

# USER MANYAL

Brushless DC Motor Driver

## **XGVD series**

(Communication)



**SPG Co., Ltd.**

<http://www.spg.co.kr>



Thank you for purchasing the product of the SPG Motor. For the safe use of this product, please be sure to be thoroughly informed of all the contents in this user's manual.

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## 1. Safety Precautions

In this user's manual, safety warning signs are divided into "Warning" and "Caution".

- |   |  |
|---|--|
|  | • A possibility of heavy injury or death when inappropriately handled. |
| [Warning]   |  |
|  | • A Possibility of minor injury when inappropriately handled.          |
| [Caution]   |  |

The lists in "Caution" can also lead to serious injury or damage depending on the situation. Please be informed of both categories for you safety.

-  [Warning]
- Do not use in the explosion, flammable, corrosive, combustible material and water place. it will cause fire, electric shock, injury.
  - Do not touch the machine with wet hands. You may receive electric shock.
  - Please turn off the machine before installation, verify and inspection.  
If not, you may receive electric shock.
  - Installation, connection, operation, handling and inspection should always be done by qualified professionals. If not, it may be the main reason of electric shock.
  - Grounding should always be done after installing the motor and the control unit. Failing to do so may cause electric shock
  - The input voltage of the control unit must not exceed the rated range.  
If so, ou may received electric shock.
  - After the connection is done, Make sure to install terminal cover over the power terminal and the input/output signal terminal. Failure to do so may cause electric shock or fire.
  - Do not stress unnecessary force into the power cable or the motor cable.  
It may cause electric shock or fire.
  - Make sure to turn off the control unit when the electricity is out. Sudden operation of the motor after the electricity comes back on may seriously Vdamage the machine.
  - Do not use the machine in elevators. Safety guard of the control unit will be activated and can make the motor stop. Which can damage the machine.
  - Do not touch the control unit within ten seconds after the power is off. Doing so may cause electric shock.
  - Do not dismantle or rebuild the motor, reduction gear and the control unit.  
It may cause injury to the user and damage to the machine.
  - For inspections and repairs, please contact the nearest agency or the head office.

**[Caution]**

- Do not exceed the recommended limit of the motor and the control unit.  
You may be injured, receive electric shock and the machine may be damaged.
- Do not pull the output shaft or cables of the motor. You may be injured.
- Do not place inflammable materials near the motor and the control unit.  
It may cause fire, electric shock or cause damage to the machine.
- Make sure to cover the cycling head of the motor. If not, you may be injured.
- Do not put foreign elements in the input shaft of the control unit. It may cause fire, electric shock and damage to the machine.
- When installing the motor or the motor with reduction gear, be careful not have your finger in between the installing machine and the motor. It may cause injury.
- When assembling the motor(gear type shaft) and reduction gear, keep you fingers away from them. You may be injured.
- Please operate the motor and the control unit with recommended setting.  
If not, it may cause fire, electric shock an damage to the machine.
- Always be prepared use the emergency break when test-operating. If not, you may be injured.
- When the machine malfunctions, immediately stop the operation and turn off the control unit. If not, it may cause fire, electric shock or injury.
- When safety guard operates, turn down the power, handle the cause and turn the power back on. Continuous operation of the machine without handling the cause may have you injured or cause damage to the machine.
- Slow run/slow stop controller of the control unit needs to be handled with insulated precision tools. If not, it may cause electric shock.
- During the insulation resistance evaluation, and insulation internal pressure test, never touch the terminal. For it may cause electric shock.
- The motor and the control unit should be disposed as an industrial waste.
- As the surface temperature of motor and control unit can exceed 70°C during operation, do not touch the motor, control unit during operating or after stopping. high temperature can result in person's burning.

**[Important]**

- XGVD Series are exclusively used for XGVM Series among SPG motor.  
Therefore it is not compatible with other company and user should combine exclusive control unit with exclusive motor.
- Once power has been turned off, do not turn power on again or remove or insert the motor connector until the POWER LED is completely extinguished (at least 30 seconds).

## 2. Protocol

### 2.1 Communication Specifications

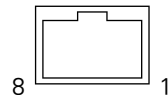
RS485	Half duplex, asynchronous communication method
Transmission Speed	2400, 4800, 9600 bps (Refer to Pr.5b)
Data bit	7 bits, 8 bits (Refer to Pr.5c)
Parity bit	None, even number, or odd number (Refer to Pr.5c)
Start bit	1 bit
Stop bit	1 bit, 2 bits (Refer to Pr.5c)
Host address	01h to 1FhSet
Driver address	80h to 9Fh (80h for simultaneous transmission.) (Refer to Pr.5a)

### 2.2 Connection

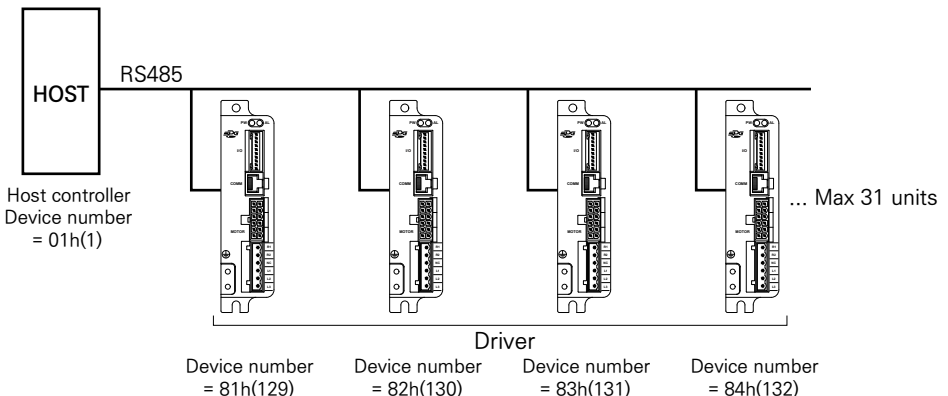
#### 2.2.1 Communication Cable Connection

Terminal number	Terminal symbol	Terminal explanation
1	—	NC
2	+5V	DC 5V (Supplied from the Driver)
3	—	NC
4	—	NC
5	RS485(+)	RS485(+) Connection terminal.
6	RS485(-)	RS485(-) Connection terminal.
7	GND	GNG
8	SCK	Interface (keypad)

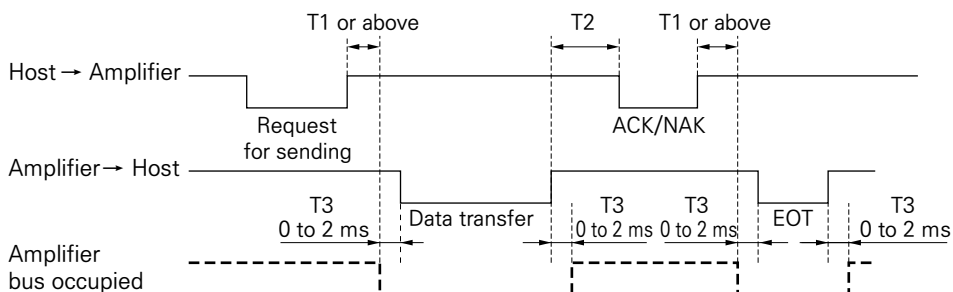
\* The pin numbers for the RJ45 terminal are The RJ45 terminal numbers are as shown in the diagram below.as shown in the diagram below.



#### 2.2.1 Connection Example



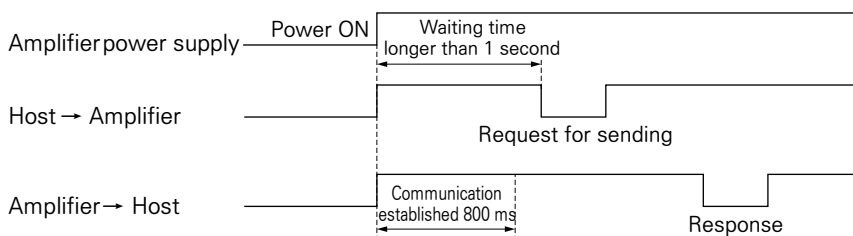
## 2.3 Communication Timing



Symbol	Name	Value
T1	Communication response time (Driver)	Refer to Pr.5b
T2	Communication response time (Host)	Take interval 10 ms or longer.
T3	Data emitting time from amplifier to host after bus is	0 to 2 ms

- 1) The timing is calculated from the rising edge of the stop bit.
- 2) The allowable time between receiving one character code and the next can be set using Pr5F "Protocol Timeout." If the next general character code is not received within the time set in this parameter, a communication timeout is detected, and the received data is discarded. If communication timeouts are continuously detected and the number of detections exceeds the retry count (Pr5E), an alarm will be triggered due to an RS485 communication error.
- 3) If the host sends data but still does not receive a response from the amplifier, a communication error may occur due to other factors such as noise. In this case, the host should resend the data after the time set in Pr5F "Protocol Timeout."

### [Timing in power-on]



## 2.4 Transmission

### 2.4.1 Handshake code

Name	Code	Functions	Description
SOH	01h	Heading start	communication start code
STX	02h	Test start	command data start code
ETX	03h	Test end	command data end code
EOT	04h	Transmission end	When the transmission message is complete, the driver will transmit
ENQ	05h	Request for sending	request code ([HOST] → [Driver])
ACK	06h	Positive response	Normal response
NAK	15h	Negative response	Abnormal response

### 2.4.2 Data Configuration


There are two transmission patterns for the transmitted data, depending on the command details:

#### (1) ENQ / EOT / ACK / NAK

SOH
Sending address 1
Sending address 2
Sending address 1
Senders address 2
ENQ/ACK/NAK/EOT

#### (2) Data Transmission Command

SOH
Sending address 1
Sending address 2
Sending address 1
Senders address 2
STX
Command 1
Command 2
Data number 1
Data number 2
Data number 3
Data number 4
Data 1
Data 2
Data 3
Data 4
ETX
BCC



#### [ Sending address ]

Set ID numbers to ASCII 2 bytes.

Host ID 01h(01) ~ 1Fh(31)

Driver ID 80h(128) ~ 9Fh(159)

If set to 80h (128), all connected drivers will execute the command (this applies only to certain commands). In this case, the driver does not respond.

#### [ Senders address ]

Set ID numbers to ASCII 2 bytes.

Host ID 01h(01) ~ 1Fh(31)

Driver ID 80h(128) ~ 9Fh(159)

#### [ Command ]

Set with ASCII 2 bytes.

#### [ Data number ]

Set with ASCII 4 bytes.

#### [ Data ]

Set with ASCII 4 bytes.

If the data is negative, it is converted to a signed 16-bit value.

(For example, if the value is -10, the data is represented as the ASCII code of hexadecimal FFF6.)

#### [ BCC ]

For data transmission commands, set the XOR (logically inverted) value of each byte from STX to ETX.

### 2.4.3 Command List

Command	Code	Transmission direction	Description
\$P	24h 50h	[HOST] → [Driver]	It is Data Write command. It is possible to change parameters and motor control data. (Parameter changes are not saved in EEPROM.)
\$S	24h 53h	[HOST] → [Driver]	It is Data Write command. It is possible to change parameters and motor control data. (Parameter changes are saved in EEPROM.) (EEPROM lifespan limit: approximately 100,000 cycles)
\$R	24h 52h	[HOST] → [Driver]	It is the Data Read request command. Requests parameters, status, control records, etc.
#R	23h 52h	[Driver] → [HOST]	It is the Data Read request command. Returns the requested parameters, status, control records to \$R.
#C	23h 43h	[Driver] → [HOST]	It is the response to Data update request. When the data of the driver status (8103h) changes, it responds to the transmission command request and returns it to [HOST].
#I	23h 49h	[Driver] → [HOST]	It is the Initial request response. When the driver's power is turned on, #I followed by 9999 is sent in response to the initial request from [HOST].



#### 2.4.4 Transmission Format

##### (1) \$P/\$S : Data Write/Parameter Write command

[HOST] -> [Driver] (Data Write)

SOH				STX	\$	P	*	*	*	*	*	*	*	*	ETX	BCC
	Amplifier ID	Host ID			Command		Data number (parameter address)				Data (parameter value)					

[Driver] -> [HOST] (Response)

SOH				ACK
	Host ID	Amplifier ID		

- If the requested data number (parameter address) or data value (parameter value) is abnormal, it will respond with NAK.
- Only when ACK is responded to by the driver, it indicates that the parameter has been set correctly.
- If the driver ID is 80h (128), the driver does not respond.

##### (2) \$R : Data Read/Parameter Read command

[HOST] -> [Driver] (Data Read)

SOH				STX	\$	R	*	*	*	*	0	0	0	0	ETX	BCC
	Amplifier ID	Host ID			Command		Data number (parameter address)				Data (parameter value)					

- When executing the data read command, set the data to '0000'.
- If the driver ID is 80h (128), the data read/parameter read command is ignored.

[Driver] -> [HOST] (Response)

SOH				ACK
	Host ID	Amplifier ID		

[HOST] -> [Driver] (Request)

SOH				ENQ
	Amplifier ID	Host ID		

[Driver] -> [HOST] (응답)

SOH				STX	#	R	*	*	*	*	*	*	*	*	ETX	BCC
	Host ID	Amplifier ID			Command		Data number (parameter address)				Reading data (parameter value)					

- The response data when the driver is powered on is the initial request response.
- If the requested data count (parameter address) is abnormal, the read data will be '0000'.
- Use the read data after confirming the data number (parameter number).

[HOST] -> [Driver] (Request)

SOH				ACK
	Amplifier ID	Host ID		

[Driver] -> [HOST] (Response)

SOH				EOT
	Host ID	Amplifier ID		

### (3) ENQ : Request for sending

When a transmission request is sent to the Driver, the response data will change depending on the status of the Driver.

The response data is returned according to the following priority:

1	When the power is turned on	The initial request response is provided.
2	When Data Read / Parameter Read is received	Refer to the Data Read Command Processing.
3	When the status of the Driver changes	The response to the Data Update request is provided.
4	In other cases	A communication completion response is provided.

- The initial request response is the response to the initial data request for transmission after the Driver's power is turned on.
- If the Driver ID is set to 80h (128), transmission requests to the amplifier are ignored.

[When the Driver's power is turned on]

[HOST] -> [Driver] (Request)

SOH					ENQ
-----	--	--	--	--	-----

Amplifier ID    Host ID

[Driver] -> [HOST] (Response)

SOH					STX	#	I	9	9	9	9	0	0	0	0	ETX	BCC
-----	--	--	--	--	-----	---	---	---	---	---	---	---	---	---	---	-----	-----

Host ID    Amplifier ID    Command    Data number    Reading data

[HOST] -> [Driver] (Request)

SOH					ACK
-----	--	--	--	--	-----

Amplifier ID    Host ID

[Driver] -> [HOST] (Response)

SOH					EOT
-----	--	--	--	--	-----

Host ID    Amplifier ID

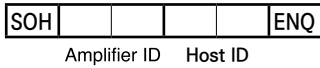
- After confirming the initial response, request parameters as needed.

[When Data Read / Parameter Read is received]

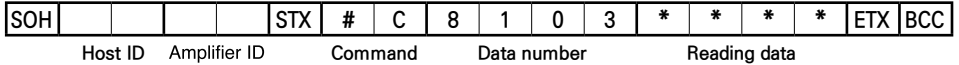
Refer to "\$R: Data Read/Parameter Read Command" (Page 62).

[When the status of the Driver changes]

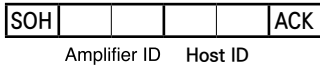
[HOST] -> [Driver] (Request)



[Driver] -> [HOST] (Response)



[HOST] -> [Driver] (Request)



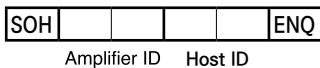
[Driver] -> [HOST] (Response)



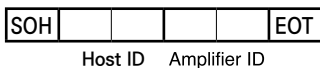
- The Driver saves the status when executing a transmission request, and if the status changes upon receiving the next transmission request, the above response is sent. The read data corresponds to the read data number 8103h..
- If continuous transmission requests are sent while the Driver's power is on, a data update request response will be made after the initial request response.

[In other cases]

[HOST] -> [Driver] (Request)



[Driver] -> [HOST] (Response)



- If the host does not request data and the Driver's status has not changed, the Driver will respond with a Settings Range

### 3. Parameter

#### 3.1 Parameter : 8000h – 805Fh

Address	Pr. No. *1	Name	Range	Default	Upper limit	Lower limit	Note
8000h	0	Int. speed (0 th speed)	0-803Bh (Maximum Speed Limit)	0000h (0)	*2	0000h (0)	
8001h	1	1st speed		0BB8h (3000)	*2	0000h (0)	
8002h	2	2nd speed		04B0h (1200)	*2	0000h (0)	
8003h	3	3rd speed		0258h (600)	*2	0000h (0)	
8004h to 8007h	4 ~ 7	4th speed ~ 7th speed		0000h (0)	*2	0000h (0)	
8010h	10	1st Acceleration Time	1-30000 (0.01 s) 1-299 (0.01 seconds-less than 3 seconds) 300-2999 (3 seconds-less than 30 seconds) 3000-30000 (30 seconds - 300 seconds)	001Eh (0.3 s)	7530h (300 s)	0001h (0.01 s)	*3
8011h	11	2nd Acceleration Time		001Eh (0.3 s)	7530h (300 s)	0001h (0.01 s)	*3
8012h	12	1st Deceleration Time		001Eh (0.3 s)	7530h (300 s)	0001h (0.01 s)	*3
8013h	13	2nd Deceleration Time		001Eh (0.3 s)	7530h (300 s)	0001h (0.01 s)	*3
8014h	14	Acceleration Mode Selection	[0] Linear [1] S type-1 [2] S type-2	0000h	0002h	0000h	
8015h	15	Deceleration Mode Selection		0000h			

\*1) Pr No. refers to the parameter number on the keypad.

\*2) The upper limit value varies according to "803Bh." If a value exceeding "803Bh" is set, it will be limited to the value of "803Bh."

\*3) For input values of 3 seconds (300) or more, the last digit is omitted. For 30 seconds (3000) or more, the last two digits are omitted.

Address	Pr. No. *1	Name	Range	Default	Upper limit	Lower limit	Note
8016h	16	Stop mode selection	[0] Free stop [1] Speed reduction stop	0001h	0001h	0000h	
8017h	17	Free-run waiting time	0-100 (0.1 s)	000Ah	0064h	0000h	
801Ah	1A	P gain	0-10000	0999h	2710h	0000h	
801Bh	1b	I gain	0-10000	01EBh	2710h	0000h	
8030h	30	Run command selection	[0] keypad [1] I/O [2] RS-485 communication	0001h	0002h	0000h	*4
8031h	31	Speed command selection	[0] keypad [1] Vol-A	0001h	0001h	0000h	*4
8032h	32	Operation mode selection	[1] 1 <sup>st</sup> speed mode [2] 2 <sup>nd</sup> speed mode [4] 4 <sup>th</sup> speed mode [8] 8 <sup>th</sup> speed mode	0001h	0008h	0001h	*4
8033h	33	I1 / I2 function selection	[0] 11(CCW) / I2(CW) [1] 11(CW) / I2(CCW) [2] 11(run/stop) / I2(CW/CCW) [3] 11(CCW) / I2(A/CLR) [4] 11(CW) / I2(A/CLR)	0002h	0004h	0000h	*4
8034h	34	I3 function selection	[0] Free [1] E-STOP [2] 2nd acceleration / deceleration [3] A/CLR	0000h	0003h	0000h	*4
8035h	35	I4 function selection		0003h	0003h	0000h	*4
8036h	36	I5 function selection		0000h	0003h	0000h	*4
803Ah	3A	Lower speed limit	0-803Bh (Maximum Speed Limit)	0000h	*2	0000h	*4
803Bh	3b	Upper speed limit	0-4000 (r/min)	0FA0h	0FA0h	0000h	*4

\*1) Pr No. refers to the parameter number on the keypad.

\*2) The upper limit value varies according to "803Bh." If a value exceeding "803Bh" is set, it will be limited to the value of "803Bh."

\*4) Changes can be made when the motor is stopped. If rewritten while the motor is running, NAK will be returned.

Address	Pr. No. *1	Name	Range	Default	Upper limit	Lower limit	Note
803Ch	3C	Torque limit	0-150 (%)	0096h	0096h	0000h	
8040h	40	O1 function selection	[0] Alarm run [1] Arriving [2] Running [3] FREE run [4] CCW run	0000h	0007h	0000h	
8041h	41	O2 function selection	[5] CW run [6] Overload detection [7] Speed pulse signal	0007h	0007h	0000h	
8042h	42	O1 output polarity selection	[0] Normal [1] Reverse	0000h	0001h	0000h	
8043h	43	O2 output polarity selection		0000h	0001h	0000h	
8044h	44	Speed matching range	20-803Bh (Upper speed limit)	0032h	*2	0000h	
8045h	45	Output pulse count	[0] 1 / [1] 2 / [2] 3 / [3] 4 / [4] 6 / [5] 8 / [6] 12 / [7] 15 / [8] 24 / [9] 30	0007h	0009h	0000h	*10
8046h	46	Monitor mode switching	[0] Rotation speed [1] Torque [2] Load factor [3] Command speed [4] Internal DC voltage	0001h	0004h	0000h	
8047h	47	Numerator of display magnification factor	0-8048h(Denominator of display magnification factor") * 10	0001h	*5	0000h	
8048h	48	Denominator of display magnification factor	0-1000	0001h	03E8h	0000h	

\*1) Pr No. refers to the parameter number on the keypad.

\*2) The upper limit value varies according to "803Bh." If a value exceeding "803Bh" is set, it will be limited to the value of "803Bh."

\*5) The maximum value varies according to "8048h: Display Scale Denominator." It is limited to the value of "8048h: Display Scale Denominator" × 10.

\*10) It cannot be set because it is [RO(Read Only)]

Address	Pr. No *1	Name	Range	Default	Upper limit	Lower limit	Note
804Bh	4b	Alarm History 1	[0] No History [1] Sensor error [2] Low Voltage Protection [3] Overvoltage Protection [4] Overload Protection [5] Overspeed Protection [7] Locked rotor Protection [8] Overcurrent Protection [9] Overheat Protection [10] E-STOP [12] RS-485 communication error [15] Open-Phase Protection [90] User para. error [91] system para. error [99] Cpu error	0000h	005Eh	0000h	*6
804Ch	4C	Alarm History 2		0000h	005Eh	0000h	*6
804Dh	4d	Alarm History 3		0000h	005Eh	0000h	*6
804Eh	4E	Alarm History 4		0000h	005Eh	0000h	*6
804Fh	4F	Alarm History 5		0000h	005Eh	0000h	*6
8050h	50	Low Voltage Alarm Selection	[0] No alarm [1] Alarm selection	0000h	0001h	0000h	*4
8051h	51	Retry Selection	[0] No retry [1-4] Retry count	0000h	0004h	0000h	*4
8052h	52	Retry Interval	1-120 (s)	0005h	0078h	0001h	
8054h	54	Parameter initializing	[0] No operation [1] Initialize to default	0000h	0001h	0000h	*7
805Ah	5A	RS-485 Driver ID	80h - 9Fh	0081h	009Fh	0080h	*8*9
805Bh	5b	RS-485 Transmission Speed	[0] 2400 bps [1] 4800 bps [2] 9600 bps	0002h	0002h	0000h	*8

\*1) Pr No. refers to the parameter number on the keypad.

\*4) Changes can be made when the motor is stopped. If rewritten while the motor is running, NAK will be returned.

\*6) It cannot be changed, and if rewriting is completed, NAK will be res. If rewritten again, NAK will be returned.

\*7) Change the parameter to "1" and write it to the EEPROM with the \$\$ command. After writing to the EEPROM, turn off the power, wait 10 seconds, and then turn the power back on to initialize the parameters. If it is not written to the EEPROM, the parameters will not be initialized after power is applied.

\*8) Changes will be applied after turning off the power and then turning it back on after 10 seconds.

\*9) If the device number is set to 80h (128), parameter changes and status requests are ignored, so it is generally set to 81h (129)~9Fh (159).

Address	Pr. No *1	Name	Range	Default	Upper limit	Lower limit	Note
805Ch	5C	RS-485 Communication Protocol	[0] 8bit , parity(no), stop bit(1) [1] 8bit , parity(no), stop bit(2) [2] 8bit , parity(odd), stop bit(1) [3] 8bit , parity(even), stop bit(1) [4] 7bit , parity(odd), stop bit(1) [5] 7bit , parity(odd), stop bit(2) [6] 7bit , parity(even), stop bit(1) [7] 7bit , parity(even), stop bit(2)	0003h	0007h	0000h	*8
805Dh	5d	RS-485 Response Time	6-255 (ms)	0006h	00FFh	0006h	*8
805Eh	5E	RS-485 Retry	[0-6] Number of retries [7] No retry	0000h	0007h	0000h	*8
805Fh	5F	RS-485 Protocol Timeout	10-255 (s)	000Ah	00FFh	000Ah	*8

\*1) Pr No. refers to the parameter number on the keypad.

\*8) Changes will be applied after turning off the power and then turning it back on after 10 seconds.



## 3.2 Data Communication Examples

### 3.2.1 When the Power is Turned On

When the Driver's power is on and a transmission request is executed, the communication data is displayed below in chronological order.

Initially, it shows the initial request response, followed by the response to the data update request. If the Driver's status does not change, it responds with transmission completion. The example below shows the host ID = 01h (1) connected to the Driver ID = 81h (129). The data is displayed as ASCII characters (the data in parentheses is the hexadecimal ASCII code).

[HOST] → [Driver] (Request)

SOH	8	1	0	1	ENQ
(01h)	(38h)	(31h)	(30h)	(31h)	(05h)

[Driver] → [HOST] (Response)

SOH	0	1	8	1	STX	#	I	9	9	9	9	0	0	0	0	ETX	BCC
(01h)	(30h)	(31h)	(38h)	(31h)	(02h)	(23h)	(49h)	(39h)	(39h)	(39h)	(39h)	(30h)	(30h)	(30h)	(30h)	(03h)	(6Bh)

[HOST] → [Driver] (Request)

SOH	8	1	0	1	ACK
(01)	(38)	(31h)	(30h)	(31h)	(06h)

[Driver] → [HOST] (Response)

SOH	0	1	8	1	EOT
(01h)	(30h)	(31h)	(38h)	(31h)	(04h)

[HOST] → [Driver] (Request)

SOH	8	1	0	1	ENQ
(01h)	(38h)	(31h)	(30h)	(31h)	(05h)

[Driver] → [HOST] (Response)

SOH	0	1	8	1	STX	#	C	8	1	0	3	0	0	0	2	ETX	BCC
(01h)	(30h)	(31h)	(38h)	(31h)	(02h)	(23h)	(43h)	(38h)	(31h)	(30h)	(33h)	(30h)	(30h)	(30h)	(32h)	(03h)	(69h)

[HOST] → [Driver] (Request)

SOH	8	1	0	1	ACK
(01)	(38)	(31h)	(30h)	(31h)	(06h)

[Driver] → [HOST] (Response)

SOH	0	1	8	1	EOT
(01h)	(30h)	(31h)	(38h)	(31h)	(04h)

[HOST] → [Driver] (Request)

SOH	8	1	0	1	ENQ
(01h)	(38h)	(31h)	(30h)	(31h)	(05h)

[Driver] → [HOST] (Response)

SOH	0	1	8	1	EOT
(01h)	(30h)	(31h)	(38h)	(31h)	(04h)

### 3.2.2 alarm clear

This example shows the communication data in chronological order when the alarm clear is executed. It demonstrates clearing the alarms of all Drivers connected with host ID = 01h (1). The data is displayed as ASCII characters (the data in parentheses is the hexadecimal ASCII code).

[HOST] -> [Driver] (Request)

SOH	8	0	0	1	STX	\$	P	8	1	9	0	0	0	0	1	ETX	BCC
(01h)	(38h)	(30h)	(30h)	(31h)	(02h)	(24h)	(50h)	(38h)	(31h)	(39h)	(30h)	(30h)	(30h)	(30h)	(31h)	(03h)	(74h)

- The Driver ID is set to 80h (128), so there is no response from the amplifier.

### 3.2.3 Parameter Change (Data Write)

This example shows the communication data in chronological order when changing a parameter (not recorded in EEPROM). It shows an example where the first target position (rotation count) Pr00 (8000h) is changed to 10 (0000Ah) in the Driver connected with host ID = 01h (1) and Driver ID = 81h (129).

[HOST] -> [Driver] (Request)

SOH	8	1	0	1	STX	\$	P	8	0	0	0	0	0	0	A	ETX	BCC
(01h)	(38h)	(31h)	(30h)	(31h)	(02h)	(24h)	(50h)	(38h)	(30h)	(30h)	(30h)	(30h)	(30h)	(30h)	(41h)	(03h)	(0Ch)

[Driver] -> [HOST] (Response)

SOH	0	1	8	1	ACK
(01h)	(30h)	(31h)	(38h)	(31h)	(06h)

### 3.2.4 Parameter Read (Data Read)

In the Data Read example, a read request is sent to the Driver, followed by the issuance of a command transmission request. This example shows reading the "Output Signal 1 Selection" Pr40 (8040h) from the Driver connected with host ID = 01h (1) and Driver ID = 81h (129). The data is displayed as ASCII characters (the data in parentheses is the hexadecimal ASCII code).

[HOST] -> [Driver] (Request)

SOH	8	1	0	1	STX	\$	R	8	0	4	0	0	0	0	0	ETX	BCC
(01h)	(38h)	(31h)	(30h)	(31h)	(02h)	(24h)	(52h)	(38h)	(30h)	(34h)	(30h)	(30h)	(30h)	(30h)	(30h)	(03h)	(7Bh)

[Driver] -> [HOST] (Response)

SOH	0	1	8	1	ACK
(01h)	(30h)	(31h)	(38h)	(31h)	(06h)

[HOST] -> [Driver] (Request)

SOH	8	1	0	1	ENQ
(01h)	(38h)	(31h)	(30h)	(31h)	(05h)

[Driver] -> [HOST] (Response)

SOH	0	1	8	1	STX	#	R	8	0	4	0	0	0	0	1	ETX	BCC
(01h)	(30h)	(31h)	(38h)	(31h)	(02h)	(23h)	(52h)	(38h)	(30h)	(34h)	(30h)	(30h)	(30h)	(30h)	(31h)	(03h)	(7Dh)

[HOST] -> [Driver] (Request)

SOH	8	1	0	1	ACK
(01)	(38)	(31h)	(30h)	(31h)	(06h)

[Driver] -> [HOST] (Response)

SOH	0	1	8	1	EOT
(01h)	(30h)	(31h)	(38h)	(31h)	(04h)

### 3.3 Communication command

#### 3.3.1 Communication command list

Data number	Applicable command on host side	Description
0h to 805Fh	\$P/\$S/\$R	Parameter
8103h	\$R	Driver status
8104h	\$R	Model code 1
8105h	\$R	Model code 2
8110h	\$R	Actual speed
8111h	\$R	Commanded speed
8112h	\$R	Internal DC voltage
8113h	\$R	Torque
8114h	\$R	Load factor
8120h	\$R	Alarm History
8130h	\$R	Input Terminal Status
8131h	\$R	Output Terminal Status
8180h	\$P/\$S	Run command
8181h	\$P/\$S	Free stop command
8190h	\$P/\$S	Alarm clear
8191h	\$P/\$S	E-stop
8192h	\$P/\$S	Alarm History Clear
81B0h	\$P/\$S	Parameter EEPROM Write

#### 3.3.2 Communication Command Details

(1) 8000h – 805Fh : Parameter

[P] : Parameter Write command (Without EEPROM writing function)

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	0		P1	P2	P3	P4	ETX	BCC
Amplifier ID		Host ID		Command		Parameter address				Parameter value					

- If the device number set on the Driver (value of Pr5A) matches the Driver ID of the received data, the parameter change will be executed.
- If the parameter address or value is abnormal, NAK will be responded.
- Set the parameter address to '80□□'. (For example, for Pr5C, set it to '805C'.)
- Set the parameter value using a 4-digit ASCII code converted from hexadecimal (P1, P2, P3, P4). (Example: 100 = '0064', -100 = 'FF9C')
- If the Driver detects an undervoltage error, NAK will be returned, and the parameter will not be changed.
- This command does not record the changed parameter to the EEPROM. To keep the changed parameter valid even after resetting the power, execute the EEPROM write command with the data number 81B0h.
- If you are executing an operation command via I/O while writing parameters via communication, input the operation command after receiving an ACK response from the Driver. The Driver will operate according to the recorded parameters.

[\$\$] : Parameter Write command (With EEPROM writing function)

[HOST] -> [Driver] (Request)

SOH				STX	\$	S	8	0			P1	P2	P3	P4	ETX	BCC			
Amplifier ID				Host ID				Command				Parameter address				Parameter value			

- If the device number set on the Driver (value of Pr5A) matches the Driver ID of the received data, the parameter change will be executed.
- If the parameter address or value is abnormal, NAK will be responded.
- Set the parameter address to '80□□'. (For example, for Pr5C, set it to '805C'.)
- Set the parameter value using a 4-digit ASCII code converted from hexadecimal (P1, P2, P3, P4). (Example: 100 = '0064', -100 = 'FF9C')
- If the Driver detects an undervoltage error, NAK will be responded., and the parameter will not be changed.
- The parameter changed by this command will be recorded to the EEPROM. Since the EEPROM writing process is required, the response may take some time.
- If you are executing an operation command via I/O while writing parameters via communication, input the operation command after receiving an ACK response from the Driver. The motor will operate according to the recorded parameters.
- Writing to the EEPROM should be minimized (EEPROM durability: approximately 100,000 write cycles.)

[\$R] : Parameter Read Request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	0			0	0	0	0	ETX	BCC			
Amplifier ID				Host ID				Command				Parameter address				Parameter value			

- Set the parameter address to '80□□'. (For Pr5C, set it to '805C'). Set the parameter value to '0000'.
- After executing this command and inputting the transmission request, the parameter value will be responded.

[#R] : Parameter Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	0			P1	P2	P3	P4	ETX	BCC
Host ID				Amplifier ID			Command			Parameter address			Parameter value			

- If the requested parameter address is abnormal, the parameter value will be responded as '0000'. Ensure that the parameter address is correct as requested.
- If the parameter read request command is completed successfully, the Driver will respond with the parameter value upon receiving the transmission request.
- The read parameter address is transmitted as '80□□'.
- The parameter value is transmitted as a 4-digit ASCII code obtained by converting the data into hexadecimal (P1, P2, P3, P4). (Exmample: 100 = '0064', -100 = 'FF9C')

## (2) 8103h : Driver status

[\$R] : Status Read request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	0	3	0	0	0	0	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- After executing this command and inputting the transmission request, the Driver status will be responded.
- Set the data value to '0000'.

[#R] : Status Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	0	3	D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- After the status read request command is completed successfully and the Driver receives the transmission request, it will respond with the status value.

[#C] : Data updating request command

[Driver] -> [HOST] (Response)

SOH				STX	#	C	8	1	0	3	D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- The Driver saves the transmission request execution status, and if the status changes when the next transmission request is received, it will respond as described above. The read data is executed the same as data number 8103.

[Detail of status]

	Bit 3	Bit 2	Bit 1	Bit 0
D1	0	0	0	0
D2	0	0	0	0
D3	0	0	0	0
D4	0	Running	Speed attainment	Trip state

- The above information is converted into hexadecimal and expressed as ASCII code. Example) Data value = 30h 30h 30h 34h = '0004' = Indicates that it is in operation.

(3) 8104h : Model code 1, 8105h: Model code 2

[\$R] : Model code Read request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	0		0	0	0	0	ETX	BCC
Amplifier ID				Host ID			Command			Data number				Data value		

- After executing this command and inputting the transmission request, the Driver's model code will be responded. Set the data value to '0000'.

[#R] : Model code Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	0		D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID			Command			Data number				Data value		

- After the model code read request command is completed successfully and the Driver receives the transmission request, it will respond with the model code value.
- The model name of the Driver is transmitted as a total of 8 ASCII characters, divided into two 4-character strings

Example ) model code 1 ('8104') = 58h 47h 56h 44h = 'XGVD'

model code 2('8105') = 31h 33h 30h 42h = '130B'

(4) 8110h : Actual speed, 8111h: Commanded speed

[\$R] : Speed Read request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	1		0	0	0	0	ETX	BCC
Amplifier ID				Host ID			Command			Data number				Data value		

- The Driver's rotational speed (actual speed) ('8110') and command speed ('8111') will be responded in response to a transmission request after executing this command.
- Set the data value to '0000'.

[#R] : Speed Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	1		D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID			Command			Data number				Data value		

- After the speed read request command is completed successfully and the Driver receives the transmission request, the rotational speed value (actual speed value) ('8110') and command speed value ('8111') will be responded.
- The data value will be responded as the rotational speed (actual speed) and command speed.

Example) Data value = 30h 42h 42h 38h = '0BBB' = 3000 [r/min]

Data value = 30h 35h 44h 43h = '05DC' = 1500 [r/min]

Positive values indicate CCW rotation, and negative values indicate CW rotation.

### (5) 8112h : Internal DC Voltage

[\$R] : Internal DC Voltage Read Request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	1	2	0	0	0	0	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- After executing this command and inputting a transmission request, the internal DC voltage of the Driver (the voltage of the power smoothing capacitor) will be responded.
- Set the data value to '0000'.

[#R] : Internal DC Voltage Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	1	2	D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- After the internal DC voltage read command is successfully completed and the Driver receives a transmission request, it will be responded the internal DC voltage (the voltage of the power smoothing capacitor).
- The Driver's voltage will be responded as the data value in [V].  
Example) Data value = 30h 31h 31h 38h = '0118' = 280[V]

### (6) 8113h : Torque, 8114h: Load factor

[\$R] : Torque Read request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	1		0	0	0	0	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- After executing this command and inputting a transmission request, the Driver's Torque ('8113') and Load Rate ('8114') will be responded.
- Set the Data value to '0000'.

[#R] : Torque Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	1		D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- After the Torque read request command is successfully completed and the Driver receives a transmission request, the Torque ('8113') and Load Rate ('8114') will be responded.
- The Driver's torque/load rate multiplied by 10 will be responded as the data value in [%].  
Example) Data value = 30h 31h 32h 43h = '012C' = 30.0 [%]

### (7) 8120h : Alarm History

[**\$R**] : Alarm History Read request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	2	0	0	0	0	0	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- After executing this command and inputting a transmission request, a response for the alarm history will be responded.
- Set the Data value to '0000'.

[**#R**] : Alarm History Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	2	0	D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- After the alarm history read request command is successfully completed and the Driver receives a transmission request, it will be responded the Driver's alarm history.
- The alarm history is responded as an alarm code.  
(Refer to the list of protection functions on P.24.)
- If the alarm code is 0, it indicates that no alarm has occurred.  
Example) Data value = 30h 30h 30h 41h = '000A' = 10 = E-STOP
- The alarm history can be read using parameters (Pr4b ~ 4f).



### (8) 8130h : Input Terminal Status

[R] : Input Terminal Status Read Request command

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	3	0	0	0	0	0	ETX	BCC
	Amplifier ID				Command		Data number			Data value						

- After executing this command and inputting a transmission request, the status of the Driver's input terminals will be responded.
- Set the Data value to '0000'.

[R] : Input Terminal Status Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	3	0	D1	D2	D3	D4	ETX	BCC
	Host ID		Amplifier ID		Command		Data number			Data value						

- After the input terminal status read request command is successfully completed and the Driver receives a transmission request, it will be responded the status of the Driver's input terminals.

[Status of input terminal]

	Bit 3	Bit 2	Bit 1	Bit 0
D1	0	0	0	0
D2	0	0	0	0
D3	0	0	0	I5
D4	I4	I3	I2	I1

- The above content is converted to hexadecimal and expressed as ASCII code.  
Example) Data value = 30h 30h 30h 35h = '0005' = Indicates that I1 and I3 are ON.

### (9) 8131h : Output Terminal Status

[\$R] : Output Terminal Status Read Requestcommand

[HOST] -> [Driver] (Request)

SOH				STX	\$	R	8	1	3	1	0	0	0	0	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- After executing this command and inputting a transmission request, the status of the Driver's output terminals will be responded.
- Set the Data value to '0000'.

[#R] : Output Terminal Status Response command

[Driver] -> [HOST] (Response)

SOH				STX	#	R	8	1	3	1	D1	D2	D3	D4	ETX	BCC
Host ID				Amplifier ID		Command		Data number				Data value				

- After the output terminal status read request command is successfully completed and the Driver receives a transmission request, it will be responded the status of the Driver's output terminals.

[Status of output terminal]

	Bit 3	Bit 2	Bit 1	Bit 0
D1	0	0	0	0
D2	0	0	0	0
D3	0	0	0	0
D4	0	0	02	01

- The above content is converted to hexadecimal and expressed as ASCII code.  
Exampe) Data value = 30h 30h 30h 31h = '0001' = Indicates that O1 is ON.

(10) 8180h : Run command

[\$P]/[\$S] : Run command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	8	0	D1	D2	D3	D4	ETX	BCC
Amplifier ID				Host ID			Command		Data number			Data value				

- If Pr30 is set to "2" (command via RS485) and the Driver's power is turned on, this command can be used to send an execution command to the Driver. In this case, operation commands cannot be given via I/O.  
(Refer to the I1/I2 function selection on P.57) If Pr30 is set to "1" (command via I/O) or "0" (digital keypad), the execution command via this command will be ignored.
- To request an operation command to the Driver with this command, first send '0000' as the data value.
- Both the \$P command and the \$S command function the same way.
- If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not respond.

[Run command]

	Bit 3	Bit 2	Bit 1	Bit 0
D1	0	0	0	0
D2	0	0	0	0
D3	0	0	0	0
D4	0	0	I2	I1

- The above content is converted to hexadecimal and expressed as ASCII code.  
Example) Data value = 30h 30h 30h 31h = '0001' = Input signal I1 is On.

### (11) 8181h : Free stop command

[\$P]/[\$S] : Free stop command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	8	1	D1	D2	D3	D4	ETX	BCC
Amplifier ID		Host ID		Command		Data number					Data value					

- If Pr30 is set to "2" (command via RS485) and the Driver's power is turned on, this command can be used to send a Free Stop command to the Driver. If Pr30 is set to "1" (command via I/O) or "0" (digital keypad), the Free Stop command via this command will be ignored.
  - Both the \$P command and the \$S command function the same way.
  - If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not respond.
  - If the data value is other than '0000' or '0001', NAK will be responded.
  - After a Free Stop command, the motor cannot be driven until an operation command (Free Stop release) is issued.
- Example) Data value = 30h 30h 30h 31h = '0001' = Free Run Stop command is On.

### (12) 8190h : Alarm clear

[\$P]/[\$S] : Alarm clear command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	9	0	0	0	0	1	ETX	BCC
Amplifier ID		Host ID		Command		Data number					Data value					

- If you execute this command with the data value set to '0001' while an alarm is active, the alarm clear will be executed.
- If the data value is other than '0000' or '0001', NAK will be responded.
- Both the \$P command and the \$S command function the same way.
- This command may not clear some alarms, depending on the cause
- After executing the alarm clear command, confirm the alarm status using the status read or alarm history read command.
- If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not be responded.

### (13) 8191h : E-Stop

[\$P]/[\$S] : E-Stop command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	9	1	0	0	0	1	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- If you execute this command with the data value set to '0001', the Driver will enter an alarm (E-Stop) state.
- If the data value is other than '0000' or '0001', NAK will be responded.
- Both the \$P command and the \$S command function the same way.
- If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not be responded.

### (14) 8192h : Alarm History Clear

[\$P]/[\$S] : Alarm History Clear command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	9	2	0	0	0	1	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- If you execute this command with the data value set to '0001', the alarm history will be cleared.
- If the data value is other than '0000' or '0001', NAK will be responded.
- Both the \$P command and the \$S command function the same way.
- If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not be responded.

### (15) 81B0h : Parameter EEPROM Write

[\$P]/[\$S] : Parameter EEPROM Write command

[HOST] -> [Driver] (Request)

SOH				STX	\$	P	8	1	B	0	0	0	0	1	ETX	BCC
Amplifier ID				Host ID		Command		Data number				Data value				

- If you execute this command with the data value set to '0001', the parameter will be recorded to the EEPROM.  
Since the EEPROM Write process is underway, the response may take some time.  
Use this command if you want the parameter changes made with the \$P command to remain in effect after resetting the power.
- If NAK is responded or the Driver detects an undervoltage error, the EEPROM writing process will not be executed.
- If the data value is other than '0000' or '0001', NAK will be responded.
- Both the \$P command and the \$S command function the same way.
- If the Driver ID is 80h (128), all connected Drivers will execute the command. But the Driver will not be responded.
- Writing to the EEPROM should be minimized.  
(EEPROM durability: approximately 100,000 cycles.)

*21C, for world geared motor!*

# USER MANYAL

 **SPG Co., Ltd.**

※For further development of the product, specification and design can be changed without notice. For other information, please contact customer service depot of the head office or sales department.

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