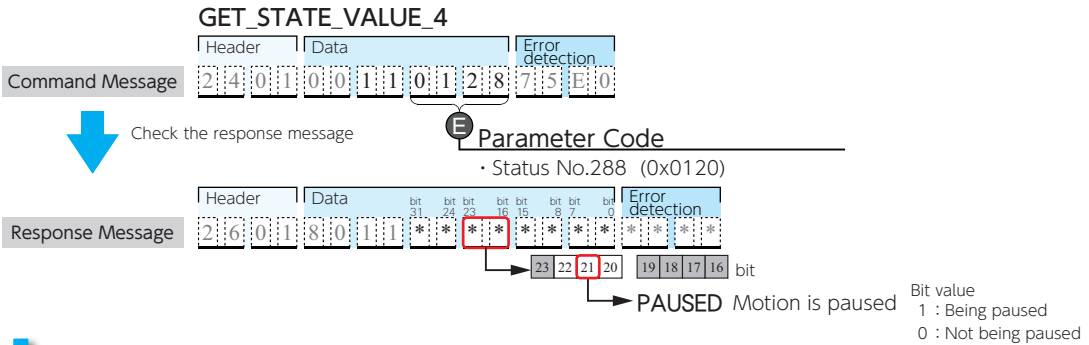
4. Communication Commands

9. Stopping the motion

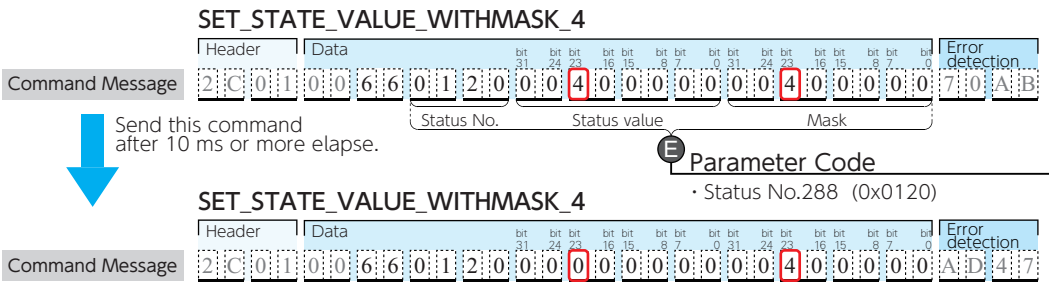
Step 1 Set the status value of bit 21 of Logical I/O input (Status No.288) to 1 during motion. After 10 ms or more elapse, set it to 0.



Step 2 Verify that the status value of bit 21 of Logical I/O output (Status No.296) is 1. (Verify that the motion is paused.)



Step 3 Set the status value of bit 22 in Logical I/O input (Status No.288) to 1. After 10 ms or more elapse, set it to 0.



Execute Step 3 to stop the motion during pause.
 Pages 39 to 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 [-]
0	722.0	724.0	726.0	727.0	720.0	728.0	720.1	729.0	720.3
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



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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 target position in Point Table.</p> <p>(1) If Relative Value 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 Absolute Value 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>												
Related To	No.643.0												
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 motor rotational speed 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 acceleration time 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 deceleration time 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 command method for point table.</p> <table border="1"> <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 0 to 20,000	Default 1 [ms]	Characteristics 
Function Use	<p>Set the dwell time for the Point Table.</p>			
	<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 to No. 1020.1	Internal Position: Point table Operation	Settings	Default	Characteristics
		0, 1	0	

Select the Running Motion of Point Table

Function Use

Settings	Running Motion																											
0	<p>Single After the motion commanded by this point number is complete, the subsequent point numbers will not be executed.</p> <p>Example: Point No.1 and 2 are set to "Single" .</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Signal Name</th> <th>Chart</th> </tr> </thead> <tbody> <tr> <td>Select Point No.</td> <td>PCSEL1...4 Input</td> <td></td> </tr> <tr> <td>Start</td> <td>PCSTART1 Input</td> <td></td> </tr> <tr> <td>Motor Rotational Speed</td> <td>-</td> <td></td> </tr> </tbody> </table>	Description	Signal Name	Chart	Select Point No.	PCSEL1...4 Input		Start	PCSTART1 Input		Motor Rotational Speed	-																
	Description	Signal Name	Chart																									
Select Point No.	PCSEL1...4 Input																											
Start	PCSTART1 Input																											
Motor Rotational Speed	-																											
1	<p>Continuous The subsequent point number(s) will be executed one after another.</p> <p>Example-1: The dwell time is set to 1 or above (for example, 3 ms). Then positioning will be executed according to each point. After the positioning is determined to be completed, the next motion will not start until the dwell time elapses.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Signal Name</th> <th>Chart</th> </tr> </thead> <tbody> <tr> <td>Select Point No.</td> <td>PCSEL1...4 Input</td> <td></td> </tr> <tr> <td>Start</td> <td>PCSTART1 Input</td> <td></td> </tr> <tr> <td>Motor Rotational Speed</td> <td>-</td> <td></td> </tr> <tr> <td>Position Deviation</td> <td>-</td> <td></td> </tr> </tbody> </table> <p>Example-2: The dwell time is set to 0. The motor will keep rotating and the rotational speed will continuously change.</p> <table border="1"> <thead> <tr> <th>Description</th> <th>Signal Name</th> <th>Chart</th> </tr> </thead> <tbody> <tr> <td>Select Point No.</td> <td>PCSEL1...4 Input</td> <td></td> </tr> <tr> <td>Start</td> <td>PCSTART1 Input</td> <td></td> </tr> <tr> <td>Motor Rotational Speed</td> <td>-</td> <td></td> </tr> </tbody> </table>	Description	Signal Name	Chart	Select Point No.	PCSEL1...4 Input		Start	PCSTART1 Input		Motor Rotational Speed	-		Position Deviation	-		Description	Signal Name	Chart	Select Point No.	PCSEL1...4 Input		Start	PCSTART1 Input		Motor Rotational Speed	-	
	Description	Signal Name	Chart																									
Select Point No.	PCSEL1...4 Input																											
Start	PCSTART1 Input																											
Motor Rotational Speed	-																											
Position Deviation	-																											
Description	Signal Name	Chart																										
Select Point No.	PCSEL1...4 Input																											
Start	PCSTART1 Input																											
Motor Rotational Speed	-																											

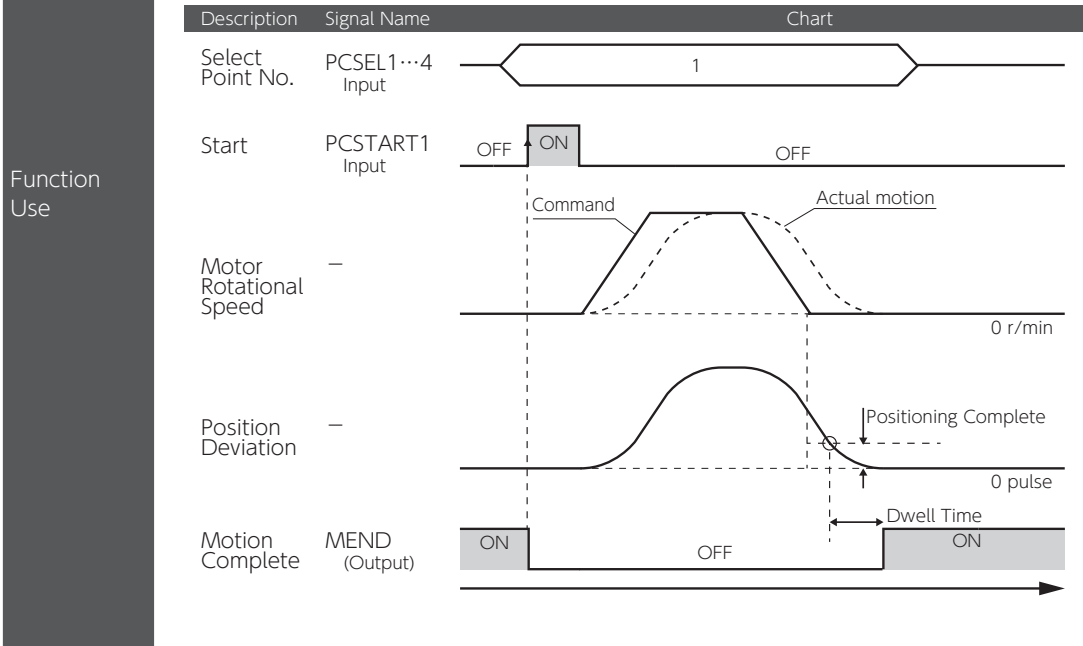
4. Communication Commands

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

Set the range for positioning complete by the Point table.

Set a position deviation threshold to determine whether or not positioning is complete. After the motion specified by the point number has been complete, when the position deviation falls in the range set by this item and then the Dwell time elapses, the MEND (motion end) signal turns ON.

■ Timing Diagram of Positioning Complete and Dwell Time



4. Communication Commands

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

Enable/Disable Point Table.

Settings	Enable/Disable
0	Disable The point number assigned "disable" is not executed and any subsequent point numbers assigned "enable" are executed.
1	Enable The point number assigned "enable" is 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.

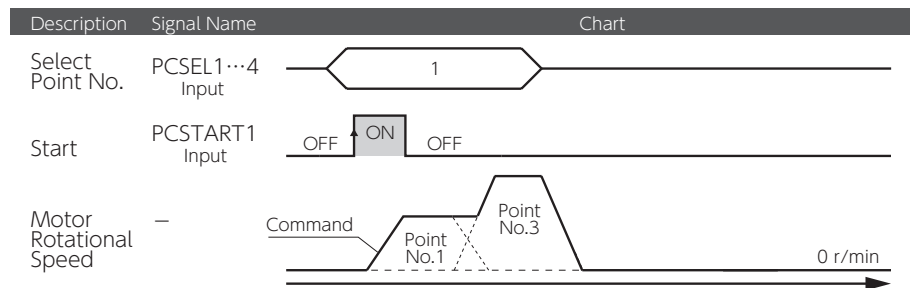
If point number with "continuous" motion and "0" dwell time, motions before and after that point number will be executed one after the other and the speed will change continuously.

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.

"Servo Studio" operation

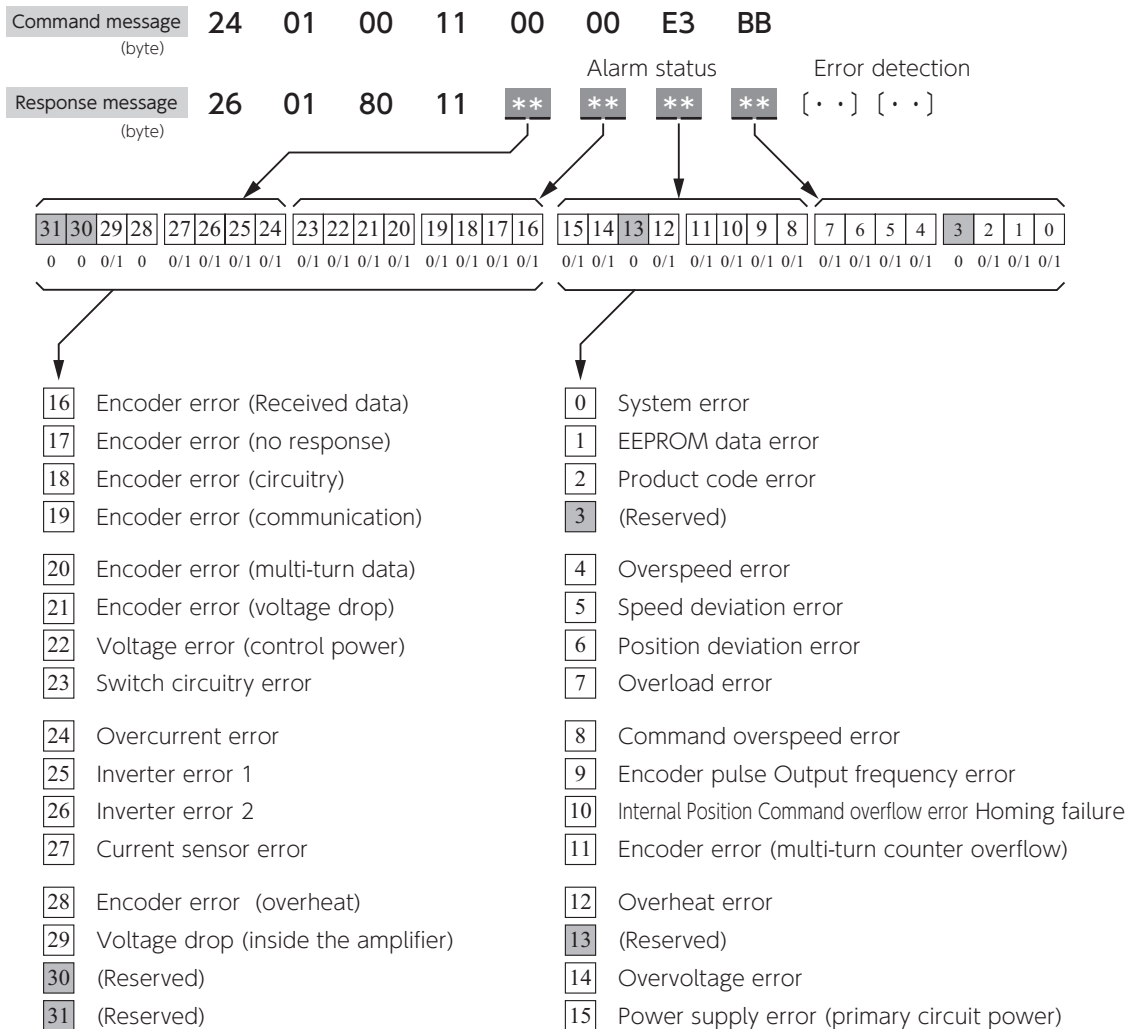
Turn the servo off or click the STOP button.

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.			
Command example	24 01 00 11 00 00 E3 BB			

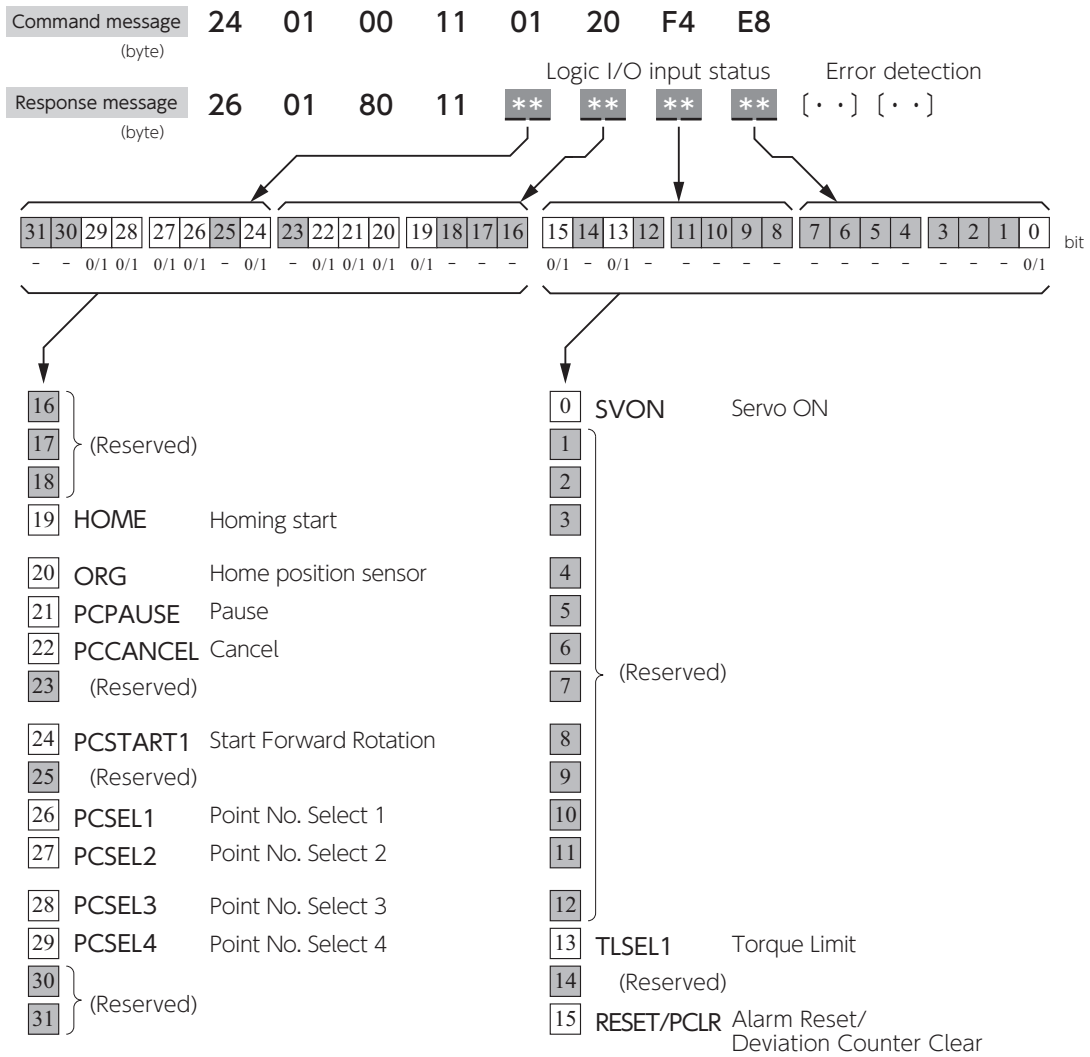
Relations between RS-485 Communication Command and Bit Tables




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 <u>point table operation in Internal Position Command mode</u> performed by the host controller through RS-485 communications.</p>			
Command example	24 01 00 11 01 20 F4 E8			

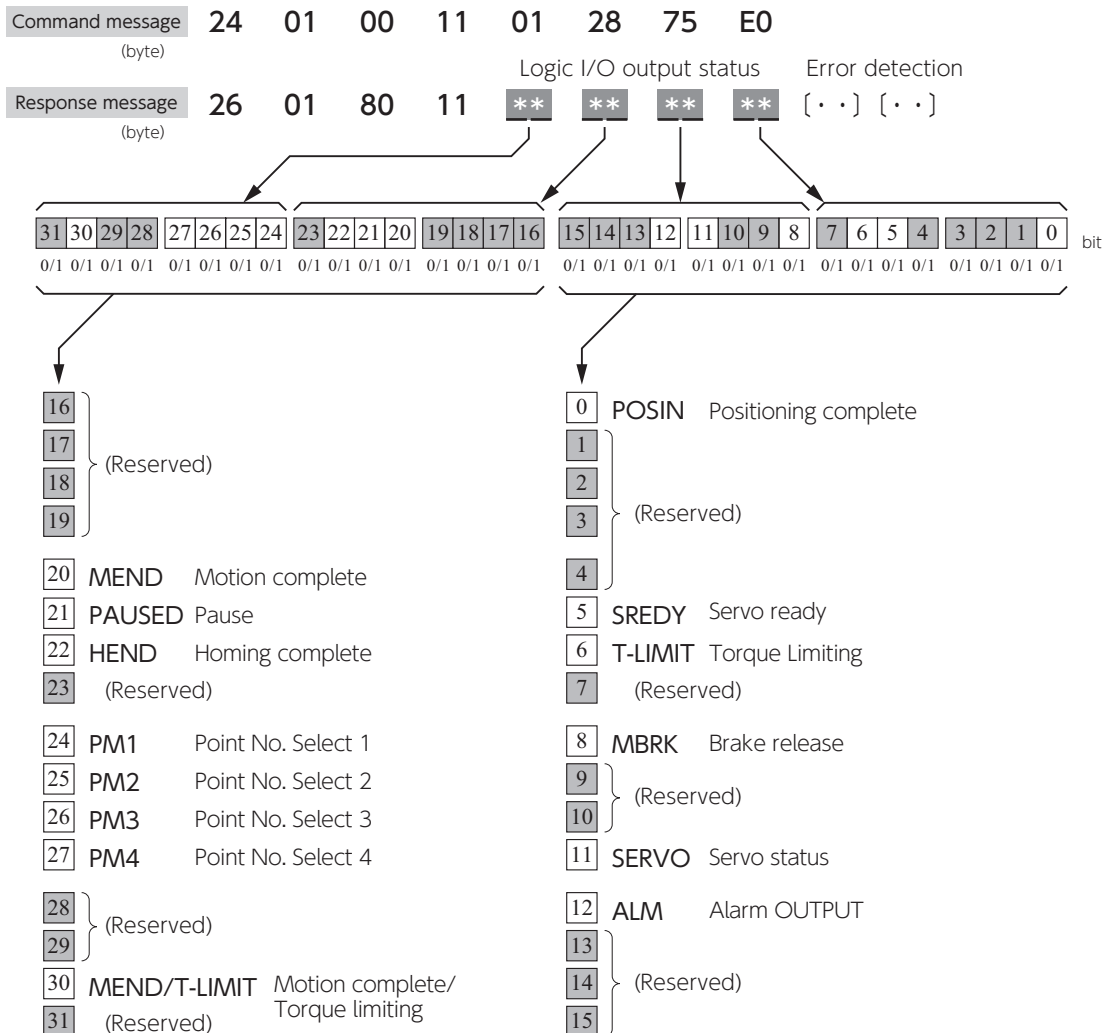
Relations between Logic I/O input command and Bit Tables



4. Communication Commands

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

Relations between Logic I/O output command and Bit Tables



MEMO
