



Operation Manual

Stage Controller

Model **SC-210/SC-410**

RoHS



Thank you for purchasing this product.

Before use, be sure to read this “Operation Manual” carefully for correct operations.

Keep this Operation Manual in a convenient place so that it can be referred to at any time when in doubt.

Ver.1.05

Version of this manual is not related to that of SC controller.

Pioneering the door to the future with a commitment to technology

KOHZU Precision Co., Ltd.

Precautions in Use

Symbols Identifications

-  This symbol indicates that there are descriptions that call attention (including warnings to the user). Make sure to read the descriptions when reading this manual.
-  This symbol indicates prohibitive activities. Make sure to read the descriptions when reading this manual.
-  This symbol indicates descriptions as reference or remarks.

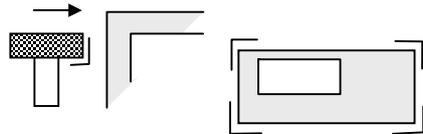
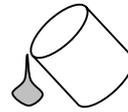
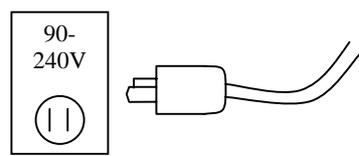
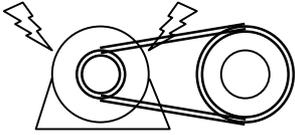
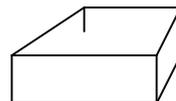
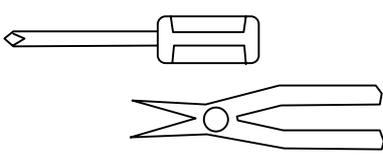
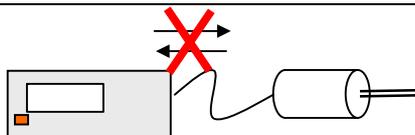
		Do not apply strong impact to the product. And avoid using in a place where vibration occurs frequently.
		Liquid or chemical splashes on this device are dangerous and cause failures. Never use this device in such places.
		Use 90-240V AC (50/60Hz) as a power supply. Confirm ratings of the power cable. The power cable (3P) for AC100V is attached usually. When you use AC200V, Please inform us when you buy it, then we will attach the power cable(flying end)for AC200V.
		This product is precision electronic equipment. It may malfunction near large sized-generating machinery or high voltage equipment, or equipment generating strong magnetism. Avoid using in such environments.
		Do not remove the fixed panel and cover needlessly except in cases where adjustment or setting of the integrated driver must be adjusted.
		Never rework or replace parts for use.
		Pay close attention when connecting the motor driven stage or a motor other than those specified by us.
		When the controller's power supply is turned ON, do not perform exclusion and adding of cables.

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1. Introduction

1-1. Features of the Product

Thank you for purchasing our stage controller SC-210/SC-410.
SC-210/SC-410 comprise extremely high cost performance products realizing a low price while featuring remarkable functions in comparison with conventional motor controllers.

Completely corresponds to our motor drive precision stage <MontBlanc Series>.
Micro step driver allowing for 250 splits at maximum is equipped as standard.
Corresponds to the trapezoid drive. Asymmetric trapezoid drives are also possible.
Realizes smooth drive by S-shape drive. Asymmetric S-shape drives are also possible.

Origin return method can be selected from 16 kinds.

Backlash correction function is equipped as standard.
Feedback control by encoder input is equipped as standard.

In conformity with EIA standards. Allows for integration with cabinet rack.
Analog type joystick with excellent operability is equipped as standard.

Corresponds to the trigger signal output function.
The trigger signal source can be selected from the motor pulse or the encoder pulse.
Trigger signal can be output in manual operation (joystick operation and absolute position movement and relative position movement).
It can specify at which movement of CW, CCW, and both direction the trigger signal is generated in manual operation.

Remote control by RS-232C communication/GP-IB communication is possible.
Stage drive application 「Customer lite」 is prepared.
Please download it from our HP.
<http://www.kohzuprecision.com/>

Corresponds to the RoHS instruction.

Outside of product range: This product does not offer the following items.

- SC series controller cannot drive motors other than a 5-phase stepping motor.
- Not compatible with motors with an electromagnetic brake.
- No program function equipped. Automatic operation should be performed on the personal computer side.
- Not compatible with remote controls (sequencer connection, etc.,) other than RS-232C and GP-IB communications.

1-2. Product Configuration

Product configuration of SC-210/SC-410 Series is as follows.



SC-210

With built-in 2-axis driver.



SC-410

With built-in 4-axis driver.

【Options】

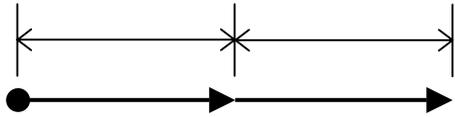
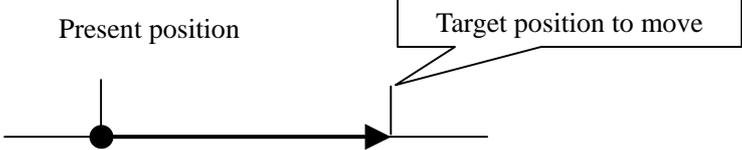
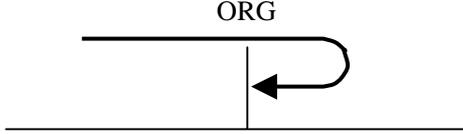
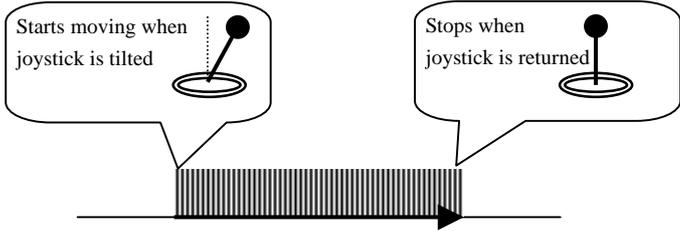


SC-200HJ

External Joy-Stick (Options)

1-3. Positioning Method (Driving Method)

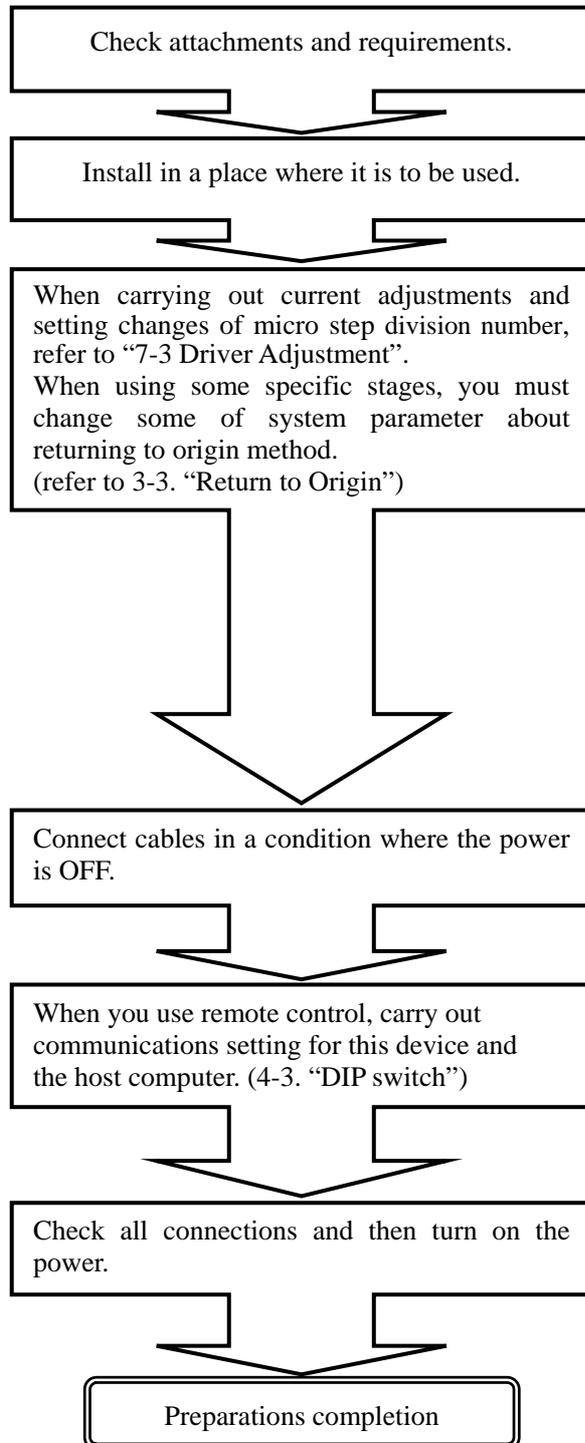
SC Series allows for positioning control by the following methods.

<p>Relative Position Movement</p>	<p>Moves toward the designated direction from the present position by a set value.</p> <p>Present position</p> <p>Movement amount Movement amount</p> 
<p>Absolute Position Movement</p>	<p>Moves to the designated position.</p> <p>Present position</p> <p>Target position to move</p> 
<p>Origin Return Movement</p>	<p>Returns to the origin point according to the specified origin return method.</p> <p>ORG</p> 
<p>Jog Movement</p>	<p>Moves continuously by joystick in manual operation.</p> <p>Starts moving when joystick is tilted</p> <p>Stops when joystick is returned</p> 

2. Installation and Preparation

2-1. Proceeding with Installation and Preparation

Install the product in the following order.



 Contact your retailer or our sales department immediately if any attachment is lost.

 Do not install in a high temperature, low temperature or high humid location, or where noise frequently occurs.

 “Driver Adjustment”
Our products are normally adjusted in accordance with customer use objectives prior to shipment. This adjustment is required if you attempt to change settings, or if this controller is shipped without stages.

 “Return to Origin”
Some models of our standard stages can’t perform returning to origin normally unless you change setting for method of returning to origin.

This adjustment is required if this controller is shipped without stages.

 Make sure to check that the power switch is OFF.

Connect Power cables, stage connections and communications cables.

 If you notice abnormalities such as an abnormal noise or smell, immediately turn off the power and investigate the cause.

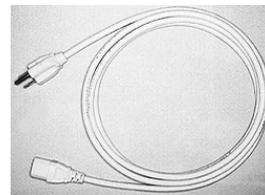
2-2. Attachments and Options

2-2-1. Attachments

The following items are attached to the products. Make sure to check that all items are included. Immediately contact us if any lost, or any attachments broken.

Power cable (3P)

power cable (3P) for AC100V is attached usually.
When you use AC200V, Please inform us, then
the power cable (flying end) for AC200V is attached.



CD-R (including Operating Manual and sample software)



Fuse to spare

SC-210's fuse to spare is built into AC inlet of the main body.
SC-410's fuse to spare is appended as an accessory.



Motor cables and communications cables such as RS-232C(Cross type)/GP-IB are not included.

Separately purchase the stage connecting cable.

Additionally, for the communications cable, commercially available cables can be used, therefore, please purchase it yourself.



In order to save paper resources, a printed Operating Manual is not included. Print the file inside the CD-R if necessary.



The file of the Operating Manual is an Acrobat (PDF) format.

In order to view the PDF format file, Adobe Reader of Adobe Systems Inc. is required. Adobe Reader is not included in this CD-R.

2-2-2. Optional Products

The following optional products are prepared to use SC-210/SC-410.

Motor Cables : This cable connects SC-210/SC-410 with a precise stage.

Connector shape (stage side)	Length	Standard Cable	Robot Cable
Rectangular connector	3m	CA2803	RCA2803
	5m	CA2805	RCA2805
	10m	CA2810	RCA2810
Round type connector	3m	CB2803	RCB2803
	5m	CB2805	RCB2805
	10m	CB2810	RCB2810

Trigger Cables : This cable connects SC-210/SC-410 with equipment that receives trigger signal.

Connector shape (receive side)	Length	Model	Remarks
BNC connector	3m	SCTGBN-030	
DF11-8DS-2C made by HIROSE ELECTRIC Co.,Ltd.	3m	SCTGT-030	For TURTLE CO.,Ltds AD conversion unit TUSB-0216ADMZ (options)
Flying end	3m	SCTGNR-030	For open collector specification

The connector on the SC-210/SC-410 side of the trigger cable is HR30-6P-3S(71) made by HIROSE ELECTRIC Co.,Ltd..

External Joy-Stick : You can perform joystick operation from a place away from SC-210/SC-410 with it.

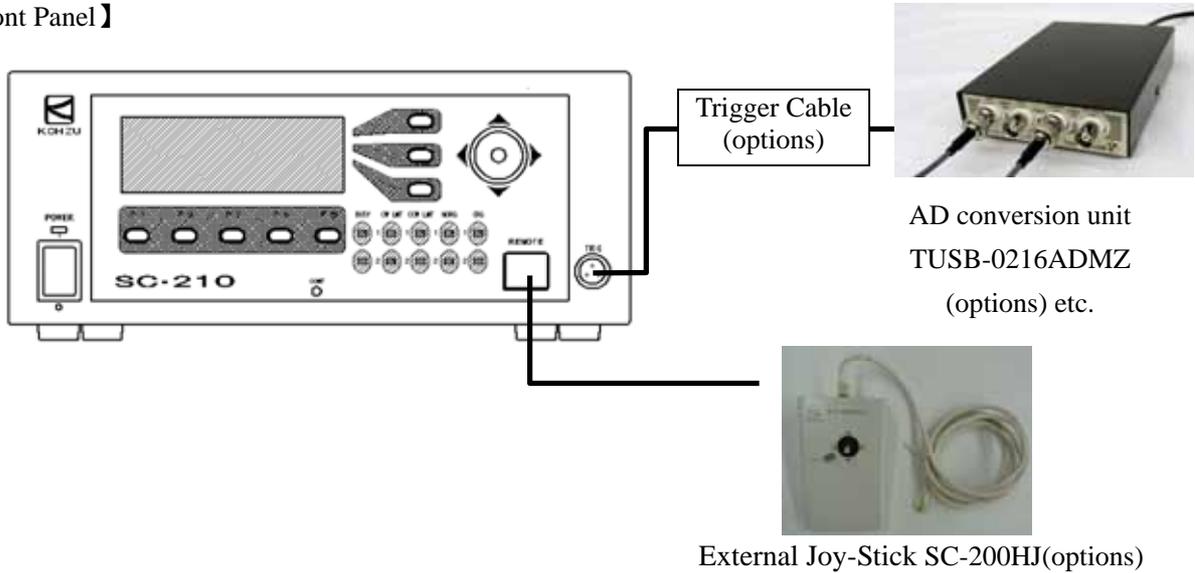
Model	Remarks
SC-200HJ	Connects with REMOTE connector of SC-210/SC-410.

2-3. How to Connect Cables

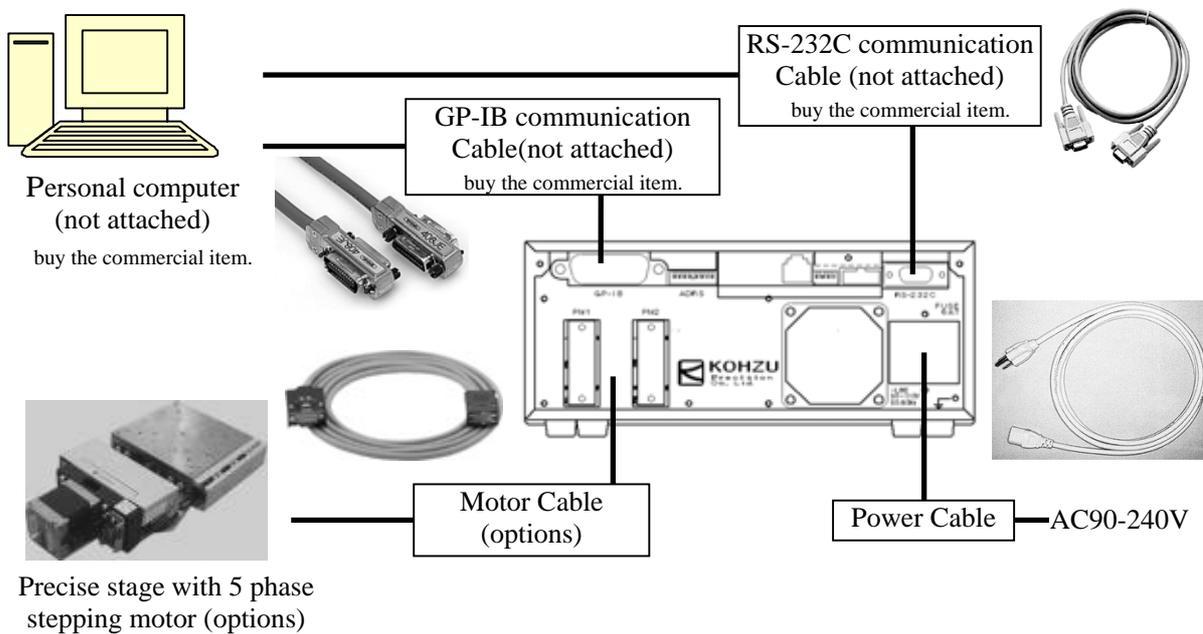
It explains connection/connecting wires of SC-210/SC-410 and an external equipment.

 When pulling out or plugging in all cables such as the power cable, motor cables and communications cable, carry out connections in a state where the power is turned OFF.

【Front Panel】



【Rear Panel】



MEMO

3. Functions

3-1. Speed Setting

3-1-1. Speed Table

With SC Series controller, you can set speed by a 1pps unit in a range from 1 to 4,095,500pps. However, there are typically many cases where fine speed setting is not required, so we adopt a method for selecting a setting from the **ten stages of the Speed Table** in order to easily perform speed setting.

(Setting for 1pps unit can be performed. Refer to **Table No.0** below.)
 Speed can be designated for each axis.

Speed Table values of the below table are initial values.

Speed Table No.	Start speed	Top speed	Accelerating time(×10ms)	Decelerating time(×10ms)
0	500	5000	24	24
1	500	2000	20	20
2	500	3000	24	24
3	500	4000	28	28
4	500	5000	32	32
5	500	6000	36	36
6	500	7000	40	40
7	500	8000	44	44
8	500	9000	48	48
9	500	10000	52	52
10	10	8000	50	15
11	1	200	1	1

Speed Selection

Joystick High Speed (PHi)

Joystick Low Speed (PLo)

Speed Table No.0

Select Speed table No.0 to do a detailed setting at the speed and the acceleration and deceleration time.

You can change and refer to the set values of speed table No.0 by the ASI/MSI/RMS command in remote control.

You can change and refer to them also by operating the system construction (SYS mode) in manual operation.

Speed Table No.1-9

You can change and refer to the setting values of speed table No.1-9 by the **WTB/RTB** command in remote control.

You can change and refer to them also by operating the system construction (SYS mode) in manual operation.

In manual control, you can change the speed table No.1-9 when the coefficient is set with SYS No.35.

Speed Table No.10,11

With speed table No.10 and No.11, speed setting in jog movement by the joystick can be performed. No.10 is for a setting at a high speed (screen display: PHi) and No.11 is for a setting at a low speed (screen display: PLo).

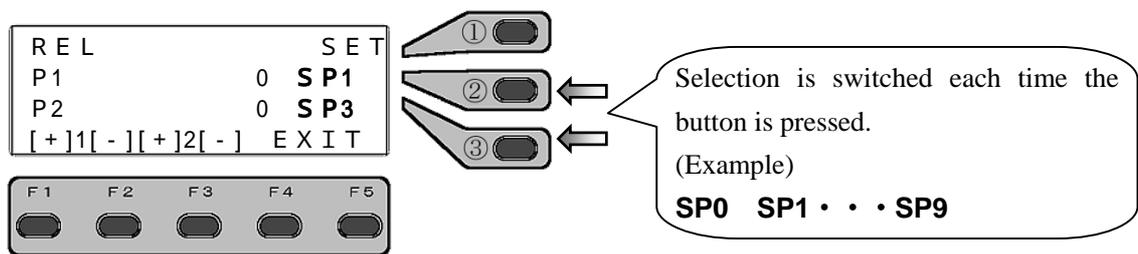
You can change and refer to a set value of speed table No.10-11 by the **WTB/RTB** command when remotely control.

You can change and refer to it also by operating the system construction (SYS mode) when the manual control.

In manual operation, the speed is automatically changed when the coefficient is set with SYS No.35.

3-1-2. Speed Change in Manual Operation

In manual operation, select the table on the panel screen before driving.



The speed table may not be selected depending on the screen.



On the absolute position moving operation screen, move the cursor to the right end (position on the "SP*" character) and press the button to switch the speed table (it cannot be switched when the cursor is on the coordinate value position).

3-1-3. Speed Change in Remote Control

In remote control, designate speed table No. in each driving command.

Command Example

```

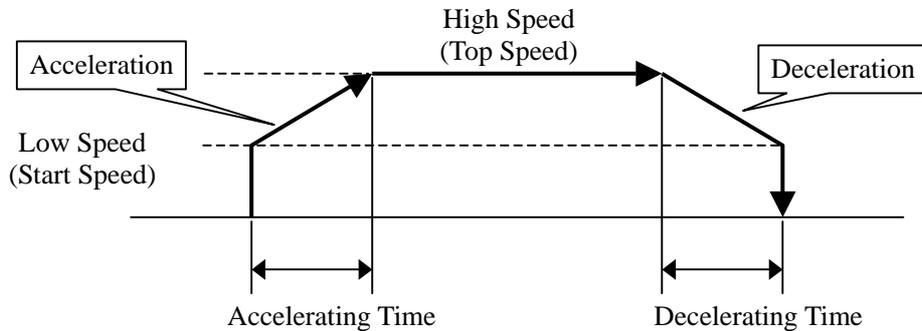
stxRPS1/2/0/3/1000/0/0/0 CRLF
    
```

(Example of relative movement command)

Set the speed table No.3.

3-2. Trapezoidal Drive and S-Shaped Drive

When moving an object, it cannot be suddenly moved at a high speed because of inertial force. In general, a stepping motor can also start from a low speed, gradually accelerate and reach a high speed.

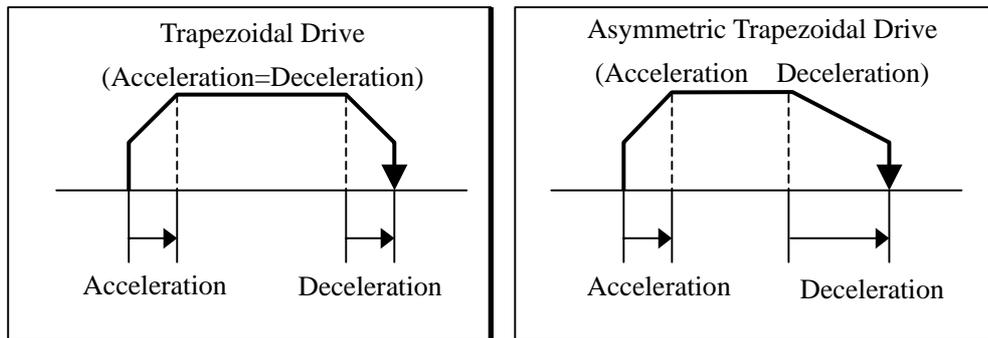


SC Series internally calculate the ratio of acceleration and deceleration and automatically perform a sequence of accelerating and decelerating movements by setting **low speed (start speed)**, **high speed (accelerating time or accelerating STEP)** and **(decelerating time or decelerating STEP)** (in asymmetric drive).

Trapezoidal Drive and Asymmetric Trapezoidal Drive

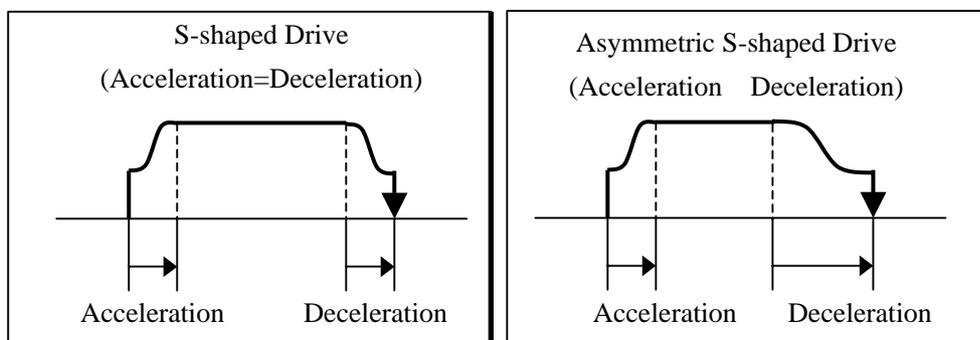
A method to increase and decrease acceleration and deceleration at a constant acceleration and deceleration ratio is called a trapezoidal drive.

With SC Series, asymmetric trapezoidal drive to accelerate and decelerate at different settings is available.



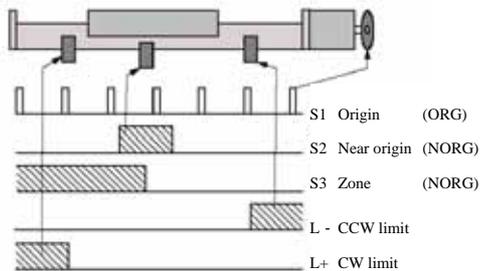
S-Shaped Drive And Asymmetric S-Shaped Drive

S-shaped drive is a method to realize smooth movement by accelerating and decelerating with a quadric curve.



3-3.Origin Return Method

Origin return method can be selected in SC-210/SC-410 according to the combination of sensors of the positioning device used.



Sensor Configuration

Method	Sensor Configuration	Description
1	S1,S3	Returning direction is determined with zone sensor NORG(S3) and detects origin ORG(S1).
2	S3	Returning direction is determined with zone sensor NORG(S3) and set the edge of the zone sensor NORG(S3) the origin position.
3	S1,S2,L-	ORG(S1) located in NORG (S2) is origin position.
4	S2,L-	NORG (S2) sensor located in moving zone is set to be the origin position.
5	S1,L+	Origin sensor ORG(S1) in proximity of CW limit(L+) is set to be the origin position.
6	S1,L-	Origin sensor in proximity of CCW limit(L-) is set to be the origin position.
7	L+	Edge of CW limit(L+) is set to be the origin position.
8	L-	Edge of CCW limit(L-) is set to be the origin position.
9	S1	ORG (S1) sensor located in moving zone is set to be the origin position.
10	Non	Present position is set to be the origin position. (stage doesn't move.)
11	S1,L+	After the origin position is detected by method 5, and moved by the set amount, this position is set to be the origin.
12	S1,L-	After the origin position is detected by method 6, and moved by the set amount, this position is set to be the origin.
13	L+	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
14	L-	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
15		Optional function
16	S1,S2,L-	ORG (S1) located in NORG (S2) is origin position.(Low speed)
17	S2,L-	NORG (S2) sensor located in moving zone is set to be the origin position.(Low speed)

Default value is method 3.



Most of our standard stages with S1 and S2 sensors adapt in default setting(method 3) but some stages without S1 sensor require to set method 4.



Amounts of the movement from the machine origin in the methods 11 to 14 are set with SYS No. 5.



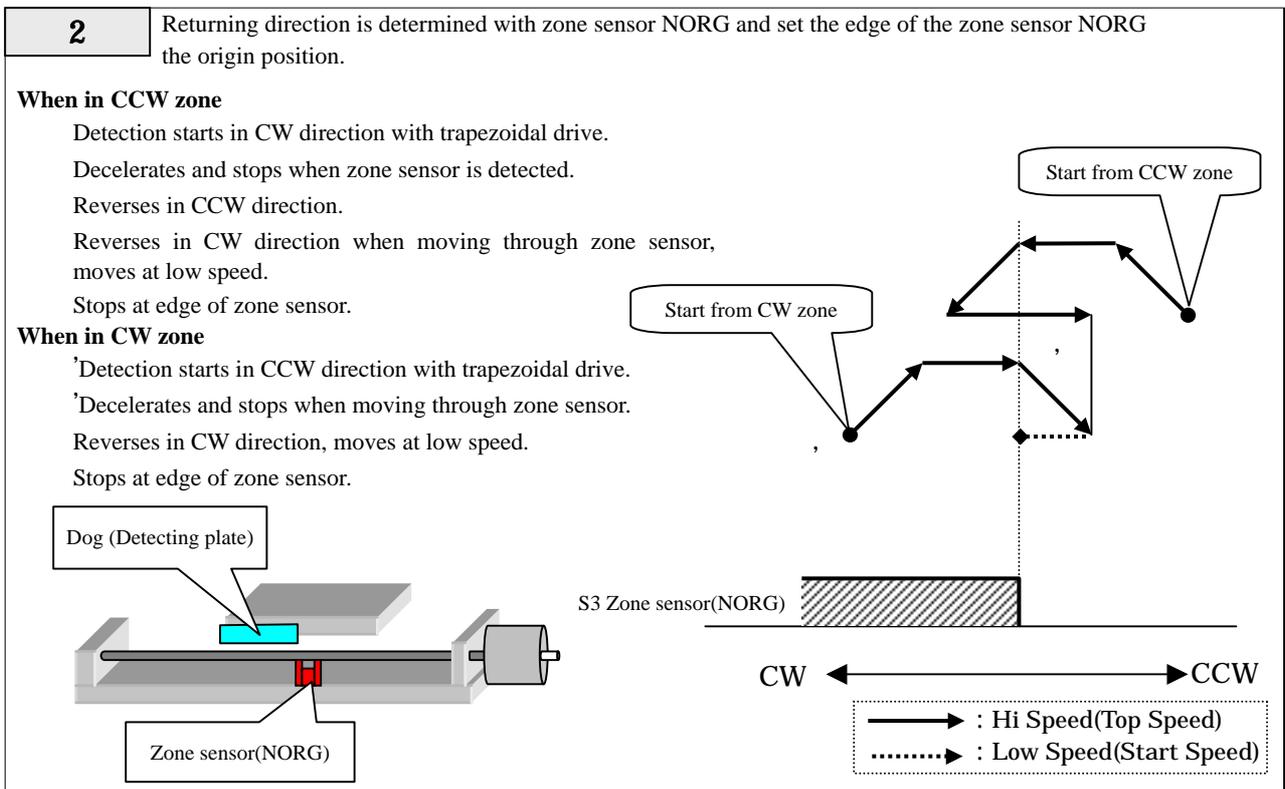
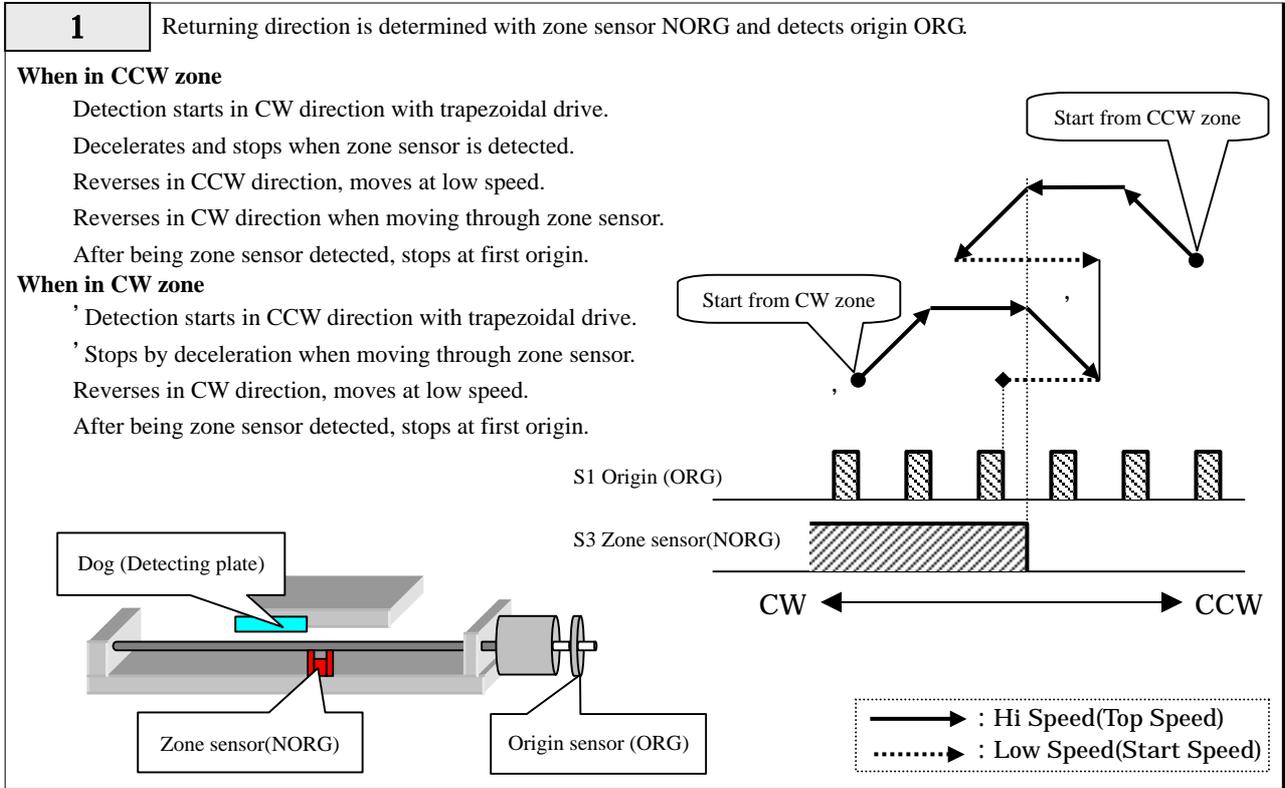
Stage moves to the neighborhood of the designated sensor at top speed of the speed table, thereafter moves to the origin at start speed(initial setting : 500pps) of the speed table and stops.

3-3-1. Details of Method

Details for each method are described below.

The accelerating and decelerating mode when starting to return to origin depends on system construction.

It explains by using a trapezoid drive method in the following for easiness.



3

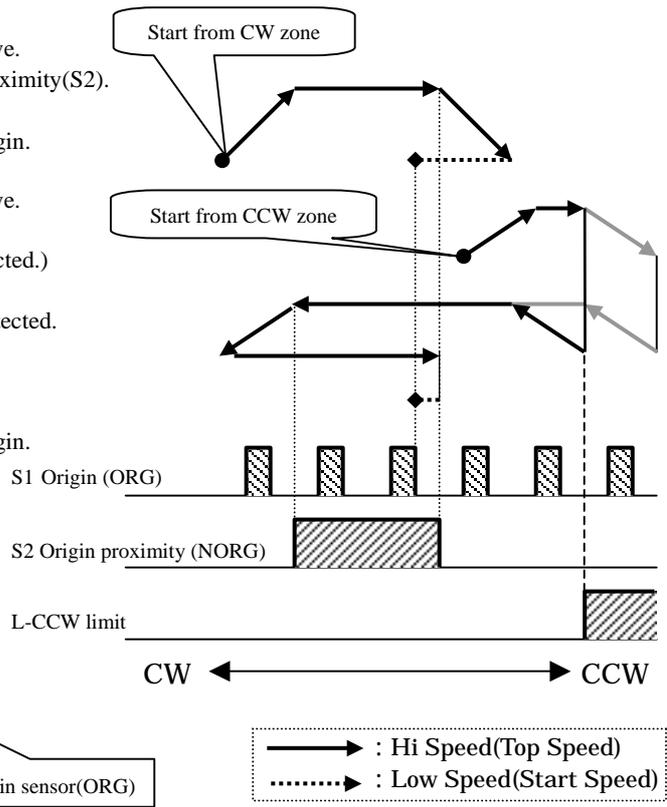
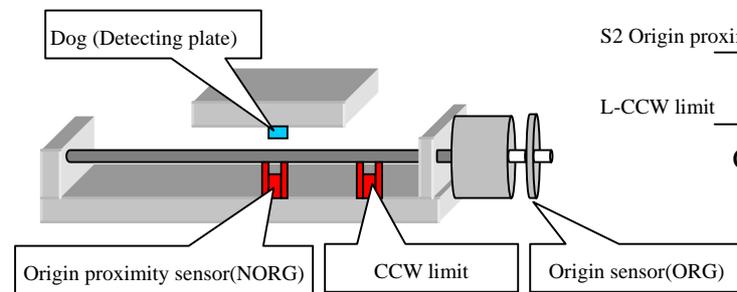
Origin (ORG) located in origin proximity (NORG) is origin position. (Our standard method)

When in CW zone

Detection starts in CCW direction with trapezoidal drive.
 Decelerates and stops when moving through origin proximity(S2).
 Reverses in CW direction, moves at low speed.
 After being origin proximity detected, stops at first origin.

When in CCW zone

Detection starts in CCW direction with trapezoidal drive.
 Stops when CCW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CW direction with trapezoidal drive.
 Decelerates and stops when origin proximity(S2) is detected.
 Reverses in CCW direction.
 Reverses in CW direction when moving through origin proximity(S2), moves at low speed.
 After being origin proximity detected, stops at first origin.



4

NORG sensor located in moving zone is set to be the origin position.



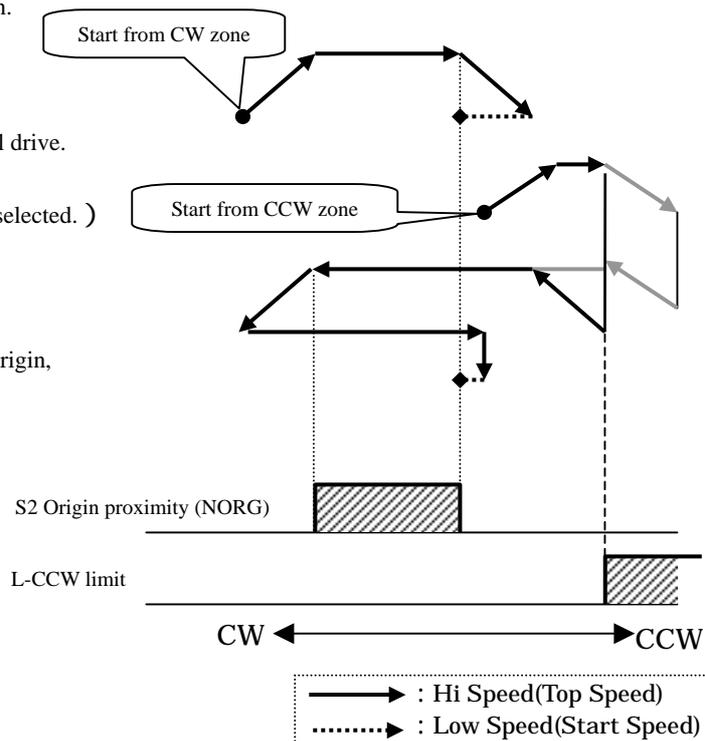
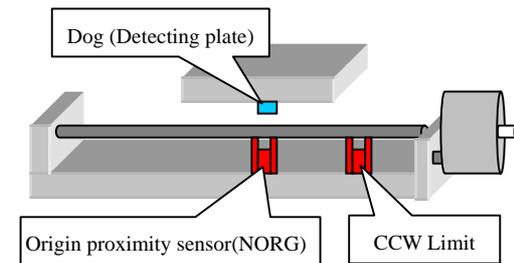
The stage without origin sensor in motor shaft requires this setting.

When in CW zone

Detection starts in CCW direction with trapezoidal drive.
 Decelerates and stops when moving through origin.
 Reverses in CW direction, moves at low speed.
 Stops when origin is detected.

When in CCW zone

Detection starts in CCW direction with trapezoidal drive.
 Stops when CCW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CW direction with trapezoidal drive.
 Decelerates and stops when origin is detected.
 Reverses in CCW direction.
 Reverses in CW direction when moving through origin,
 moves at low speed.
 Stops when origin is detected.



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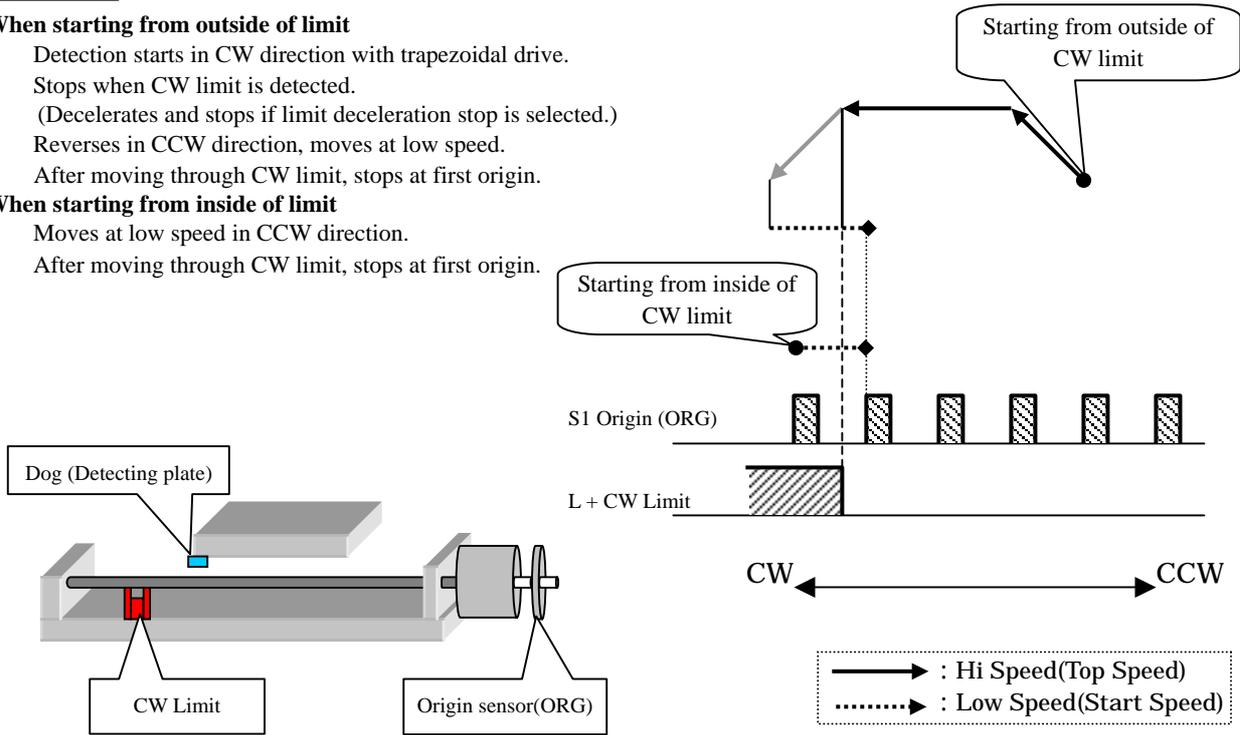
Origin sensor ORG in proximity of CW limit is set to be the origin position.

When starting from outside of limit

Detection starts in CW direction with trapezoidal drive.
 Stops when CW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CCW direction, moves at low speed.
 After moving through CW limit, stops at first origin.

When starting from inside of limit

Moves at low speed in CCW direction.
 After moving through CW limit, stops at first origin.



6

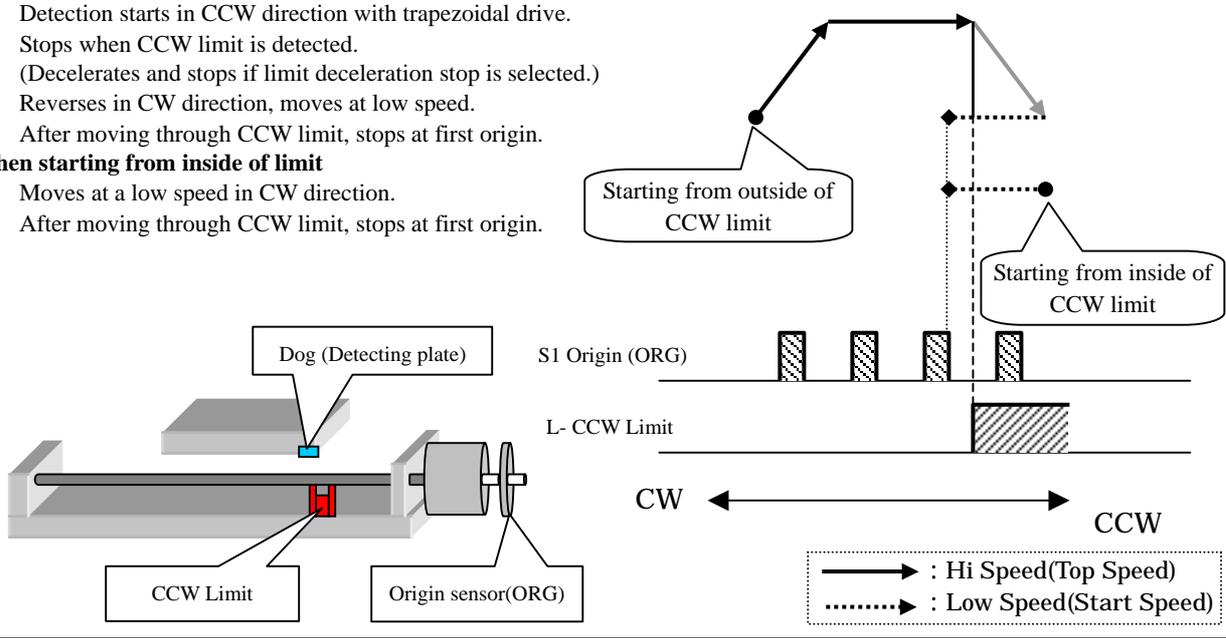
Origin sensor in proximity of CCW limit is set to be the origin position.

When starting from outside of limit

Detection starts in CCW direction with trapezoidal drive.
 Stops when CCW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CW direction, moves at low speed.
 After moving through CCW limit, stops at first origin.

When starting from inside of limit

Moves at a low speed in CW direction.
 After moving through CCW limit, stops at first origin.



7

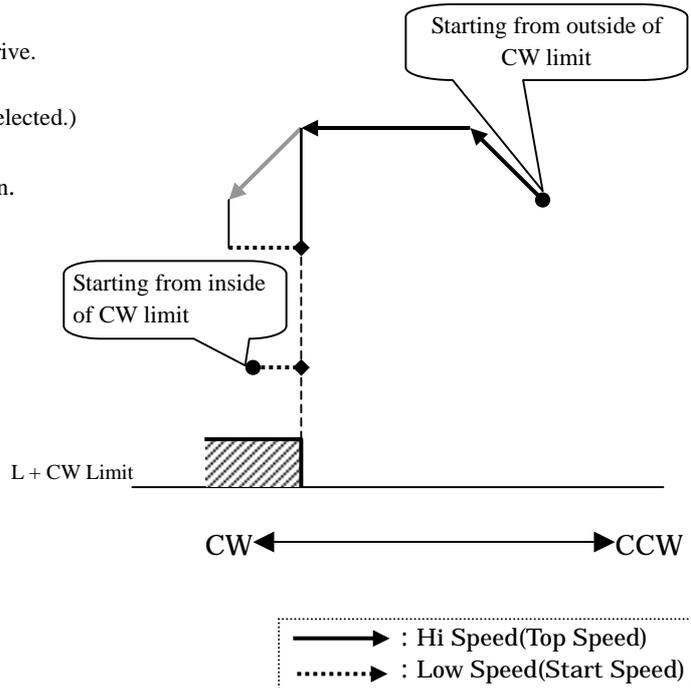
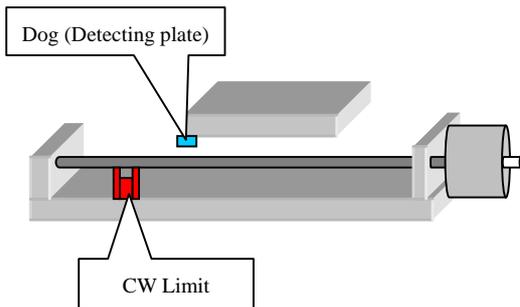
Edge of CW limit is set to be the origin position.

When starting from outside of limit

Detection starts in CW direction with trapezoidal drive.
 Stops when CW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CCW direction, moves at low speed.
 A position where moving through CW limit is origin.

When starting from inside of limit

Moves at low speed in CCW direction.
 Stops at a position when moving through CW limit.



8

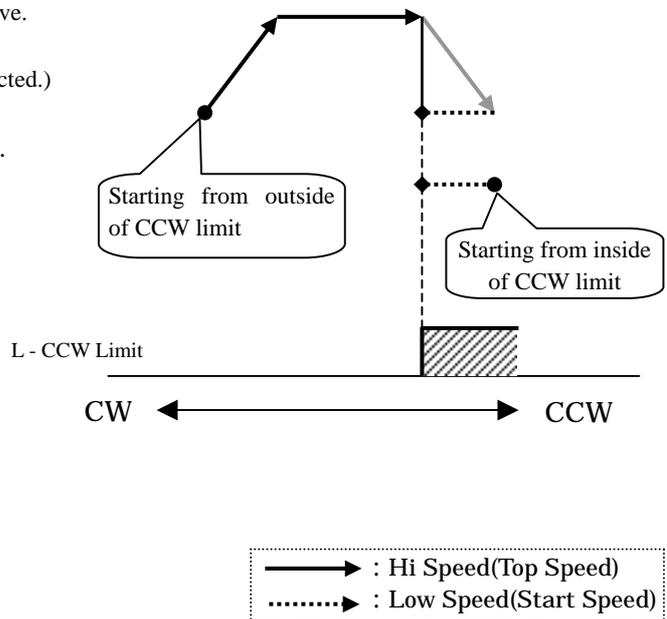
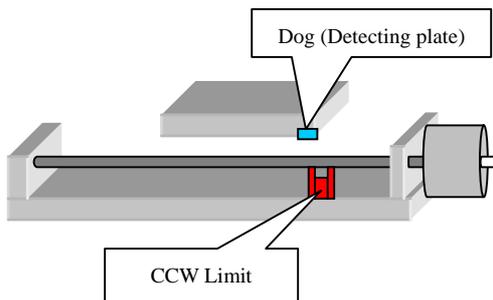
Edge of CCW limit is origin position.

When starting from outside of limit

Detection starts in CCW direction with trapezoidal drive.
 Stops when CCW limit is detected.
 (Decelerates and stops if limit deceleration stop is selected.)
 Reverses in CW direction, moves at low speed.
 A position where moving through CCW limit is origin.

When starting from inside of limit

Moves at low speed in CW direction.
 Stops at a position where moving through limit.

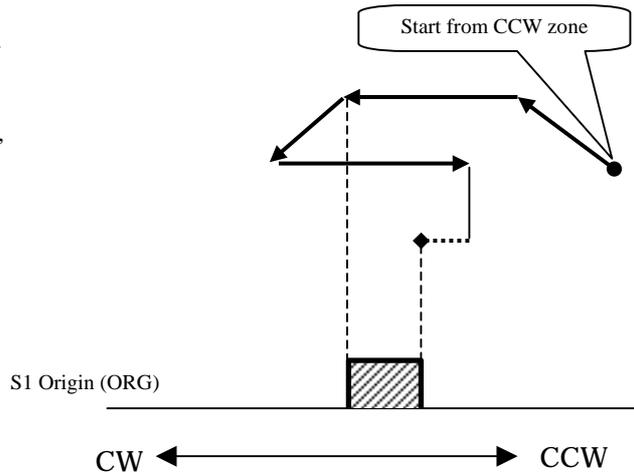
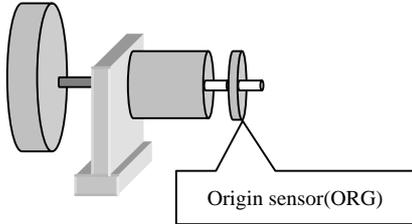


9

ORG sensor located in moving zone is set to be the origin position.

When starting from outside of ORG sensor

Detection starts in CW direction with trapezoidal drive.
 Decelerates and stops when moving through origin.
 Reverses in CCW direction.
 Reverses in CW direction when moving through origin,
 moves at low speed.
 Stops when origin sensor detects.



Stops if limit sensor is detected during returning to origin.

— : Hi Speed(Top Speed)
 - - - : Low Speed(Start Speed)

10

Present position is origin position.(stage doesn't move.)

In this mode, the present position is set to be the origin position without driving and it is considered that detection of returning to origin is completed.

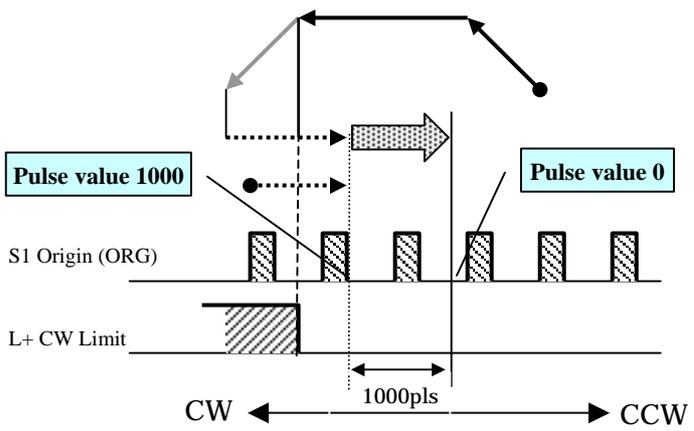
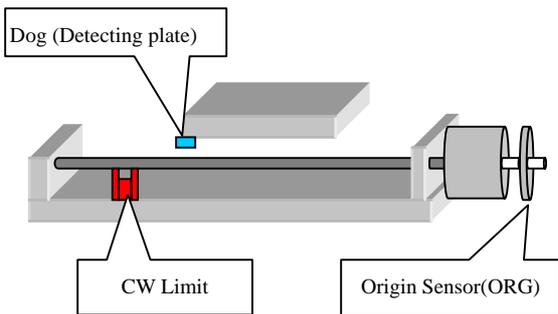


Present coordinate value can also be set by setting system parameter No.5 (ORG PRESET DATA).

11

After returning to the origin by method 5, the position is considered as the position set (SYS No.5) and moves to the position of pulse value "0", this position is set to the origin.

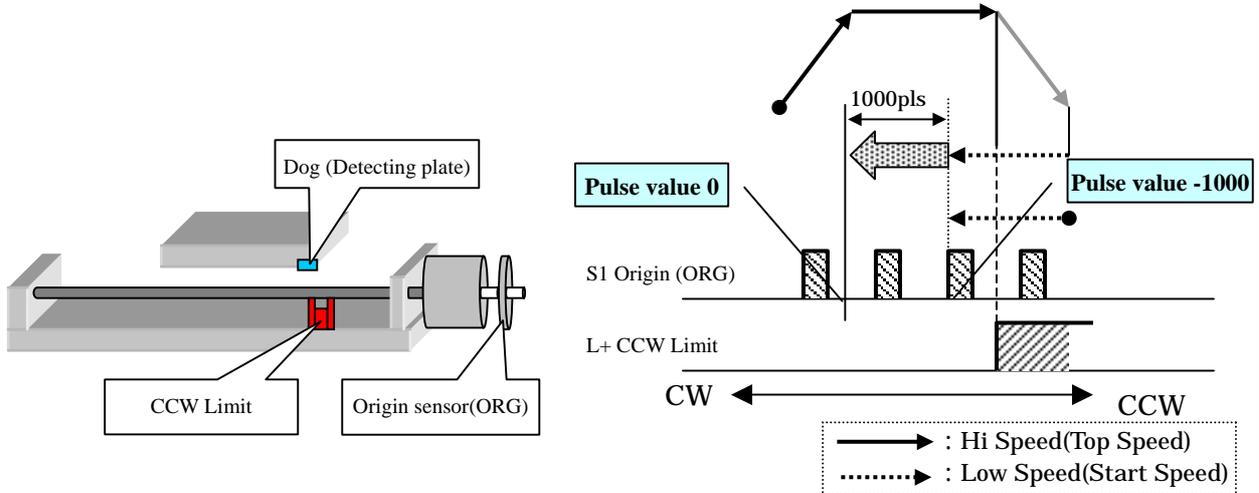
In the case of an arrangement as shown in the diagram below, set the parameter No.5 to 1000.



— : Hi Speed(Top Speed)
 - - - : Low Speed(Start Speed)

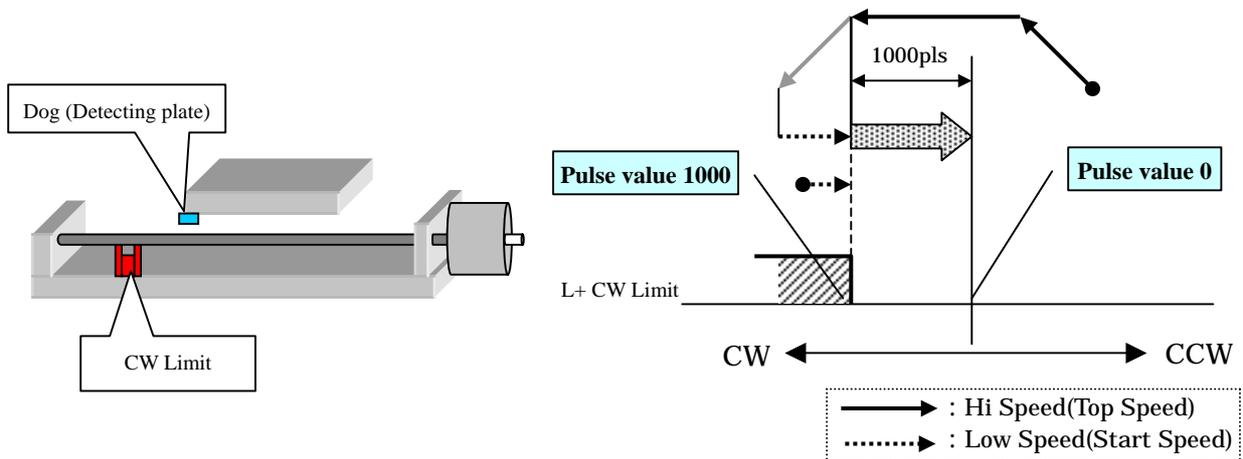
12

After returning to origin in method 6, the position is considered as the position set (SYS No.5) and moves to the position of pulse value "0", this position is set to the origin.
In the case of arrangement as shown in the diagram below, set the parameter No.5 to -1000.



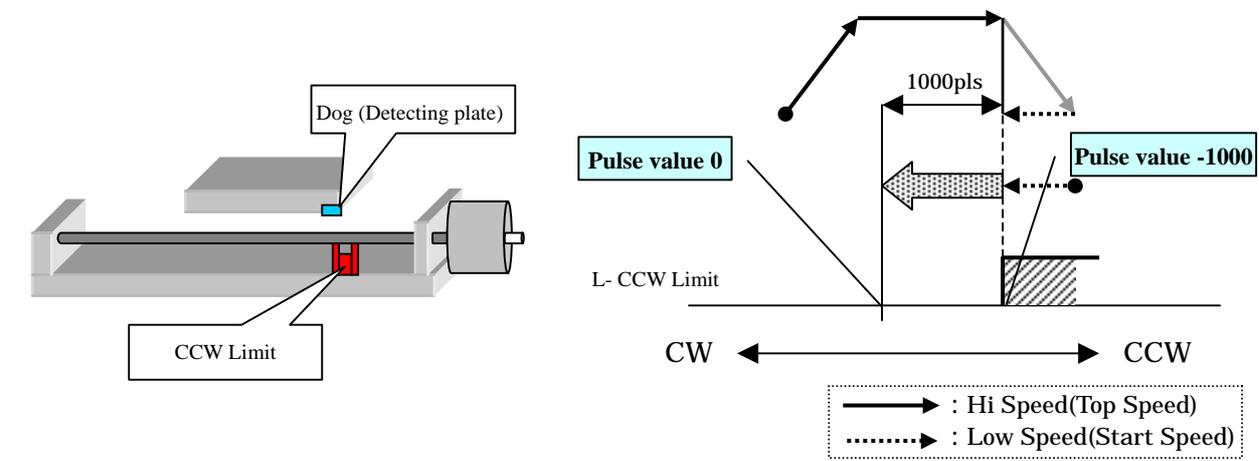
13

After returning to origin in method 7, the position is considered as the position set (SYS No.5) and moves to the position of pulse value "0", this position is set to the origin.
In the case of arrangement as shown in the diagram below, set the parameter No.5 to 1000.



14

After returning to origin in method 8, the position is considered as the position set (SYS No.5) and moves to the position of pulse value "0", this position is set to the origin.
In the case of arrangement as shown in the diagram below, set the parameter No.5 to -1000.



ORG method No.15 is a optional function.

1 6 ORG located in NORG is origin position.(at low speed)

When in CW zone
 Detection starts in CCW direction at low speed.
 Stops when moving through origin proximity,
 and reverses in CW direction.
 After being origin proximity detected, stops at first origin.

When in CCW zone
 Detection starts in CCW direction at low speed.
 Stops when limit is detected, reverses in CW direction.
 Reverses in CCW direction, when moving through origin proximity.
 Reverses in CW direction when moving through origin proximity again.
 After being origin proximity detected, stops at first origin.

The diagram for section 1.6 illustrates the origin detection process. On the left, a 3D cutaway shows a motor shaft with a dog (detecting plate) and two sensors: an origin proximity sensor (NORG) and an origin sensor (ORG). The NORG is positioned to detect the dog's proximity, while the ORG is positioned to detect the dog's actual position. A CCW limit is also shown. On the right, a 2D timeline diagram shows the sequence of events. It starts with 'Start from CW zone' and 'Start from CCW zone'. The timeline shows the motor moving in the CW direction, detecting the origin proximity (NORG), reversing to CW, and then stopping at the first origin (ORG). The timeline also shows the motor moving in the CCW direction, detecting the L-CCW limit, reversing to CW, detecting the origin proximity (NORG), reversing to CCW, detecting the origin proximity (NORG) again, reversing to CW, and finally stopping at the first origin (ORG). A legend indicates that dotted arrows represent 'Low Speed (Start Speed)'.

1 7 NORG sensor located in moving zone is set to be the origin position. (at low speed)

When in CW zone
 Detection starts in CCW direction at low speed.
 Stops when moving through origin, and reverses
 in CW direction.
 Stops when origin is detected.

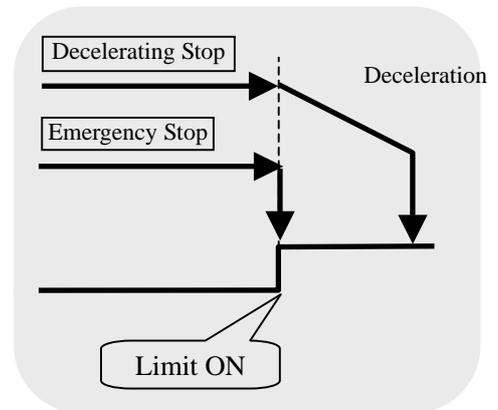
When in CCW zone
 Detection starts in CCW direction at low speed.
 Reverses and moves at low speed in CW direction when
 CCW limit is detected.
 Reverses in CW direction when moving through origin.
 Reverses in CCW direction when moving through origin.
 Stops when origin is detected.

The diagram for section 1.7 illustrates the origin detection process where the NORG sensor is set to be the origin position. On the left, a 3D cutaway shows a motor shaft with a dog (detecting plate) and two sensors: an origin proximity sensor (NORG) and a CCW limit. On the right, a 2D timeline diagram shows the sequence of events. It starts with 'Start from CW zone' and 'Start from CCW zone'. The timeline shows the motor moving in the CW direction, detecting the origin proximity (NORG), reversing to CW, and then stopping at the origin (NORG). The timeline also shows the motor moving in the CCW direction, detecting the L-CCW limit, reversing to CW, detecting the origin proximity (NORG), reversing to CCW, detecting the origin proximity (NORG) again, reversing to CW, and finally stopping at the origin (NORG). A legend indicates that dotted arrows represent 'Low Speed (Start Speed)'.

3-4. Limit Stop

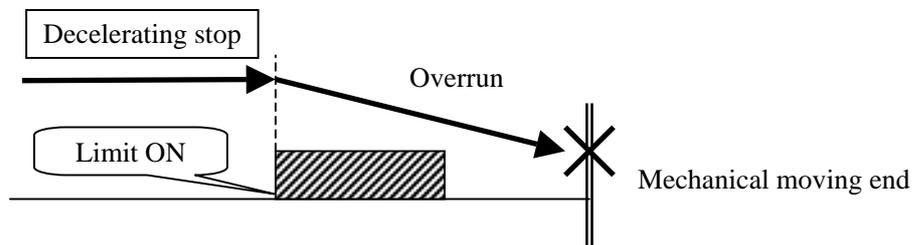
The controller stops output when a limit signal is detected. Stop methods are the following two types.

Setting	Stop Method	
0	Emergency stop	Immediately stops at the limit detected position.
1	Decelerating stop	Decelerates and stops. The decelerating time is the same as that of decelerating setting in normal drive.



⚠ In standard specifications, in order to eliminate the following trouble, “0: Emergency stop” is fixedly set. If you want to use in “1: Decelerating stop,” please contact us.

⚠ To customers who set the “decelerating stop” setting to valid In decelerating stop setting, attention must be paid because the amount of overrun becomes large and mechanical failures such as bumping the moving end may occur, if the decelerating time is set to be long.



3-5. Feedback

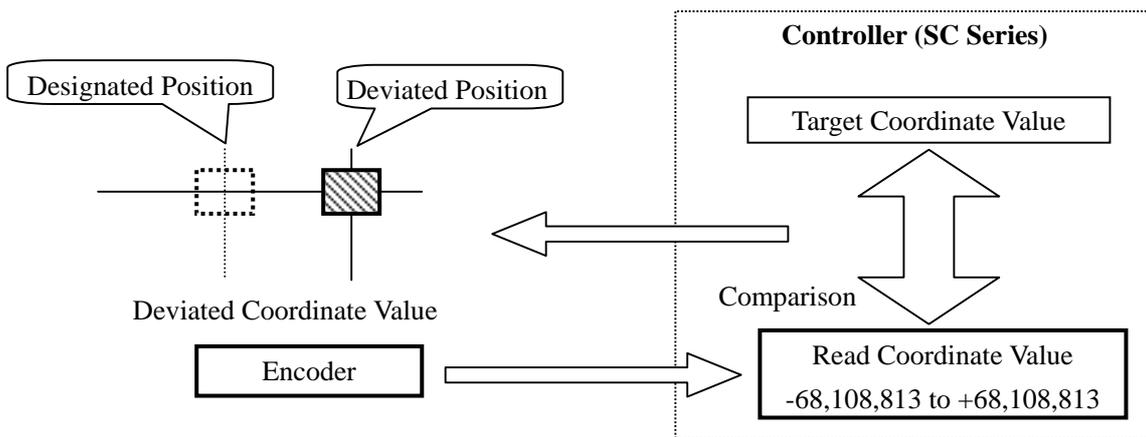
3-5-1. Feedback

As a feature of SC-210/SC-410, feedback can be performed with encoder input.

Methods for feedback are roughly classified into an incremental method and absolute method. This product adopts the following absolute method.

absolute method

Coordinate value (absolute value) is controlled and feedback control is performed. This product is controlled in below absolute method.



The controller constantly reads coordinate values with signals from the encoder and compares these values with the designated position. When deviation between the read coordinate value and the designated position occurs, the controller drives the motor to reset it to the designated position. The coordinate range that this device can control is a wide range from -68,108,813 to +68,108,813, and the controller can correct pulse in this range even if the position deviates.

3-5-2. Setting of Feedback

In order to perform correction (feedback) by encoder input, settings of items in the following table are required.

When performing setting in manual operation, use “SYS” mode (“5-8. System Setting”), and when in remote operation, perform with the ESI command.

Function	Manual operation (System setting)			Remote operation
	SYS No.	Display	Setting	
Encoder conversion Denominator	24	ENC CAL DIV 1/N	1 to 16,777,215	ESI command
Encoder conversion Numerator	25	ENC CAL DIV N/1	1 to 16,777,215	ESI command
Multiplication setting	26	ENC MULTIPLI 1-4	1,2,4	ESI command
0 clear position	27	ENC PRESCALE	0 to 16,777,215	ESI command
Conversion rounding designation	28	ENC RND OFF 0-9	0 to 9	ESI command
Correction setting	29	FEEDBACK TYPE 0-2	0,1,2	APS/RPS/SPS/ SCN command
Correction Retry number	31	RETRY COUNT	1 to 10,000	ESI command
Correction Wait time	32	WAIT TIME(1ms)	1 to 10,000	ESI command
Encoder adding direction	33	ENC ROTATE CHANGE	0,1	ESI command
Encoder coordinate synchronization	34	PM&ENC SYNC WRITE	0,1	-
Display selection (Second line)	43	SOUR PMC:0 ENC:1	0,1	-
Display selection (Third line)	46	SOUR PMC:0 ENC:1	0,1	-



Make sure to set and adjust the functions marked with  in the above table.

3-5-3. Details of Functions (In Manual Operation)

About remote control, refer to the items for the ESI command.

No.24 **No.25** Encoder Conversion Denominator And Numerator

When minimum resolution for the motor (movement amount per 1 pulse) is different from the minimum resolution for the encoder, set the conversion coefficient with this parameter.

SYS No.	Setting Range	Description
24	1 to 16,777,215	Denominator for conversion
25	1 to 16,777,215	Numerator for conversion

No.26 Encoder Multiplication Setting

Multiply count signal from the encoder to enhance resolution.

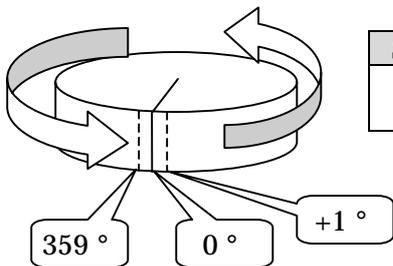
SYS No.	Setting Range	Description
26	1	Normal × 1
	2	2 Multiplication × 2
	4	4 Multiplication × 4



Multiplication (multiply) means multiplying frequency by n.

No.27 Encoder Prescale (0 Clear Position)

When attempting to set the coordinate value to 0 ° by using the multi-rotation stage and turning by 360°, this sets ‘the movement amount per one orbit – “1”(pulse)’.



SYS No.	Setting Range	Description
27	0 to 16,777,215	Movement amount per one orbit – “1”(pulse)

No.28 Encoder Conversion Rounding Designation

When the conversion value for the encoder results in a decimal fraction, designates the digit to be rounded off.

【Example】 Setting: In case of 4 Conversion value is 0.00288888 0.003
 Setting: In case of 6 Conversion value is 0.00866666 0.00867

SYS No.	Setting Range	Description
28	0 to 9	Digit number right from decimal point. 0 is not rounded off.

No.29 Correction Setting

Sets implementation of feedback control. You can select feedback method either from implementing only once after movement is completed or continuing feedback after movement is completed.

SYS No.	Setting Range	Description
29	0	Not correct. Feedback (encoder correction) is not performed.
	1	Correct (only in positioning). After movement, encoder correction is performed once and completed.
	2	Correct (constant). After movement is completed, feedback continues.

During implementation of feedback, the BUSY lamp on the front panel is lit even if the motor is suspended. However, BUSY flag is OFF in status response by feedback control.

No.30 Correction Permissible Range

No.31 Correction Retry Number

No.32 Correction Waiting Time

Completion conditions for correction are set. If correction is not completed within the set conditions, feedback is completed and an error (drive system error No.309) is returned.

SYS No.	Setting Range	Initial Setting	Description
30	1	1	Only the perfect matching. Pulse conversion value = Encoder conversion value
31	1 to 10,000	100	Set retry number
32	1 to 10,000	100	Set waiting time

No.33 Encoder Adding Direction

Increase and decrease polarity of counter value from encoder. That is, the rotating direction of the encoder.

SYS No.	Setting	Description
33	0	Normal
	1	Reverse: Positive and negative are reversed to setting 0.

No.34 Encoder Coordinate Synchronization

If this is set "1: executes", the encoder coordinate value together with pulse display value are simultaneously rewritten to ORG PRESET DATA in the case of completion of returning to origin.

SYS No.	Setting	Description
34	0	doesn't execute Encoder Coordinate Synchronization
	1	executes Encoder Coordinate Synchronization

No.43 No.46 Display selection

Selection of display of pulse count number or display of encoder counter value in coordinate display is performed.

SYS No.	Setting	Content
43	0: Pulse display	Change in display on the second line
46	1: Encoder display	Change in display on the third line

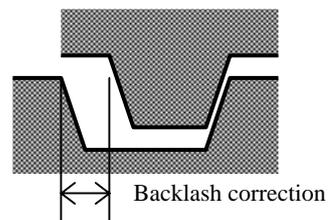
No.44 No.47 Selection of conversion display

About pulse count number (or encoder counter value)selection of display of conversion or display of non-conversion in coordinate display is performed.

SYS No.	Setting	Content
44	0: Non conversion display	Change in display on the second line
47	1: Conversion display	Change in display on the third line

3-6. Backlash Correction

Backlash generated in the gear mechanism, etc., can be corrected.
 In order to carry out backlash correction, settings of corrected pulse amount and correcting method are required.



3-6-1. Remote control operation procedures

Set a correction amount with motor-related initial setting (the ASI command).

stxASI /h/ . . . **GRLF** Set with the 8th parameter.

For details, refer to the ASI command.

Designate a method by the parameter of each drive command (such as APS or RPS.)

3-6-2. Manual operation setting

In order to carry out backlash correction by manual operation, carry out necessary settings with SYS parameters in advance.

SYS No.	Setting	Content
7	0 to 16,777,215	Backlash correction pulse amount
8	0 to 4	Correction method

3-6-3. Backlash correction method

Executable backlash correction methods are as follows. The setting is common to remote control and manual operation.

Method	Description
0	Backlash correction invalid
1	When moving direction is changed from CCW to CW, reciprocating movement by correcting pulse amount is performed before moving.
2	When moving direction is changed from CW to CCW, reciprocating movement by correcting pulse amount is performed before moving.
3	After moving in the CCW direction, reciprocating movement by correcting pulse amount is performed.
4	After moving in the CW direction, reciprocating movement by correcting pulse amount is performed.

3-6-4. Details of correcting method

1		<p>When moving direction is changed from CCW to CW, reciprocating movement by the set correcting pulse amount is performed and then movement in the CW direction is performed. In this method, error by backlash is generated, however, the error amount is constant.</p>
2		<p>When moving direction is changed from CW to CCW, reciprocating movement by the set correcting pulse amount is performed and then movement in the CCW direction is performed. In this method, error by backlash is generated, however, the error amount is constant.</p>
3		<p>When moving in the CCW direction, at first, moving in the CCW direction, and reciprocating movement by the backlash correction amount is performed and then movement ends in the CW direction. With this method, lost motion caused by backlash is not generated because a stop is made on the determined gear surface side even when moving is performed from either the CW direction or CCW direction.</p>
4		<p>When moving in the CW direction, at first, moving in the CW direction, and reciprocating movement by the backlash correction amount is performed and then movement ends in the CW direction. With this method, lost motion caused by backlash is not generated because a stop is made on the determined gear surface side (opposite to 3) even when moving is performed from either the CW direction or CCW direction.</p>

In the above table, S represents a start position, (S2) represents a start position after backlash correction, and E represents a moving end position.

: Essentially drive
 : Correction drive

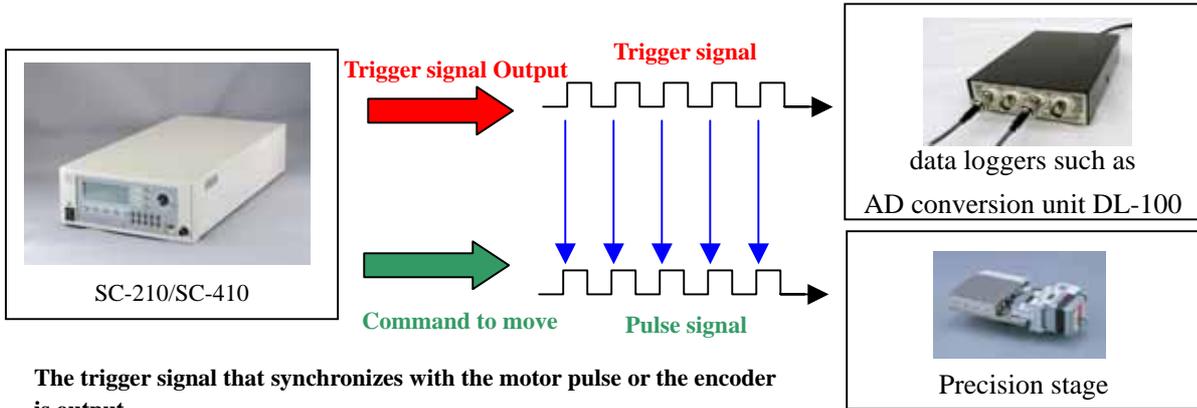
【Remarks】



In the case of methods 3 and 4, a slightly longer period of time is required to complete moving.

3-7. Trigger Function

In SC-210 and SC-410, you can select trigger source either from motor pulse or encoder, and the controller can generate trigger signal to data loggers such as TURTLE Co.,Ltd s AD conversion unit TUSB-0216ADMZ from the front panel TRG connector. You can choose the method to output trigger signal either from the differential output or the open collector output.



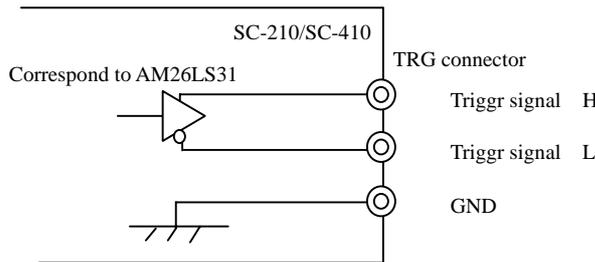
The trigger signal that synchronizes with the motor pulse or the encoder is output.
 (You can set the division of the trigger signal output in a range from 1/1 to 1/1000.)

3-7-1. Trigger signal output method

In SC-210 and SC-410, You can select trigger signal output method either from the differential output or the open collector output. It is set the differential output at the shipment. About method to change, refer to "7-6.Trigger Output System".

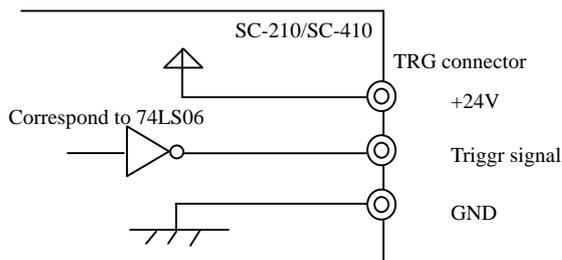
the differential output

We use the differential output IC(AM26LS31) for the output circuit of the controller.



the open collector output

We use the open collector output IC(74LS06) for the output circuit of the controller.



3-7-2. Remote control operation procedures

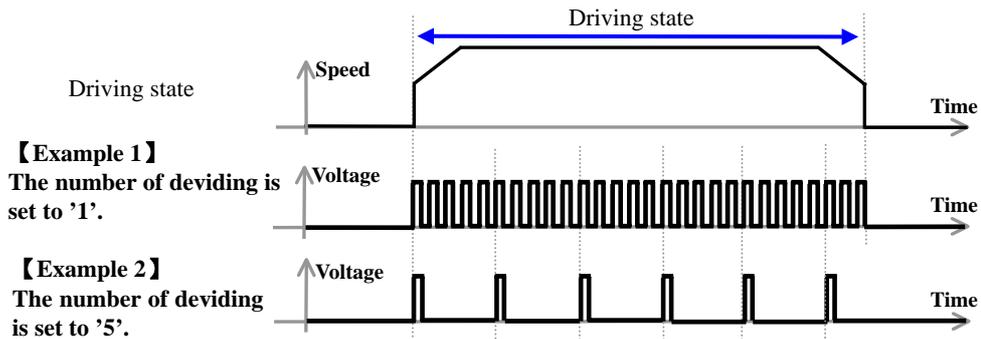
The trigger signal can be output by a remote control according to the following condition.

Trigger signal output by the TRG command

When driving depending on the command(APS,RPS,SPS,MPS,OSC, FRP,SCN, PMA, PMP), the trigger signal is output synchronizing with the trigger signal source.

You can select either of motor pulse/encoder pulse as the trigger signal source.

Moreover, the number of partitions of the output trigger signal can be set within a range of 1-1,000.



【Example 1】

The driving pulse of No.1 Axis is chosen as the trigger signal source, the trigger signal is output every 1 pulse.

`stx`TRG1/0/1/0 `CRLF` Sets the trigger signal output setting.

`stx`TRS1/1 `CRLF` Sets the selection of trigger signal to output by the TRG command.

`stx`RPS1/2/0/0/1000/0/0 `CRLF` Drives relativity moving.

【Example 2】

The driving pulse of No.1 Axis is chosen as the trigger signal source, the trigger signal is output every 5 pulse. (The number of deviding: 5).

`stx`TRG1/0/5/0 `CRLF` Sets the trigger signal output setting.

`stx`TRS1/1 `CRLF` Sets the selection of trigger signal to output by the TRG command.

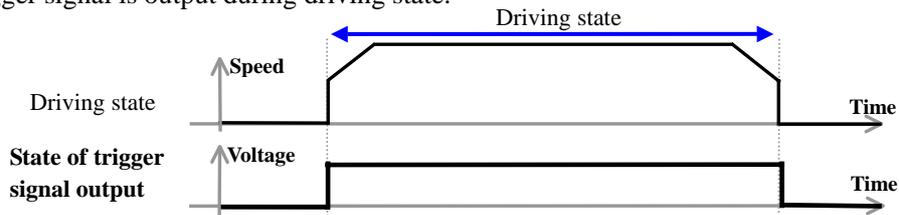
`stx`RPS1/2/0/0/1000/0/0 `CRLF` Drives relativity moving.

【Remarks】

Once you transmit the TRG command, thereafter the trigger signal can be output by transmitting the TRS command and driving command (APS,RPS,SPS,MPS, OSC,FRP, SCN,PMA,PMP).

State of BUSY (Only for SC-410)

When drive is performed with the APS,RPS,SPS,MPS,OSC,FRP,SCN,PMA,PMP command, the trigger signal is output during driving state.



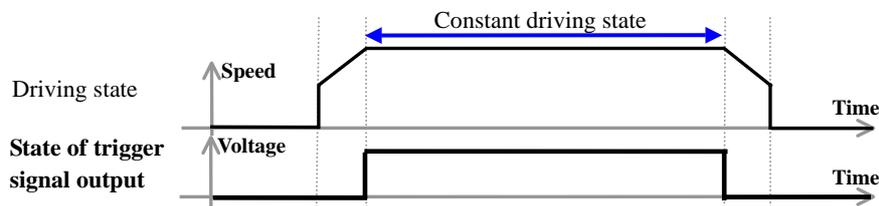
【Example of transmitting command】

`stx` TRS1/2 `CRLF` Sets the selection of trigger signal to output in the state of BUSY (driving signal).

`stx` RPS1/2/0/0/1000/0/0 `CRLF` Drives Relativity moving.

Constant Driving State(Only for SC-410)

When drive is performed with the APS,RPS,SPS,MPS,OSC,FRP,SCN,PMA,PMP command, the trigger signal is output during constant moving state.



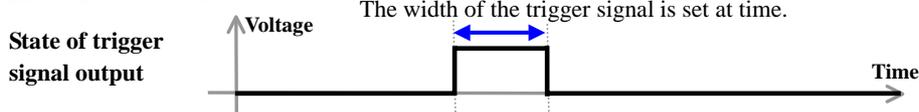
【Example of transmitting command】

`stx` TRS1/3 `CRLF` Sets the selection of trigger signal to output in the constant driving state (constant velocity drive signal).

`stx` RPS1/2/0/0/1000/0/0 `CRLF` Drives Relativity moving.

time control (Shutter control)(Only for SC-410)

The trigger signal is output by time control.



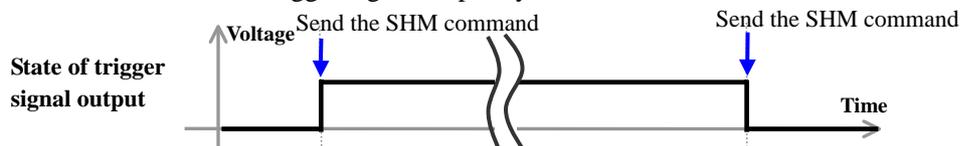
【Example of transmitting command】

`stx` TRS0/4 `CRLF` Sets the selection of trigger signal to output by the SHG,SHM command.

`stx` SHG100/30/30/1/0 `CRLF` Expose time 100msec,
Beam Offset time 30usec,
Beam Rise time 30usec
The trigger signal is output. (Exposures)

manual control (Shutter control)(Only for SC-410)

Performs the start / end of the trigger signal output by transmission of the SHM command.



【Example of transmitting command】

`stx` TRS0/4 `CRLF` Sets the selection of trigger signal to output by the SHG,SHM command.

`stx` SHM1/1 `CRLF` The trigger signal output begins. (Opens the shutter)

⋮

`stx` SHM1/0 `CRLF` The trigger signal output finishes. (Closes the shutter)

3-7-3. Manual operation setting / driving

[Setting]

When you use Trigger function by manual driving, you have to set the SYS parameters in advance.

SYS No.	Setting	Content
48	SOUR PMC=0:ENC=1	Trigger source select 0:Pulse 1:Encoder(2 Multiplication)
49	Div RATIO 1-1000	Ratio of Trigger set
50	Edge UP:0 DW:1	Edge of Trigr select 0:Up 1:Down
51	Both:0 CW:1 CCW:2	Direction of Trigger generation 0:Both 1:CW 2:CCW
52	TRG Pass:0 Exec:1	validate setting to SYS No.48 – SYS No.51 0: Pass 1: Exec



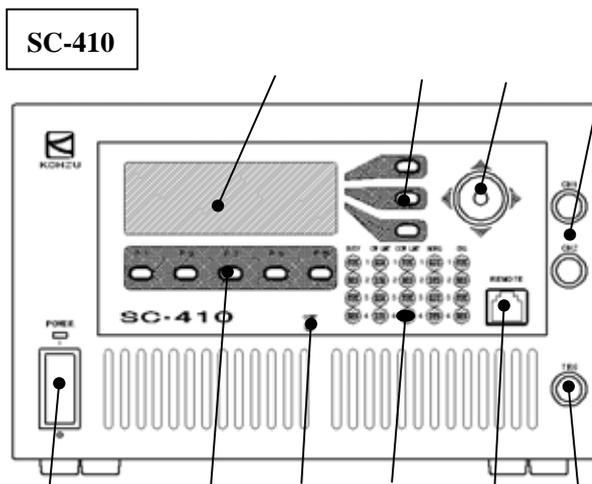
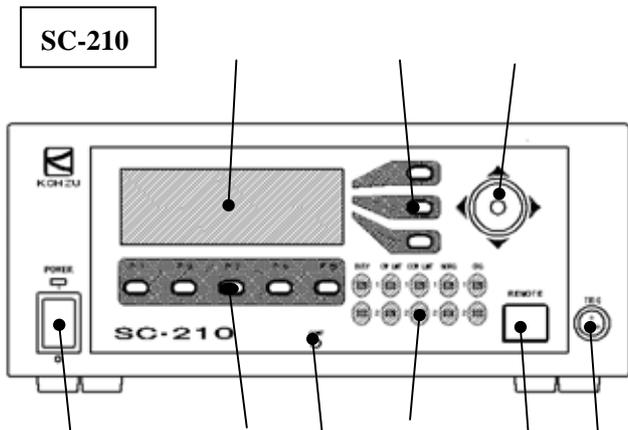
A trigger signal setting of the system construction (SYS mode) by the above manual operation doesn't influence the setting of the trigger signal by remote control.

[Driving]

The controller can generate trigger signal with driving at joystick operations mode, absolute position movement mode and relative position movement mode.

4. Part Names and Functions

4-1. Front Panel



Liquid Crystal Display

Displays the present mode, pulse value and function of each button.

Select Buttons

Mainly used for switching operations.

Joystick

Moving direction and speed can be controlled depending on the tilt direction and tilt angle of the joystick.

Power Switch

Turns ON/OFF AC power.

Function Buttons F1 to F5

Used for selecting mode and driving.

Liquid Crystal Contrast Adjustments

Adjust the contrast if characters on the liquid crystal screen are difficult to read.

Limit and Position Sensor Display LED

Status of each position sensor and moving status is displayed.

Connector for Connecting Externally

The operation that is similar to Joystick is possible from SC-200HJ(options).

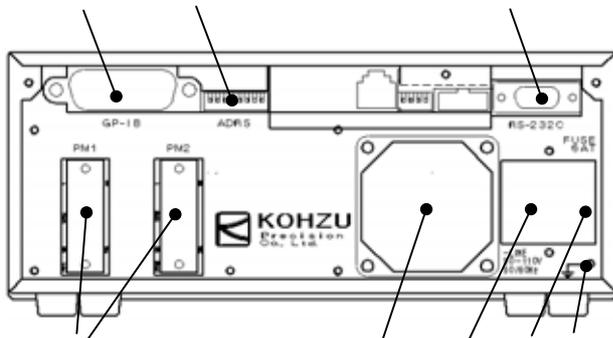
TRG connector

Outputs trigger signal.

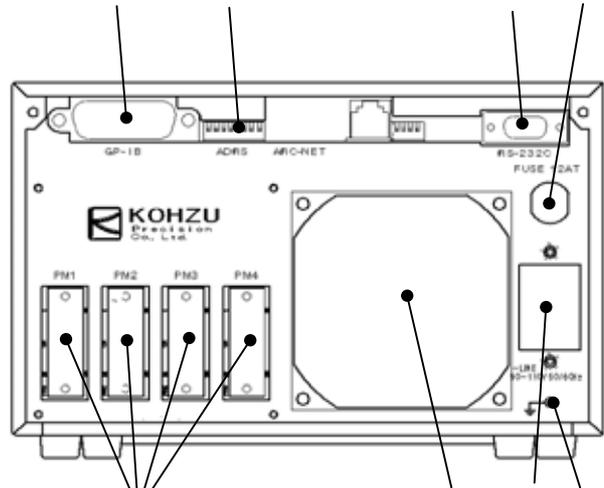
Scaler Counter BNC

4-2. Rear Panel

SC-210



SC-410



GP-IB Connector

GP-IB communications connector

RS-232C/GP-IB Setting Switch

DIP switch to set communications conditions for RS-232C and GP-IB.
(Refer to the next page)

RS-232C Connector

Connector 9 pins for RS-232C communications line

Motor Connecting Connector

Stage driving output, sensor input

Fan



Never place an object behind the fan and obstruct exhaust.

Power Supply Connector (3P type)

Input connector for 90-240V AC.

Fuse



Make sure to use a specified rated fuse.

SC-210 : 250V/6.3A

SC-410 : 250V/10A

Grounding Terminal

Make sure to establish a ground. Ground can also be established from the power supply connector(3 pins type).

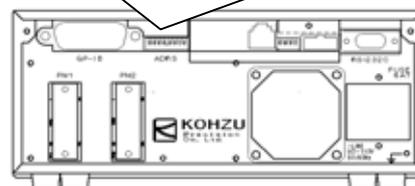
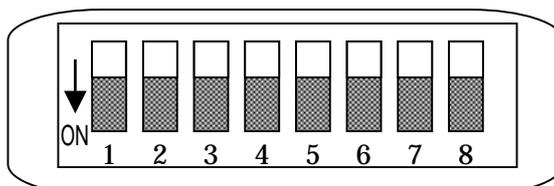
4-3. DIP Switch (RS-232C/GP-IB Setting Switch)

Conditions for RS-232C and GP-IB communications can be set and changed with the DIP switch (ADRS) on the rear panel of the main body.

 Turn off the power switch of SC-210/SC-410 when you set DIP switch.

Position of DIP switch

The DIP switch is located at the upper part of the rear panel on the main body.



Settings

Settings are as in the table below.

Switch settings in the left half of the table are reflected in settings in the right half of the table.

Switch setting								Communi- cation mode	RS-232C setting				GP-IB	
1	2	3	4	5	6	7	8		Speed	Parity	Word length	S bit	Delimiter	Address
OFF	OFF	*	*	*	*	*	OFF	RS	38400	*	*	*	*	*
ON	OFF	*	*	*	*	*	OFF	RS	28800	*	*	*	*	*
OFF	ON	*	*	*	*	*	OFF	RS	19200	*	*	*	*	*
ON	ON	*	*	*	*	*	OFF	RS	9600	*	*	*	*	*
*	*	OFF	OFF	*	*	*	OFF	RS	*	NON	*	*	*	*
*	*	OFF	ON	*	*	*	OFF	RS	*	EVEN	*	*	*	*
*	*	ON	ON	*	*	*	OFF	RS	*	ODD	*	*	*	*
*	*	*	*	OFF	*	*	OFF	RS	*	*	8	*	*	*
*	*	*	*	ON	*	*	OFF	RS	*	*	7	*	*	*
*	*	*	*	*	OFF	*	OFF	RS	*	*	*	1	*	*
*	*	*	*	*	ON	*	OFF	RS	*	*	*	2	*	*
OFF	OFF	OFF	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	0
ON	OFF	OFF	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	1
OFF	ON	OFF	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	2
ON	ON	OFF	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	3
OFF	OFF	ON	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	4
ON	OFF	ON	OFF	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	5
ON	ON	ON	ON	OFF	*	*	ON	GP-IB	*	*	*	*	CRLF	15
OFF	OFF	OFF	OFF	ON	*	*	ON	GP-IB	*	*	*	*	CRLF	16
ON	ON	ON	ON	ON	*	*	ON	GP-IB	*	*	*	*	CRLF	31



- GP-IB delimiters are fixed to CRLF.
- 6 to 14 and 17 to 30 in the GP-IB addresses are omitted in the above table.

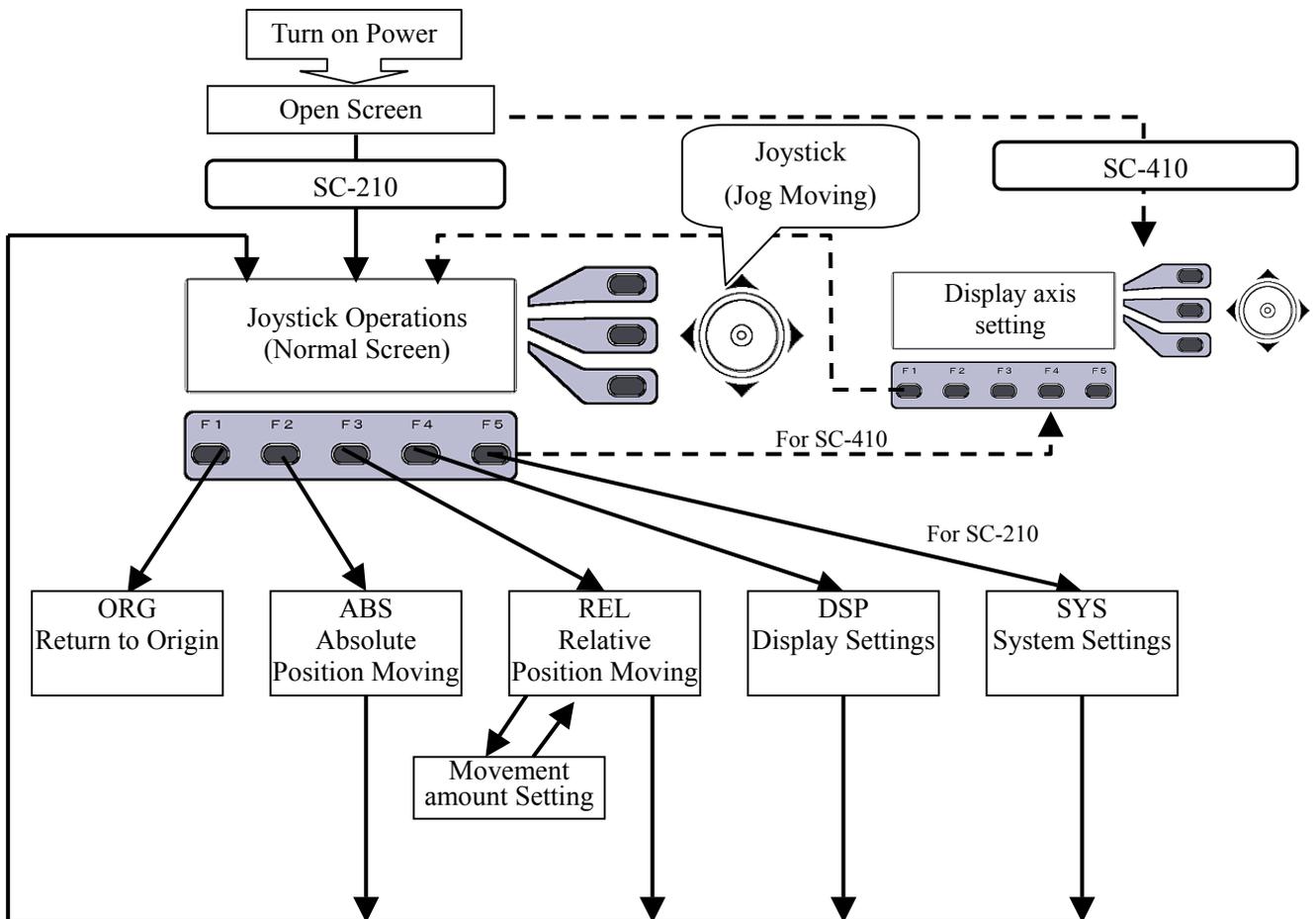
5. Manual Operations

5-1. Description

SC-210/SC-410 can perform stage positioning and driving operations of a stage and motor as a unit without connecting to a personal computer. Most of the functions available in remote control can be performed even in manual operations.

In manual operations, respective functions are performed by a total of 5 function buttons [F1] to [F5] arranged on the lower portion of the LCD screen and 3 buttons arranged on the right portion of the LCD screen and joystick.

■ Flow of Manual Operations

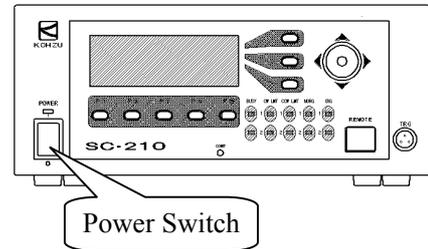


The functions of select buttons and function buttons vary according to screen and mode.

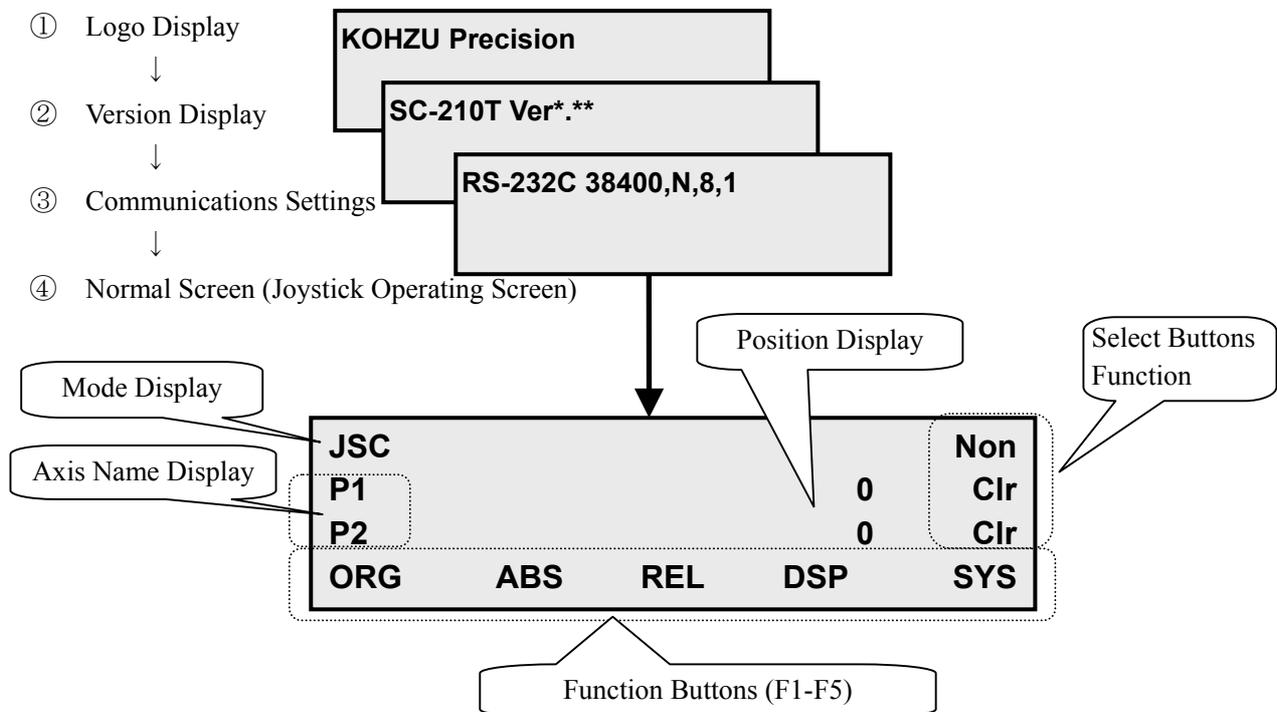
5-2. Turning on Power

For SC-210

Check connections of the motor cables and communication cables, etc. and then turn on power.



When power is turned on, controller information is displayed on the display panel for a few seconds and then the normal screen appears.

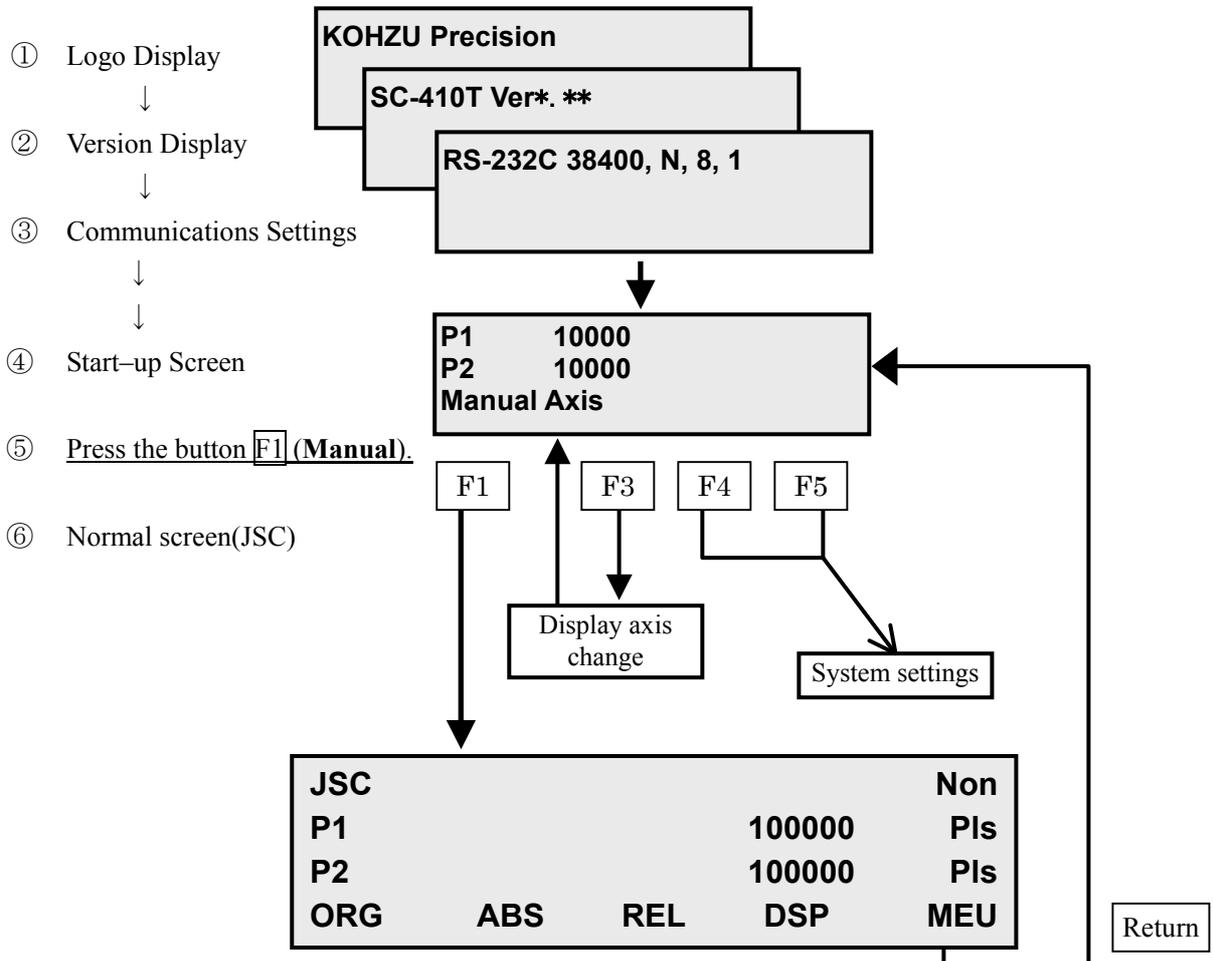


 RS-232C/GP-IB communications cannot be performed until the normal screen appears after the power is turned on.

 The position display stores and displays values at the time when power is turned OFF. Status displaying LED displays the status of the sensor at the time of starting.

For SC-410

The screen at the time of start-up differs from that of SC-210. Pressing the button **F1 (Manual)** when start-up shifts to the operation screen(JSC).



5-2-1. System settings

In SC-410, system change button is hidden command. For system settings, pressing the buttons **F4** and **F5** simultaneously more than two seconds on the start-up screen (screen on which “Manual” is displayed) displays a “SYS” mode button.

5-2-2. Change of the display axis

Pressing the button **F3 (Axis)** on the start-up screen shifts to the screen of “display axis settings” and carries out the following settings.

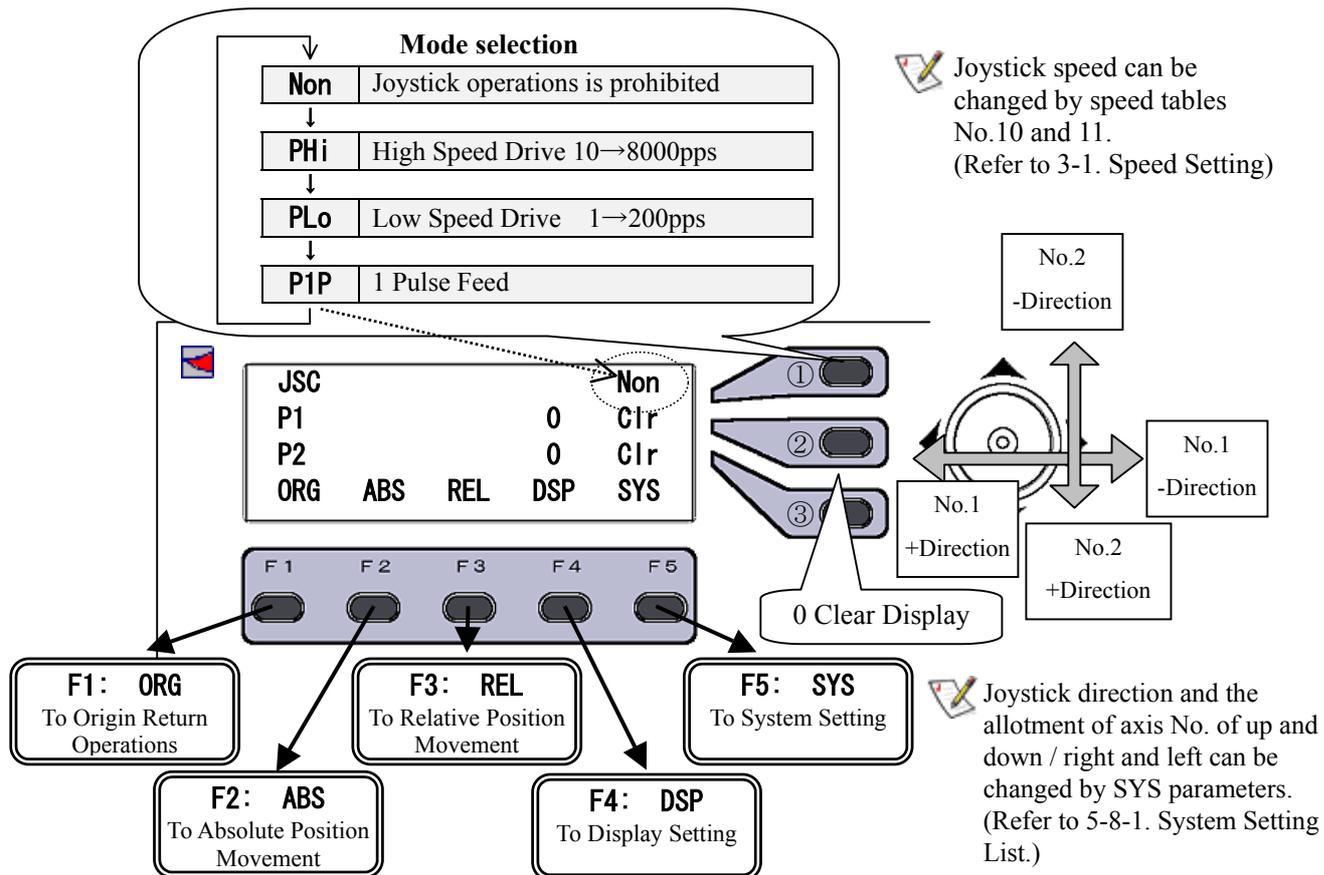
- Designation of display axis:you can select two axes to be displayed among all axes. The same axes can be displayed.
- Display format (calculated value, non-calculated value) of each axis can be set with the select switch.
- P1*****PIs Pulse value
- p2*****Cal Pulse calculated value
- E1*****PIs encoder value
- e2*****Cal encoder calculated value

5-3. Joystick Operations

After power is turned on, the normal screen appears and operations of the joystick are enabled. The mode of joystick operations changes with ① button at the right upper. Please sure that the joystick mode is Non - mode when power is turned on.

《Joystick of Front Panel》

If you set SYS No.37 to "0: the main body side", the operation from the main body side joystick becomes possible.



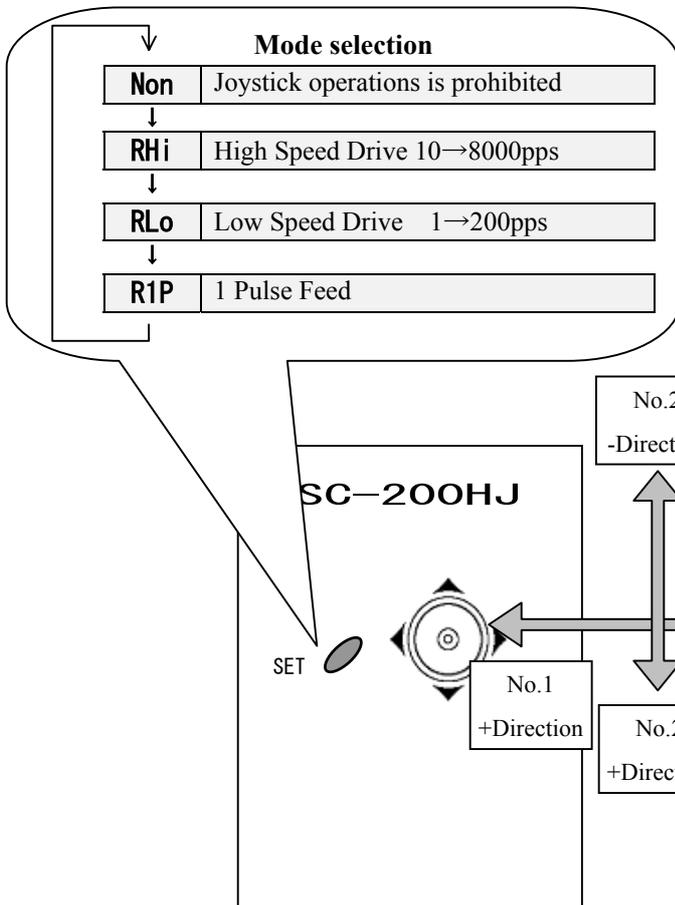
■ Operations at normal screen

Operations		Functions		
		SC-210	SC-410	
Joystick	→			No.1 axis moves while tilting in the - direction, or 1 step feed
	←			No.1 axis moves while tilting in the +direction, or 1 step feed
	↑			No.2 axis moves while tilting in the - direction, or 1 step feed
	↓			No.2 axis moves while tilting in the +direction, or 1 step feed
Select buttons	①	***	←	Joystick operations mode selection
	②	Clr	Pls/Cal	Value for the first axis is cleared to zero / Display style change
	③	Clr	Pls/Cal	Value for the second axis is cleared to zero / Display style change
Function buttons	F1	ORG	←	To the origin return operations screen
	F2	ABS	←	To the absolute position movement screen
	F3	REL	←	To the relative position movement screen
	F4	DSP	←	To the setting screen for displayed value
	F5	SYS	MEU	To the system setting screen / Return to menu screen

⚠ When starting, the joystick operations mode is prohibited (Non) and the joystick does not work.

《External Joy-Stick》

If you set SYS No.37 to “1:External input”(Refer to 5-8-1. System Setting List), you can use External Joy-Stick SC-200HJ (options).



Joystick speed can be changed by speed tables No.10 and 11. (Refer to 3-1. Speed Setting)

Joystick direction and the allotment of axis No. of up and down / right and left can be changed by SYS parameters. (Refer to 5-8-1. System Setting List.)

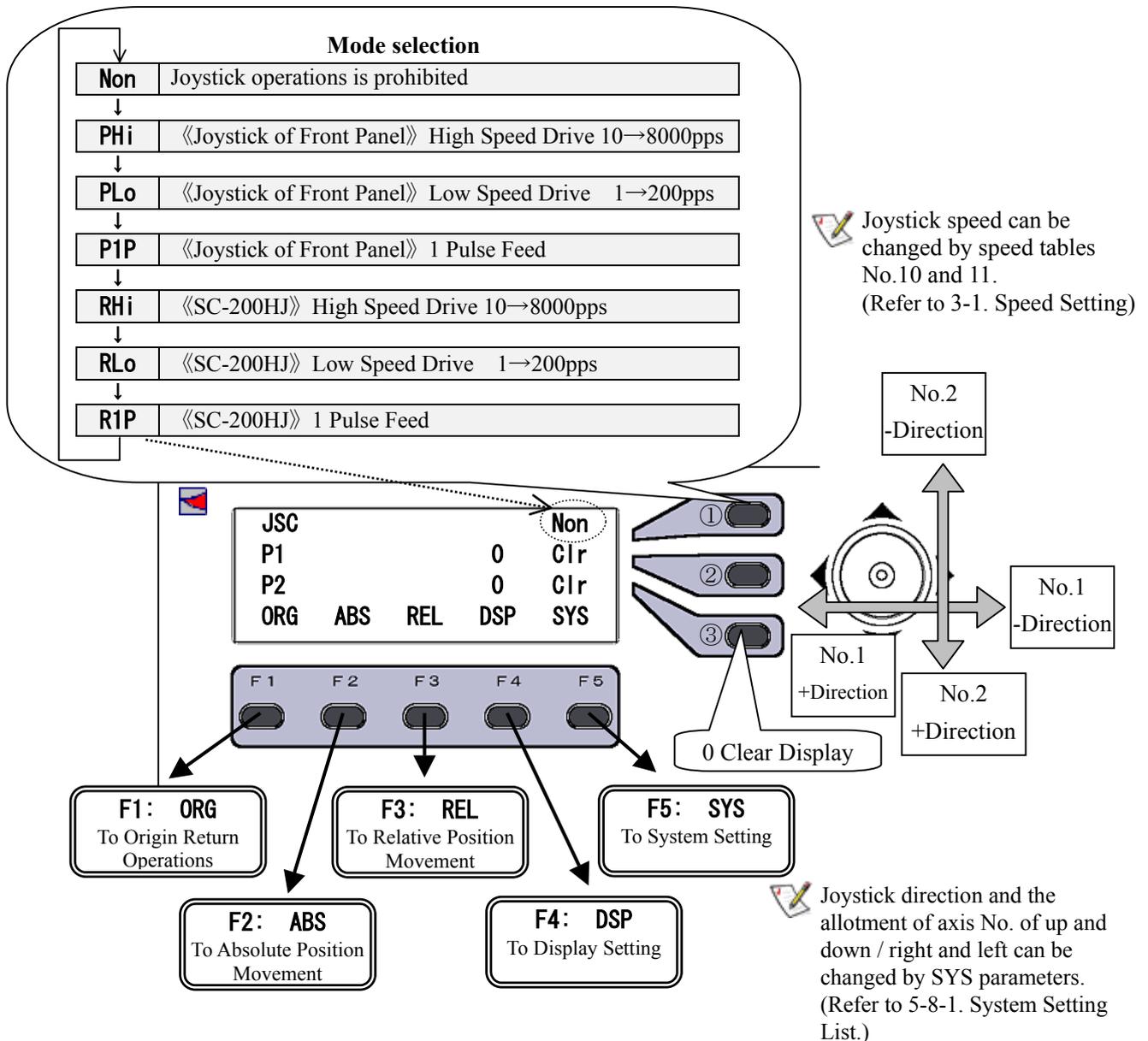
■ Operations at normal screen

Operations		Functions
Joystick	→	No.1 axis moves while tilting in the - direction, or 1 step feed
	←	No.1 axis moves while tilting in the +direction, or 1 step feed
	↑	No.2 axis moves while tilting in the - direction, or 1 step feed
	↓	No.2 axis moves while tilting in the +direction, or 1 step feed
Set button		Joystick operations mode selection ※Set button is useful only when you select the mode "2:External" on SYS No.37.

If you set SYS No.37 to “1:External input”(Refer to 5-8-1. System Setting List),you cannot use the Joystick of Front Panel.
Then operations of the select buttons and function buttons except for that of the Joystick of Front Panel does't change.

《Joystick of Front Panel & External Joy-Stick》

If you set SYS No.37 to “2:Possible on both sides” (Refer to 5-8-1. System Setting List), you can switch the use of both joysticks by ① button of Front Panel.



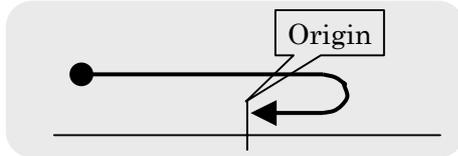
■ Operations at normal screen

Operations		Functions
Joystick	→	No.1 axis moves while tilting in the - direction, or 1 step feed
	←	No.1 axis moves while tilting in the +direction, or 1 step feed
	↑	No.2 axis moves while tilting in the - direction, or 1 step feed
	↓	No.2 axis moves while tilting in the +direction, or 1 step feed

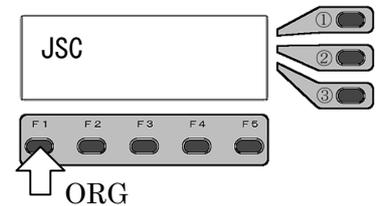
When you set SYS No.37 to ”2:Possible on both sides”, operations of the select buttons and function buttons except for that of the Joystick of Front Panel doesn’t change. Then you cannot use the Set button of External Joy-Stick SC-200HJ(Options).

5-4. Returning to Origin

Function Performs origin return drive according to the origin return method selected.



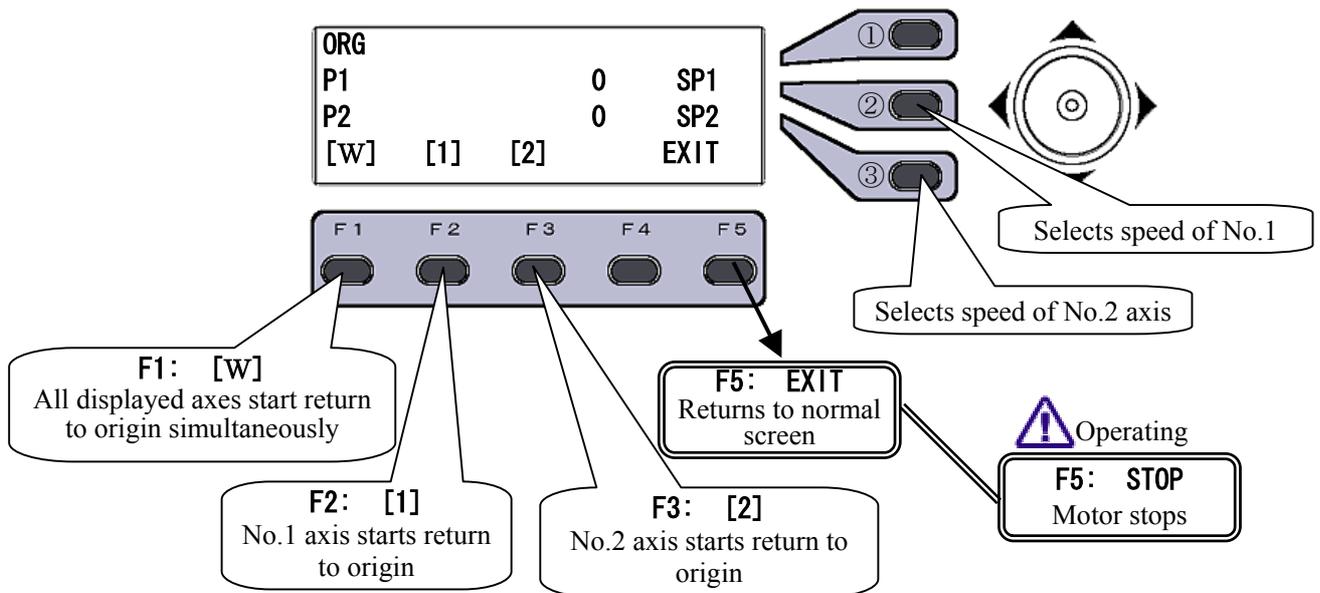
Selection The origin return operations screen appears by pressing the button **F1 (ORG)** on the normal screen (JSC).



Start Origin return movement starts by pressing any of the buttons **F1**, **F2**, **F3**.

Method selection Preset the origin return method by system parameters.
 ※Default setting is method 3(NORG+ORG).
 Some stages without origin sensor in motor shaft require to set method 4(NORG).

Operations end The screen returns to the normal screen (joystick operations) by pressing the button **F5 (EXIT)**.



■ Operations at origin return screen

Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①		
	②	SP*	Selects speed table for No.1 axis 0 → 9
	③	SP*	Selects speed table for No.2 axis 0 → 9
Function buttons	F1	[W]	All displayed axes start return to origin simultaneously
	F2	[1]	No.1 axis starts return to origin
	F3	[2]	No.2 axis starts return to origin
	F4		
	F5	EXIT	In suspended: Returns to normal screen(JSC)
	STOP	Operating: Stop button	

■ Selection of Origin Return Method

The selection of origin return method is set with system parameter No.9.

SYS No.	Display	Function	Setting range	Initial value
9	ORG Type 1-17	Sets origin return method	1 to 17	3

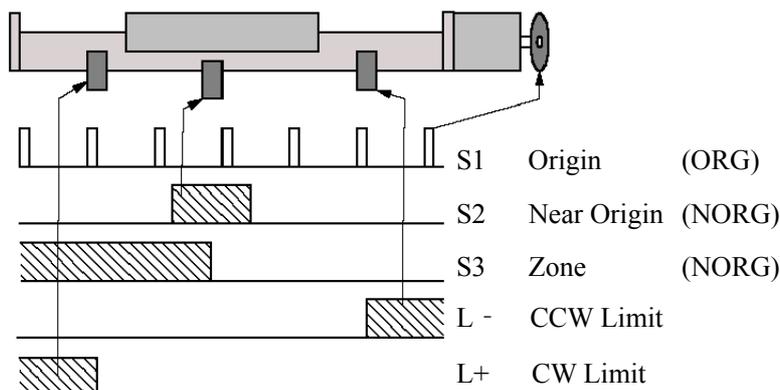
■ Origin Return Method

Method 3 is a default value. Method 4 is used for some stages without S1 sensor.

Method	Sensor configuration	Description
1	S1, S3	Returning direction is determined with zone sensor NORG(S3) and detects origin ORG(S1).
2	S3	Returning direction is determined with zone sensor NORG(S3) and set the edge of the zone sensor NORG(S3) the origin position.
3	S1, S2, L-	ORG(S1) located in NORG (S2) is origin position.
4	S2, L-	NORG (S2) sensor located in moving zone is set to be the origin position.
5	S1, L+	Origin sensor ORG(S1) in proximity of CW limit(L+) is set to be the origin position.
6	S1, L-	Origin sensor in proximity of CCW limit(L-) is set to be the origin position.
7	L+	Edge of CW limit(L+) is set to be the origin position.
8	L-	Edge of CCW limit(L-) is set to be the origin position.
9	S1	ORG (S1) sensor located in moving zone is set to be the origin position.
10	Non	Present position is set to be the origin position. (stage doesn't move.)
11	S1, L+	After the origin position is detected by method 5, and moved by the set amount, this position is set to be the origin.
12	S1, L-	After the origin position is detected by method 6, and moved by the set amount, this position is set to be the origin.
13	L+	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
14	L-	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
15		Optional function
16	S1,S2,L-	ORG (S1) located in NORG (S2) is origin position.(Low speed)
17	S2,L-	NORG (S2) sensor located in moving zone is set to be the origin position.(Low speed)

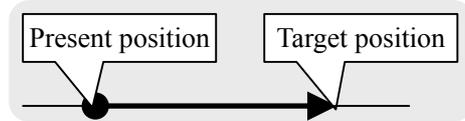
For details of origin return mode, refer to “3-3. Origin Return Method”.

Sensor Configuration



5-5. Absolute Position Movement

Function Performs moving to the inputted designated position.

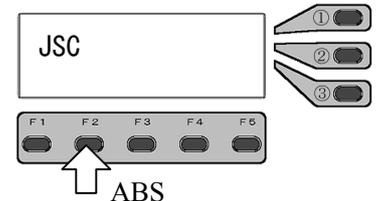


Selection The absolute position moving operations screen appears by pressing the button **F2** (**ABS**) on the normal screen (JSC).



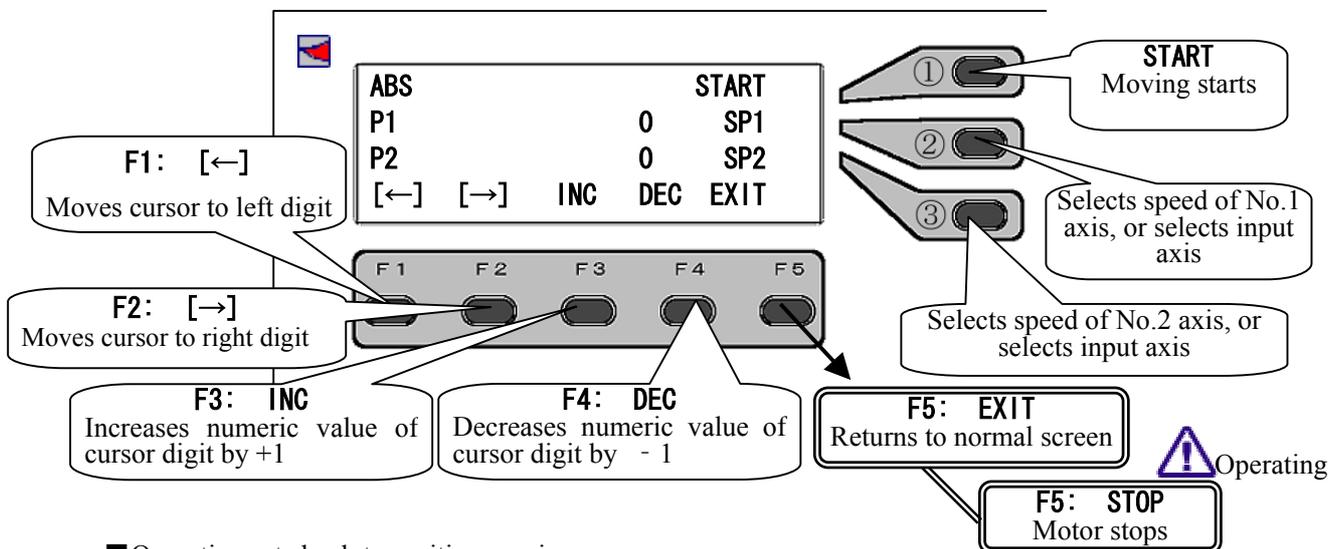
The present coordinate value is displayed on the screen.

Start Set the moving target value by using a function button. Moving starts by pressing ① button (**START**).



Operations end The screen returns to the normal screen (joystick operations) automatically at the end of moving.

When stopping the screen returns to the normal screen (joystick operations) by pressing the button **F5** (**EXIT**).

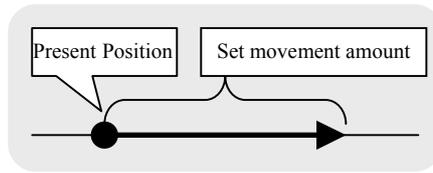


■ Operations at absolute position moving screen

Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①	START	Starts absolute position movement
	②	SP*	Selects speed of No.1 axis, or selects input axis ⚠ When selecting speed, move the cursor to the right end.
	③	SP*	Selects speed of No.2 axis, or selects input axis ⚠ When selecting speed, move the cursor to the right end.
Function buttons	F1	←	Moves the cursor to the left digit
	F2	→	Moves the cursor to the right digit
	F3	INC	Increases numeric value of a digit where the cursor is placed by +1
	F4	DEC	Decreases numeric value of a digit where the cursor is placed by - 1
	F5	EXIT	In suspended: Returns to the normal screen (JSC)
		STOP	Operating: Stop button

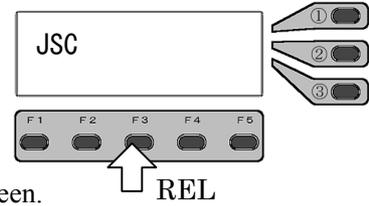
5-6. Relative Position Movement

Function Performs moving from the present position by set amount.



Selection The relative moving operations screen appears by pressing the button **F3 (REL)** on the normal screen (JSC).

The present moving set value is displayed on the screen.

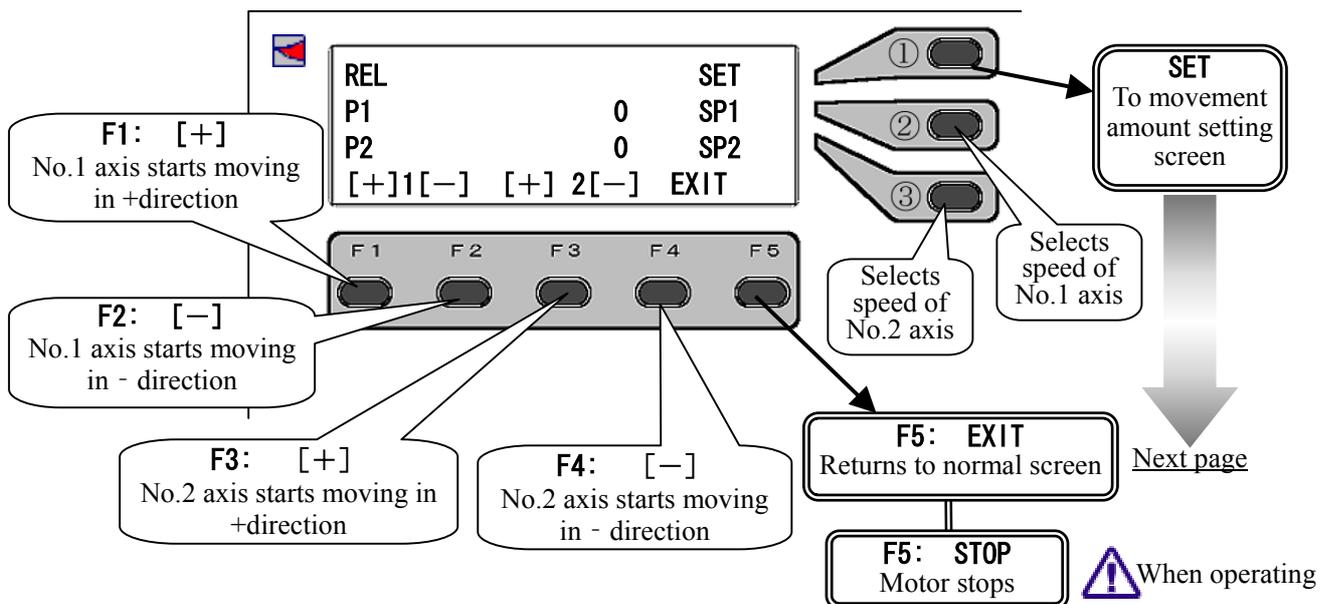


Start Designate axis and direction with the buttons **F1 F2 F3 F4** to start moving.

Movement amount settings Change or setting of the movement amount is performed by pressing ① button (**SET**) for switching to the normal screen.

Operations end The screen returns to the normal screen (joystick operations) by pressing the button **F5 (EXIT)**.

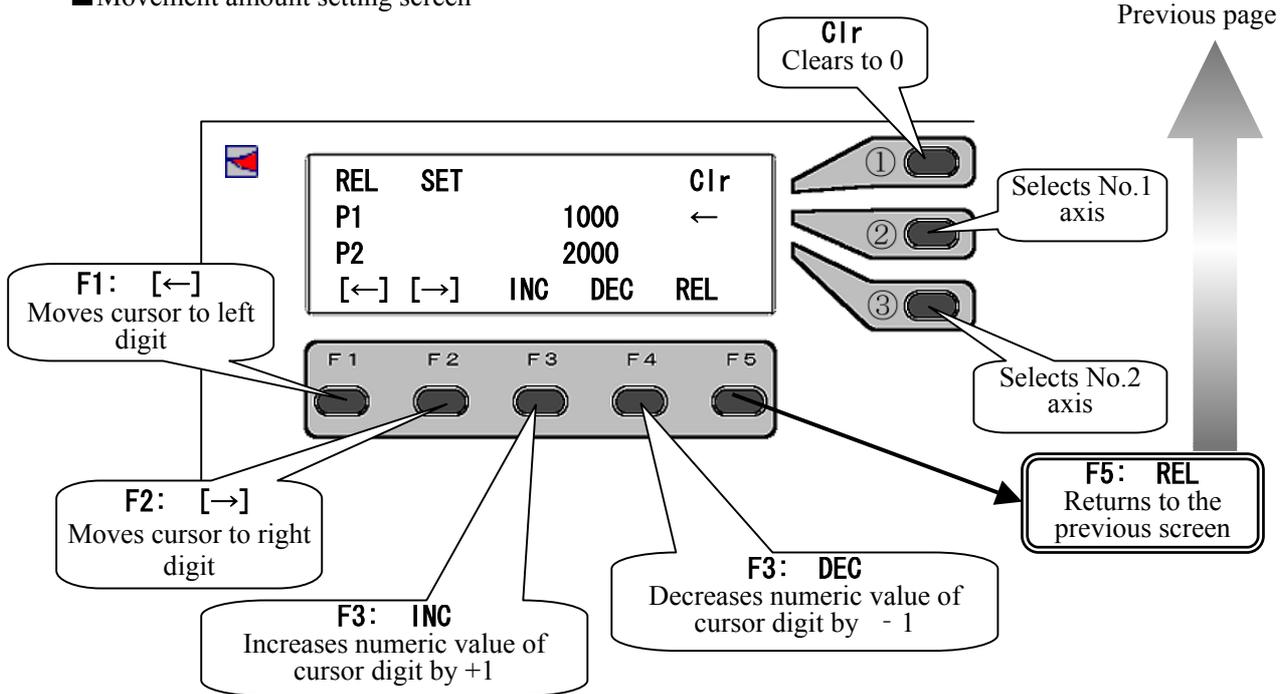
■ Moving Implementation Screen



■ Operations at Relative Moving Screen

Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①	SET	Moves to the movement amount setting screen
	②	SP*	Selects speed of No.1 axis
	③	SP*	Selects speed of No.2 axis
Function buttons	F1	[-]	Moves No.1 axis in - direction by a set amount.
	F2	[+]	Moves No.1 axis in +direction by a set amount.
	F3	[-]	Moves No.2 axis in - direction by a set amount.
	F4	[+]	Moves No.2 axis in +direction by a set amount.
	F5	EXIT	In suspended: Returns to the normal screen (JSC).
		STOP	Operating: Stop button

■ Movement amount setting screen

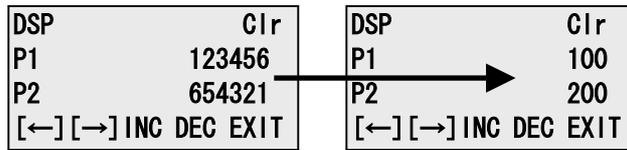


■ Operations at movement amount setting screen

Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①	Clr	Clears numeric value to 0.
	②	←	Selects input for No.1 axis.
	③	←	Selects input for No.2 axis.
Function buttons	F1	[←]	Moves the cursor to the left digit.
	F2	[→]	Moves the cursor to the right digit.
	F3	INC	Increases numeric value of a digit where the cursor is placed by +1.
	F4	DEC	Decreases numeric value of a digit where the cursor is placed by - 1.
	F5	REL	Returns to the relative moving implementation screen.

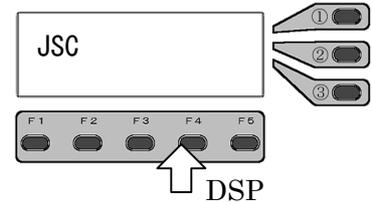
5-7. Change in Displayed Value

Function Rewrites displayed coordinate values.



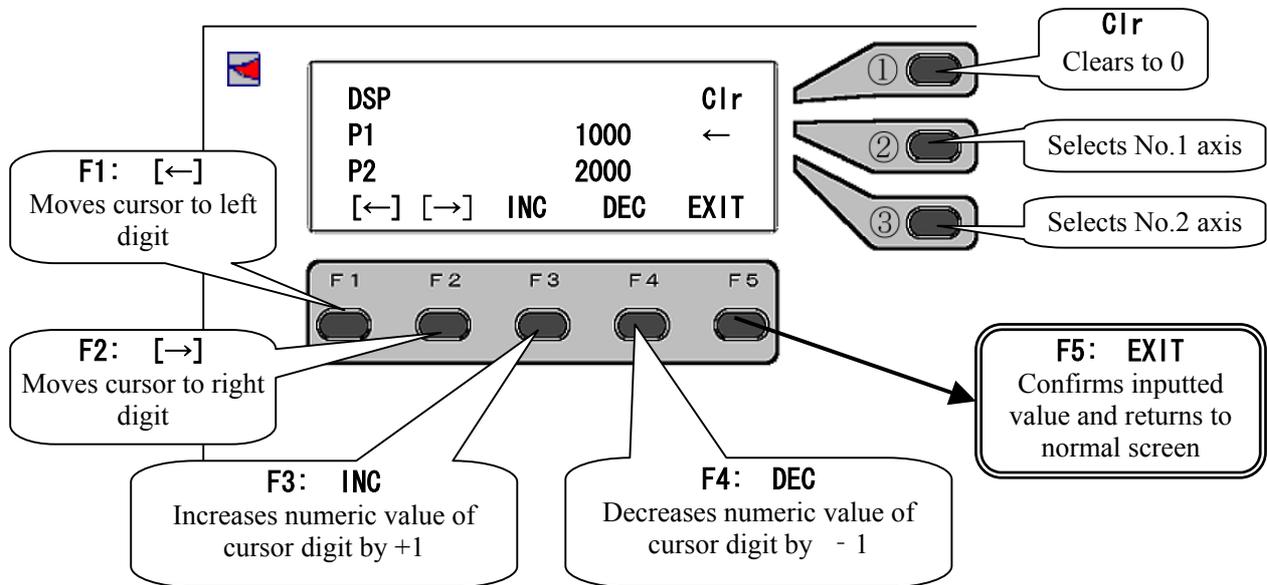
Selection Press the button **F4 (DSP)** on the normal screen (JSC) to move to the display change screen.

Present value appears on the screen after moving.



Setting Change the numeric values with the buttons **F1 F2 F3 F4**.

Setting end The input is confirmed by pressing the button **F5** and the screen returns to the normal screen (joystick operations).



■ Operations at displayed value change screen

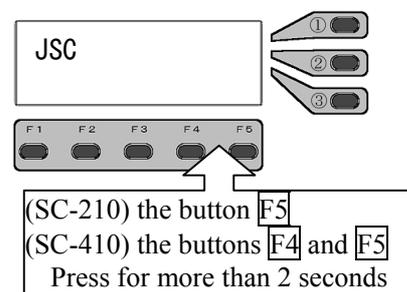
Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①	Clr	Clears numeric value to 0.
	②	←	Selects input for No.1 axis.
	③	←	Selects input for No.2 axis.
Function buttons	F1	[←]	Moves the cursor to the left digit.
	F2	[→]	Moves the cursor to the right digit.
	F3	INC	Increases numeric value of a digit where the cursor is placed by +1
	F4	DEC	Decreases numeric value of a digit where the cursor is placed by - 1
	F5	REL	Confirms the inputted value and returns to the normal screen.

5-8. System Setting

Function Changes and sets system settings for motor control.

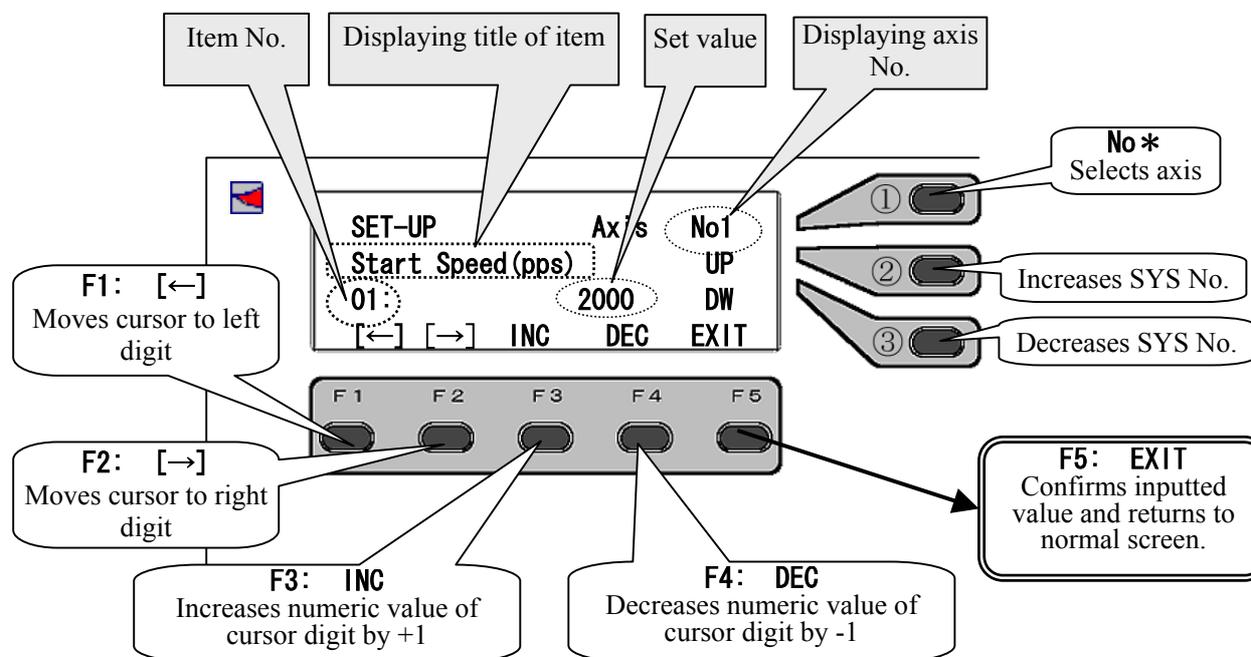
Selection (SC-210) The screen changes to the system setting screen by pressing the button **F5** (**SYS**) on the normal screen (JSC) for more than 2 seconds.

(SC-410) Pressing the buttons **F4** and **F5** simultaneously on the start-up screen (screen on which “Manual” is displayed) displays a “SYS” mode button for more than 2 seconds.



Selection of item Selects item by pressing ② button (UP)/③ button (DW).

Operations end The screen returns to the normal screen (JSC) by pressing the button **F5**.



■ Operations at the displayed value change screen

Operations		Functions	
Joystick	↑ ↓ ← →	***	Invalid
Select buttons	①	No*	Selects axis.
	②	UP	Increases SYS No. of the system parameters
	③	DW	Decreases SYS No. of the system parameters
Function buttons	F1	←	Moves the cursor to the left digit
	F2	→	Moves the cursor to the right digit
	F3	INC	Increases numeric value of a digit where the cursor is placed by +1
	F4	DEC	Decreases numeric value of a digit where the cursor is placed by -1
	F5	EXIT	Confirms the inputted value and returns to the normal screen.

5-8-1. System Setting List

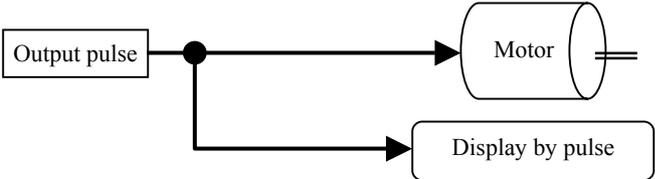
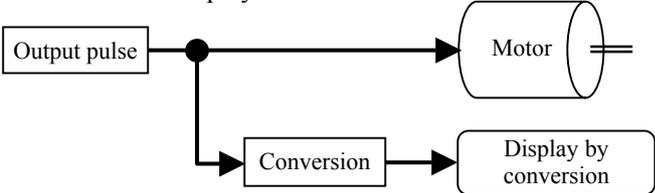
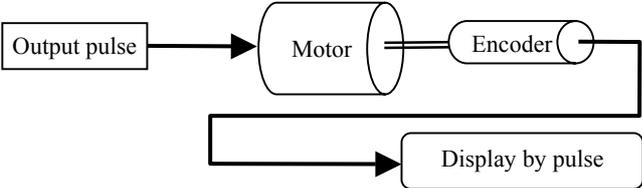
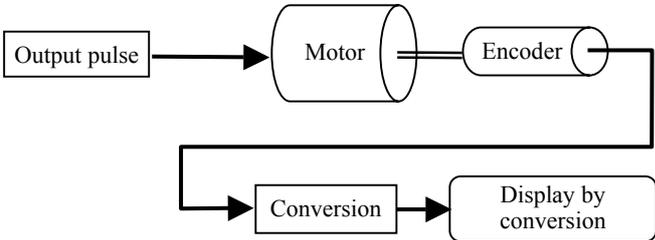
SYS No.	Display	Function	Setting range	Initial value
1	START SPEED (pps)	Start speed of speed table No.0	1 to 4,095,500	500
2	TOP SPEED (pps)	Maximum speed of speed table No.0	1 to 4,095,500	5,000
3	ACC TIME (10ms)	Accelerating time of speed table No.0	1 to 3,275	24
4	DEC TIME (10ms)	Decelerating time of speed table No.0	1 to 3,275	24
5	ORG PRESET DATA	Coordinate value after return to origin	-16,777,215 to +16,777,215	0
6	PM PRESCALE	Motor pulse pre-scaler 0 clear position when using the multi-rotation stage	0 to 16,777,215	0
7	BACKLASH PULSE	Backlash correction Pulse amount	0 to 16,777,215	0
8	BACKLASH TYPE 0-4	Backlash correction 0: Invalid 1 to 4: the selected method	0 to 4	0
9	ORG TYPE 1-17	Selection of origin return method ※ORG method No.15 is a optional function.	1 to 17	3
10	PLS CAL DIV 1/N	Motor pulse conversion Denominator	1 to 16,777,215	1
11	PLS CAL DIV N/1	Motor pulse conversion Numerator	1 to 16,777,215	1
12	PLS RND OFF 0-9	Motor pulse conversion Designating rounding	0 to 9	2
13	STOP EMG : 0 Fixed	Limit stop method (This function is optional.) 0: Emergency 1: Deceleration	0,1	0
14	OFFSET DATA	Offset	-16,777,215 to +16,777,215	0
15	PM ROTATE CHANGE	Change of rotating direction	0,1	0
16	CWL NON:0 INV:1	CW limiter signal logic	0,1	0
17	CCWL NON:0 INV:1	CCW limiter signal logic	0,1	0
18	NORG NON:0 INV:1	NORG sensor signal logic	0,1	0
19	ORG NON:0 INV:1	ORG sensor signal logic	0,1	0
20	LMT SWAP N:0 Y:1	exchange CW limiter signal and CCW limiter signal	0,1	0
21	COFF ON:0 OFF:1	Motor excitation 0: Excitation ON 1: Excitation OFF	0,1	0
22	ACC CURVE 1-5	Accelerating and decelerating mode 1:Rectangular drive 2:Trapezoidal drive 3:Asymmetric trapezoidal drive 4:S-shaped drive 5:Asymmetric S-shaped drive	1 to 5	2
23	CONSTANT PULSE	low-speed movement pulses until stopping after it decelerates	1 to 16,777,215	5
24	ENC CAL DIV 1/N	Encoder pulse conversion Denominator	1 to 16,777,215	1
25	ENC CAL DIV N/1	Encoder pulse conversion Numerator	1 to 16,777,215	1
26	ENC MULTIPLI 1-4	Encoder pulse multiplication settings 1:1 multiplication 2:2 multiplication 4:4 multiplication	1,2,4	1
27	ENC PRESCALE	Encoder pulse 0 clear position when using the multi-rotation stage	0 to 16,777,215	0
28	ENC RND OFF 0-9	Encoder pulse conversion Designating rounding	0 to 9	2

SYS No.	Display	Function	Setting range	Initial value
29	FEEDBACK TYPE 0-2	Encoder correction settings 0: Not correct 1: Correct (only in positioning) 2: Correct (constant)	0 to 2	0
30	PERMIT RANGE PULS	Encoder correction Permissible range (Pulse)	1	1
31	RETRY COUNT	Encoder correction Retry number (times)	1 to 10,000	100
32	WAIT TIME (1ms)	Encoder correction Wait time (ms)	1 to 10,000	100
33	ENC ROTATE CHANGE	Encoder addition direction	0,1	0
34	PM&ENC SYNC WRITE	Encoder coordinate synchronization	0,1	0
35	SPD TABLE 1-300	Speed table multiple setting	1 to 300	1
36	SYS Refresh!! Pass:0 Exec:1	Initialization of system 0: Pass 1: Execute initializing	0,1	0
37	JSC Function P:0 R:1 P&R:2	Selection of joystick 0: On main body side 1: External 2: Possible on both sides	0 to 2	0
38	JSC Fnc d:0 LR:1 UD:2	Joystick allotment of top and bottom, right and left 0:default 1:LR 2:UD	0 to 2	0 (Axis No.1 : LR Axis No.2 : UD)
39	JSC DIR NON:0 INV:1	Joystick direction 0:normal 1:invert	0,1	0
40	JSC Hi Speed (pps)	Joystick High Speed change	0 to 4,095,500	8,000
41	JSC Low Speed (pps)	Joystick Low Speed change	0 to 4,095,500	200
42	DSP Line No1 Axis_No Select	LCD panel Axis No. displayed in second line	1 to 8	1
43	DSP Line No1 SOUR PMC:0 ENC:1	Selection of display (Second line) 0: Pulse display 1: Encoder display	0,1	0
44	DSP Line No1 DATA Pls:0 Cal:1	Selection of conversion display (Second line) 0: Non conversion display 1: Conversion display	0,1	0
45	DSP Line No2 Axis_No Select	LCD panel Axis No. displayed on third line	1 to 8	2
46	DSP Line No2 SOUR PMC:0 ENC:1	Selection of display (Third line) 0: Pulse display 1: Encoder display	0,1	0
47	DSP Line No2 DATA Pls:0 Cal:1	Selection of conversion display (Third line) 0: Non conversion display 1: Conversion display	0,1	0
48	TRG SOUR PMC:0 ENC:1	Selection of trigger signal source 0:Pulse 1:Encoder(only 2 Multiplication)	0,1	0
49	TRG Div RATIO 1-1000	Ratio of trigger signal	1 to 1000	1
50	TRG Edge UP:0 DW:1	Selection of edge of trigger signal 0:Up 1:Down	0,1	0
51	TRG Both:0 CW:1 CCW:2	Direction of trigger signal generation 0:Both 1:CW 2:CCW	0,1,2	0
52	TRG Pass:0 Exec:1	Enable setting to SYS No.48 – SYS No.51 0: Pass 1: Execute	0,1	0

5-9. Display of Position

5-9-1. Type of Display

In this device, you can select the method to display position with numerical from the following 4 types. Change in display is carried out by the system settings of manual operations. (→ “5-8. System Settings”)

<p>① Display by motor pulse</p> <p>SYS settings No.43 ← 0 (No.1 axis) No.46 ← 0 (No.2 axis)</p>	<p>Directly displays the same value as the pulse number outputted to the motor.</p> 
<p>② Display by motor pulse conversion</p> <p>SYS settings No.44 ← 1 (No.1 axis) No.47 ← 1 (No.2 axis)</p>	<p>Converts the pulse number into an actual distance or angle by the set conversion value to display.</p> 
<p>③ Display by encoder pulse</p> <p>SYS settings No.43 ← 1 (No.1 axis) No.46 ← 1 (No.2 axis)</p>	<p>Directly displays the read pulse number from the connected encoder.</p> 
<p>④ Display by encoder pulse conversion</p> <p>SYS settings No.43 ← 1 (No.1 axis) No.44 ← 1 No.46 ← 1 (No.2 axis) No.47 ← 1</p>	<p>· Converts the pulse from the connected encoder into an actual distance and angle with the set conversion value to display. · Or, converts and displays the value of the position if ratios of output pulse and encoder input pulse are different.</p> 

【Reference】

“5-8. System Settings”

6. Remote Control

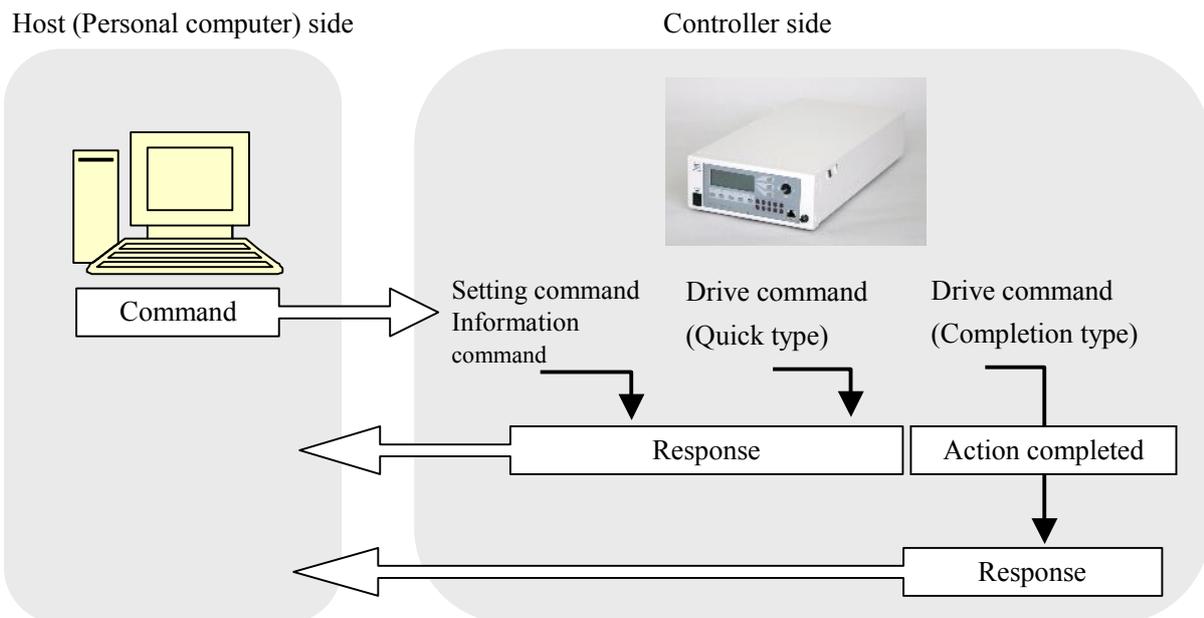
6-1. Remote Control

6-1-1. Transmission and Reception

The controller returns one response for one command.

The response timing varies according to the type of command or selection of response method.

- ① **Setting Command** The Commands such as MPC and ASI immediately return a response.
- ② **Drive Command** For drive-related commands, two types of response methods can be selected. (in RS-232C communications)
 - 1. Returns a response after completion of operations. (Completion mode)
 - 2. Returns a response immediately after receipt of the command, and confirms completion of operations by the STR command (Status Check). (Quick mode)
- ③ **Information Request Command** These commands returns requested data.

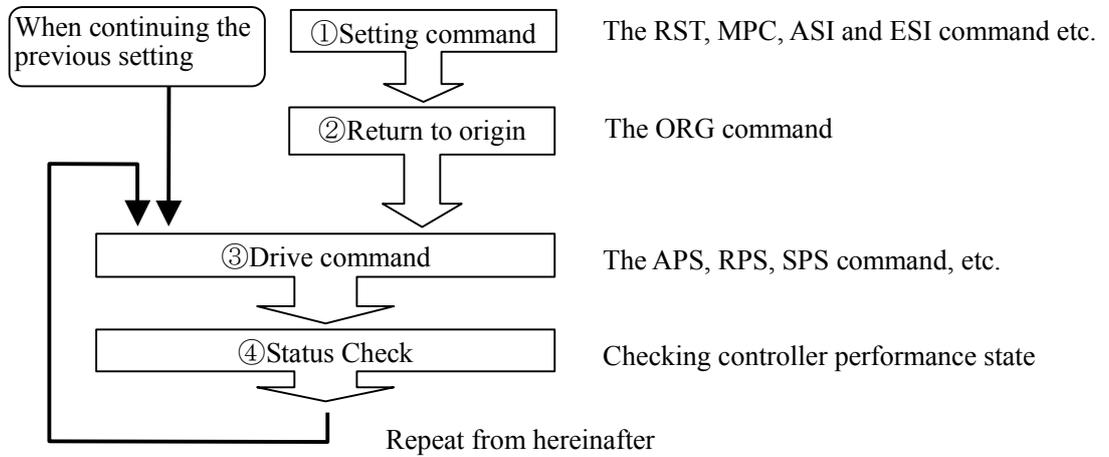


 All responses in GP-IB communications are of quick mode.

 Please refer to " 4-3. setting of DIP switch" about communication setting.

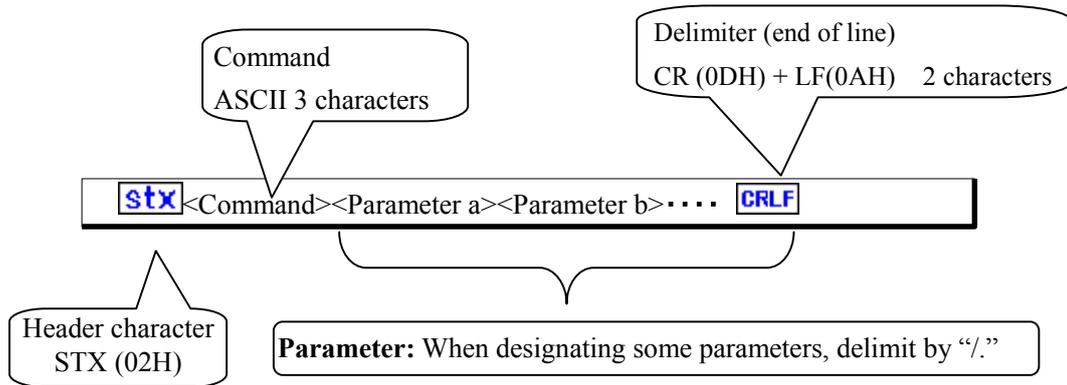
6-1-2. Remote Control Procedures

When you use SC-210/SC-410 for the first time or when you change the settings, it is required to transmit setting command at the beginning of remote control procedures.



6-1-3. Command Format

One command consists of a header character (STX) and the command, parameters, and delimiter (CRLF).



【Example】 Present position writing command: When you set pulse value of Axis No.2 to 1000

Sequence	1	2	3	4	5	6	7	8	9	10	11,12
Command	stx	W	R	P	2	/	1	0	0	0	CRLF
Hexadecimal	02	57	52	50	32	2F	31	30	30	30	0D,0A

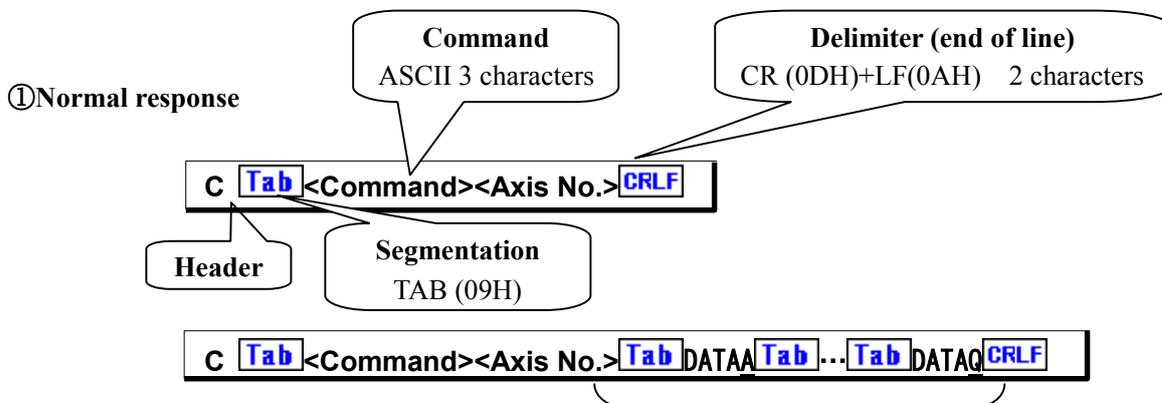
Characters which can be used in the command are numerical values (0 to 9), uppercase letters (A to Z), code (+, -) and symbol (/ , ?).

Space (20H) cannot be used in the command.

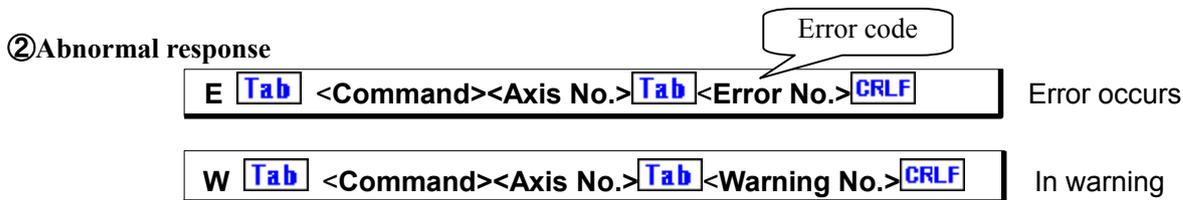
All parameters are required. Each parameter cannot be omitted.

6-1-4. Response

Format for response is as follows. When abnormality occurs, abnormal Response is returned. The response varies depending on each command, therefore, refer to the detailed page for each command.



In a case where a plurality of these characters exist, these are segmented by TAB and sent.



6-1-5. Characters Used

Characters described in the table below are characters which can be used in communications.

	0*	1*	2*	3*	4*	5*	6*	7*	8* to F*
*0	x	x	x	0	x	P	x	x	x
*1	x	x	x	1	A	Q	x	x	x
*2	stx	x	x	2	B	R	x	x	x
*3	x	x	x	3	C	S	x	x	x
*4	x	x	x	4	D	T	x	x	x
*5	x	x	x	5	E	U	x	x	x
*6	x	x	x	6	F	V	x	x	x
*7	x	x	x	7	G	W	x	x	x
*8	x	x	x	8	H	X	x	x	x
*9	Tab	x	x	9	I	Y	x	x	x
*A	LF	x	x	x	J	Z	x	x	x
*B	x	x	+	x	K	x	x	x	x
*C	x	x	x	x	L	x	x	x	x
*D	CR	x	-	x	M	x	x	x	x
*E	x	x	.	x	N	x	x	x	x
*F	x	x	/	?	O	x	x	x	x

Small letters (a to z) aren't usable.

6-2. List of Commands

The commands that are usable in SC-210/SC-410 are as in the table below.
For details, refer to the pages for respective commands.

		Command		Applicable model SC-		Page
Type	Description	Function		210	410	
Settings	RST	System Reset		○	○	78
	MPC	Motor-related Polarity Change		○	○	66
	ASI	Motor-related Initial Setting (set acceleration and deceleration by time)		○	○	56
	MSI	Motor-related Initial Setting (set acceleration and deceleration with STEP)		○	○	56
	ESI	Encoder-related Initial Settings		○	○	62
	LNK	Link Move Ratio Setting		2 axes	3 axes	65
	DSP	Display Switching		○	○	61
	RSI	Change Rectangular Drive Speed		○	○	77
Drive	ORG	Origin Return Drive		○	○	68
	APS	Absolute Position Drive		○	○	55
	RPS	Relative Position Drive		○	○	76
	SPS	Linear Interpolate Drive		○	○	81
	MPS	Multi-axis Position Drive		2 axes	4 axes	67
	OSC	Oscillation Drive		○	○	69
	FRP	Free Rotation Drive		○	○	63
	STP	Stop		○	○	83
	COF	ON/OFF for Excitation		○	○	60
Coordinate	RDP	Position Read		○	○	72
	WRP	Position Write		○	○	87
	RDE	Encoder Read		○	○	70
	WRE	Encoder Write		○	○	85
	RDO	Offset Read		○	○	71
	WRO	Offset Write		○	○	86
Information	STR	Status Read		○	○	84
	RSY	System Setting Information Read		○	○	78
	RMS	Motor Setting Information Read		○	○	75
	RMP	MPC Setting Information Read		○	○	74
	RES	(ESI) Encoder Setting Information Read		○	○	73
	IDN	Version Read		○	○	64
Speed Table	WTB	Speed Table Setting Information Write		○	○	88
	RTB	Speed Table Setting Information Read		○	○	79
Teaching	TAS	Teaching Function	Axis Information Set	2 axes	3 axes	89
	TMS	Teaching Function	Position Information Set	2 axes	3 axes	90
	RDT	Teaching Function	Position Data Read	2 axes	3 axes	92
	WRT	Teaching Function	Position Data Write	2 axes	3 axes	92
	TPS	Teaching Function	Teaching Drive Teaching Function	2 axes	3 axes	91

(To be continued to next page)

Commands that are usable in SC-210/SC-410 are as in the table below. For details, refer to the pages for respective commands.

(Continuance of previous page)

Type	Description	Command		Applicable model SC-		Page
			Function	210	410	
Easy control (Internal setting dependence)	PMS	Easy Control	Speed Change	○	○	93
	PMP	Easy Control	Relative Position Drive	○	○	94
	PMA	Easy Control	Absolute Position Drive	○	○	95
	PMH	Easy Control	Origin Search	○	○	96
Measurement	SCN	Continuous Scan		/	○	97
	RBU	Scan Data Read		/	○	99
	SFT	Fixed Time Measurement		/	○	101
Drive aid	RCP	Constant Pulse Read		○	○	103
	WCP	Constant Pulse Write		○	○	103
Shutter Control	SHM	Shutter	Manual Control	/	○	104
	SHG	Shutter	Expose	/	○	105
Trigger Control	TRG	Trigger	Setting	○	○	107
	TRS	Trigger	Select	○	○	109
	TRP	Trigger	Polarity Setting	/	○	111

6-3. Details of Commands

Details of each command are described below in alphabetical order.

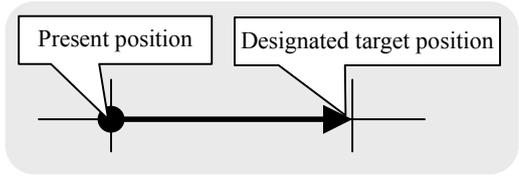
A P S	<i>Absolute Position Drive</i>	SC-210 SC-410
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【Function】 Moves to a target position by controlling absolute position.

【Format】 `stx` **APS**a/b/c/d/e/f/g/h `CRLF`

Parameter = 8

 Space between characters cannot be used.
Each parameter cannot be omitted.



Command parameters

Function	Setting	Remarks
a Axis No.	1 to 4	Varies according to model
b Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c Synchronizing mode	0: Invalid 1: Valid	Refer to the LNK command
d Selection of speed table	0 to 9	
e Moving target position	-68,108,813 to 68,108,813	※1
f Backlash correction	0: Invalid 1: CCW direction1 2: CW direction1 3: CW direction2 4: CCW direction2	Refer to the ASI command
g Encoder correction	0: Invalid 1: Valid 2: Continue	Refer to the ESI command
h Response method	0: Completed 1: Quick	※2

【Response】 Returns status information. ※Return timing varies depending on the response method.

Status	Response data
Normal	<code>C</code> <code>Tab</code> APS < Axis No.> <code>CRLF</code>
Abnormal	<code>W</code> <code>Tab</code> APS < Axis No.> <code>Tab</code> <Warning No.> <code>CRLF</code>
	<code>E</code> <code>Tab</code> APS < Axis No.> <code>Tab</code> <Error No.> <code>CRLF</code>

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

- Moves No. 1 axis to a position of 10000 with trapezoidal drive.
`stx` **APS1**/2/0/0/10000/0/0/0 `CRLF`
- Moves No. 2 axis to a position of -2000 with rectangular drive of speed table No.5 .
`stx` **APS2**/1/0/5/-2000/0/0/0 `CRLF`

【Remarks】

-  Carries out stop during driving with the stop command. → Refer to the STP command.
- (Note) When the response method is “0: Completed”, no response is returned if stopped by the STP command.
- ※1. Regarding to setting the target position, the amounts of the movement between the target position and the current position should be set up the value in a range from -16,777,215 to 16,777,215.
- ※2. When controlling by GPIB, operations are constantly carried out as “1: Quick” regardless of settings.

ASI MSI	<i>Motor-related Initial Setting</i>	SC-210 SC-410
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【Function】 Performs various settings to drive motor. For parameter details, refer to the next page and thereafter.

ASI = (Sets acceleration and deceleration by time)

MSI = (Sets acceleration and deceleration with STEP)

【Format】 **stx** ASI**a/b/c/d/e/f/g/h/i/j/k/l/m/n** **CRLF** Parameter = 14

【Format】 **stx** MSI**a/b/c/d/e/f/g/h/i/j/k/l/m/n** **CRLF** Parameter = 14



Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks	SYS
a	Axis No.	1 to 8	Varies according to model ※Effective when designating the speed table No. 0 (Refer to “3-1. Speed Setting”)	–
b	Start speed	1 to 4,095,500pps		1
c	Top speed	1 to 4,095,500pps		2
d	Accelerating time (ASI) Accelerating STEP (MSI)	1 to 1,000,000 ×10ms 1 to 1,000,000 STEP		3
e	Decelerating time (ASI) Decelerating STEP (MSI)	1 to 1,000,000 ×10ms 1 to 1,000,000 STEP		4
f	Position after detecting origin	-16,777,215 to 16,777,215		5
g	Prescale	0 to 16,777,215 pulse	6	
h	Backlash correction	0 to 16,777,215 pulse	7	
i	Motor pulse conversion Denominator	1 to 16,777,215	10	
j	Motor pulse conversion Numerator	1 to 16,777,215	11	
k	(Conversion: Trigonometric function)	0	Fixed to 0 ※Option	–
l	(Conversion: Distance from center)	0	Fixed to 0 ※Option	–
m	Designating rounding converted value	0 to 9		12
n	Stop method when detecting limit	0: Emergency stop (1: Decelerating stop)	※Fixed to 0 in case of standard specifications	13

※SYS in the above table is SYS No. in manual operations. Refer to “5-8. System Settings.”

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data				
Normal	C	Tab	ASI <Axis No.>	CRLF	
	C	Tab	ASI <Axis No.>	CRLF	
Abnormal	E	Tab	ASI <Axis No.>	Tab	<Error No.> CRLF
	E	Tab	ASI <Axis No.>	Tab	<Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Related】

The RMS Command Motor Setting Information Read

【Example】 When setting the same value as the default value on the No.2 axis, details of the parameter are as follows.

- When you use the ASI command

`stx`ASI2/500/5000/24/24/0/0/1/1/0/0/0/0`CRLF`

- When you use the MSI command

`stx`MSI2/500/5000/658/658/0/0/1/1/0/0/0/0`CRLF`

【Remarks】

 Note that if the limit stop method is set to “1: Deceleration” , the moving end limit is exceeded if the decelerating time is too long, whereby mechanical damage may occur. (Standard specification is fixed to “0: Emergency stop.”)

 Details that has been set is stored in the backup memory.

 When settings of the same item are changed by manual operation after setting by remote control, the details of the setting by manual operation is stored.

【Caution】

 Please note that a top speed up to 4,095,500 pps can be outputted, however, this does not mean that the motor and stage actually operate at that speed.

 Speed and other settings cannot be changed during driving.

■ ASI/MSI Command : Details of Parameter

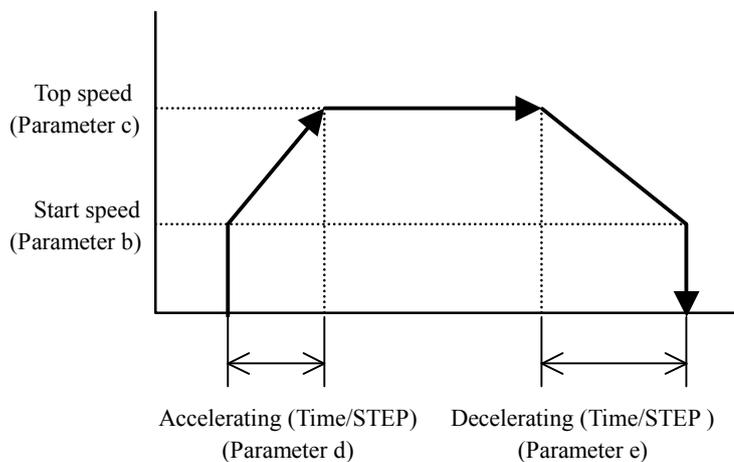
b Start Speed

c Top Speed

d Accelerating Time/ STEP

e Decelerating Time/ STEP

Sets the start speed, top speed, accelerating time and decelerating time. Relationships among them are as in the figure on the right.



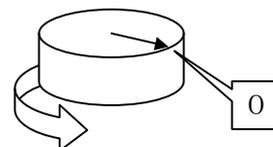
 This setting becomes effective when designating the speed table No. 0. In a case where designating the speed table No. 1 to 9, speed is driven with each table setting value.

f Position After Detecting Origin

Sets coordinate value (pulse amount) after origin detection (ORG) completed.
 (Example)When $f=1000$ was set, coordinate value of origin position becomes 1000 after returning to origin completed.

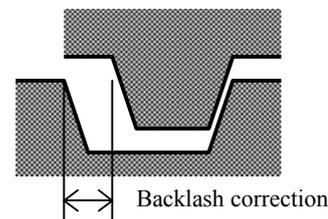
g Pre-Scale

When the pulse value exceeds the set coordinate value (pulse amount),it is automatically reset to 0.
 Set the value to “pulse of 1 rotation minus 1 pulse” when you use the multi-rotation stage.



h Backlash Correction Pulse Number

Corrects backlash generated by gear mechanism.
 Implementation of backlash correction is set by a drive command (such as APS and RPS).



【Reference】

Backlash correction method is selected from the following methods in implementation.

Setting	Details
0	Backlash correction invalid
1	When moving direction is changed from CCW to CW, reciprocating movement by correcting pulse amount is performed before moving.
2	When moving direction is changed from CW to CCW, reciprocating movement by correcting pulse amount is performed before moving.
3	After moving in the CCW direction, reciprocating movement by correcting pulse amount is performed.
4	After moving in the CW direction, reciprocating movement by correcting pulse amount is performed.

i j Motor Pulse Conversion Numerator and Denominator

Defines the ratio to convert the output pulse value of the motor into the coordinate value(distance/angle).
 It is a coefficient when the conversion value is specified by conversion display or the RDP (position read) command.

k 1 Trigonometric Function and Distance From Center(Optional function)

 This function is not equipped with the standard-spec products. Normally set these parameters to 0.

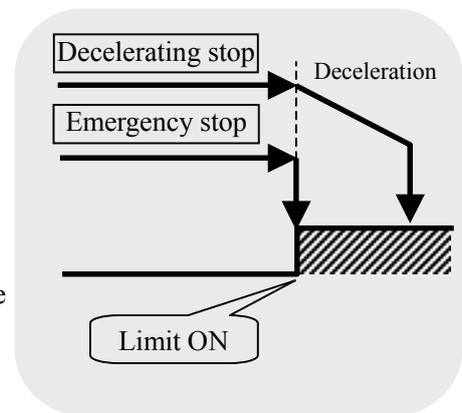
m Motor Pulse Conversion Value Designating Digit to be Rounded off

When using the conversion function, designates the digit of conversion data to be rounded off.

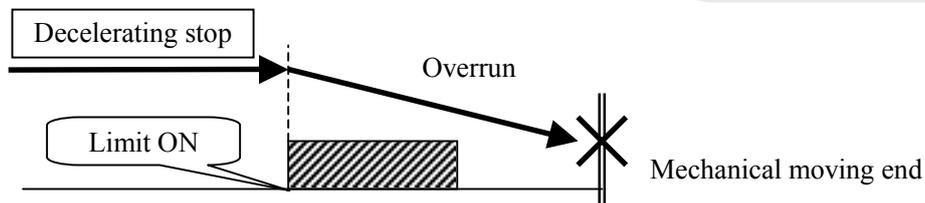
n Stop Method When Detecting Limit

Defines the stop method when detecting the limit sensor at the moving end.
There are two methods as follows.

Setting	Stop method	
0	Emergency stop	Immediately stops at the position where limit sensor is detected.
1	Decelerating stop	Decelerates and stops. The decelerating time is the same as that of the decelerating setting in normal drive.



 In decelerating stop setting, attention must be paid because if the decelerating time is set to be long, the amount of overrun becomes large and a mechanical failure such as bumping to the moving end occurs.



 With standard specifications, in order to eliminate the above trouble, “0: Emergency stop” becomes a fixed setting. If you would like to use in “1: Decelerating stop”, contact us for how to make a change in setting since a change can be made with internal setting.

COF	<i>ON/OFF for Excitation</i>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SC-210</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">SC-410</div>
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【Function】 Switches ON/OFF for motor output current.

【Format】 `stx` **COF**a/b `CRLF` Parameter = 2

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Excitation output switching	0, 1	0: Excitation ON 1: Excitation OFF

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	<code>C</code> <code>Tab</code> COF < Axis No.> <code>CRLF</code>
Abnormal	<code>E</code> <code>Tab</code> COF < Axis No.> <code>Tab</code> <Error No.> <code>CRLF</code>

For <Error No.>, refer to the item of "6-4. Error Code."

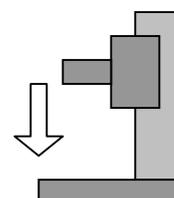
【Example】

 Error occurs if transmitting the drive-related command in a state of excitation OFF.
(Error code No.308)

 When using it for the Z axis, pay attention because falling off may occur when turning excitation OFF.

 When turning excitation OFF, the position may deviate because the motor becomes free. It is recommended to carry out origin return operations again after turning excitation ON.

 When turning off the power of the controller in the excitation OFF state and turning on the power again, the controller starts up in the excitation ON state.

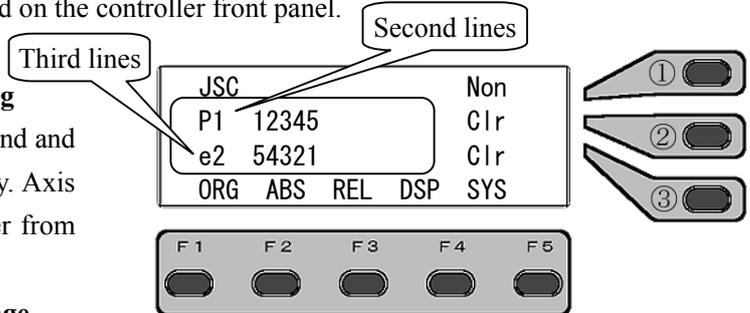


D S P	<i>Display Switching</i>	SC-210 SC-410
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【Function】 Switches description displayed on the controller front panel.

Function 1. Displayed axis No. switching

Switches axis No. displayed on the second and third lines from the liquid crystal display. Axis No. is displayed at the second character from the left.



Function 2. Pulse/Encoder display change

Switches pulse value display and encoder counter value display. In the case of pulse display, “P” or “p” is displayed for the first character from the left, and in the case of encoder display, “E” or “e” is displayed.

Function 3. Conversion value, Non conversion value switching

Determines whether pulse and encoder counter values are directly displayed or conversion-displayed by the set coefficient. Panel displays are distinguished by capital or small letter such as “P” and “p”.

Meaning of displayed characters

P	Pulse display value (Non conversion value)	E	Encoder count value (Non conversion value)
p	Pulse display value (Conversion value)	e	Encoder count value (Conversion value)

【Format】 stx **DSP**a/b/c CRLF Parameter = 3

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters ※SYS is SYS No. in manual operations.

Function	Setting	Remarks	SYS
a Designating display line	1, 2	1: Second line 2: Third line	—
b Axis No.	1 to 4	Varies according to model	42,45
c Selection of method	0, 1, 2, 3	0: Pulse value (Non conversion) 1: Encoder value (Non conversion) 2: Pulse value (Conversion) 3: Encoder value (Conversion)	43,44 46,47

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab DSP <Line No.> CRLF
Abnormal	E Tab DSP <Line No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Reference】 Pulse conversion setting (SYS No. 10 and 11), Encoder conversion setting (SYS No. 24 and 25)

【Remarks】

Details that has been set is stored in the backup memory.

When settings of the same item are changed by manual operation after setting by remote control, the details of the setting by manual operation is stored.

ESI	<i>Encoder-related Initial Settings</i>	<div style="display: inline-block; border: 1px solid black; padding: 2px;">SC-210</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-left: 10px;">SC-410</div>
------------	---	--

【Function】 Performs initial setting when using the encoder.

- Setting when reading a value of the encoder and only displaying → Setting of format ①
- Setting when performing feedback control (supplement) with position data of encoder → Setting of format ②

【Format】

①	stx	ESIa/b/c/d/e/f/g	CRLF Reading out encoder value	Parameter = 7
②	stx	ESIa/b/c/d/e/f/g/h/i/j/k	CRLF Performing encoder correction	= 11

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks	SYS
a	Axis No.	1 to 4	Varies according to model	-
b	N.C	0	Fixed to 0	-
c	Encoder conversion Denominator	1 to 16,777,215		24
d	Encoder conversion Numerator	1 to 16,777,215		25
e	Pre-scale	0 to 16,777,215		27
f	Multiplication	1, 2, 4-fold		26
g	Encoder polarity change	0: Normal 1: Reverse		33
h	Retry number	1 to 10,000 times		31
i	Permissible stop range	1		30
j	Waiting time	1 to 10,000	msec	32
k	Conversion designating rounding	0 to 9 digits	Refer to the RDE command	28

※SYS in the above table is SYS No. in manual operations. Refer to “5-8. System Setting.”

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab ESI <Axis No.> CRLF
Abnormal	E Tab ESI <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Remarks】



If this command is issued, the present encoder data is rewritten.



Details that has been set is stored in the backup memory.



When settings of the same item are changed by manual operation after setting by remote control, the details of the setting by manual operation is stored.

FRP	<i>Free Rotation Drive</i>	SC-210 SC-410
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【Function】 Continuous drive is carried out until the stop command (STP) is issued.

【Format】 **stx** FRP**a/b/c/d/e/f** **CRLF** Parameter = 6

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c	Synchronizing mode	0: Invalid 1: Valid	Refer to the LNK command
d	Selection of speed table	0 to 9	
e	Rotational direction	1: CW direction 0: CCW direction	
f	Response method	0: Completed 1: Quick	※1

【Response】 Returns status information. ※Return timing varies depending on the response method.

Status	Response data
Normal	C Tab APS< Axis No.> CRLF
Abnormal	W Tab APS< Axis No.> Tab <Warning No.> CRLF
	E Tab APS< Axis No.> Tab <Error No.> CRLF

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

1. Continuously rotates the No. 1 axis in the CW direction by trapezoidal drive.

stx FRP1/2/0/0/1/0 **CRLF**

【Remarks】

Carries out stop during driving with the stop command. → Refer to the STP command.

(Note) When the response method is 0: completed, no response is returned if stopped by the STP command.

※1. When controlling by GPIB, operations are constantly carried out as “1: Quick” regardless of settings.

I D N	<i>Version Read</i>	SC-210 SC-410
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【Function】 Responds with the model name of the controller body and the version of the system program.

【Format】 stx IDN CRLF Parameter = 0

【Response】 C Tab IDN0 Tab <Model name> Tab <Version> CRLF

【Example of Response】 C Tab IDN0 Tab 210 Tab 1000 CRLF “SC-210 Ver1.000”

【Example of Response】 C Tab IDN0 Tab 410 Tab 1000 CRLF “SC-410 Ver1.000”

LNK	<i>Link Move Ratio Setting</i>	SC-210 SC-410
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【Functions】 Sets axes and ratios of synchronous drive.

【Format】 Master+ Slave 1

```

[stx] LNKab/c [CRLF]
    
```

Parameter = 3

【Format】 Master+ Slave 1+ Slave 2

```

[stx] LNKab/c/d/e [CRLF]
    
```

Parameter = 5



Space between characters cannot be used. Each parameter cannot be omitted.

Command Parameters

	Function	Settings	Remarks
a	Master axis No.	1 to 4	Varies according to model
b	Slave 1 axis No.	1 to 4	Varies according to model
c	Slave 1 ratio	1 to 256	
d	Slave 2 axis No.	1 to 4	Varies according to model
e	Slave 2 ratio	1 to 256	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response Data
Normal	C [Tab] LNK <Axis No.> [CRLF]
Abnormal	E [Tab] LNK <Axis No.> [Tab] <Error No.> [CRLF]

For <Error No.>, refer to the item of "6-4. Error Code."

【Example】

Sets axis No.1 to master axis, axis No.2 to slave 1 axis/ratio 2 and axis No.3 to slave 2 axis/ratio 3.

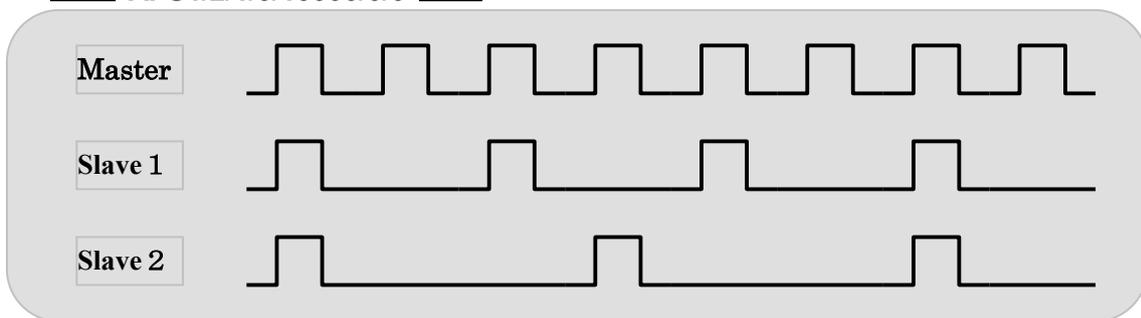
```

[stx] LNK1/2/2/3/3 [CRLF]
    
```

Moves No. 1 axis to the position of 10000 in synchronization mode by trapezoidal drive. (Synchronization mode 1 : Valid)

```

[stx] APS1/2/1/0/10000/0/0 [CRLF]
    
```



【Remarks】



Details that has been set is stored in the backup memory.

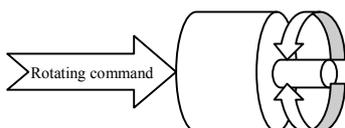
M P C	<i>Motor-related Polarity Change</i>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SC-210</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">SC-410</div>
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【Function】 Changes and sets rotating direction of the motor and input logic of each sensor such as limit and origin.

①Motor rotating direction
Sets actual rotating direction to rotating command.

②Sensor input logic
Sets logic (N.C, N.O) in agreement with the connected sensor.

③CW, CCW swap
Electrically switches effective limit sensor for moving direction.



【Format】 **stx** **MPC**a/b/c/d/e/f/g **CRLF** Parameter = 7

Space between characters cannot be used. Each parameter cannot be omitted.

Command Parameters

	Function	Setting range	Remark
a	Designating axis	1 to 4	Varies according to model
b	Motor rotating direction	0: Forward rotation 1: Reverse rotation	
c	CW limit sensor	0: Positive 1: Negative	
d	CCW limit sensor	0: Positive 1: Negative	
e	NORG sensor	0: Positive 1: Negative	
f	ORG sensor	0: Positive 1: Negative	
g	CW, CCW swap	0: Positive 1: Negative	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	C Tab MPC <Axis No.> CRLF
Abnormal	E Tab MPC <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Related】

The RMP command MPC setting information read

【Remarks】

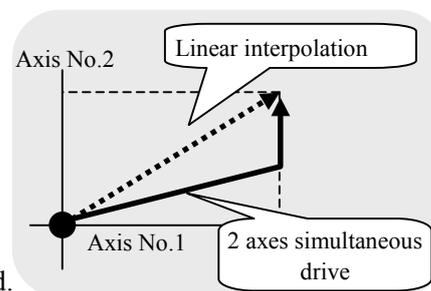
Details that has been set is stored in the backup memory.

When settings of the same item are changed by manual operation after setting by remote control, the details of the setting by manual operation is stored.

MPS	<i>Multi-axis Position Drive</i>	SC-210 SC-410
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【Function】 Performs simultaneous drive of 2 to 4 axes.

【Explanation】 In general, periods of time required for movement differ and loci are depicted as shown by the broken line as in the right handed figure, if the moving distance and moving speed differ from each other in the 2 axes simultaneous drive. However, if the linear interpolation (SPS) command is designated, the speeds of the respective axes are automatically calculated.



- 【Format】**
- ① Designating 2 axes `stxMPSa/b/c/d/i` `CRLF` Parameter = 5
 - ② Designating 3 axes `stxMPSa/b/c/d/e/f/i` `CRLF` Parameter = 7
 - ③ Designating 4 axes `stxMPSa/b/c/d/e/f/g/h/i` `CRLF` Parameter = 9

Space between characters cannot be used. Each parameter cannot be omitted.
 3-4 axes specification cannot be used with SC-210.

Command parameters

	Function	Setting	Remarks
a	1st axis No.	1 to 4	Varies according to model
b	1st axis target position	-68,108,813 to 68,108,813	※1
c	2nd axis No.	1 to 4	Varies according to model
d	2nd axis target position	-68,108,813 to 68,108,813	※1
e	3rd axis No.	1 to 4	Varies according to model
f	3rd axis target position	-68,108,813 to 68,108,813	※1
g	4th axis No.	1 to 4	Varies according to model
h	4th axis target position	-68,108,813 to 68,108,813	※1
i	Response method	0: Completed 1: Quick	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	<code>C</code> <code>Tab</code> <code>APS< No. 1 Axis No.></code> <code>CRLF</code>
Abnormal	<code>W</code> <code>Tab</code> <code>APS< No. 1 Axis No.></code> <code>Tab</code> <code><Warning No.></code> <code>CRLF</code>
	<code>E</code> <code>Tab</code> <code>APS< No. 1 Axis No.></code> <code>Tab</code> <code><Error No.></code> <code>CRLF</code>

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】 When simultaneously driving with the MPS command for No. 1 to No. 3 axes

1. Sets the drive condition by setting the target positions of No. 1 to No. 3 axes to ?. (Type ? character)
 - `stx` `APS1/2/0/0/?/0/0/0` `CRLF`
 - `stx` `APS2/2/0/0/?/0/0/0` `CRLF`
 - `stx` `APS3/2/0/0/?/0/0/0` `CRLF`
2. Sets No.1 axis to the target position 1000, No.2 axis to the target position 2000, and No.1 axis to the target position 1500.
 - `stx` `MPS1/1000/2/2000/3/1500/0` `CRLF`

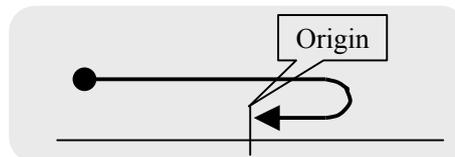
【Remarks】

The content set in APS ? is stored in the backup memory as MPS data.

※1. Regarding to setting the target position, the amounts of the movement between the target position and the current position should be set up the value of the range from -16,777,215 to 16,777,215.

ORG	<i>Origin Return Drive</i>	SC-210 SC-410
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【Function】 Performs origin position detection according to the selected method. For return to origin, 16 methods can be selected. For details, refer to “3-3. Origin Return Method.”

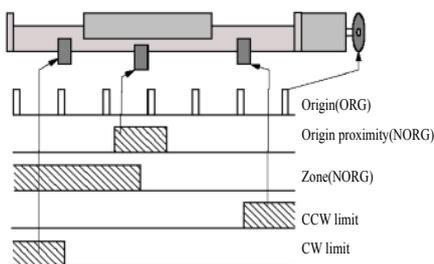


【Format】 stx **ORG**a/b/c/d/e/f CRLF Parameter = 6

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c	Synchronizing mode	0: Invalid 1: Valid	Refer to the LNK command
d	Speed table selection	0 to 9	
e	Origin return method selection	1 to 14	Refer to “3-3. Origin Return Method”
f	Response method	0: Completed 1: Quick	



Sensor configuration

Method	Sensor configuration	Description
1	S1, S3	Returning direction is determined with zone sensor NORG(S3) and detects origin ORG(S1).
2	S3	Returning direction is determined with zone sensor NORG(S3) and set the edge of the zone sensor NORG(S3) the origin position.
3	S1, S2, L-	ORG(S1) located in NORG (S2) is origin position.
4	S2, L-	NORG (S2) sensor located in moving zone is set to be the origin position.
5	S1, L+	Origin sensor ORG(S1) in proximity of CW limit(L+) is set to be the origin position.
6	S1, L-	Origin sensor in proximity of CCW limit(L-) is set to be the origin position.
7	L+	Edge of CW limit(L+) is set to be the origin position.
8	L-	Edge of CCW limit(L-) is set to be the origin position.
9	S1	ORG (S1) sensor located in moving zone is set to be the origin position.
10	Non	Present position is set to be the origin position. (stage doesn't move.)
11	S1, L+	After the origin position is detected by method 5, and moved by the set amount, this position is set to be the origin.
12	S1, L-	After the origin position is detected by method 6, and moved by the set amount, this position is set to be the origin.
13	L+	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
14	L-	After the origin position is detected by method 7, and moved by the set amount, this position is set to be the origin.
15		Optional function
16	S1, S2, L-	ORG (S1) located in NORG (S2) is origin position.(Low speed)
17	S2, L-	NORG (S2) sensor located in moving zone is set to be the origin position.(Low speed)

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	C Tab ORG <Axis No.> CRLF
Abnormal	E Tab ORG <Axis No.> Tab <Error No.> CRLF

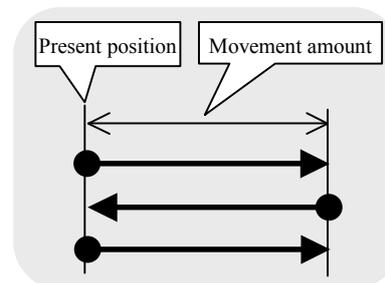
For <Error No.>, refer to the item of “6-4. Error Code.”

【Remarks】

Speed setting of manual operation is not changed by speed setting of the ORG command.

OSC	<i>Oscillation Drive</i>	SC-210 SC-410
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【Function】 Performs oscillation drive between the present position and the position specified by movement amount.



【Format】 `[stx] OSCa/b/c/d/e/f/g/h/i/j/k [CRLF]`

Parameter = 11

Space between characters cannot be used.
Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c	Synchronizing mode	0: Invalid 1: Valid	Refer to the LNK command
d	Selection of speed table	0 to 9	
e	Oscillating direction	0: CCW 1: CW	
f	Movement amount	-16,777,215 to 16,777,215	
g	Oscillating times	1 to 65,534	One reciprocation by 2 times
h	Stop time	0 to 65,534	× 1msec
i	Shutter synchronization	0: Invalid 1: Valid	※1
j	Backlash correction	0: Invalid 1: CW direction1 2: CCW direction1 3: CCW direction2 4: CW direction2	Refer to the ASI command
k	Response method	0: Completed 1: Quick	※2

【Response】 Returns status information. ※Return timing varies depending on the response method.

Status	Response data
Normal	<code>C [Tab] OSC <Axis No.> [CRLF]</code>
Abnormal	<code>W [Tab] OSC <Axis No.> [Tab] <Warning No.> [CRLF]</code>
	<code>E [Tab] OSC <Axis No.> [Tab] <Error No.> [CRLF]</code>

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

Performs 5 reciprocations of the No. 1 axis between the present position and the position that are 10000 pulses away from the present position.
(Stop time when reversing: 0.1 seconds)

`[stx] OSC1/2/0/0/10000/10/100/0/0/0 [CRLF]`

【Remarks】

Carry out a stop during driving by the stop (STP) command. Refer to the STP command.
(Note) When the Response method is 0: completed, no response is returned if stopped by the STP command.

The present oscillating times can be known with the STR command.

※1. In SC-210, the shutter synchronization can use only "0: invalidity".
When "1: effective" is transmitted shutter synchronously with SC-210, error code 700 is answered.
※2. When controlling by GPIB, operations are constantly performed as “1: Quick” regardless of settings.

RDE	<i>Encoder Read</i>	SC-210 SC-410
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【Function】 Responds with the counter value of the connected encoder input.

【Format】 **stx** RDE**a/b** **CRLF** Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Mode	0: Pulse 1: Pulse + Offset 2: Conversion value 3: Conversion value + Offset	

【Response】 Returns counter value.

Status	Response data
Normal	C Tab RDE <Axis No.> Tab <Counter value> CRLF
Abnormal	E Tab RDE <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of "6-4. Error Code."

【Example】 Reads the second encoder value.

Command: **stx** RDE**2/0** **CRLF**
 ↓
 Response: **C** **Tab** RDE**2** **Tab** **-2000** **CRLF**

【Related】

The ESI command Initial setting of the encoder

RDO	<i>Offset Read</i>	SC-210 SC-410
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【Function】 Responds with the present set offset.

【Format】 **stx** **RDO****a** **CRLF** Parameter = 1

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model

【Response】 Returns an offset value.

Status	Response data			
Normal	C	Tab	RDO <Axis No.>	Tab <Offset value> CRLF
Abnormal	E	Tab	RDO <Axis No.>	Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Reads the offset value of axis No.1.

Command: **stx** **RDO****1** **CRLF**

↓

↓

Response: **C** **Tab** **RDO****1** **Tab** **100** **CRLF**

RDP	<i>Position Read</i>	SC-210 SC-410
------------	----------------------	---------------

【Function】 Responds with the present position information (counter value).

【Format】 **stx** RDP**a/b** **CRLF** Parameter = 2

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Mode	0: Pulse 1: Pulse + Offset 2: Conversion value 3: Conversion value + Offset	

【Response】 Returns the counter value.

Status	Response data
Normal	C Tab RDP <Axis No.> Tab <Counter value> CRLF
Abnormal	E Tab RDP <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of "6-4. Error Code."

【Example】 Reads the coordinate value of axis No.2.

Command: **stx** RDP2/0 **CRLF**

↓

Response: **C** **Tab** RDP2**Tab**123456**CRLF**

RES	<i>(ESI) Encoder Setting Information Read</i>	SC-210 SC-410
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【Function】 Responds with present encoder setting information set by the ESI command.

【Format】 **stx** RES**a** **CRLF** Parameter = 1

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model

【Response】 Returns encoder setting information.

Plural parameters are returned being sandwiched in the Tab codes.

Status	Response Data
Normal	C Tab RES A Tab ... Tab K CRLF
Abnormal	E Tab RES<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Response data】

	Item	Status	Remarks
A	Axis No.	1 to 4	Varies according to model
B	N.C	0	Fixed to 0
C	Encoder conversion Denominator	1 to 16,777,215	
D	Encoder conversion Numerator	1 to 16,777,215	
E	Pre-scale	0 to 16,777,215	
F	Multiplication	1、 2、 4	
G	Encoder polarity change	0: Normal 1: Reverse	
H	Retry number	1 to 10,000	
I	Permissible stop range	1	
J	Waiting time	1 to 10,000	msec
K	Conversion Designating rounding	0 to 9	Refer to the RDE command

【Example】 Reads the setting of axis No.2.

Command: stx RES2 CRLF

↓

Response: **C** Tab RES2 Tab 0 Tab 1 Tab 1 Tab 0 Tab 1 Tab 0 Tab 10 Tab 1 Tab 10 Tab 0 CRLF

【Related】

The ESI Command Initial settings of the encoder

RMP	<i>MPC Setting Informaion Read</i>	SC-210 SC-410
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【Function】 Responds with present motor related polarity setting information set by the MPC command.

【Format】 **stx** **RMP****a** **CRLF** Parameter = 1

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
<u>a</u>	Axis No.	1 to 4	Varies according to model

【Response】 Returns motor related polarity setting information.

Plural parameters are returned being sandwiched in the **Tab** codes.

Status	Response Data
Normal	C Tab RMP <u>A</u> Tab <u>B</u> Tab ... Tab <u>G</u> CRLF
Abnormal	E Tab RMP <Axis No.> Tab <Error No.> CRLF

For **<Error No.>**, refer to the item of “6-4. Error Code.”

【Response data】

	Item	Status	Remarks
<u>A</u>	Axis No.	1 to 4	Varies according to model
<u>B</u>	Motor rotating direction	0: Forward rotation 1: Reverse rotation	
<u>C</u>	CW limit sensor	0: Positive 1: Negative	
<u>D</u>	CCW limit sensor	0: Positive 1: Negative	
<u>E</u>	NORG sensor	0: Positive 1: Negative	
<u>F</u>	ORG sensor	0: Positive 1: Negative	
<u>G</u>	CW, CCW swap	0: Positive 1: Negative	

【Example】 Reads setting of No. 1 axis.

Command: **stx****RMP****1****CRLF**

↓

Response: **C** **Tab** **RMP****1** **Tab** **0** **Tab** **1** **Tab** **1** **Tab** **0** **Tab** **1** **Tab** **0** **CRLF**

【Related】

The MPC command Motor related polarity setting

RMS	<i>Motor Setting Information Read</i>	SC-210 SC-410
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【Function】 Responds with present motor related initial setting information set by the ASI and MSI commands.

【Format】 **stx** **RMSa** **CRLF** Parameter =1

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model

【Response】 Returns motor related initial setting information.

Plural parameters are returned being sandwiched in the Tab codes.

Status	Response Data
Normal	C Tab RMS A Tab B Tab ... Tab Q CRLF
Abnormal	E Tab RMS <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Response data】

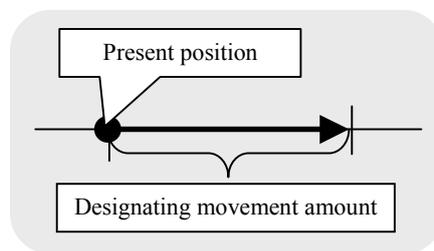
	Item	Status	Remarks
A	Axis No.	1 to 4	Varies according to model
B	Start speed	1 to 4,095,500 pps	※Setting value of speed table No. 0 (Refer to “3-1. Speed setting”)
C	Top speed	1 to 4,095,500 pps	
D	Accelerating pulse number	0 to 1,000,000 pulse	
E	Decelerating pulse number	0 to 1,000,000 pulse	
F	Position after detecting origin	-16,777,215 to 16,777,215	
G	Pre-scale	0 to 16,777,215 pulse	
H	Backlash correction	0 to 16,777,215 pulse	
I	Motor pulse conversion Denominator	0 to 16,777,215	
J	Motor pulse conversion Numerator	1 to 16,777,215	
K	(Conversion Trigonometric function)	0	※Option
L	(Conversion Distance from center)	0	※Option
M	Designating rounding off converted value	0 to 9	
N	Stop method when detecting limit	0: Emergency stop (1: Decelerating stop)	※Fixed to 0 for standard specification
O	Accelerating time	1 to 1,000,000	× 10msec
P	Decelerating time	1 to 1,000,000	
Q	Rectangular driving speed	1 to 4,095,500	pps ※SC controller Ver.3.00 or more

【Related】

The ASI Command、the MSI Command Motor Related Initial Setting
The RSI Command Rectangular Drive Speed

RPS	<i>Relative Position Drive</i>	SC-210 SC-410
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【Function】 Moves from the present position to a position by a set movement amount.



【Format】 `stx RPSa/b/c/d/e/f/g/h CRLF`

Parameter = 8

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c	Synchronizing mode	0: Invalid 1: Valid	Refer to the LNK command
d	Selection of speed table	0 to 9	
e	Movement amount	-16,777,215 to 16,777,215	
f	Backlash correction	0: Invalid 1: CW direction1 2: CCW direction1 3: CCW direction2 4: CW direction2	Refer to the ASI command
g	Encoder correction	0: Invalid 1: Valid 2: Continue	Refer to the ESI command
h	Response method	0: Completed 1: Quick	※1

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	<code>C Tab RPS<Axis No.> CRLF</code>
Abnormal	<code>W Tab RPS<Axis No.> Tab <Warning No.> CRLF</code>
	<code>E Tab RPS<Axis No.> Tab <Error No.> CRLF</code>

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

1. Moves No. 1 axis with trapezoidal drive by 1000 pulses.
`stx RPS1/2/0/0/1000/0/0/0 CRLF`
2. Moves No. 2 axis in negative direction by 2000 pulses with rectangular drive of speed table No.5.
`stx RPS2/1/0/5/-2000/0/0/0 CRLF`

【Remarks】

Carried out a stop during driving by the stop (STP) command. Refer to the STP command.
(Note) When the response method is 0: completed, no response is returned if stopped by the STP command.

The RPS command exerts no influence on setting of relative movement amount /speed table No.(REL) in manual operation.

※1. When controlling by GPIB, operations are constantly performed as “1: Quick” regardless of settings.

RSI	<i>Change Rectangular Drive Speed</i>	SC-210 SC-410
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【Function】 Changes rectangular speed of the speed parameter set by the ASI,MSI,WTB command.

【Format】 **stx** **RSI**a/b/c **CRLF** Parameter=3

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Speed table	0 to 9	
c	Rectangular Drive Speed	1 to 4,095,500	pps

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab RSI <Axis No.> CRLF
Abnormal	E Tab RSI <Axis No.> Tab <Error No.> CRLF

For <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Remarks】

There is a rectangular, driving speed that cannot be set the ASI,MSI,WTB command in the calculation of the pulse etc. ,this command supplements it.

【Related】

The RMS Command、 the RTB Command

R S T	<i>System Reset</i>	SC-210 SC-410
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【Function】 Resets all settings in the controller to the initial status (settings when shipping from the factory).

【Format】 stx RST CRLF Parameter = 0

Space cannot be used in the command sentence.

【Response】 Returns status information.

Status	Response data
Normal	C Tab RST CRLF
Abnormal	E Tab RST Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Remarks】

About 60 ms is required to complete (response) the reset after transmitting the RST command.

R S Y	<i>System Setting Information Read</i>	SC-210 SC-410
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【Function】 Reads the present set value of the system setting parameters.
For system setting, refer to the “5-8-1. List of System Settings.”

【Format】 stx RSYa/b CRLF Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	SYS No.	1 to 47	

【Response】 Returns set value.

Status	Response data
Normal	C Tab RSY<Axis No.> Tab <SYS No.> Tab <Set value> CRLF
Abnormal	E Tab RSY<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】

1. Check the excitation output status ON/OFF of No. 1 axis.
stx RSY1/21CRLF -> CTabRSY1Tab21Tab0CRLF ...Excitation ON
2. Check the origin return method of No. 2 axis.
stx RSY2/9CRLF -> CTabRSY2Tab9Tab3CRLF ...Setting 3

RTB	<i>Speed Table Setting Information Read</i>	SC-210 SC-410
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【Function】 Reads the present set value in the speed table.

【Format】 **stx** RTBa/b **CRLF** Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Speed table No.	1 to 11	

※Speed table No.1-9 are used for drive commands in remote control, origin return drive, absolute position movement and relative position movement in manual operations.

Speed table No. 10 and 11 are speed for joystick operation in manual operations. No. 10 is the setting in high speed operations, and No. 11 is the setting in low speed operations.

【Response】 Returns set value. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab RTB A Tab B Tab ... Tab J CRLF
Abnormal	E Tab RTB <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Response data】

	Item	Status	Remarks
A	Axis No.	1 to 4	Varies according to model
B	Speed table No.	1 to 11	1 - 9: For drive system 10, 11: Joystick operation speed
C	Setting method check	0:MSI 1 : ASI	※1
D	Start speed	1 to 4,095,500	pps
E	Top speed	1 to 4,095,500	pps
F	Accelerating pulse number	1 to 1,000,000	Pulse
G	Decelerating pulse number	1 to 1,000,000	Pulse
H	Accelerating time	1 to 1,000,000	× 10ms
I	Decelerating time	1 to 1,000,000	× 10ms
J	Rectangular drive speed	1 to 4,095,500	pps ※SC Controller Ver.3.00 or more

※1 Returns command type (MSI or ASI) used for motor setting.

【Reference】

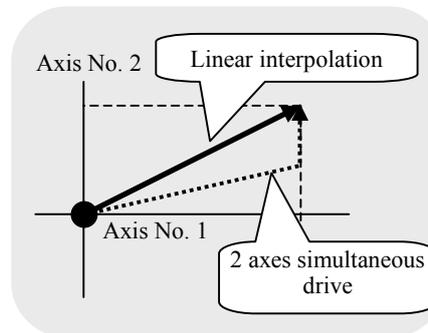
The WTB command, the RSI command

MEMO

S P S	<i>Linear Interpolate Drive</i>	SC-210 SC-410
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【Function】 Performs linear interpolation in simultaneous drive of 2 or 3 axes.

【Description】 In general 2 axes simultaneous drive, if the moving distances or moving speeds of the axes are different from each other, the time period required to move also differs as shown by the broken line in the figure on the right, however, if linear interpolation is designated, the velocities of respective axes are automatically calculated and respective axes move linearly.



【Format】

- | | | | |
|---|--------------------|---|----------------|
| ① | Designating 2 axes | <code>stx</code> SPSa/b/c/d/g/h/i/j/l/m <code>CRLF</code> | Parameter = 10 |
| ② | Designating 3 axes | <code>stx</code> SPSa/b/c/d/e/f/g/h/i/j/k/l/m <code>CRLF</code> | Parameter = 13 |



Space between characters cannot be used. Each parameter cannot be omitted.

- The speed of other axes is decided based on the speed of the first axis, and note the overspeed, please when driving distance of the first axis is more extremely shorter than that of other axes.
- Designation of 3 axes cannot be used for SC-210.

Command parameters

Function	Setting	Remarks
a 1st axis No.	1 to 4	Varies according to model
b 1st axis target position	-68,108,813 to 68,108,813	※1
c 2nd axis No.	1 to 4	Varies according to model
d 2nd axis target position	-68,108,813 to 68,108,813	※1
e 3rd axis No.	1 to 4	Varies according to model
f 3rd axis target position	-68,108,813 to 68,108,813	※1
g Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
h Speed table selection	0 to 9	
i 1st axis encoder correction	0: Invalid 1: Valid 2: Continue	Refer to the ESI command
j 2nd axis encoder correction	0: Invalid 1: Valid 2: Continue	
k 3rd axis encoder correction	0: Invalid 1: Valid 2: Continue	
l Backlash correction	0: Invalid 1: CW direction1 2: CCW direction1 3: CCW direction2 4: CW direction2	Refer to the ASI command
m Response method	0: Completed 1: Quick	※2

※1. Regarding to setting the target position, the amounts of the movement between the target position and the current position should be set up the value of the range from -16,777,215 to 16,777,215.

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data	
Normal	C	Tab SPS<No. 1 axis>CRLF
Abnormal	W	Tab SPS<No. 1 axis>Tab <Warning No.>CRLF
	E	Tab SPS<No. 1 axis>Tab <Error No.>CRLF

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

1. Moves No. 1 and No. 2 axes to respective positions of No. 1=1000 and No. 2=2000 with trapezoidal drive and at speed table No.3.

stx SPS1/1000/2/2000/2/3/0/0/0/0 **CRLF**

2. Performs encoder correction for all 3 axes of No. 1, No. 2 and No. 3 when they move to positions of No. 1=100, No. 2=-200 and No. 3=500 respectively at speed table No.5.

stx SPS1/100/2/-200/3/500/2/5/1/1/1/0/0 **CRLF**

【Remarks】



Carries out a stop during driving by the stop (STP) command. Refer to the STP command.

(Note) When the Response method is “0:Completed”, Response is not returned if stopped by the STP command.



※2. When controlling by GPIB, operations are constantly performed as “1: Quick” regardless of setting.

S T P	<i>Stop</i>	SC-210 SC-410
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【Function】 Stops the motor driving. You can designate stopping only designated axis or stopping all axes.

【Format】 ① `stx STPa/b CRLF` Stop designated axis Parameter =2
 ② `stx STP0/b CRLF` Stop all axes

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

Function		Setting	Remarks
a	Axis No.	0: All axes stop 1 to 4:Axis No.	Varies according to model
b	Selecting stop mode	0: Decelerate and stop 1: Emergency stop	

【Response】 Returns set value.

Status	Response data
Normal	<code>C Tab STP<Axis No.>CRLF</code>
Abnormal	<code>E Tab STP<Axis No.>Tab <Error No.>CRLF</code>

For <Error No.>, refer to the item of “6-4. Error Code.”

 Response is transmitted when the axis completely stops.

STR	<i>Status Read</i>	SC-210 SC-410
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- 【Function】** Checks status of the controller.
- ① Checking driving operations
 - ② Status of limit and sensor
 - ③ Error information

【Format】 **stx** STRa/b **CRLF** Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Mode	1	Fixed to 1 (For standard specification)
b	Axis No.	1 to 4	Varies according to model

※Designation of mode a is used for special specifications. Normally setting is fixed to 1.

【Response】 Returns status of controller. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab STR A Tab B Tab ... Tab I CRLF
Abnormal	E Tab STR<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Response data】

	Item	Status	Remarks
A	Axis No.	1 to 4	Varies according to model
B	Mode	1	1 Fixed(For standard specification)
C	Driving operations	0: In suspended 1: Operating alone 2: Operating as slave of link 3: Operating with multi-axes drive	
D	NORG signal	0:OFF 1:ON	
E	ORG signal	0:OFF 1:ON	
F	CW limit signal	0:OFF 1:ON	
G	CCW limit signal	0:OFF 1:ON	
H	Swing drive count number	Returns count number	In oscillation drive During normal time, the count number is 0.
I	Error	Returns error No.	If the error No. has read once, then it is cleared to 0.

WRE	<i>Encoder Write</i>	SC-210 SC-410
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【Function】 Rewrites the counter value of the encoder. The counter value by the encoder signal continues to increase and decrease from the rewritten value.

【Format】 STX WREa/b CRLF Parameter = 2

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Set value	-68,108,813 to 68,108,813	Pulse

【Response】 Returns status.

Status	Response data
Normal	C Tab WRE<Axis No.> CRLF
Abnormal	E Tab WRE<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

WRO	<i>Offset Write</i>	SC-210 SC-410
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【Function】 Rewrites the offset value.

【Format】 `stx` `WROa/b` `CRLF` Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Offset value	-68,108,813 to 68,108,813	Pulse

【Response】 Returns status.

Status	Response data
Normal	<code>C</code> <code>Tab</code> <code>WRO<Axis No.></code> <code>CRLF</code>
Abnormal	<code>E</code> <code>Tab</code> <code>WRO<Axis No.></code> <code>Tab</code> <code><Error No.></code> <code>CRLF</code>

For <Error No.>, refer to the item of “6-4. Error Code.”

Writes offset 100 to the present coordinate.

Command: `stx` `RDP2/1` `CRLF` → `C` `Tab` `RDP2` `Tab` `0` `CRLF`

Command: `stx` `WRO2/100` `CRLF` → `C` `Tab` `WRO2` `CRLF`

Command: `stx` `RDP2/1` `CRLF` → `C` `Tab` `RDP2` `Tab` `100` `CRLF`

【Remarks】

The offset is also reflected on the read values converted.
 Issue the ASI and ESI commands in advance.

WRP	<i>Position Write</i>	SC-210 SC-410
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【Function】 Rewrites the value of the present position.

【Format】 stx **WRP**a/b CRLF Parameter =2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Set value	-68,108,813 to 68,108,813	Pulse

【Response】 Returns status.

Status	Response data		
Normal	C	Tab WRP<Axis No.>	CRLF
Abnormal	E	Tab WRP<Axis No.>	Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

W T B	<i>Speed Table Setting Information Write</i>	SC-210 SC-410
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【Function】 Rewrites the set value of the speed table.

【Format】 **stx** **WTBa/b/c/d/e/f** **CRLF** Parameter = 6

 Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Speed table No.	1 to 11	1 ~ 9: For drive system 10, 11: Joystick operation speed
c	Start speed	1 to 4,095,500	pps
d	Top speed	1 to 4,095,500	pps Top speed > Start speed
e	Accelerating time	1 to 1,000,000	× 10ms
f	Decelerating time	1 to 1,000,000	× 10ms

※Speed table No.1-9 are used for drive commands in remote control, origin return drive, absolute position movement and relative position movement in manual operations.

Speed table No. 10 and 11 are for joystick operation speed in manual operations. No. 10 is the setting in high speed operations, and No. 11 is the setting in low speed operations.

【Response】 Returns status.

Status	Response data
Normal	C Tab WTB <Axis No.> Tab <Speed table No.> CRLF
Abnormal	E Tab WTB <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Reference】

The RTB Command

【Remarks】

 The set content is stored in the backup memory.

T A S	<i>Teaching Function Axis Information Set</i>	SC-210 SC-410
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【Function】 Sets teaching of the n axes. (Links axis No. with the coordinate memory.)

- | | | |
|-----------------|---|---------------|
| 【Format】 | 1 axis <code>stx</code> TASa <code>CRLF</code> | Parameter = 1 |
| 【Format】 | 2 axes <code>stx</code> TASa/b <code>CRLF</code> | Parameter = 2 |
| 【Format】 | 3 axes <code>stx</code> TASa/b/c <code>CRLF</code> | Parameter = 3 |

Space between characters cannot be used. Each parameter cannot be omitted.
3 axes setting cannot be used for SC-210.

Command parameters

	Function	Setting	Remarks
a	Designating axis of coordinate memory 1	1 to 4	Varies according to model
b	Designating axis of coordinate memory 2	1 to 4	Varies according to model
c	Designating axis of coordinate memory 3	1 to 4	Varies according to model

【Response】 Returns status of controller.

Status	Response data
Normal	C <code>Tab</code> WTB<The number of axes> <code>CRLF</code>
Abnormal	E <code>Tab</code> WTB<The number of axes> <code>Tab</code> <Error No.> <code>CRLF</code>

<The number of axes> 1 axis = 1, 2 axes = 2, 3 axes = 3 For <Error No.>, refer to the item of "6-4. Error Code."

【Example】

- Sets teaching of 1 axis. `stx` **TAS1** `CRLF`
 Position data of axis No. 1 is registered into the coordinate memory 1.

【Example】

- Sets teaching of 2 axes. `stx` **TAS1/2** `CRLF`
 Position data of axis No. 1 is registered into the coordinate memory 1.
 Position data of axis No. 2 is registered into the coordinate memory 2.

【Example】

- Sets teaching of 3 axes. `stx` **TAS1/2/4** `CRLF`
 Position data of axis No. 1 is registered into the coordinate memory 1.
 Position data of axis No. 2 is registered into the coordinate memory 2.
 Position data of axis No. 4 is registered into the coordinate memory 3.

【Remarks】

Relation between the axis No. and coordinate memory set by this command is stored in the backup memory.

When teaching of 1 axis is performed, writing in the coordinate memory 2 or 3 (the WRT command), even if it is carried out, is invalid.

TMS	<i>Teaching Function Position Information Set</i>	SC-210 SC-410
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【Function】 Writes the coordinate value of the axis No. linked by the TAS command in the designated memory address.

【Format】 `stx TMSa CRLF` Parameter = 1

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Coordinate memory address	0 to 10,000	

【Response】 Returns status of controller. ※Returns immediately after receiving the command.

Status	Response data					
Normal	C	Tab	TMS<The number of axes>	CRLF	<Memory address>	CRLF
Abnormal	E	Tab	TMS<The number of axes>	Tab	<Error No.>	CRLF

<The number of axes> 1 axis = 1, 2 axes = 2, 3 axes = 3 For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】

Performs teaching to write the coordinate values of 3 axes.

```

stx TAS1/2/4 CRLF
stx APS1/2/0/0/100/0/0/1 CRLF
stx APS2/2/0/0/100/0/0/1 CRLF
stx APS4/2/0/0/100/0/0/1 CRLF
stx TMS0 CRLF

stx APS1/2/0/0/110/0/0/1 CRLF
stx APS2/2/0/0/120/0/0/1 CRLF
stx APS4/2/0/0/130/0/0/1 CRLF
stx TMS1 CRLF

stx APS1/2/0/0/115/0/0/1 CRLF
stx APS2/2/0/0/125/0/0/1 CRLF
stx APS4/2/0/0/140/0/0/1 CRLF
stx TMS2 CRLF

stx APS1/2/0/0/10/0/0/1 CRLF
stx APS2/2/0/0/20/0/0/1 CRLF
stx APS4/2/0/0/30/0/0/1 CRLF
stx TMS3 CRLF
    
```

Address	Axis No. 1		Axis No. 2		Axis No. 4	
	Coordinate value	Speed	Coordinate value	Speed	Coordinate value	Speed
0	100	0	100	0	100	0
1	110	0	120	0	130	0
2	115	0	125	0	140	0
3	10	0	20	0	30	0

【Related】
 The RDT Command read teaching table
 The WRT Command write teaching table

【Remarks】

For the speed tables, the speed table 0 is stored as a default when the TMS command is issued. When attempting to change the speed table, use the WRT command to change.

TPS	<i>Teaching Function Teaching Drive</i>	SC-210 SC-410
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【Function】 Drives axis according to the value of the designated coordinate memory address.

【Format】 `stx TPSa/b CRLF` Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Coordinate memory address	0 to 10,000	Varies according to model
b	Response method	0:Completed 1:Quick	

【Response】 Returns status of controller.

Status	Response data
Normal	<code>C Tab TPS<The number of axes> CRLF</code>
Abnormal	<code>W Tab TPS<The number of axes> CRLF <Warning No.> CRLF</code>
	<code>E Tab TPS<The number of axes > Tab <Error No.> CRLF</code>

<The number of axes> 1 axis = 1, 2 axes = 2, 3 axes = 3 For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】

When the coordinate data is set as in the table below.

<code>stx TPS0/0 CRLF</code>	→	<code>C Tab TPS3 CRLF</code>	Moves to the coordinate of memory address 0
<code>stx TPS1/0 CRLF</code>	→	<code>C Tab TPS3 CRLF</code>	Moves to the coordinate of memory address 1
<code>stx TPS2/0 CRLF</code>	→	<code>C Tab TPS3 CRLF</code>	Moves to the coordinate of memory address 2
<code>stx TPS3/0 CRLF</code>	→	<code>C Tab TPS3 CRLF</code>	Moves to the coordinate of memory address 3
<code>stx TPS4/0 CRLF</code>	→	<code>W Tab TPS3 Tab 100 CRLF</code>	Coordinate data is not set

Address	Axis No. 1		Axis No. 2		Axis No. 4	
	Coordinate value	Speed	Coordinate value	Speed	Coordinate value	Speed
0	100	0	100	0	100	0
1	110	0	120	0	130	0
2	115	0	125	0	140	0
3	10	0	20	0	30	0
4	----	----	----	----	----	----
----	----	----	----	----	----	----
9999	----	----	----	----	----	----

RDT	<i>Teaching Function Position Data Read</i>	SC-210 SC-410
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【Functions】 Reads out teaching data. ※This can be used as an editing function.

【Format】 **stx** RDT**a**/**b** **CRLF** Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Coordinate memory address	0 to 10,000	

【Response】 Returns the position information and speed table No.

Status	Response data
Normal	C Tab RDT<Axis No.> Tab <Position information> Tab <Speed Table No.> CRLF
Abnormal	W Tab RDT<Axis No.> Tab <Warning No.> CRLF
	E Tab RDT<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Reads out the coordinate memory address 100 of axis No. 1.

stx RDT1/100**CRLF** \Rightarrow **C** **Tab** RDT1 **Tab** 1234 **Tab** 0 **CRLF**

WRT	<i>Teaching Function Position Data Write</i>	SC-210 SC-410
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【Functions】 Rewrites the teaching data. ※This can be used as editing function.

【Format】 **stx** WRT**a**/**b**/**c**/**d** **CRLF** Parameter = 4

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Coordinate memory address	0 to 10,000	
c	Set value	-68,108,813 to 68,108,813	Pulse
d	Speed table selection	0 to 9	

【Response】 Returns status of controller.

Status	Response data
Normal	C Tab WRT<Axis No.> CRLF
Abnormal	E Tab WRT<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Writes the position information 1245 and speed table selection 7 in the coordinate memory 100 of axis No. 1.

stx WRT1/100/1245/7 **CRLF** \Rightarrow **C** **Tab** WRT1 **CRLF**

 Easy control commands are a group of commands to drive with minimum parameters by using parameters set via manual operation. Therefore, please notice that the movement changes when the internal parameters are changed via manual operation.

PMS	<i>Easy Control Speed Change</i>	SC-210 SC-410
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【Functions】 Designates a speed table when executing easy control commands.

【Format】 **stx** **PMS****a**/**b** **CRLF** Parameter = 2

 Space between characters cannot be used. Each parameter cannot be omitted.
Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Speed table No.	0 to 9	

【Response】 The response method is fixed to Quick method.

Status	Response data
Normal	C Tab PMS <Axis No.> CRLF
Abnormal	E Tab PMS <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Designates the speed table to 5 when executing easy control commands.

stx **PMS**1/5**CRLF** \Rightarrow **C** **Tab** **PMS**1**CRLF**

PMP	<i>Easy Control Relative Position Drive</i>	<div style="display: inline-block; border: 1px solid black; padding: 2px 5px;">SC-210</div> <div style="display: inline-block; border: 1px solid black; padding: 2px 5px; margin-left: 10px;">SC-410</div>
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【Functions】 Performs relative position movement.

【Format】
stx
PMP
a/b
CRLF
 Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.
Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Movement amount	-16,777,215 to 16,777,215	Pulse

【Response】 The response method is fixed to Quick method. Use the STR command to check the end of moving.

Status	Response data
Normal	C Tab PMP <Axis No.> CRLF
Abnormal	E Tab PMP <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Performs relative position movement of the axis No. 1 by 1000 pulses.

stx **PMP**1/5CRLF ➡ **C** Tab **PMP**1CRLF

【Remarks】

Drives with accelerating and decelerating mode (SYS No.22), backlash correction method (SYS No.8), and encoder correction method (SYS No.29) of the each values system construction (SYS mode).

PMA	<i>Easy Control Absolute Position Drive</i>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SC-210</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">SC-410</div>
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【Functions】 Performs absolute position movement.

【Format】 **stx** PMA**a/b** **CRLF** Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Moving target position	-68,108,813 to 68,108,813	※Regarding to setting the target position, the amounts of the movement between the target position and the current position should be set up the value of the range from -16,777,215 to 16,777,215.

【Response】 The response method is fixed to Quick method. Use the STR command to check the end of moving.

Status	Response data
Normal	C Tab PMA<Axis No.> CRLF
Abnormal	E Tab PMA<Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Performs absolute position movement of the axis No. 1 by 1000 pulses.

stx PMA1/1000**CRLF** \longrightarrow **C** **Tab** PMA1**CRLF**

【Remarks】

Drives with accelerating and decelerating mode (SYS No.22), backlash correction method (SYS No.8), and encoder correction method (SYS No.29) of the each values system construction (SYS mode).

PMH	<i>Easy Control Origin Search</i>	SC-210 SC-410
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【Functions】 Performs origin return movement.

【Format】 **stx** **PMH****a** **CRLF** Parameter = 1

 Space between characters cannot be used. Each parameter cannot be omitted.
Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model

【Response】 The response method is fixed to Quick method. Use the STR command to check the end of moving.

Status	Response data
Normal	C Tab PMH <Axis No.> CRLF
Abnormal	E Tab PMH <Axis No.> Tab <Error No.> CRLF

For <Error No.>, refer to the item of “6-4. Error Code.”

【Example】 Performs origin search for the axis No. 1.

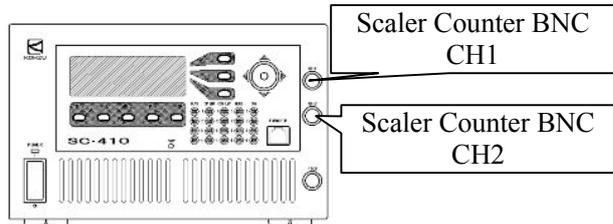
stx **PMH****1****CRLF**  **C** **Tab** **PMH****1****CRLF**

【Remarks】

 Drives with Origin return method (SYS No.9) of the system construction (SYS mode).

SCN	<i>Continuous Scan</i>	SC-410
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【Functions】 Collect data with two scaler counters while moving by the designated movement amount from the present position.



【Format】 **stx** **SCNa/b/c/d/e/f/g/h/i/j** **CRLF** Parameter = 10

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

Function	Setting	Remarks
a Axis No.	1 to 4	Varies according to model
b Accelerating and decelerating mode	1: Rectangular drive 2: Trapezoidal drive 3: Asymmetric trapezoidal drive 4: S-shaped drive 5: Asymmetric S-shaped drive	
c Synchronizing mode	0: Valid 1: Invalid	Refer to the LNK command
d Speed table	0 to 9	
e Movement amount (relative value)	-16,777,215 to 16,777,215	Pulse Set this setting to twice or more the measuring STEP.
f Measuring STEP	2 to 16,777,215	Pulse
g Measuring time	0 to 16,777,215	msec. The time spent at each measurement step
h Backlash correction	0: Invalid 1: CW direction1 2: CCW direction1 3: CCW direction2 4: CW direction2	Refer to the ASI command
i Encoder correction	0: Invalid 1: Valid 2: Continue	Refer to the ESI command
j Response method	0: Completed 1: Quick	※1

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	C Tab SCN <Axis No.> CRLF
Abnormal	W Tab SCN <Axis No.> Tab <Warning No.> CRLF
	E Tab SCN <Axis No.> Tab <Error No.> CRLF

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

Maximum sampling numbers (movement amount/measuring STEP) are 20000 points for CH1 and CH2 respectively.

The collected data can be read with the RBU command.

【Example 1】 When executing the SCN command by 1 axis control

Parameter setting method when using a goniometer with minimum resolution of 0.001°/step.

【Measuring condition】	Measuring range	0° to 10°
	Measuring speed	0.1° STEP/SEC (Moves by 0.1° for 1000 ms)
【Set value】	Present value	10°
	Movement amount	10000 【Pulse】
	Measuring step	100 【Step】
	Measuring time	1000 【ms】

 **APS1/2/0/0/0/0**  Moves to 0° by absolute position movement

 **SCN1/2/0/0/10000/100/1000/0/0/1**   **C**  **SCN1** 

【Example 2】 When executing the SCN command by 2 axes synchronizing proportional control

AXIS_A Parameter setting method when using a goniometer with minimum resolution of 0.001°/step

AXIS_B Parameter setting method when using a goniometer with minimum resolution of 0.001°/step

【Measurement condition】

AXIS_A	Measuring range	0° to 10°
	Measuring speed	0.1° STEP/SEC (Moves by 0.1° for 1000 ms)
	Axis No.	1
	Present value	10°
AXIS_B	Measuring range	0° to 5°
	Measuring speed	0.05° STEP/SEC (Moves by 0.05° for 1000 ms)
	Axis No.	2
	Present value	10°
【Set value】	Movement amount	10000 【Pulse】
	Measuring step	100 【Step】
	Measuring time	1000 【ms】

 **LNK1/2/2** 

Set **AXIS_B** so as to perform synchronizing proportional movement with half of **AXIS_A**.

 **APS1/2/0/0/0/0** 

Moves **AXIS_A** to 0° by absolute position movement.

 **APS2/2/0/0/0/0** 

Moves **AXIS_B** to 0° by absolute position movement.

 **SCN1/2/1/0/10000/100/1000/0/0/1** 

【Remarks】



Carry out a stop during driving by the stop (STP) command. Refer to the STP command.

(Note) When the response method is 0: completed, no response is returned if stopped by the STP command.



g. When Measuring time = 0

Collects the counter data of each measuring step(parameter f) at the speed that depends on the speed table(parameter d).

When you want to execute the SCN command at high speed, it is convenient to set the measuring time(parameter g) "0" and specify a target speed for the speed table(parameter d).

g. When Measuring time ≠ 0

Calculates measurement speed(Top speed) from measuring step(parameter f) and measuring time(parameter g).

It refers to the parameter of the speed table for the start speed and the accelerating and decelerating time.

However, when the calculated measuring speed falls below the start speed of speed table (parameter d), the accelerating and decelerating mode is changed to rectangular drive.



※1. When controlling by GPIB, operations are constantly performed as "1: Quick" regardless of settings.

RBU	<i>Scan Data Read</i>	SC-410
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【Functions】 Reads the counter data collected by the SCN command.

【Format】 `stx RBUa/b CRLF` Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Data source	1:Ch1 2: Ch2 3:Ch1 & Ch2 4:Ch1 & Ch2& Position	
b	Data No	0 to 20,000	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data	Remarks
Normal	<code>C Tab RBU A Tab B Tab C Tab D CRLF</code>	Data source CH1
	<code>C Tab RBU A Tab B Tab C Tab E CRLF</code>	Data source CH2
	<code>C Tab RBU A Tab B Tab C Tab D Tab E CRLF</code>	Data source CH1&CH2
	<code>C Tab RBU A Tab B Tab C Tab D Tab E Tab F CRLF</code>	Data source CH1&CH2&Position
Abnormal	<code>W Tab RBU<Data source> Tab <Warning No.> CRLF</code>	
	<code>E Tab RBU<Data source> Tab <Error No.> CRLF</code>	

For the <Error No.> and <Warning No.>, refer to items of “6-4. Error Code.”

【Response data】

	Item	Status	Remarks
A	Data source	1: Ch1 2: Ch2 3: Ch1 & Ch2 4: Ch1 & Ch2 & Position	Ch1: Scaler counter1 Ch2: Scaler counter2 Position : Position at sampling
B	Data No.	0 to 20,000	
C	Status	0: Data unconfirmed 1: Data confirmed 2: Data completed	
D	CH1 Count value	0 to 4,000,000	Input frequency Max 4MHz
E	CH2 Count value	0 to 4,000,000	Input frequency Max 4MHz
F	Sampling Position value	-16,777,215 to 16,777,215	Pulse

【Explanation of Response parameter】

The response parameter varies with selection of data source for transmission command.

```

stx RBU 1/0 CRLF → C Tab RBU 1 Tab 0 Tab <Status> Tab <CH1 Count value> CRLF
stx RBU 2/0 CRLF → C Tab RBU 2 Tab 0 Tab <Status> Tab <CH2 Count value> CRLF
stx RBU 3/0 CRLF → C Tab RBU 3 Tab 0 Tab <Status> Tab <CH1 Count value> Tab
<CH2 Count value> CRLF
stx RBU 4/0 CRLF → C Tab RBU 4 Tab 0 Tab <Status> Tab <CH1 Count value> Tab
<CH2 Count value> Tab <Sampling Position value> CRLF
    
```

【Example】 Explains a method for use in combination with the SCN command.

SCAN is started. The response method is Quick.

```

stx SCN1/2/0/0/1000/100/1/0/0/1 CRLF → C Tab SCN1 CRLF
    
```

stx RBU1/0 CRLF → C	Tab RBU1 Tab 0 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/0 CRLF → C	Tab RBU1 Tab 0 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/0 CRLF → C	Tab RBU1 Tab 0 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/0 CRLF → C	Tab RBU1 Tab 0 Tab 1 Tab 1000 CRLF	Data is confirmed
stx RBU1/1 CRLF → C	Tab RBU1 Tab 1 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/1 CRLF → C	Tab RBU1 Tab 1 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/1 CRLF → C	Tab RBU1 Tab 1 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/1 CRLF → C	Tab RBU1 Tab 1 Tab 1 Tab 1010 CRLF	Data is confirmed



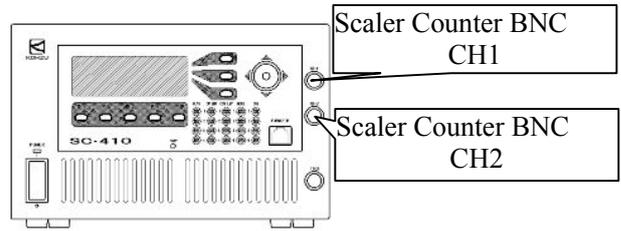
stx RBU1/9 CRLF → C	Tab RBU1 Tab 9 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/9 CRLF → C	Tab RBU1 Tab 9 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/9 CRLF → C	Tab RBU1 Tab 9 Tab 0 Tab 0 CRLF	Data is not confirmed
stx RBU1/9 CRLF → C	Tab RBU1 Tab 9 Tab 1 Tab 1010 CRLF	Data is confirmed
stx RBU1/10 CRLF → C	Tab RBU1 Tab 10 Tab 2 Tab 0 CRLF	Data is ended

【Remarks】

-  The captured scaler data is held until the next the SCN command is issued.
-  The captured scaler data is stored in the backup memory.

SFT	<i>Fixed Time Measurement</i>	SC-410
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【Functions】 Counts the number of pulses inputted into the data source(CH1,CH2) within the set measuring period of time.



【Format】 ① **stx** SFT**a/b** **CRLF** Parameter=2(※1、 ※2)
 ② **stx** SFT**a/b/c** **CRLF** Parameter=3(※2、 ※3)

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Data source	1: CH1 2: CH2 3: CH1&CH2	
b	Measuring time	1 to 16,777,215	msec
c	Response method	0: Completed 1: Quick	※2、 ※3

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data	Remarks
Normal	C Tab SFT A Tab B CRLF	Data source CH1
	C Tab SFT A Tab C CRLF	Data source CH2
	C Tab SFT A Tab B Tab C CRLF	Data source CH1&CH2
	C Tab SFT A CRLF	When the response method is a quick method.
Abnormal	W Tab SFT<Data source> Tab <Warning No. > CRLF	
	E Tab SFT<Data source> Tab <Error No. > CRLF	

For the <Error No.> and <Warning No.>, refer to the "6-4. Error Code."

【Response Data】

	Item	Status	Remarks
A	Data source	1: CH1 2: CH2 3: CH1 & CH2	CH1 : Scaler Counter 1 CH2 : Scaler Counter 2
B	CH1 Counter data value	0 to 4,000,000	Input frequency Max 4MHz
C	CH2 Counter data value	0 to 4,000,000	Input frequency Max 4MHz

【Explanation of Response parameter】

The response parameter varies with selection of data source in transmission command.

```

[stx] SFT1/1000[CRLF]  => C [Tab] SFT1[Tab] Ch1 Data [CRLF]
[stx] SFT2/1000[CRLF]  => C [Tab] SFT2[Tab] Ch2 Data [CRLF]
[stx] SFT3/1000[CRLF]  => C [Tab] SFT3[Tab] Ch1 Data [Tab] Ch2 Data [CRLF]

```

【Example】

1. Measurement of pulse inputted into CH1 for one second is carried out.

```
[stx] SFT1/1000[CRLF]  => C [Tab] SFT1[Tab] Ch1 Data [CRLF]
```

1. Measurement of pulse inputted into CH1 and CH2 for one second is carried out.

```
[stx] SFT3/1000[CRLF]  => C [Tab] SFT1[Tab] Ch1 Data [Tab] Ch2 Data [CRLF]
```

【Remarks】



Carry out a stop during driving by the stop (STP) command. Refer to the STP command.

(Note) When the response method is 0: Completed, no response is returned if stopped by the STP command.



※1. The response is returned as "0: Completed method" if the number of parameter is two when controlling by the RS-232C communication.

※2. When controlling by GPIB, operations are constantly performed as "1: Quick" regardless of settings.

※3. The answer data of the SFT command is only "A: the data source " when the answer method is assumed to be "1: Quick method".

In this case, data is acquired by the RBU command.

In that case, set the Data No. of RBU command(parameter b) to 0, and transmit the RBU command.

RCP	<i>Constant Pulse Read</i>	SC-210 SC-410
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【Functions】 Reads out the set constant speed pulses at deceleration.

【Format】 stx RCPa CRLF Parameter = 1

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model

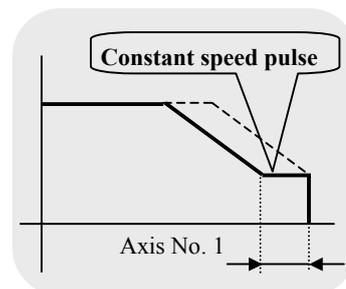
【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	C Tab RCP <Axis No.> CRLF
Abnormal	E Tab RCP <Axis No.> Tab <Error No.> CRLF

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

WCP	<i>Constant Pulse Write</i>	SC-210 SC-410
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【Functions】 Sets constant speed pulses at deceleration.



【Format】 stx WCPa/b CRLF Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	Varies according to model
b	Constant speed pulse	0 to 20,000	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	C Tab WCP<Axis No.> CRLF
Abnormal	E Tab WCP<Axis No.> Tab <Error No.> CRLF

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Remarks】

The set content is stored in the backup memory.

SHM	<i>Shutter Manual Control</i>	SC-410
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【Functions】 begins and ends the trigger signal output(opening and shutting of the shutter).

【Format】 `stx` **SHM**a/b `CRLF` Parameter = 2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Designating shutter	1 : the 1st shutter 2 : the 2nd shutter	※1
b	Close/Open	0 : Close 1 : Open	

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	C <code>Tab</code> SHM<Shutter No.><code>CRLF</code>
Abnormal	E <code>Tab</code> SHM<Shutte No.><code>Tab</code> <Error No.> <code>CRLF</code>

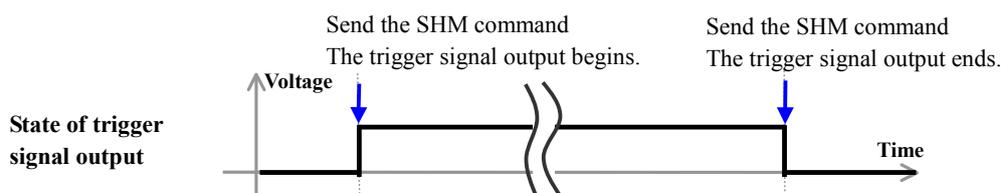
For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】 When you begin/end the trigger signal output by the SHM command (opening and shutting of the 1st shutter).

`stx` **TRS0/4** `CRLF` Set the trigger signal output setting to the output by the SHG, SHM command.

`stx` **SHM1/1** `CRLF` The trigger signal output begins.(Opens the shutter)

`stx` **SHM1/0** `CRLF` The trigger signal output ends.(Closes the shutter)



【Remarks】

- ※1. Please specify "1: the 1st shutter " usually.
- "2: the 2nd shutter" is a configuration parameter for our high-speed shutter only.

SHG	<i>Shutter Expose</i>	SC-410
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【Functions】 output the trigger signal by time control. (Expose)

【Format】

①	<code>stx</code>	<code>SHGa/b/c/d</code>	<code>CRLF</code>
②	<code>stx</code>	<code>SHGa/b/c/d/e</code>	<code>CRLF</code>

Parameter=4
Parameter=5

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Expose time	(msec)	
b	Beam Offset time	(usec)	
c	Beam Rise time	(usec)	
d	Flap select	1 : double flap 2 : single flap	※1、※2
e	Response method	0: Completed 1: Quick	※3

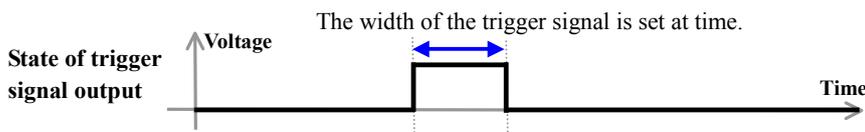
【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	<code>C Tab SHG CRLF</code>
Abnormal	<code>E Tab SHG Tab <Error No.> CRLF</code>

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】 When you output the trigger signal by the time control (expose).

`stx TRS 0/4 CRLF` Set the trigger output selection to the output by the SHG/SHM command.
`stx SHG 100/30/30/1/0 CRLF` Expose time 100msec,
 Beam Offset time 30usec,
 Beam Rise time 30usec
 The trigger signal is output. (Expose)



【Remarks】



※1. Please specify "2: single flap" usually.

"1: double flap" is a configuration parameter for our high-speed shutter.

※2. In the single flap mode, 30msec or less cannot be exposed.

※3. It always operates as "1: a quick method" regardless of the setting when controlling by the GP-IB communication.

MEMO

TRG	<i>Trigger Setting</i>	SC-210 SC-410
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【Functions】 Sets parameters of trigger signal output.

【Format】 `stx TRGab/c/d CRLF` Parameter=4

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	1 to 4	
b	Trigger source	0:Pulse 1:Encoder(2 Multiplication)	※1
c	Ratio	1 to 1000	
d	Polarity	0 : Normal 1 : Reserve	

【Response】 Returns status information. ※Return timing depends on the response method.

Status	Response data
Normal	<code>C Tab TRG<Axis No.> CRLF</code>
Abnormal	<code>E Tab TRG <Axis No.> Tab <Error No.> CRLF</code>

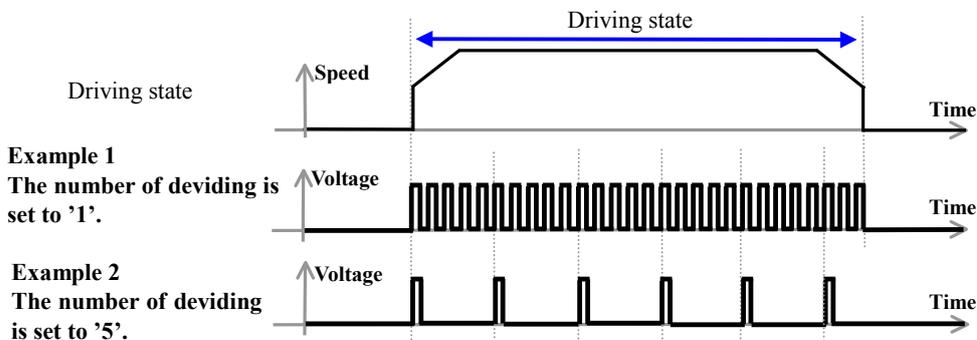
For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example 1】 The driving pulse of No.1 Axis is chosen as the trigger signal source, the trigger signal is output every 1 pulse.

`stx TRG 1/0/1/0 CRLF` Sets the trigger signal output setting.
`stx TRS 1/1 CRLF` Sets the selection of trigger signal to output by the TRG command.
`stx RPS1/2/0/0/1000/0/0 CRLF` Drives relativity moving.

【Example 2】 The driving pulse of No.1 Axis is chosen as the trigger signal source, the trigger signal is output every 5 pulse. (The number of deviding: 5).

`stx TRG 1/0/5/0 CRLF` Sets the trigger signal output setting.
`stx TRS 1/1 CRLF` Sets the selection of trigger signal to output by the TRG command.
`stx RPS1/2/0/0/1000/0/0 CRLF` Drives relativity moving.



【Remarks】

 You can use this command with drive commands (APS,RPS,SPS,MPS,OSC,FRP,SCN,PMA,PMP)

 SYS No.48(Selection of trigger signal source) and SYS No.49(Ratio of trigger signal) of the system construction in manual operation (SYS mode) doesn't change by transmitting this command.



※1. The value of the encoder as the signal source of this command is 2 multiply fixed.

※2. Please issue the following command by the model when you want to change the polarity of the trigger signal.

For SC-210

Please change the polarity of the trigger signal by the parameter of the polarity change in the TRG command.

For SC-410

We will recommend the polarity change by the TRP command.

※The change in the polarity of the trigger signal by the parameter of the polarity change in the TRG command is also effective.

TRS	<i>Trigger Select</i>	SC-210 SC-410
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【Functions】 When this command is issued and either of driving command(APS,RPS,SPS,MPS,OSC,FRP,SCN, PMA,PMP,SHG,SHM) is executed, the controller outputs the selected trigger signal.

Issue this command every time ahead of driving command to generate trigger signal.

【Format】 **stx** TRS**a/b** **CRLF** Parameter=2

Space between characters cannot be used. Each parameter cannot be omitted.

Command parameters

	Function	Setting	Remarks
a	Axis No.	0 to 4	Varies according to model ※1
b	Trigger signal output select	0 : Nothing 1 : by the TRG command 2 : BUSY(Driving signal) 3 : CONST(Constant velocity Driving signal) 4 : by the SHG,SHM command	Refer to the next page ※2

【Response】 Returns status information. ※Returns immediately after receiving the command.

Status	Response data
Normal	C Tab TRS<Axis No. > Tab CRLF
Abnormal	E Tab TRS<Axis No. > Tab Tab <Error No. > CRLF

For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Example】 The driving pulse of No.1 Axis is chosen as the trigger signal source, the trigger signal is output every 1 pulse.

stx TRG1/0/1/0 CRLF Set the trigger signal output setting.

stx TRS1/1 CRLF Set the trigger signal output selection to the signal output by the TRG command.

stx RPS1/2/0/0/1000/0/0 CRLF Drive Relativity moving.

【Remarks】

Once you transmit ①the TRG command, thereafter the trigger signal can be output by transmitting ② the TRS command and ③driving command (APS,RPS,SPS,MPS,OSC,FRP,SCN,PMA,PMP).

SYS No.48(Selection of trigger signal source) and SYS No.49(Ratio of trigger signal) of the system construction in manual operation (SYS mode) doesn't change by transmitting this command.

When this command is issued and driving commands other than the APS,RPS,SPS,MPS,OSC, FRP,SCN,PMA,PMP,SHG,SHM command are issued, the setting by this command is invalidated.

※1. In the shutter mode,set the axis No. to "0".

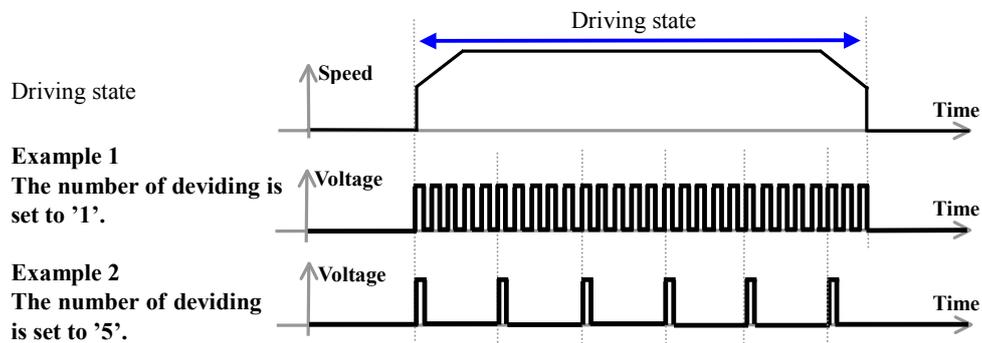
※2. In SC-210, only "1: output by the TRG command" is effective.

When other parameters are transmitted, the controller returns the response with error No.700.

 It explains details of the trigger signal output selection.

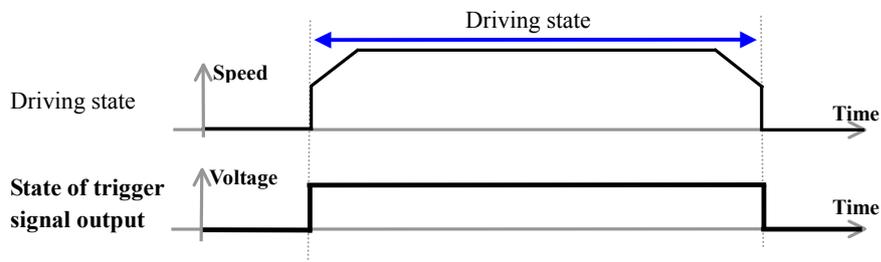
1 : by the TRG command

The trigger signal that synchronizes with driving pulse or the encoder pulse is output.
Moreover, the number of partitions of the output trigger signal can be set.



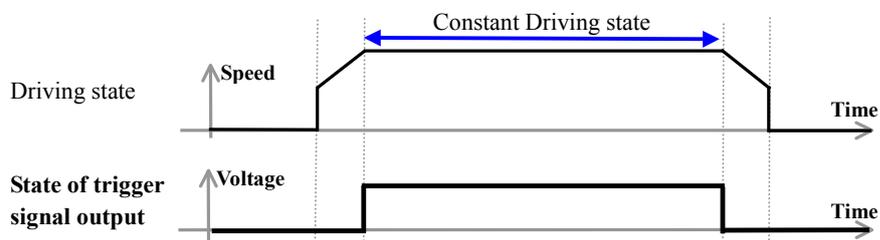
2 : BUSY(For SC-410)

The trigger signal output begins when beginning to drive, and the trigger signal output is ended when the drive ends.



3 : CONST(For SC-410)

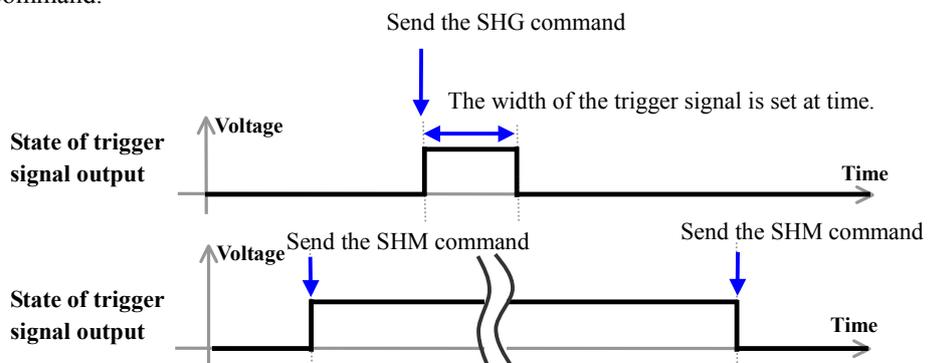
The trigger signal output begins when beginning to constant velocity drive, and the trigger signal output is ended when the constant velocity drive ends.



4 : by the SHG,SHM command(For SC-410)

The SHG command sets the time of the trigger signal and outputs the signal.

The SHM command specifies the timing of begin/end of the trigger signal output by transmitting the command.



TRP	<i>Trigger Polarity Setting</i>	SC-410
------------	---------------------------------	---------------

【Functions】 Set the polarity when the trigger signal is output
 The setting is preserved until this command is transmitted next when setting it once.
 This command is uniquely effective to all axes.
 The trigger signal output is set by the TRS command.

【Format】 `stx` **TRPa** `CRLF` Parameter=1

Space between characters cannot be used. Each parameter cannot be omitted.
 Command parameters

Function	Setting	Remarks
a Polarity of trigger signal select	0 : Normal 1 : Reserve	

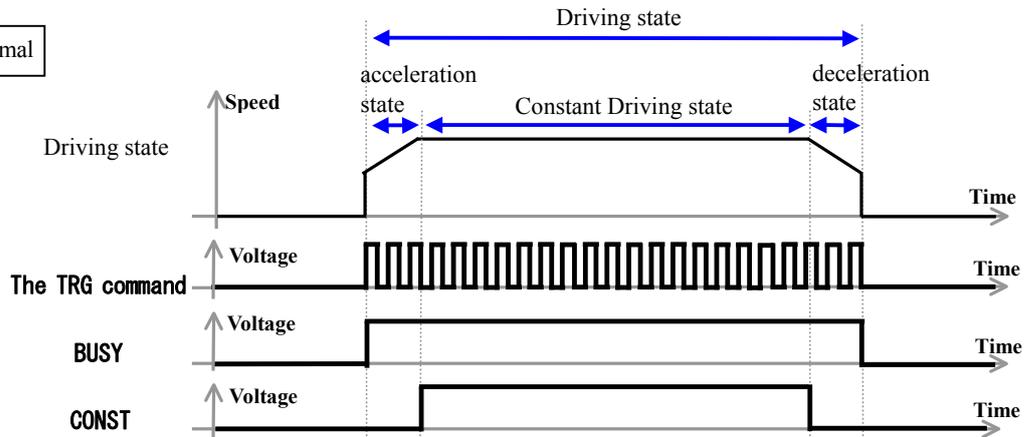
【Response】 Returns status information.

Status	Response data
Normal	C <code>Tab</code> TRP<Axis No. > <code>CRLF</code>
Abnormal	E <code>Tab</code> TRP<Axis No. > <code>Tab</code> <Error No. > <code>CRLF</code>

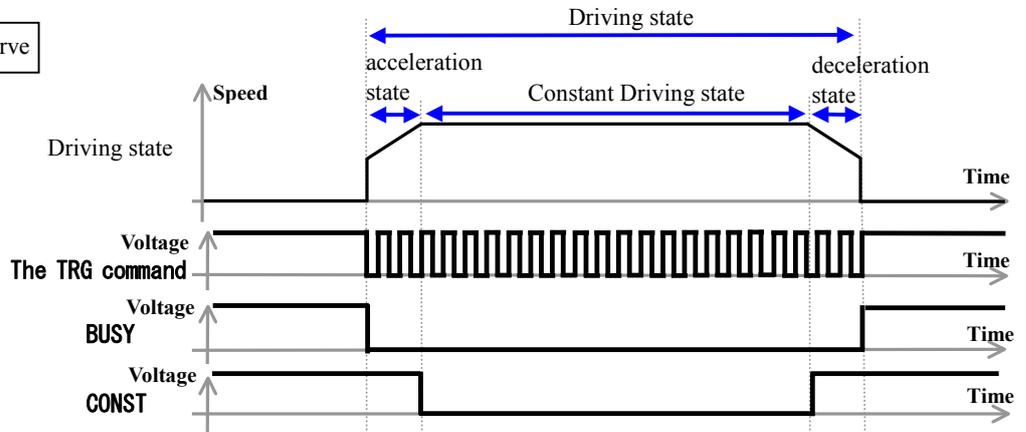
For the <Error No.> and <Warning No.>, refer to the “6-4. Error Code.”

【Remarks】

when Polarity is 0 : Normal



when Polarity is 1 : Reserve



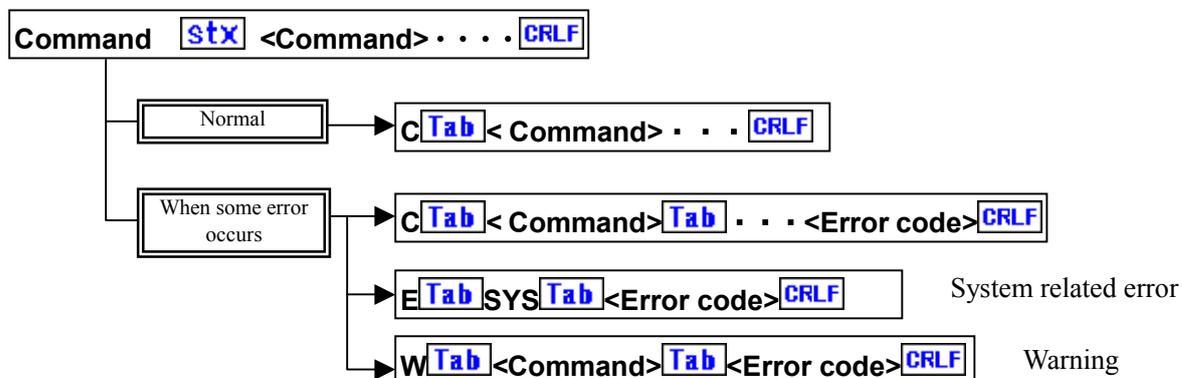
MEMO

6-4. Error Code

6-4-1. Error Code

If an error is confirmed when transmitting a command, the controller returns the response with the error code.

In addition, after a drive error occurs, you can check the error code with the STR command (status read).



When no error occurs, the head character is C. When some error occurs, the error code with E or W is returned.

6-4-2. List of Error Codes

System Related Error (※independent of the command type)

Error code	Description	Remarks
1	No STX on head of the command.	
2	Total number of commands is short.	
3	Absence of CR+LF	
4	Character other than specified characters and figures is included.	
5	No applicable command.	
10	Now operating in manual mode.	

Parameter Error

Error code	Description	Remarks
100	Total number of parameters is incorrect.	
1n ₁ n ₂	Numerical value of n ₁ n ₂ th parameter is out of range.	n ₁ n ₂ =01 to 14
120	Value is designated so that movable value at one time is exceeded.	

Command Issue Sequence Error

Error code	Description	Remarks
200	Reset command is not issued.	
201	The MSI and ASI commands are not issued.	
202	Link command is not issued.	
205	The ORG command is not issued. (Origin is not detected)	
206	The APS/RPS? command corresponding to the first parameter of the MPS command is not issued.	
207	The APS/RPS? command corresponding to the second parameter of the MPS command is not issued.	
208	The APS/RPS? command corresponding to the third parameter of the MPS command is not issued.	
209	APS/RPS? command corresponding to the fourth parameter of the MPS command is not issued.	
210	The ESI command is not issued.	

(To next page)

(From last page)

Drive Related Error

Error code	Description	Remarks
300	PMG is in use.	Inside IC (Integrated circuit) related error
301	Speed setting is 0 in rectangular drive.	
302	Operating the axis during driving.	
303	Tried to rewrite the present value of the axis during driving.	
304	Stopped by CW limiter during driving.	
305	Stopped by CCW limiter during driving.	
306	Any axis on MPS driving stopped by limiter.	
307	Both of CW and CCW limiters are activated.	
308	Tried to move the axis for which excitation is OFF.	
309	Out of the control range in feedback control.	

Link Related Error

Error code	Description	Remarks
400	Hardware which does not allow for LNK driving.	
401	Operating axis during LNK driving.	
402	Link counter is now in use.	
403	Tried to rewrite present value of axis during LNK driving.	
404	Designated to stop axis which is driving by slave axis.	
405	Axis designation of LNK slave 1 is incorrect.	
406	Axis designation of LNK slave 2 is incorrect.	

Multi-Axes Setting Error

Error code	Description	Remarks
501	First parameter and second parameter are the same.	
502	First parameter and third parameter are the same.	
503	First parameter and fourth parameter are the same	
504	Second parameter and third parameter are the same.	
505	Second parameter and fourth parameter are the same.	
506	Third parameter and fourth parameter are the same.	

ASI, WTB, RTB Command Calculation Error

Error code	Description	Remarks
600	Accelerating pulse number is large, or accelerating time is long.	
601	Accelerating pulse number is small, or accelerating time is short.	
602	Decelerating pulse number is large, or decelerating time is long.	
603	Decelerating pulse number is small, or decelerating time is short.	
604	Preparation failure of speed table with the WTB command.	

Controller Error

Error code	Description	Remarks
700	The command and the parameter uncorresponds to SC-210 were issued.	

Scanning Error

Error code	Description	Remarks
1102	The value specified by the SCN command for the movement amount did not come up to twice measuring STEP.	

Teaching Error

Error code	Description	Remarks
1200	In teaching function, positional coordinates aren't written in the memory of specified axis No.	

Warning Message

Error code	Description	Remarks
1	The target position and present position are the same.	
2	In one move setting, waiting time is designated with OSC command.	
100	Designated address to which a coordinate is not registered by the TPS command.	

MEMO

7. Internal Motor Driver

7-1. Driver Specifications

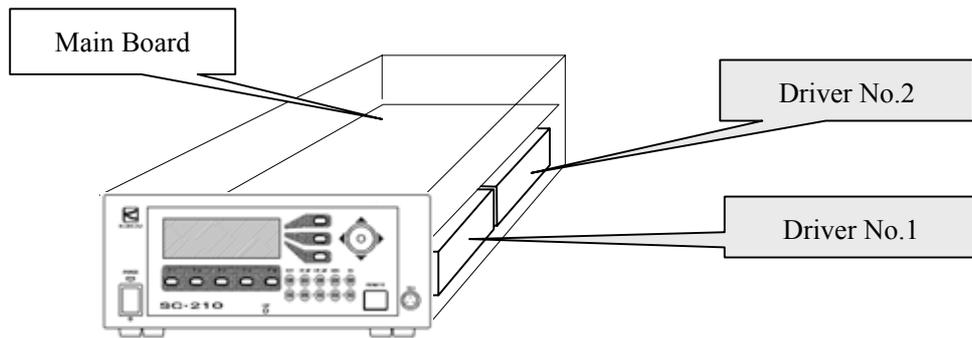
		SC-210/SC-410				
Model		MD-501C(For SC controller Series)				
Power supply		AC90-264V 3.0A Max. 50/60Hz				
Output current		Rated current : 0.35-1.4A/Phase Capable of setting the current to 0.4-1.4A/phase by the digital switch "RUN"				
Driving Type		Bipolar pentagon constant current drive				
Input signal circuit	Signal name	Functional description		input resistance		
	CW ₊	Pulse signal input for 1 clock mode		270		
	CW ₋	CW rotation input for 2 clock mode				
	CCW ₊	Rotational direction input for 1 clock mode		270		
	CCW ₋	CCW rotation input for 2 clock mode				
	H.O. ₊	Motor exciting OFF control signal		390		
	H.O. ₋	"H" for motor exciting OFF				
		Pulse width : 0.25us,Min.,Rising-up time : 1us,Max Pulse interval : 0.25us,Min.,Pulse frequency : 500kpps Max Pulse voltage : "H" for 4-8V & "L" for 0-0.5V Triggered at the edge of OFF ("L") to ON ("H") of photo-coupler current CCW rotation with CCW input of "L" in 1-clock system				
Output signal circuit	Signal name	Functional description		output capacity		
	Z.P. ₊	Origin exciting output signal		DC30V Max. 50mA Max.		
	Z.P. ₋	Switched ON while origin is being excited				
		This signal is ON at the exciting sequence of [0] and is transmitted each 7.2 degrees for the step motor with 0.72 steps.(50/rotation) When micro-step angle is changed after the power supply is turned on, it may not be transmitted.				
Setting of micro-step interpolation		For micro-step driving of one type only, set the number interpolation using the digital SW MS1. 16 steps(refer to 119 pages)				
Setting of output current		The output current to the motor in rotation is set by the digital switch "RUN" to select from below 16 steps. 16 steps(refer to 119 pages)				
Automatic current down		The output current to the motor at stationary is set by the digital switch "STOP" to select from below 16 steps. The value is set by the percent to "RUN" current. The current decreases at approx.500ms after the last pulse. 16 steps(refer to 119 pages)				
Setting of dip-switches		No.	Symbol	Function	ON	OFF
		1	TEST	Built-in test function	Rotating at 250pps	Normal operation
		2	1/2 CLK	Switching of clock	1 clock mode	2 clock mode
		3	C/D	Automatic current-down	Invalid	Valid
Operating temperature & humidity		0-40 85%RH Max without any dew any condensed.				
Storage temperature & humidity		-10-70 85% RH Max without any dew any condensed.				
Mass		Approximately 750g				

The above-mentioned is a specification in the driver unit only.

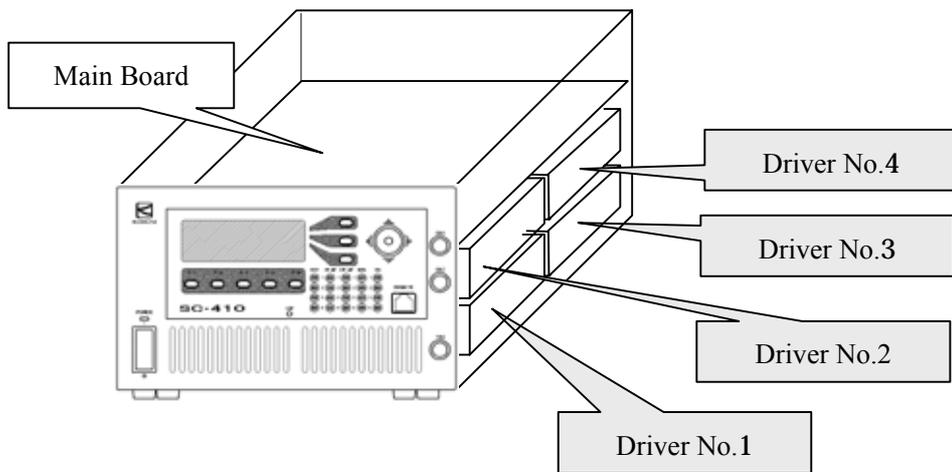
7-2. Arrangement of Driver

Built-in stepping motor drivers are posted under the main board.

《SC-210》



《SC-410》



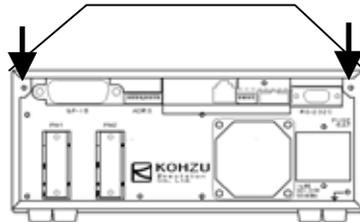
7-3. Open and Close of Enclosure, Adjustment of Driver

Adjustments of the driver in the controller are required in order to perform setting of the division number for the micro step or to adjust output current.
Method to open and close the controller enclosure is as follows.

Opening and Closing Enclosure

 Do not plug into the controller for your safety when you will open the housing.

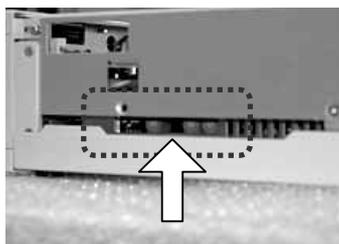
Remove the 2 screws on the rear panel.



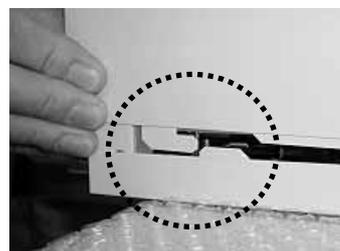
Slightly move the upper cover backward, and lift it up.



The adjustment part for the driver is seen from the gap on the side, and make adjustments by using tweezers and a clock driver.



When closing, align pawls of the upper cover with that of the lower cover to close.



Carry out carefully so that no breakage or abnormality occurs.



A change in parts other than the driver adjustment part such as the switch is not allowed.



Please be advised that some products in SC Series differ in the method of opening the enclosure depending on the specifications.

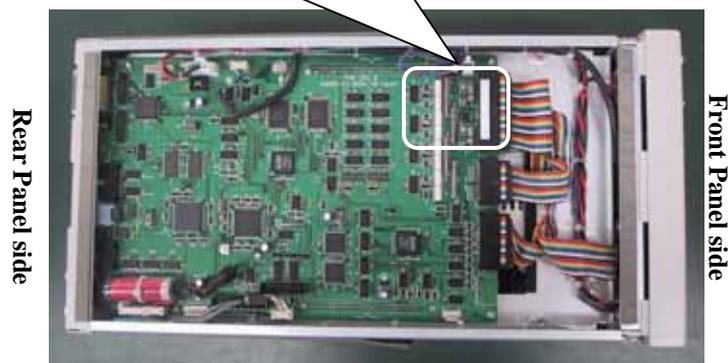
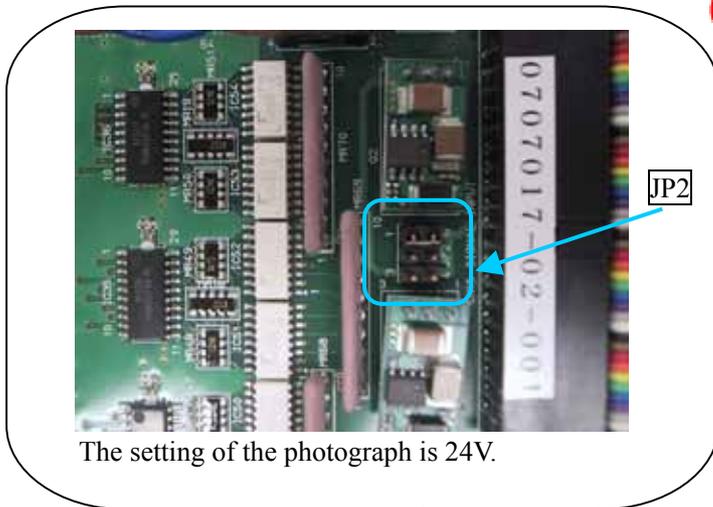
7-4. Voltage change of Sensor Power Source

Power supply to each sensor, such as origin and limit can be changed to 5V / 12V / 24V.

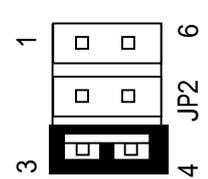
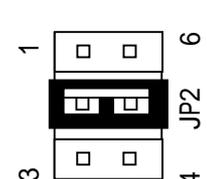
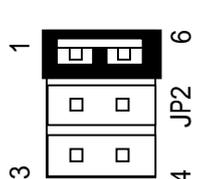
When changing voltage, replacement of the jumper pins are required. The setting is 24V at shipment.

1. Position of jumper pins

 Do not plug into the controller for your safety when you will open the housing.



2. Setting

Supply voltage	5V	12V	24V (Setting at shipment)
JP2 Setting			

7-5. Change in Encoder Input System

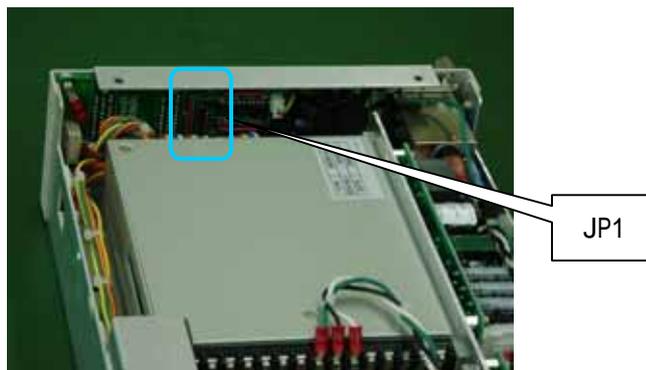
In SC-210/SC-410, the encoder input method can be selected from differential input/open collector input. When the encoder input method is changed, it is necessary to replace the jumper pin. The setting when shipping it is a differential input setting.

《encoder signal input SC-210》

1. Open Enclosure (refer to P.118), please remove a lower panel after removing 4 rubber foot under the main body. And set the jumper-pin on the substrate mounted in the reverse-side of a rear panel.

 Do not plug into the controller for your safety when you will open the housing.

Rear Panel side Lower side of SC controller

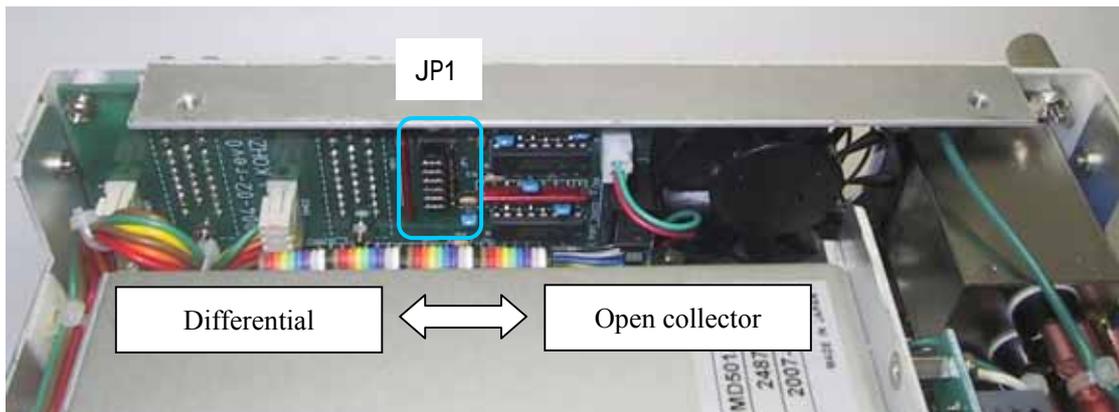


Front Panel side

2. The jumper on the above-mentioned substrate like the photograph below?"Differential input" of the encoder input or "Open collector input" is selected with pin JP1 (six places). (The setting when shipping it is a differential input setting.)

Move the jumper pin to the open collector side when you use the encoder of the open collector input type.

Rear Panel side Lower side of SC controller



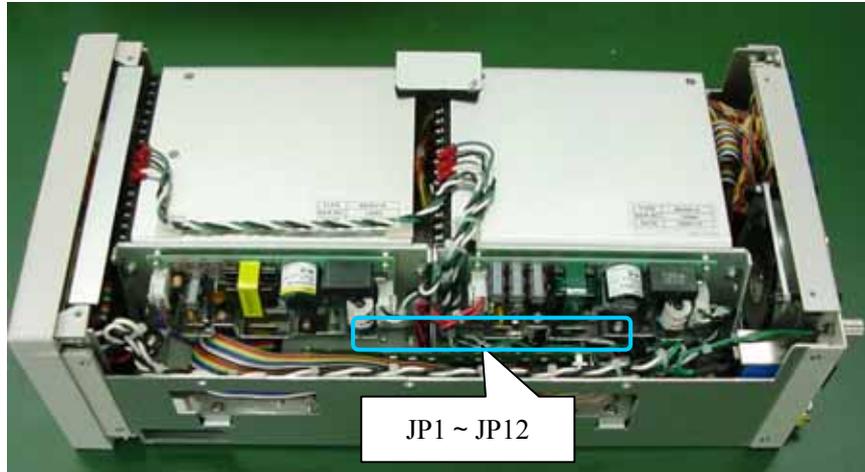
Front Panel side

The setting of the photograph is Differential.

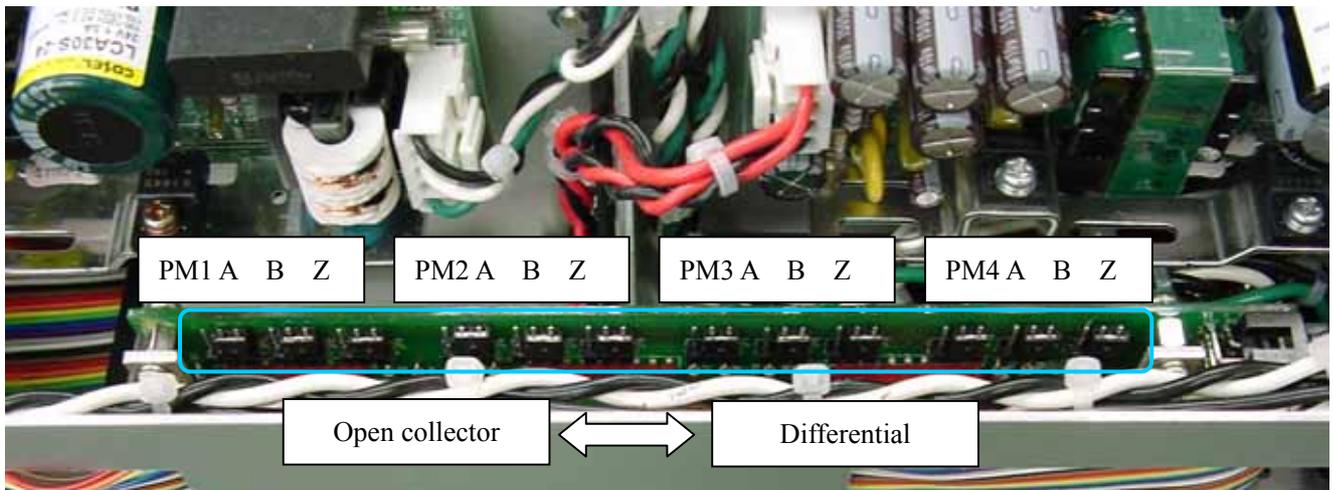
《encoder signal input SC-410》

1. Open Enclosure (refer to P.118), Please remove a lower panel after removing 4 rubber foot under the main body. The jumper pin on the substrate in view of the rear panel seen at that time, mounted on a left side is set.

 Do not plug into the controller for your safety when you will open the housing.



2. "Differential input" of the encoder input or "Open collector input" is selected with jumper pin JP1-JP12 on the above-mentioned substrate as shown in the photograph below. (The setting when shipping it is a differential input setting)
Please move the jumper pin to the open collector side when you use the encoder of the open collector input type.



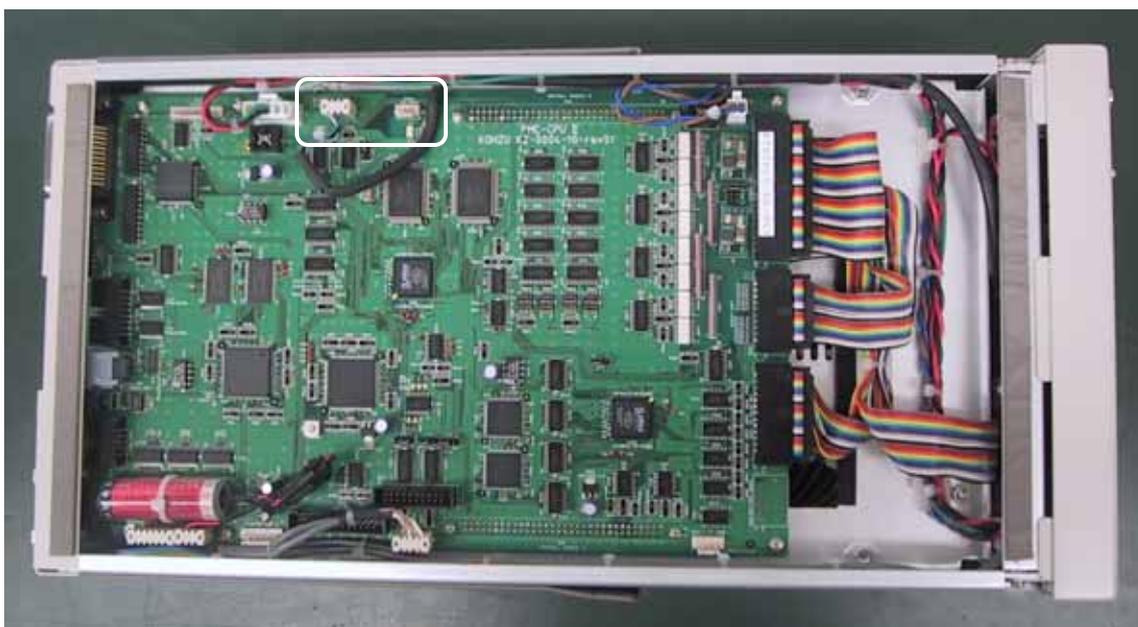
The setting of the photograph is Differential output.

7-6.Trigger Output System

In SC-210/SC-410, the trigger signal output method can be selected from differential output (5V)/open collector output (24V). When the trigger signal output method is changed, it is necessary to change in connected part of the connector. The setting when shipping it is differential output (5V).

1. Open Enclosure (refer to P.118), change the connection of the connector.

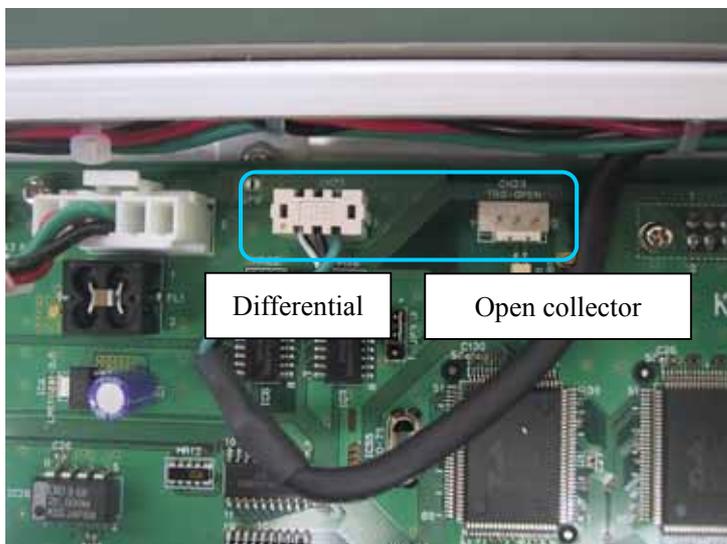
 Do not plug into the controller for your safety when you will open the housing.



2. "Differential output (5V)" of the trigger signal output or "Open collector output (24V)" is selected by setting the connection on the above-mentioned substrate to the connector as shown in the photograph below.

(The setting when shipping is differential output (5V).)

Differential output (5V) : CN22 TRG-DIFF
 Open collector output (24V) : CN23 TRG-OPEN



The setting of the photograph is differential output.

8. Maintenance and After-Service

8-1. Before you judge as failure

Power is not turned on

Is the power cord pulled out or loosened?

Plug the power cord into the main body securely.

Is the fuse on the rear panel inserted or burnt?

Insert or replace with a new fuse.

(If the fuse frequently burns out, this may be caused by an internal failure.)

Is power conducted to the outlet?

Plug the power cord of another electric appliance into the outlet, and check if the appliance operates.

Check if power is applied with a voltmeter such as a tester.

Is the power cord broken at some point ?

Check conductivity between both ends of the cord if you have a tester.

The display plate and switches on the front panel do not light up while the heat release fan is rotating.

After turning off the power, turn on the power again. If the same phenomenon occurs, this is considered to be an internal failure.

Display on the front panel is incorrect.

Characters displayed are incorrect. That is, not displayed correctly.

Try to adjust the contrast of Front Panel.(Refer to “4-1. Front Panel”)

After turning off the power, turn on the power again. If the same phenomenon occurs, this is considered to be an internal failure.

The device does not operate even when the joystick is tilted

Is “Non” displayed on the right upper portion of the liquid crystal screen?

This is in the prohibitive mode for joystick operations. Press the switch on the right upper portion of the display, and change the mode.

Is there a rotating sound or abnormal sound?

This is considered to be an out-of-adjustment of the motor, therefore, change the speed, or adjust the output current of the driver.

(When there is a rotating sound), is the motor rotating ?

If the device has been used for a long period of time, the coupling of the motor shaft may be loosened in some rare cases.

(When there is no rotating sound), do the limit indications light up?

The device stopped by the limit switch. Move in the reverse direction and move through the limit zone.

(When there is no rotating sound), is the stage connecting cable pulled out, or loosened ?

Securely plug the stage connector into the main body connector.

(In case of multi-axes specification), do all axes of the move ?

If some axes move, but others do not, exchange the connectors of respective axes (motor), and determine whether trouble is caused on the main body side or motor side.

Origin return operations cannot be performed

Do the motors completely operate ?

Check the other items such as “The device does not operate even when the joystick is tilted”.

(The axis stops at position which is not origin), is the origin sensor correctly installed ?

Adjust the origin sensor.

In such a case where the moving range is small, the limit sensor range may overlap with the origin sensor range. In this case, the device does not operate properly. Make an adjustment so that the origin sensor range is out of the limit range.

When using the origin proximity sensor and origin sensor, take the positional relationship into account. If the origin is out of the origin proximity sensor range, the axis cannot return to the origin properly. Make an adjustment of the origin position.

(The axis stops at a position which is not the origin), is logic for origin sensor properly set ?

Switch the input logic for the sensor (Normal open, Normal close).

Positional deviation

Is the setting such that the moving step value is incorrect?

Check each setting according to the Operation Manual.

Is the motor properly operating ? Does an abnormal sound occur ?

An out-of adjustment may be considered, therefore, change the speed, or adjust the output current of the driver.

Is the load exceeding the rated applied ?

Check the load. Also try to lower the speed.

Is the axis in the limit range ?

In a case where the axis is in the limit range, the stop position and counter value are not guaranteed. Use it out of the limit range.

Is there any problem with the motor assembly and driving portions ?

If the device has been used for a long period of time, the coupling of the motor shaft may be loosened.

Remote control (RS-232C, GP-IB) does not operate properly

Is the communications cable pulled out or loosened ?

Plug the connector of the communications cable into the connector of the main body surely.

Have the parameter settings of RS-232C and address settings of GP-IB been properly performed ?

Read the setting method in the Operation Manual for a check.

(After the settings have been changed, turn on the power again.)

Is a proper cable used ?

Check the arrangement of the connector pins on each cable.

During communications, is any error code transmitted ?

Take measures for an error on the host computer.

Is there any error in the control program on the host computer ?

Check the program. Please note that errors such as distinction between upper and lower case letters and setting of the delimiter code frequently occur.

Are commands transmitted and received properly ? Make sure to receive data for commands which have a response (for example, status reading).

Checking by support software. Support software which can be easily operated is also available.

If proper operations can be performed by the support software, it is considered that the user's software is not correctly written.

Are communications forcedly interrupted mid-stream?

Turn on the power again.

8-2. Maintenance of Product

Maintenance of Controller

- In such cases of using in a dusty room, carry out internal cleaning periodically.
- When not using or storing for a long period of time, make sure to disconnect the power cord from the outlet and also to remove the other cables.
- Maintenance and service other than troubleshooting shall be carried out only by us at cost.

Maintenance of Stage

【Lubrication】

【Looseness of screws】

【Looseness of couplings】

8-3. Contact

If you have question about our products, fill in the necessary items below and notify us by FAX or mail.
 Questions by E-mail are also acceptable.

To KOHZU Precision Co., Ltd., Sales Department

2-6-15, Kurigi, Asao-ku, Kawasaki-shi, Kanagawa 215-8521 Japan

FAX +81-44-981-2181 E-mail: sale@kohzu.co.jp

Product name SC-		Contact date	
		Serial No.	Date / / ()
Customer	Name	TEL	FAX
		Extension	
	Name of company, school or institution	E-mail	
	Department, Affiliation	Address 〒	
Reason for contact Failure How to use Hardware Software			

Please do not hesitate to notify us of your questions and opinions about our company and our products.

8-4. Warranty and After-Service

If the product fails within the warranty period, we will repair free of charge under our stipulations.

Warranty Period	One year from the date of shipment
-----------------	------------------------------------

Request for repair within warranty period

Please contact the sales agent or commercial firm from which you purchased our product, or our Sales Department.

Repair after warranty period has elapsed

Even if the warranty period has elapsed, initially, consult the sales agent or commercial firm from which you purchased the product. Repairs shall be carried out depending on failure at cost.

Maintenance for repairing parts

We will carry out maintenance of most parts for repair within a period specified by us after discontinuing production. Please understand that repair requiring parts for which the warranty period has elapsed may be rejected. Also, this condition may not be satisfied due to inconvenience of the parts supply maker.

9. Specification

9-1. General Specifications

	SC-210	SC-410
Number of axes controlled	2 axes	4axes
Number of axes controlled simultaneously	2 axes	4 axes
Drive motor	5 phases stepping motor	
Driver type	Micro step drive	
Power for driver	AC90-264V	
Driving current	MAX 1.4A / phase	
Power	AC90-240V、 50/60Hz	
electricity consumption	430VA (2 axes motion at 1.4A)	790VA (4 axes motion at 1.4A)
Operating environment	Temperature 0°C to 40°C Humidity 0 to 85%	
Exterior dimensions (mm)	W215 × H88 × D425	W215 × H133 × D425
Weight	5.2kg	7.6kg

9-2. Performance Specifications

	SC-210/SC-410
Driving Function	2 axes simultaneously/independently, 2 axes linear interpolation, 3 axes linear interpolation (SC-410), Trapezoidal/asymmetric trapezoidal drive, S-shaped/asymmetric S-shaped drive
Micro Step Division Number	16 stages 1/2/4/5/8/10/16/20/25/40/50/80/100/125/200/250
Set Movement amount	1 to 16,777,215 pulse
Driving Frequency	1 to 500 Kpps (according to driver)
Origin Return Method	16 methods
Display Type	Display by pulse, Display by conversion pulse, Display by encoder, Display by conversion encoder
Communications Function	RS-232C/GP-IB
Others	Continuous drive, Swing drive, Trigger output

9-3. Connector

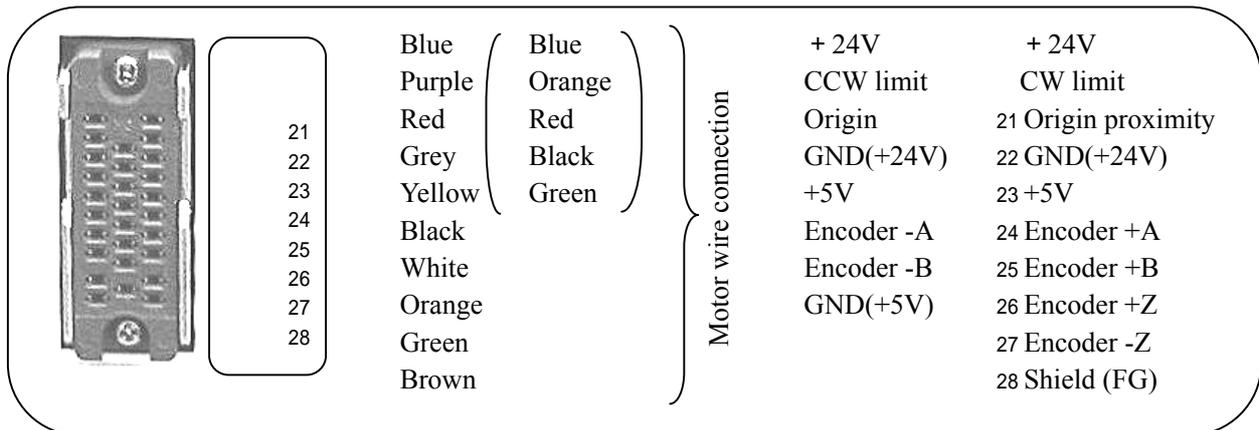
9-3-1. Motor Connecting Connector

The bellow pin arrangement figure is the figure which is shown from the connector side.

Connector model : SD-1628A(09) made by HIROSE ELECTRIC Co.,Ltd.

(Conformity connector : P-1628BA(09) made by HIROSE ELECTRIC Co.,Ltd.)

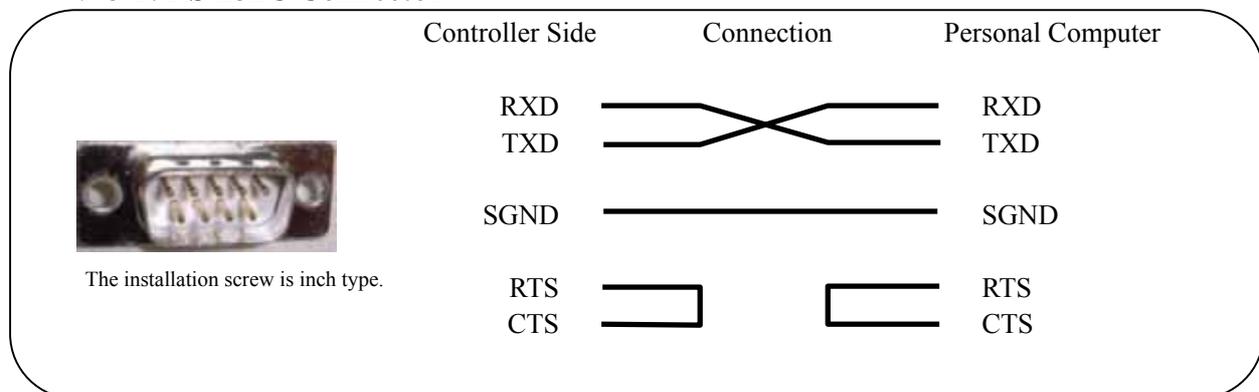
(Conformity cover : P-1628A-CA(20))



The colors of motor line are those of ten lead motors made in Oriental Motor Co.,Ltd..

The colors of motor line bound with a parenthesis are those of five lead motor made in Oriental Motor Co.,Ltd. or Tamagawa Seiki Co.,Ltd..

9-3-2. RS-232C Connector



9-3-3. GP-IB Connector

Connector Arrangement



Signal Name	Pin Arrangement		Signal Name
DIO1	1	13	DIO5
DIO2	2	14	DIO6
DIO3	3	15	DIO7
DIO4	4	16	DIO8
EOI	5	17	REN
DAV	6	18	GND
NRFD	7	19	GND
NDAC	8	20	GND
IFC	9	21	GND
SRQ	10	22	GND
ATN	11	23	GND
FG	12	24	GND

9-3-4. TRG Connector

Connector model :HR30-6R-3S made by HIROSE ELECTRIC

(Conformity connector : HR30-6P-3S(71) made by HIROSE ELECTRIC)



Differential output(at the shipment)

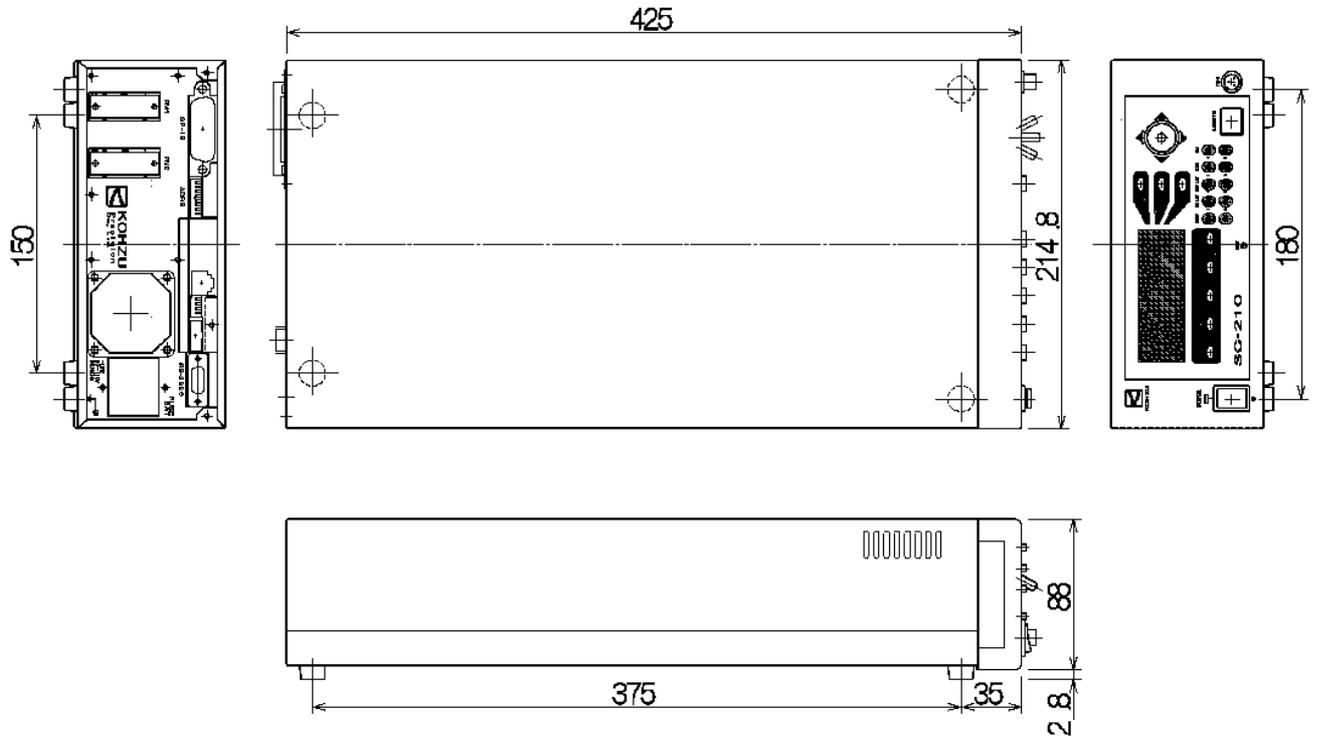
Pin Arrangement	Signal Name
1	TRG H
2	TRG L
3	GND

Open collector output

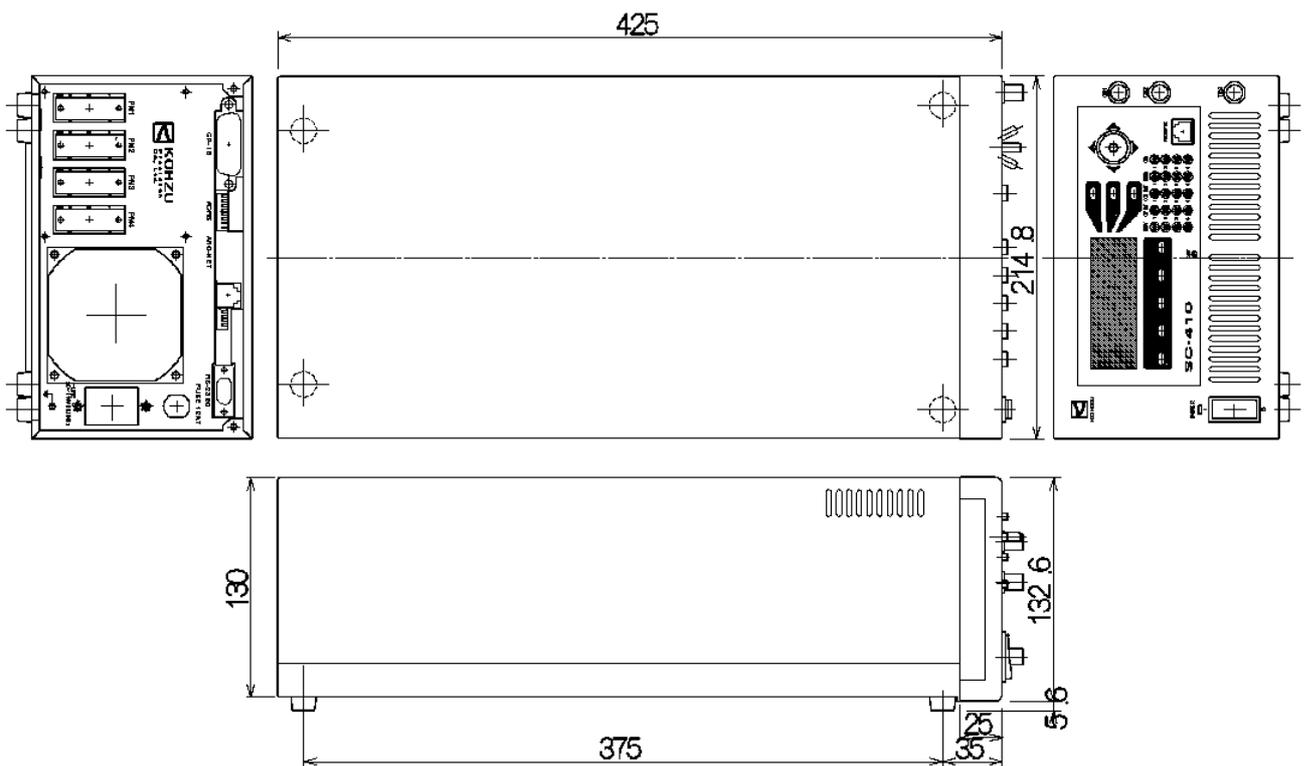
Pin Arrangement	Signal Name
1	+24V
2	TRG
3	GND

9-4. Exterior Dimensions

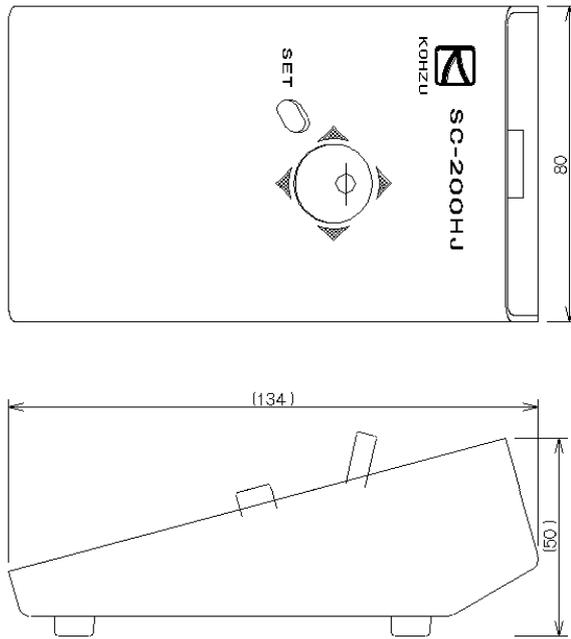
SC-210



SC-410



SC-200HJ(Options)



10. Attached CD-R

10-1. Configuration

The description of the attached CD-R is as follows.

Description	Remarks
SC-210/SC-410 Operation manual	This reference

Descriptions may be subject to change without prior notice.

10-2. Sample Software

- The sample software that SC controller can operate from PC is prepared.
The sample software can be downloaded from our HP.(<http://www.kohzu.co.jp/>)

Appendix

System Setting List

SYS No.	Display	Function	Setting range	Initial value
1	START SPEED(pps)	Start speed of speed table No.0	1 to 4,095,500	500
2	TOP SPEED(pps)	Maximum speed of speed table No.0	1 to 4,095,500	5,000
3	ACC TIME (10ms)	Accelerating time of speed table No.0	1 to 3,275	24
4	DEC TIME (10ms)	Decelerating time of speed table No.0	1 to 3,275	24
5	ORG PRESET DATA	Coordinate value after return to origin	-16,777,215 to +16,777,215	0
6	PM PRESCALE	Motor pulse pre-scaler 0 clear position when using the multi-rotation stage	0 to 16,777,215	0
7	BACKLASH PULSE	Backlash correction Pulse amount	0 to 16,777,215	0
8	BACKLASH TYPE 0-4	Backlash correction 0: Invalid 1 to 4: the selected method	0 to 4	0
9	ORG TYPE 1-17	Selection of origin return method ORG method No.15 is a optional function.	1 to 17	3
10	PLS CAL DIV 1/N	Motor pulse conversion Denominator	1 to 16,777,215	1
11	PLS CAL DIV N/1	Motor pulse conversion Numerator	1 to 16,777,215	1
12	PLS RND OFF 0-9	Motor pulse conversion Designating rounding	0 to 9	2
13	STOP EMG : 0 Fixed	Limit stop method (This function is optional.) 0: Emergency 1: Deceleration	0,1	0
14	OFFSET DATA	Offset	-16,777,215 to +16,777,215	0
15	PM ROTATE CHANGE	Change of rotating direction	0,1	0
16	CWL NON:0 INV:1	CW limiter signal logic	0,1	0
17	CCWL NON:0 INV:1	CCW limiter signal logic	0,1	0
18	NORG NON:0 INV:1	NORG sensor signal logic	0,1	0
19	ORG NON:0 INV:1	ORG sensor signal logic	0,1	0
20	LMT SWAP N:0 Y:1	exchange CW limiter signal and CCW limiter signal	0,1	0
21	COFF ON:0 OFF:1	Motor excitation 0: Excitation ON 1: Excitation OFF	0,1	0
22	ACC CURVE 1-5	Accelerating and decelerating mode 1:Rectangular drive 2:Trapezoidal drive 3:Asymmetric trapezoidal drive 4:S-shaped drive 5:Asymmetric S-shaped drive	1 to 5	2
23	CONSTANT PULSE	low-speed movement pulses until stopping after it decelerates	1 to 16,777,215	5
24	ENC CAL DIV 1/N	Encoder pulse conversion Denominator	1 to 16,777,215	1
25	ENC CAL DIV N/1	Encoder pulse conversion Numerator	1 to 16,777,215	1
26	ENC MULTIPLI 1-4	Encoder pulse multiplication settings 1:1 multiplication 2:2 multiplication 4:4 multiplication	1,2,4	1
27	ENC PRESCALE	Encoder pulse 0 clear position when using the multi-rotation stage	0 to 16,777,215	0
28	ENC RND OFF 0-9	Encoder pulse conversion Designating rounding	0 to 9	2

SYS No.	Display	Function	Setting range	Initial value
29	FEEDBACK TYPE 0-2	Encoder correction settings 0: Not correct 1: Correct (only in positioning) 2: Correct (constant)	0 to 2	0
30	PERMIT RANGE PULS	Encoder correction Permissible range (Pulse)	1	1
31	RETRY COUNT	Encoder correction Retry number (times)	1 to 10,000	100
32	WAIT TIME (1ms)	Encoder correction Wait time (ms)	1 to 10,000	100
33	ENC ROTATE CHANGE	Encoder addition direction	0,1	0
34	PM&ENC SYNC WRITE	Encoder coordinate synchronization	0,1	0
35	SPD TABLE 1-300	Speed table multiple setting	1 to 300	1
36	SYS Refresh!! Pass:0 Exec:1	Initialization of system 0: Pass 1: Execute initializing	0,1	0
37	JSC Function P:0 R:1 P&R:2	Selection of joystick 0: On main body side 1: External 2: Possible on both sides	0 to 2	0
38	JSC Fnc d:0 LR:1 UD:2	Joystick allotment of top and bottom, right and left 0:default 1:LR 2:UD	0 to 2	0 (Axis No.1 : LR Axis No.2 : UD)
39	JSC DIR NON:0 INV:1	Joystick direction 0:normal 1:invert	0,1	0
40	JSC Hi Speed (pps)	Joystick High Speed change	0 to 4,095,500	8,000
41	JSC Low Speed (pps)	Joystick Low Speed change	0 to 4,095,500	200
42	DSP Line No1 Axis_No Select	LCD panel Axis No. displayed in second line	1 to 8	1
43	DSP Line No1 SOUR PMC:0 ENC:1	Selection of display (Second line) 0: Pulse display 1: Encoder display	0,1	0
44	DSP Line No1 DATA PIs:0 Cal:1	Selection of conversion display (Second line) 0: Non conversion display 1: Conversion display	0,1	0
45	DSP Line No2 Axis_No Select	LCD panel Axis No. displayed on third line	1 to 8	2
46	DSP Line No2 SOUR PMC:0 ENC:1	Selection of display (Third line) 0: Pulse display 1: Encoder display	0,1	0
47	DSP Line No2 DATA PIs:0 Cal:1	Selection of conversion display (Third line) 0: Non conversion display 1: Conversion display	0,1	0
48	TRG SOUR PMC:0 ENC:1	Selection of trigger signal source 0:Pulse 1:Encoder(only 2 Multiplication)	0,1	0
49	TRG Div RATIO 1-1000	Ratio of trigger signal	1 to 1000	1
50	TRG Edge UP:0 DW:1	Selection of edge of trigger signal 0:Up 1:Down	0,1	0
51	TRG Both:0 CW:1 CCW:2	Direction of trigger signal generation 0:Both 1:CW 2:CCW	0,1,2	0
52	TRG Pass:0 Exec:1	Enable setting to SYS No.48 – SYS No.51 0: Pass 1: Execute	0,1	0

List of Commands

The commands that are usable in SC-210/SC-410 are as in the table below.
For details, refer to the pages for respective commands.

		Command		Applicable model SC-		Page
Type	Descriptio	Function		210	410	
Settings	RST	System Reset				78
	MPC	Motor-related Polarity Change				66
	ASI	Motor-related Initial Setting (set acceleration and deceleration by time)				56
	MSI	Motor-related Initial Setting (set acceleration and deceleration with STEP)				56
	ESI	Encoder-related Initial Settings				62
	LNK	Link Move Ratio Setting		2 axes	3 axes	65
	DSP	Display Switching				61
	RSI	Change Rectangular Drive Speed				77
Drive	ORG	Origin Return Drive				68
	APS	Absolute Position Drive				55
	RPS	Relative Position Drive				76
	SPS	Linear Interpolate Drive				81
	MPS	Multi-axis Position Drive		2 axes	4 axes	67
	OSC	Oscillation Drive				69
	FRP	Free Rotation Drive				63
	STP	Stop				83
	COF	ON/OFF for Excitation				60
Coordinate	RDP	Position Read				72
	WRP	Position Write				87
	RDE	Encoder Read				70
	WRE	Encoder Write				85
	RDO	Offset Read				71
	WRO	Offset Write				86
Information	STR	Status Read				84
	RSY	System Setting Information Read				78
	RMS	Motor Setting Information Read				75
	RMP	MPC Setting Informaion Read				74
	RES	(ESI) Encoder Setting Information Read				73
	IDN	Version Read				64
Speed Table	WTB	Speed Table Setting Information Write				88
	RTB	Speed Table Setting Information Read				79
Teaching	TAS	Teaching Function Axis Information Set		2 axes	3 axes	89
	TMS	Teaching Function Position Information Set		2 axes	3 axes	90
	RDT	Teaching Function Position Data Read		2 axes	3 axes	92
	WRT	Teaching Function Position Data Write		2 axes	3 axes	92
	TPS	Teaching Function Teaching Drive Teaching		2 axes	3 axes	91

(To be continued to next page)

Commands that are usable in SC-210/SC-410 are as in the table below. For details, refer to the pages for respective commands.

(Continuance of previous page)

Type	Description	Command Function	Applicable model SC-		Page
			210	410	
Easy control (Internal setting dependence)	PMS	Easy Control Speed Change			93
	PMP	Easy Control Relative Position Drive			94
	PMA	Easy Control Absolute Position Drive			95
	PMH	Easy Control Origin Search			96
Measurement	SCN	Continuous Scan			97
	RBU	Scan Data Read			99
	SFT	Fixed Time Measurement			101
Drive aid	RCP	Constant Pulse Read			103
	WCP	Constant Pulse Write			103
Shutter Control	SHM	Shutter Manual Control			104
	SHG	Shutter Expose			105
Trigger Control	TRG	Trigger Setting			107
	TRS	Trigger Select			109
	TRP	Trigger Polarity Setting			111

List of Error Codes

System Related Error (independent of the command type)

Error code	Description	Remarks
1	No STX on head of the command.	
2	Total number of commands is short.	
3	Absence of CR+LF	
4	Character other than specified characters and figures is included.	
5	No applicable command.	
10	Now operating in manual mode.	

Parameter Error

Error code	Description	Remarks
100	Total number of parameters is incorrect.	
1n ₁ n ₂	Numerical value of n ₁ n ₂ th parameter is out of range.	n ₁ n ₂ = 01 to 14
120	Value is designated so that movable value at one time is exceeded.	

Command Issue Sequence Error

Error code	Description	Remarks
200	Reset command is not issued.	
201	The MSI and ASI commands are not issued.	
202	Link command is not issued.	
205	The ORG command is not issued. (Origin is not detected)	
206	The APS/RPS? command corresponding to the first parameter of the MPS command is not issued.	
207	The APS/RPS? command corresponding to the second parameter of the MPS command is not issued.	
208	The APS/RPS? command corresponding to the third parameter of the MPS command is not issued.	
209	APS/RPS? command corresponding to the fourth parameter of the MPS command is not issued.	
210	The ESI command is not issued.	

Drive Related Error

Error code	Description	Remarks
300	PMG is in use.	Inside IC (Integrated circuit) related error
301	Speed setting is 0 in rectangular drive.	
302	Operating the axis during driving.	
303	Tried to rewrite the present value of the axis during driving.	
304	Stopped by CW limiter during driving.	
305	Stopped by CCW limiter during driving.	
306	Any axis on MPS driving stopped by limiter.	
307	Both of CW and CCW limiters are activated.	
308	Tried to move the axis for which excitation is OFF.	
309	Out of the control range in feedback control.	

(To next page)

(From last page)

Link Related Error

Error code	Description	Remarks
400	Hardware which does not allow for LNK driving.	
401	Operating axis during LNK driving.	
402	Link counter is now in use.	
403	Tried to rewrite present value of axis during LNK driving.	
404	Designated to stop axis which is driving by slave axis.	
405	Axis designation of LNK slave 1 is incorrect.	
406	Axis designation of LNK slave 2 is incorrect.	

Multi-Axes Setting Error

Error code	Description	Remarks
501	First parameter and second parameter are the same.	
502	First parameter and third parameter are the same.	
503	First parameter and fourth parameter are the same	
504	Second parameter and third parameter are the same.	
505	Second parameter and fourth parameter are the same.	
506	Third parameter and fourth parameter are the same.	

ASI, WTB, RTB Command Calculation Error

Error code	Description	Remarks
600	Accelerating pulse number is large, or accelerating time is long.	
601	Accelerating pulse number is small, or accelerating time is short.	
602	Decelerating pulse number is large, or decelerating time is long.	
603	Decelerating pulse number is small, or decelerating time is short.	
604	Preparation failure of speed table with the WTB command.	

Controller Error

Error code	Description	Remarks
700	The command and the parameter uncorresponds to SC-210 were issued.	

Scanning Error

Error code	Description	Remarks
1102	The value specified by the SCN command for the movement amount did not come up to twice measuring STEP.	

Teaching Error

Error code	Description	Remarks
1200	In teaching function, positional coordinates aren't written in the memory of specified axis No.	

Warning Message

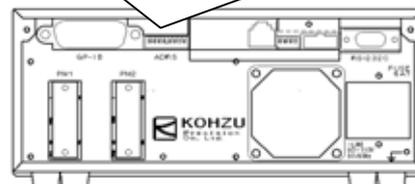
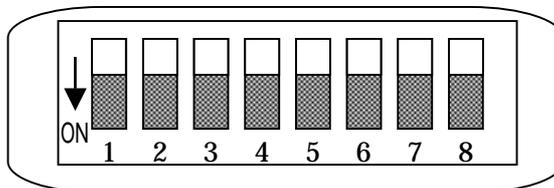
Error code	Description	Remarks
1	The target position and present position are the same.	
2	In one move setting, waiting time is designated with OSC command.	
100	Designated address to which a coordinate is not registered by the TPS command.	

DIP Switch (RS-232C/GP-IB Setting Switch)

 Turn off the power switch of SC-210/SC-410 when you set DIP switch.

Position of DIP switch

The DIP switch is located at the upper part of the rear panel on the main body.



Settings

Settings are as in the table below.

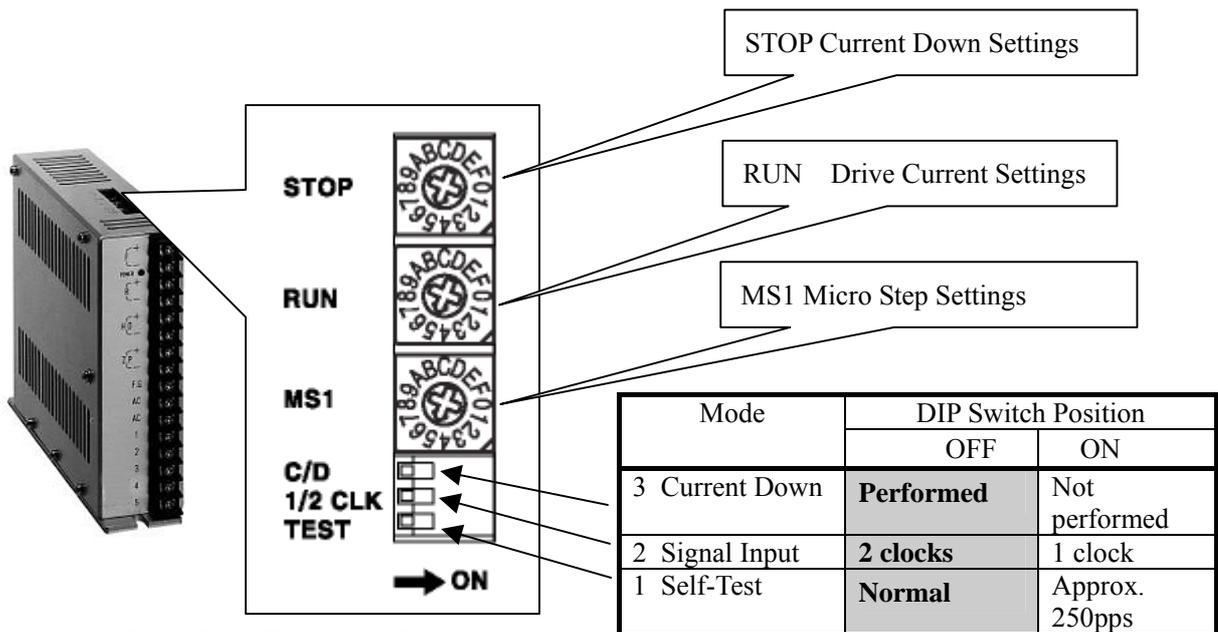
Switch settings in the left half of the table are reflected in settings in the right half of the table.

Switch setting								Communi- cation mode	RS-232C setting				GP-IB	
1	2	3	4	5	6	7	8		Speed	Parity	Word length	S bit	Delimiter	Address
OFF	OFF	*	*	*	*	*	OFF	RS	38400	*	*	*	*	*
ON	OFF	*	*	*	*	*	OFF	RS	28800	*	*	*	*	*
OFF	ON	*	*	*	*	*	OFF	RS	19200	*	*	*	*	*
ON	ON	*	*	*	*	*	OFF	RS	9600	*	*	*	*	*
*	*	OFF	OFF	*	*	*	OFF	RS	*	NON	*	*	*	*
*	*	OFF	ON	*	*	*	OFF	RS	*	EVEN	*	*	*	*
*	*	ON	ON	*	*	*	OFF	RS	*	ODD	*	*	*	*
*	*	*	*	OFF	*	*	OFF	RS	*	*	8	*	*	*
*	*	*	*	ON	*	*	OFF	RS	*	*	7	*	*	*
*	*	*	*	*	OFF	*	OFF	RS	*	*	*	1	*	*
*	*	*	*	*	ON	*	OFF	RS	*	*	*	2	*	*
OFF	OFF	OFF	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	0
ON	OFF	OFF	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	1
OFF	ON	OFF	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	2
ON	ON	OFF	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	3
OFF	OFF	ON	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	4
ON	OFF	ON	OFF	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	5
ON	ON	ON	ON	OFF	*	*	ON	GPIB	*	*	*	*	CRLF	15
OFF	OFF	OFF	OFF	ON	*	*	ON	GPIB	*	*	*	*	CRLF	16
ON	ON	ON	ON	ON	*	*	ON	GPIB	*	*	*	*	CRLF	31



- GP-IB delimiters are fixed to CRLF.
- 6 to 14 and 17 to 30 in the GP-IB addresses are omitted in the above table.

Internal Driver(MD-501C)



Setting of Micro Step Division Number

Set the micro step division number with the rotary digital switch MS1. The setting of the switch and the division number is as in the following table (“Setting table for number of divisions”)

Setting table for division number **MS1**

Setting	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
number of divisions	1	2	4	5	8	10	16	20	25	40	50	80	100	125	200	250

The driver is set to the setting 1 (2 divisions) when shipped from the factory.

Setting of Drive Current

Set the current when the motor is running with the digital switch indicated as RUN. The setting and the current value is as in the following table.

Setting table for drive current **RUN**

Setting	0	1	2	3	4	5	6	7	8	9
Driving current	0.35	0.42	0.5	0.58	0.66	0.75	0.8	0.85	0.92	0.98
					A	B	C	D	E	F
					1.05	1.12	1.18	1.26	1.32	1.4



The driver is set to the setting 5 (0.75A) when shipped from the factory.

If the product and our motor drive stage are purchased simultaneously, the settings of the motor and the stage are made compatible before shipment. In a case of replacement with another stage (motor), check the drive current of the motor for the setting.

Setting of Current-Down

If setting of automatic current down has been set (C.D switch is OFF), current down is performed at the set ratio when the motor stops. Set with the digital switch indicated as STOP.

Setting table for current down **STOP**

Setting	0	1	2	3	4	5	6	7	8	9
%	27	31	36	40	45	50	54	58	62	66
					A	B	C	D	E	F
					70	74	78	82	86	90



In general, the driver is set to the setting 5 (50%) when shipped from the factory.

When it is considered that the automatic current down has not been performed, check the switch setting for the correct setting.

Change Check-Sheet

Record a change in the setting of the main body and driver if made.

Customer Name		Serial No.	
Person in Charge		Date shipped/purchased	
Remarks			

DIP Switch

Changed date	ADRS																			
	1	2	3	4	5	6	7	8												
• •																				
• •																				

Speed Table

Axis Name																	
Selection		L	H	A	D	L	H	A	D	L	H	A	D	L	H	A	D
Speed Table	0																
	1																
	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																
	11																

Setting for each axis

Changed Date		• •	• •	• •	• •	• •	• •	• •	• •
Axis Name									
SYS Parameter Setting	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
	No=								
Sensor Voltage									
Internal Driver	Model								
	STOP								
	RUN (Current)								
	M1 (Division number)								
	2/ICK								
	CD								
	L/HV								

【Revision History】

Date	Version	Contents of revision
2008.09.30	1.00	
2008.11.25	1.01	• correction of misprint
2009.09.15	1.02	• correction of misprint about RS-232C Connector
2009.11.30	1.03	• correction of misprint about the change method of Encoder Input System at SC-210 • correction of misprint
2011.02.10	1.04	• correction of misprint about Commands example. • correction of misprint about Encoder Feedback correction permissible range. • The AD converter is changed. The DL-100 production discontinuance is shifted to TUSB-0216ADMZ.
2011.06.27	1.05	• Sample soft explanation change. • Driver RUN current setting is change.

MEMO



Kohzu Precision Co., Ltd.