Robo Cylinder/E-Con

Communication protocol

Command List only

Preliminary Revised Version

Jun 24 ’04

1.Outline

The RC communicates by the RS485 interface, and the communication condition is as follows.

Item	Description
Electrical Specifications	EIA RS485

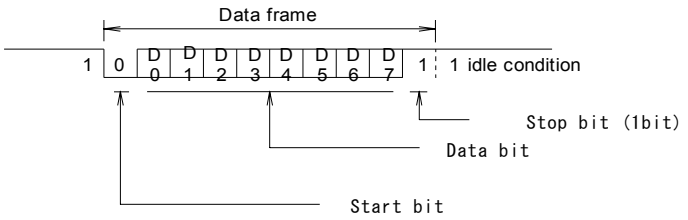
Synchronization Method	Asynchronous
Connection Method	Differential Line
Connector	6 pole modular
Strings Fromat	ASCII
Baud Rate	38.4kbps (Standard). 9.6kbps, 19.2kbps (Can be set as a factory default)
Data length	Eight bits
Stop bit	One bit
Parity check	None
Communication Method	Half-Duplex

2.Transmission control procedure

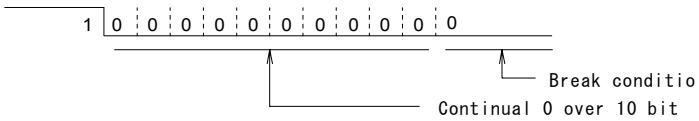
Frame format

The state of the signal on the line is assumed to be either the data frame, idle state or break state shown as follows:

(1) Data frame and idle condition



(2) Break condition



Packet transmission timing

The basic transmission control procedure is assumed to be the command packet transmitted from the HOST to a slave and the response from that slave back to the HOST. The timing between sending and receiving for the HOST and the communication to the slave station depends as follows:

(1) Minimum delay time from the slave receive to transmit = αmsec

α is the minimum delay time (RTIM) parameter related to the SIO communication (described later). After the slave receives the string, it will wait at least this long before sending the response. Please ensure the HOST can receive from the slave within this time.

(2) Minimum delay time from the HOST receive to transmit = 1 msec

After transmitting the response, the slave will be ready to receive within 1msec. Therefore, the HOST must wait at least this long between receiving a response and sending a command.

3.Packet outline

3.1 Command/Response format

The command packet and the response packet are assumed to be a fixed format of 16 characters shown as follows:

(1) Command Packet Format

Header 1char. STX (02H)	Axis No. 1char.	Command Info. 11char.	BCC 2char.	Delimiter 1char. ETX (03H)

(2) Response Packet Format

Header 1char. STX (02H)	Response ID 1char. 'U' (55H)	Axis No. 1char.	Response Info. 10char.	BCC 2char.	Delimiter 1char. ETX (03H)

Header: STX(02H)
Axis No: Hexadecimal number '0-F' representing the axis number.
Command Info: Alphanumeric characters containing command packet information of 11 characters
Response ID: Response identifier hexadecimal (55H)
Response Info: Alphanumeric characters containing response packet information of 10 characters
Delimiter: ETX(03H)
BCC: Two characters '00-FF' showing hexadecimal number digits for block check characters. It is calculated by using the 12 data characters (excluding STX, ETX and BCC). It's calculated by taking last 2 characters of the one's complement of the sum of the ASCII codes of those 12 characters.

Example of calculating BCC

[STX]1a1234567800[BCC][ETX]

First, add all ASCII codes for the 12 data characters:

sum = 31H+61H+31H+32H+33H+34H+35H+36H+37H+38H+30H+30H = 296H

Second, take the last 2 characters of the 1's complement:

[BCC] = "6A"

Only the slave addressed in the string can send a response for each command transmitted by the HOST. Therefore, the axis number in the command packet and the axis number in the response packet are always the same. This is similar for the broadcast command (all slave stations in the line receive it at the same time).

3.2 Command List

Command	Function	Supported			
		RCP	RCS	E-Con	RCP2 /ERC
n	Status read	○	○	○	○
a	Absolute position move (PTP)	○	○	○	○
d	Cancel remaining movement	○	○	○	○
i	Position band change	○	○	○	○
m	Incremental position move (PTP)	○	○	○	○
o	Home	○	○	○	○
q	Servo ON/OFF	○	○	○	○

r	Alarm reset	○	○	○	○
v	Set speed and acceleration	○	○	○	○
c	Absolute position move PTP (mm unit)		○	○	○
e	Incremental position move PTP (mm unit)		○	○	○
f	Set speed and acceleration (mm unit)		○	○	○
k	Decelerate and stop		○	○	○
Q１	Non-volatile memory→edit area forwarding	○	○	○	○
Q３	Position No. PTP move	○	○	○	○
R４	Memory read	○	○	○	○
T４	Write addressing	○	○	○	○
W４	Memory write	○	○	○	○
V５	Edit area→non-volatile memory forwarding	○	○	○	○
RM	Memory read (mm unit)		○	○	○
WM	Memory write (mm unit)		○	○	○

3.3 Command/Response information structure

1)'n' Command (Status Read)

Command	STX	Aixs#	'n'	Ten continuous '0'									BCC	ETX
	02		6E	30	30	30	30	30	30	30	30	30	30		03
Res	STX	'U'	Aixs#	'n'	Status		Alarm		IN		OUT		PE	BCC	ETX
	02	55		6E											03

Function

This command read out the status of the controller

Command Data

There is no command data, ten '0' s.

Response data

1) "Status"(hexadecimal ASCII value)

Internal operation of CPU is shown by the following bit patterns.

Bit	Content
Bit 0	Power supply status (1 = ON) This bit is always one when the unit is powered.
Bit 1	Servo status (1 = ON, 0 = OFF) The servo is turned ON and OFF by the servo ON command
Bit 2	RUN status (1 = RUN state, 0 = not in RUN state) When driver CPU is not in alarm, and the servo is ON, this bit becomes one. The driver CPU does not accept a movement instruction when this bit is 0.
Bit 3	HOME status (1 = HOME complete, 0 = HOME not yet complete) This bit shows whether or not the axis has completed homing (same as the ZFIN OUT bit). Absolute/Incremental move instructions are rejected when this bit is 0. Other PTP moves Home first and then move to the specified position.
Bit 4	Not in use
Bit 5	Not in use
Bit 6	Not in use
Bit 7	Command rejection (1 = rejected, 0 = accepted) When this bit is one, the sent command was rejected by the CPU. When the rejection response is received, the alarm content shows the reason for rejection

2) “Alarm” (Hexadecimal, ASCII)

Showing alarm, waring condition with 2 charactors(1 byte) in hexadecimal format. Refrer the table below.

Alarm	Description	Level
00	No Alarm (Normal)	Normal
5A	Receive Buffer Overflow	Warning
5B	Receive Buffer Framing Error	
5D	Header Abnormal Character	
5E	Delimiter Abnormal Character	
7F	BCC Error	
61	Received Bad Character	
62～64	Incorrect Operand	
70	Tried to move while run status was off	
74	Tried to move during motor communication	
75	Tried to move while homing	
B1	Position data error	Alarm
B8～B9	Motor communication error	
BB～BE	Bad encoder feedback while homing	
C0～C1	Excess speed / servo error	
C8	Excess current	
D0～D1	Excess main power voltage / over-regeneration	
D8	Deviation error	
E0	Overload	
E8～EC	Encoder disconnect	
ED～EE	Encoder error	
F8	Corrupt memory	

3)”IN” “OUT” “PE” (Hexadecimal, ASCII)

The IN and OUT portion of the response are both 2 characters(1 byte) in hexadecimal format. The PIO input and out put status are shown in the following table.

※IOPN is the parameter which can set only for RCP2/ERC

	Model	RCP	RCS	E-Con	RCP2	RCP2	RCP2	RCP2	RCP2	ERC
※	IOPN	-	-	-	0	1	2	3	4	0

IN	Bit 7	*STP	*STP	*STP	*STP	RES	RES	RES	RES/JOG-	*STP
	Bit 6	-	SON	SON	-	SON	*STP	SON	SON	-
	Bit 5	-	RES	RES	-	HOME	HOME	HOME	HOME	-
	Bit 4	CSTR	CSTR	CSTR	CSTR	CSTR	CSTR	CSTR	CSTR/PWRT	CSTR
	Bit 3	PC8	PC8	PC8	PC8	PC8	PC8	PC8	PC8	HOME
	Bit 2	PC4	PC4	PC4	PC4	PC4	PC4	PC4	PC4	PC4
	Bit 1	PC2	PC2	PC2	PC2	PC2	PC2	PC2	PC2	PC2
	Bit 0	PC1	PC1	PC1	PC1	PC1	PC1	PC1	PC1	PC1

OUT	Bit 7	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM
	Bit 6	ZONE	ZONE	ZONE	ZONE	SRDY	MOVE	SRDY	SRDY	SRDY
	Bit 5	HEND	HEND	HEND	HEND	HEND	HEND	HEND	HEND	HEND
	Bit 4	PEND	PEND	PEND	PEND	PEND	PEND	PEND	PEND/WEND	PEND
	Bit 3	PM8	PM8	PM8	PM8	PM8	PM8	PM8	PM8	-
	Bit 2	PM4	PM4	PM4	PM4	PM4	PM4	PM4	PM4	-
	Bit 1	PM2	PM2	PM2	PM2	PM2	PM2	PM2	PM2	-
	Bit 0	PM1	PM1	PM1	PM1	PM1	PM1	PM1	PM1	-

PE	Bit 3	-	-	PM32	-	MOVE	PM32	ZONE2	MOVE	-
	Bit 2	-	-	PM16	-	ZONE	PM16	ZONE1	MODES	-
	Bit 1	-	-	PC32	-	*STP	PC32	*STP	*STP/JOG+	-
	Bit 0	-	-	PC16	-	-	PC16	-	MODE	-

※Refer each controller's operation manual for the each symbol's meaning.

(2) ‘a’ command (absolute PTP position move command)

Command	STX	Axis#	‘a'	Position								‘0'		BCC		ETX
	02		61									30	30			03
Response	STX	‘U'	Axis#	‘a'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		61												03

Function

This command makes a PTP move to the position specified.

This command rewrites the content of the positional coordinate target position (PCMD) of the position data in the execution data area. Other parameters (i.e. velocity, acceleration) use what’s currently in the execution data area.

Command data

“Position” (hexadecimal ASCII value)

The absolute position value (encoder pulses) is specified. Please refer the appendix B “Unit conversion table” for converting mm → pulses.

When the user parameter No. 5 “ Homing direction” is “1”, please specify the value in hexadecimal after the two's complement.

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm” , “IN”, “OUT”, “PE” contents.

Example

Axis 0 (RCP-SMI-M-400;10mm lead) moves to 100.00mm.

Command	STX	Axis#	‘a'	Position								‘0'		BCC		ETX
	02	30	61	46	46	46	46	45	30	43	30	30	30	30	46	03

・100.00×800/10=8000 pulses = 1F40H

・When the two's complement of 00001F40H is taken, FFFFE0C0H.

Position = FFFFE0C0H

(3) ‘d’ command (cancel motion)

Command	STX	Axis#	‘d'	'0' ten continuous bytes										BCC		ETX
	02		64	30	30	30	30	30	30	30	30	30	30			03
Response	STX	‘U'	Axis#	‘d'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		64												03

Function

The remaining movement is canceled.

This command changes the target position (PCMD) of the position data in the execution data area to the present position (PNOW) in the internal state monitor area. This effectively stops the motor from continuing motion.

Command data

There is no command data (10 0’s).

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm”, “IN”, “OUT”, “PE” contents.

(4) 'i' command (Change position band width)

Command	STX	Axis#	'i'	Width								'0'		BCC		ETX
	02		69									30	30			03
Response	STX	'U'	Axis#	'i'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		69												03

Function

This command changes position band's width that is specified in the command data.

Command data

"Width" (hexadecimal ASCII value)

Specifies position band's width. (encoder pulses)

The setting range is, 00000000H ~ 3FFFFFFFH

Please refer the appendix B "Unit conversion table" for converting mm → pulses.

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

Example

Change position band of Axis 0 (RCP-SMI-M-400;10mm lead) to 5mm width.

Command	STX	Axis#	'i'	Width								'0'		BCC		ETX
	02	30	69	30	30	30	30	30	31	39	30	30	30	37	44	03
Width ; 5×800/10=400 pulses = 00000190H																			

(5) 'm' command (relative PTP move)

Command	STX	Axis#	'm'	Distance								'0'		BCC		ETX
	02		6D									30	30			03
Response	STX	'U'	Axis#	'm'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		6D												03

Function

This command performs an incremental move from its present position.

This command adds the relative position data to the content of the execution area's target position (PCMD). Other parameters (i.e. velocity, acceleration) use what's currently in the execution data area.

Please be careful not to send multiple incremental even if attempting to perform a retry after a time-out.

Command data

Distance (hexadecimal ASCII value)

The relative position value is specified. (units: pulses)

Please refer the appendix B "Unit conversion table" for converting mm → pulses.

When the user parameter No. 5 " Homing direction" is "1", please specify the value in hexadecimal after the two's complement.

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

Example

Axis 0 (10mm lead) moves 10mm from present location.

Command	STX	Axis#	'm'	Distance								'0'		BCC		ETX
	02	30	6D	46	46	46	46	46	43	45	30	30	30	31	42	03
10×800/10=800=00000320H pulses When the two's complement of 00000320H is taken, FFFFFCE0H. Distance = FFFFFCE0H																

(6) o Command (Home)

Command	STX	Axis#	'o'	Org		Eight continuous '0'.								BCC		ETX
	02		6F			30	30	30	30	30	30	30	30			03
Response	STX	'U'	Axis#	'o'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		6F												03

Function

The axis performs the homing procedure.

Command data

"Org" (hexadecimal ASCII value)

Specifies the homing direction.

For RCP/RCP2/ERC series

"07": Normal rotation

“08": Reverse rotation (Folded motor type)

For RCS/E-Con series
“09”: Normal rotation
“0A”: Reverse rotation (Folded motor type)

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm”, “IN”, “OUT”, “PE” contents.

(7) q command (servo ON/OFF)

Command	STX	Axis#	'q'	ON/OFF	Nine continuous '0'.									BCC	ETX
	02		71		30	30	30	30	30	30	30	30	30		03
Response	STX	'U'	Axis#	'q'	Status		Alarm		IN		OUT		PE	BCC	ETX
	02	55		71											03

Function

Turns servo ON or OFF.

This command turns the servo ON or OFF. Servo is automatically turned ON during initial power-up.

Command data

ON/OFF (hexadecimal ASCII value)

'1' = servo ON

'0' = servo OFF

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

(8) r command (Alarm reset)

Command	STX	Axis#	'r'	Rsel		Eight continuous '0'.								BCC	ETX
	02		72	30	33	30	30	30	30	30	30	30	30		03
Response	STX	'U'	Axis#	'r'	Status		Alarm		IN		OUT		PE	BCC	ETX
	02	55		72											03

Function

This command resets the Alarm.

Command data

"Rsel"

It is fixed "03"

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

(9) 'v' command (set speed and acceleration)

Command	STX	Axis#	'v'	Vsel	Vcmd		Acmd		0	BCC	ETX	
	02		76	32					30		03	
Response	STX	'U'	Axis#	'v'	Status	Alarm	IN	OUT	PE	BCC	ETX	
	02	55		76							03	

Function

The speed and the acceleration are specified by this command.

This command changes the content of speed instruction value (VCMD) and acceleration instruction value (ACMD) of the position data in the execution data area.

Command data

"Vcmd" (hexadecimal ASCII value)

Specifies the speed (unit : 0.2rpm)

Please refer the appendix B "Unit conversion table" for converting mm/sec→0.2rpm to the units of speed.

Acmd (hexadecimal ASCII value)

Specifies the acceleration (unit : 0.1rpm/msec)

Please refer the appendix B "Unit conversion table" for converting G→0.1rpm/msec to the units of the acceleration.

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

Example

Axis 0 (RCP-SMI-M-400 ;10mm lead) is set to speed 100mm/sec and acceleration 0.3G.

Command	STX	Axis#	'v'	Vtyp	Vcmd				Acmd				0	BCC		ETX
	02	30	76	32	30	42	42	38	30	30	42	30	30	33	41	03

Vcmd[0.2rpm] = 100 × 60 / 10 / 0.2

= 3000 = 0BB8H

Acmd[0.1rpm/msec] = 0.3 × 60 × 9.80665 × 1000 / (10 × 1000) / 0.1

= 176.5197

= 176 (round-down)

= 00B0H

(10) ‘c’ command (absolute PTP position move command : mm unit)

*Not supported for RCP series

Command	STX	Axis#	‘c'	Position								‘0'		BCC		ETX
	02		63									30	30			03
Response	STX	‘U'	Axis#	‘c'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		63												03

Function

This command makes a PTP move to the position specified.

Command data

“Position” (hexadecimal ASCII value)

The absolute position value is specified. (Unit : 0.01mm)

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm” , “IN”, “OUT”, “PE” contents.

Example

Axis 0 moves to 10.25mm.

Command	STX	Axis#	‘c'	Position								‘0'		BCC		ETX
	02	30	63	30	30	30	30	30	34	30	31	30	30	38	38	03

Position (0.01mm) = 10.25 X 100

= 1025

= 00000401H

(11) ‘e’ command (relative PTP position move : mm unit)

*Not supported for RCP series

Command	STX	Axis#	‘e'	Distance								‘0'		BCC		ETX
	02		65									30	30			03
Response	STX	‘U'	Axis#	‘e'	Status		Alarm		IN		OUT		PE	BCC		ETX

	02	55		65								03

Function

This command performs an incremental move from its present position.

Command data

"Distance" (hexadecimal ASCII value)

The relative position value is specified. (Unit : 0.01mm)

Response data

Please refer 1) 'n' command for "Status", "Alarm" , "IN", "OUT", "PE" contents.

Example

Axis 0 moves to –5.03mm from present location.

Command	STX	Axis #	'e'	Position								'0'		BCC		ETX
	02	30	65	46	46	46	46	46	45	30	39	30	30	46	46	03

Distance (0.01mm) = - 5.03 X 100

= - 503

= FFFFFE09H

(12) ‘f’ command (set speed and acceleration : mm Unit)

*** Not supported for RCP series**

Command	STX	Axis#	‘f’	Fsel	Vcmd				Acmd				0	BCC		ETX
	02		66	32									30			03
Response	STX	‘U'	Axis#	‘f’	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		66												03

Function

The speed and the acceleration are specified by this command.

This command changes the content of speed instruction value (VCMD) and acceleration instruction value (ACMD) of the position data in the execution data area.

Command data

“Vcmd” (hexadecimal ASCII value)

Specifies speed (Unit : mm/sec)

Acmd (hexadecimal ASCII value)

Specifies Acceleration (Unit : 0.01G)

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm”, “IN”, “OUT”, “PE” contents.

Example

Axis 0 is set to speed 100mm/sec and acceleration 0.3G.

Command	STX	Axis#	‘f’	Fsel	Vcmd				Acmd				0	BCC		ETX
	02	30	66	32	30	30	36	34	30	30	31	45	30	36	38	03

Vcmd[mm/sec] = 100

= 0064H

Acmd[0.01G] = 0.3 × 100

= 30

= 001EH

(13) ‘k’ command (Decelaration and Stop)

*** Not supported for RCP Series**

Command	STX	Axis#	‘k'	'0' ten continuous bytes										BCC	ETX
	02		6B	30	30	30	30	30	30	30	30	30	30		03
Response	STX	‘U'	Axis#	‘k'	Status		Alarm		IN		OUT		PE	BCC	ETX
	02	55		6B											03

Function

Decelarates and stops the sprecified axis

Command data

There is no command data (10 0's).

Response data

Please refer 1) 'n' command for "Status", "Alarm", "IN", "OUT", "PE" contents.

(14) 'Q1' command (nonvolatile memory area → edit area forwarding)

Command	STX	Axis#	'Q1'		Bank		Pos No.		Five continuous '0'					BCC	ETX
	02		51	31	30	31			30	30	30	30	30		03
Response	STX	'U'	Axis#	'Q'	Status		Alarm		IN		OUT		PE	BCC	ETX
	02	55		51											03

Function

Performs batch forwarding to the edit area (Window area) from the nonvolatile memory area.

Command data

Bank

The value is fixed "01"

Pos No. (hexadecimal ASCII value)

Position No. of the position data in the nonvolatile memory which is forwarded is specified by "00-0F".

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm”, “IN”, “OUT”, “PE” contents.

Example

The data of position No.1 of the nonvolatile memory area for axis 0 is transmitted to the edit area (Window area).

Command	STX	Axis#	“Q1"		Bank		Pos No.		Five continuous ‘0'					BCC		ETX
	02	30	51	31	30	31	30	31	30	30	30	30	30	39	43	03

(15) ‘Q3’ command (PTP move to position No.)

Command	STX	Axis#	“Q3"		Bank		Pos No.		Five continuous ‘0'.					BCC		ETX
	02		51	33	30	31			30	30	30	30	30			03
Response	STX	‘U'	Axis#	‘Q'	Status		Alarm		IN		OUT		PE	BCC		ETX
	02	55		51												03

Function

This command moves the axis to the specified point in the point table.

* If you want execute push mode, please create position data using PC software or teaching pendant then use this command.

Command data

Bank

Data is fixed "01"

Pos No. (hexadecimal ASCII value)

Desired position number is specified by “00”-“FF”.

Response data

Please refer 1) ‘n’ command for “Status”, “Alarm”, “IN”, “OUT”, “PE” contents.

Example

Axis 0 moves to position No.1 in the point table.

Command	STX	Axis#	“Q3"		Bank		Pos No.		Five continuous ‘0'.					BCC		ETX
	02	30	51	33	30	31	30	31	30	30	30	30	30	39	41	03

(16) 'R4' command (memory read)

Command	STX	Axis #	'R4'		Address								'0'		BCC		ETX
	02		52	34									30				03
Response	STX	'U'	Axis #	'R4'		Data									BCC		ETX
	02	55		52	34												03

Function

The data from the address specified (32 bit data) is read.

Command data

Address (hexadecimal ASCII value)

The desired memory address is specified. Refer appendix "Address Table"

Response data

Data (hexadecimal ASCII value)

The data from the specified address (32 bit data) is returned.

- When the user parameter No. 5 is '1', returned position and distance are in hexadecimal after the two's complement.
- Returned data are "Position" "Distance" (Pulses), "Speed" (0.2rpm), "Acceleration" (0.1rpm/msec).

Example

Axis 1 (RCP-SMI-M-400 : lead 10mm) position is read.

Command	STX	Axis #	'R4'		Address								'0'		BCC		ETX
	02	31	52	34	30	30	30	30	37	34	30	30	30		38	45	03
Response	STX	'U'	Axis #	'R4'		Data									BCC		ETX
	02	55	31	52	34	46	46	46	46	31	46	34	30				03

- The memory address for the position is 00007400H.

Address = 00007400H

- The returned position data is FFFFE0C0H

  Take two's complement of above = 00001F40H

  Convert to decimal 00001F40H = 8000 (pulses)

  Axis 1's current position is 8000 x 10/800 = 100 mm

(17) ‘T4’ command (write addressing)

	STX	Axis#	‘T4'		Address								‘0'	BCC		ETX
Command	02		54	34									30			03

	STX	‘U'	Axis#	‘T4'		Address								BCC		ETX
Response	02	55		54	34											03

Function

This command specifies the memory address (Window area) for the data in the W4 command to be written to.

Command data

Address (hexadecimal ASCII value)

Specifies the editing memory address. Refer appendix A “Address Table”

Response data

Address (hexadecimal ASCII value)

The address specified by the T4 command is returned as is.

Example

Axis 0 writing address specifies for position data address.

	STX	Axis#	‘T4'		Address								‘0'	BCC		ETX
Command	02	30	54	34	30	30	30	30	30	34	30	30	30	39	34	03
The position data address in window area is 0000400CH.																

(18) W4 command (memory write)

Command	STX	Axis#	'W4'		Data								'0'	BCC	ETX
	02		57	34									30		03
Response	STX	'U'	Axis#	'W4'		Address								BCC	ETX
	02	55		57	34										03

Function

Data (32 bit data) is written to the address in the edit area. (Window area)

It is necessary to set the address beforehand by T4 command "Write addressing" for the writing destination. After the W4 command is executed, the memory address automatically increments. Therefore, it is not necessary to set the address by the T4 command every time.

Command data

Data (hexadecimal ASCII value)

The written data (32 bit data) is specified.

- When the user parameter No. 5 "Home direction" is "1", write hexadecimal after two's complement for position and distance data.
- Written data units are, "Position" (Pulses), "Speed" (0.2rpm), "Acceleration" (0.1rpm/msec)

Response data

Address (hexadecimal ASCII value)

The next address number (incremented) is returned.

Attention

Addresses not described in this specification are reserved and have the possibility of causing unanticipated and potentially dangerous operations when these areas are written to. Please do not write to these areas.

Example

Write position data (100mm) to Axis 0 (RCP-SMI-M-400 ; Lead 10mm)

Command	STX	Axis#	'W4'		Data								'0'	BCC		ETX
	02	30	57	34	46	46	46	46	45	30	43	30	30	31	35	03
Response	STX	'U'	Axis#	'W4'		Address								BCC		ETX
	02	55	30	57	34	30	30	30	30	30	34	30	31	36	42	03

It is necessary to specify address 0000400CH of position data by the T4 command beforehand.
Data (Pluses) = 100 x 800/10 = 8000 = 00001F40H
Two's complement of 00001F40H = FFFFE0C0H
* The address data in the response has 00000401H which is incremented from position data address 00000400H

(19) V5 command (edit area → nonvolatile memory area forwarding)

Command	STX	Axis#	'V5'		Bank		Pos No.		Five continuous '0'.					BCC		ETX
	02		56	35	30	31			30	30	30	30	30			03
Response	STX	'U'	Axis#	'V5'		Total # times written								BCC		ETX
	02	55		56	35											03

Function

Performs batch forwarding to the nonvolatile memory area the data of the edit area (Window area).

Command data

Bank

The data is fixed “01”

Pos No. (hexadecimal ASCII value)

Position No. of the position data in the nonvolatile memory which is forwarded is specified by "00-0F".

Response data

Total # times written (hexadecimal ASCII value) to the data area of the nonvolatile memory is returned. Total # times written is incremented for each V5 command execution.

Attention

<u>The maximum number of times you can write to each data area in the nonvolatile memory is 100,000 times.</u>

Please confirm the logic of the loop frequency and the end condition, etc. to ensure it is not infinite or very large. This can easily overcome the 100,000 limit if a mistake is made.

Example

The position data in the edit area (Window area) of axis 0 is transmitted to position No.1 in the nonvolatile memory.

Command	STX	Axis#	‘V5'		Bank		Pos No.		Five continuous ‘0'.					BCC		ETX
	02	30	56	35	30	31	30	31	30	30	30	30	30	39	32	03

(20) 'RM' command (memory read : Unit mm)
*** Not supported for RCP series**

Command	STX	Axis #	'RM'		Address								'0'	BCC		ETX
	02		52	4D									30			03

Response	STX	'U'	Axis #	'RM'		Data								BCC		ETX
	02	55		52	4D											03

Function

The data from the address specified (32 bit data) is read.

Command data

Address (hexadecimal ASCII value)

The desired memory address is specified. Refer appendix "Address Table"

Response data

Data (hexadecimal ASCII value)

The data from the specified address (32 bit data) is returned.

- When the user parameter No. 5 is '1', returned position and distance are in hexadecimal after the two's complement.
- Returned data are "Position" "Distance" (0.01mm), "Speed" (mm/sec), "Acceleration" (0.01G).

Example

Axis 1 (RCP-SMI-M-400 : lead 10mm) position is read.

Command	STX	Axis #	'RM'		Address								'0'	BCC		ETX
	02	31	52	4D	30	30	30	30	37	34	30	30	30	37	35	03

Response	STX	'U'	Axis #	'RM'		Data								BCC		ETX
	02	55	31	52	4D	46	46	46	46	46	30	30	30	45	44	03

- The memory address for the position is 00007400H.

  Address = 00007400H
- The returned position data is FFFFF000H

  Take two's complement of above = 00000100H

  It is 4096 in Decimal

  The current position is 4096/100 = 40.96mm

(21) WM command (memory write : Unit mm)
*** Not supported for RCP series**

Command	STX	Axis#	'WM'		Data								'0'	BCC		ETX
	02		57	4D									30			03

Response	STX	'U'	Axis#	'WM'	Address	BCC	ETX

	02	55		57	4D										03

Function

Data (32 bit data) is written to the address in the edit area. (Window area)

It is necessary to set the address beforehand by T4 command "Write addressing" for the writing destination. After the W4 command is executed, the memory address automatically increments. Therefore, it is not necessary to set the address by the T4 command every time.

Command data

Data (hexadecimal ASCII value)

The written data (32 bit data) is specified.

- When the user parameter No. 5 “Home direction” is “1”, write hexadecimal after two’s complement for position and distance data.
- Written data units are, “Position” (mm), “Speed” (mm/sec), “Acceleration” (0.01G)

Response data

Address (hexadecimal ASCII value)

The next address number (incremented) is returned.

Attention

Addresses not described in this specification are reserved and have the possibility of causing unanticipated and potentially dangerous operations when these areas are written to. Please do not write to these areas.

Example

Write position data (100mm) to Axis 0 (RCP-SMI-M-400 ; Lead 10mm)

Command	STX	Axis#	‘WM'		Data								‘0'	BCC		ETX
	02	30	57	4D	46	46	46	46	44	38	46	30	30	46	32	03
Response	STX	‘U'	Axis#	‘W4'		Address								BCC		ETX
	02	55	30	57	4D	30	30	30	30	30	34	30	31	35	32	03

It is necessary to specify address 0000400CH of position data by the T4 command beforehand.

Data (0.01mm) = 100 x 100 = 10000 = 00002710H

Two’s complement of 00002710H = FFFFD8F0H

* The address data in the response has 00000401H which is incremented from position data address 00000400H

3.4 Command rejection response

The command rejection response (bit 7 of "Status") is sent to the HOST when the slave station cannot execute a command even when the CPU receives the command from the HOST as a normal command.

When a memory command is rejected, the response contains the staus resond Func-Num and it changes into "Status" using the direct response format. Therefore, if the Func-Num of the response is between 8 and F, it should be interpretted as a command rejection response. This operand response shall be interpretted as a direct response format by judging the command refusal response. This response has the content of "Alarm" as the warning level error No. showing the reason for command rejection.

※If you receive the command rejection response, please stop the system or take any other appropriate action.

Command rejection response format

Response	STX	'U'	Aixs #	Fnc Num.	Status	Alarm	ＩＮ	ＯＵＴ	PE	ＢＣＣ	ETX
	02	55									03

Appendix **A Address Table**

(1) Edit area (Window area)

Address （ＨＥＸ）	Description
０００００４００	Position data
０００００４０４	Speed data
０００００４０５	Acceleration data
０００００４０７	Moving current limit

(2) Status monitor area

Address（ＨＥＸ）	Description
０００７４００	Current position
０００７４０１	Current speed

Appendix B Unit conversion table

1. RCP Series

(1) HOST → RCP Controller (Write)

Item	Conversion formula and Rounding method
Position, Distance	Position, Distance (Pulses)=Position, Distance(mm) X 800/Lead(mm) ※Round off decimal point.
Speed	Speed (0.2rpm)=Speed (mm/sec) X 60/Lead(mm)/0.2 ※Cut off decimal point (Round-up only if Speed(mm/sec)=1)
Acceleration	Acceleration (0.1rpm/msec)=Acceleration(G)X 60 9.80665 x 1000/(Lead mm x 1000)/0.1 ※Cut off decimal point (Round-up only if acceleration(G)=0.01)
Position Band	Position band (Pulses)=Position band(mm) x 800/Lead(mm) ※Cut off decimal point (Round-up only if position band(mm)=0.01)

(2)RCP Controller → HOST (Read)

Item	Conversion formula and Rounding method
Position, Distance	Position, Distance(mm)=Position, Distance(Pulses) X lead(mm)/800 ※Round off the third digit from decimal point.
Speed	Speed(m/sec)=Speed(0.2rpm) X 0.2 X Lead(mm)/60 ※Round off the third digit from decimal point.
Acceleration	Acceleration(G)=Acceleration(0.1rpm/msec X 0.1 X Lead(mm) ×1000／(60×9.80665×1000) ※Round off the third digit from decimal point.
Position Band	Position band(mm)=Position band(Pulses) X Lead(mm)/800 ※Round off the third digit from decimal point.

2. RCS, E-Con, RCP2, ERC series

(1)HOST → RCS/E-Con/RCP2/ERC Controller (Write)

Item	Conversion formula and Rounding method
Position, Distance	Position, Distance (Pulses)=Position, Distance(mm) X **A** /Lead(mm) ※Round off decimal point.
Speed	Speed (0.2rpm)=Speed (mm/sec) X 60/Lead(mm)/0.2 ※Cut off decimal point (Round-up only if Speed(mm/sec)=1)
Acceleration	Acceleration (0.1rpm/msec)=Acceleration(G)X 60 9.80665 x 1000/(Lead mm x 1000)/0.1 ※Cut off decimal point (Round-up only if acceleration(G)=0.01)
Position Band	Position band (Pulses)=Position band(mm) x **A** /Lead(mm) ※Cut off decimal point (Round-up only if position band(mm)=0.01)

(2)RCS/E-Con/RCP2/ERC Controller → HOST (Read)

Item	Conversion formula and Rounding method
Position, Distance	Position, Distance(mm)=Position, Distance(Pulses) X lead(mm)/ **A** ※Round off the third digit from decimal point.
Speed	Speed(m/sec)=Speed(0.2rpm) X 0.2 X Lead(mm)/60 ※Round off the third digit from decimal point.
Acceleration	Acceleration(G)=Acceleration(0.1rpm/msec X 0.1 X Lead(mm) ×1000／(60×9.80665×1000) ※Round off the third digit from decimal point.
Position Band	Position band(mm)=Position band(Pulses) X Lead(mm)/ **A** ※Round off the third digit from decimal point.

※**A** ①RA35 = 8192 ②RB75 = 3072 ③Other RCS・E-con = 16384 ④RCP2/ERC = 800