6. Internal Motor Driver

6-1. Driver Specifications

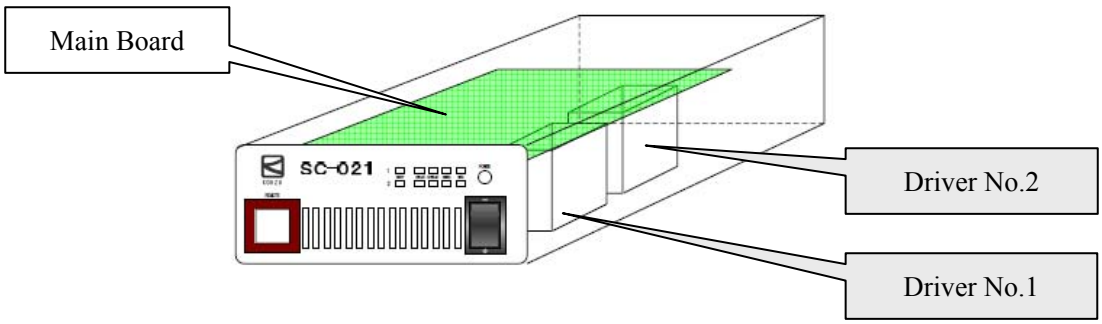
	SC-021
Model	DS507F-2 or DS503F-2
Pwer supply	DC24V 1.4A Max. DC5V 0.02A Max.
Output current	Rated current：0.75A/Phase(DS507F-2) , 0.35A/Phase(DS503F-2)
Input signal	C-MOS input
Maximum response frequency	500kpps Max
Output signal	C-MOS output
Setting of micro-step interpolation	For micro-step driving of one type only, set the number interpolution using the digital SW DSW4 and DSW5. 16 steps(refer to 119 pages)
Operating temperature & humidity	0-40℃ 85%RH Max without any dew any condended.
Storage temperature & humidity	0-80℃ 85% RH Max without any dew any condended.
Mass	Approximately 40g

※The above-mentioned is a specification in the driver unit only.

6-2. Arrangement of Driver

Built-in stepping motor drivers are posted under the main board.

《SC-021》



6-3. 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.

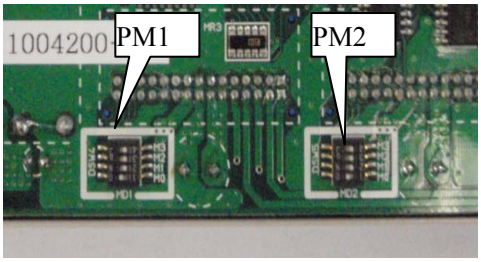
●Opening and Closing Enclosure

Do not plug into the controller for your safety when you will open the housing.

①Remove the 8 screws on the top cover and bottom cover.

②Pull up the top cover and bottom cover.

③The adjustment part for DSW4 and DSW5 on the main board.(Resolution SW)
The adjustment part for Driver under the main board is seen from the rear side,
and make adjustments by using tweezers and a clock driver.(RUN current, STOP current)



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.

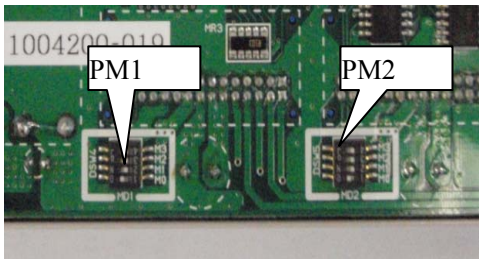
◇Setting of Micro Step division number.

Set the micro step division number with the digital switch DSW4, DSW5.

The setting of the switch and the division number is as in following table.

(Setting table for division number)

The driver is set to the setting 2 resolution when shipped from the factory.



Setting table for division number

		Resolution															
		1	**2**	**2.5**	**4**	**5**	**8**	**10**	**20**	**25**	**40**	**50**	**80**	**100**	**125**	**200**	**250**
SW Setting	**M0**	OFF	**ON**	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
	M1	OFF	**OFF**	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
	M2	OFF	**OFF**	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
	M3	OFF	**OFF**	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON

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.

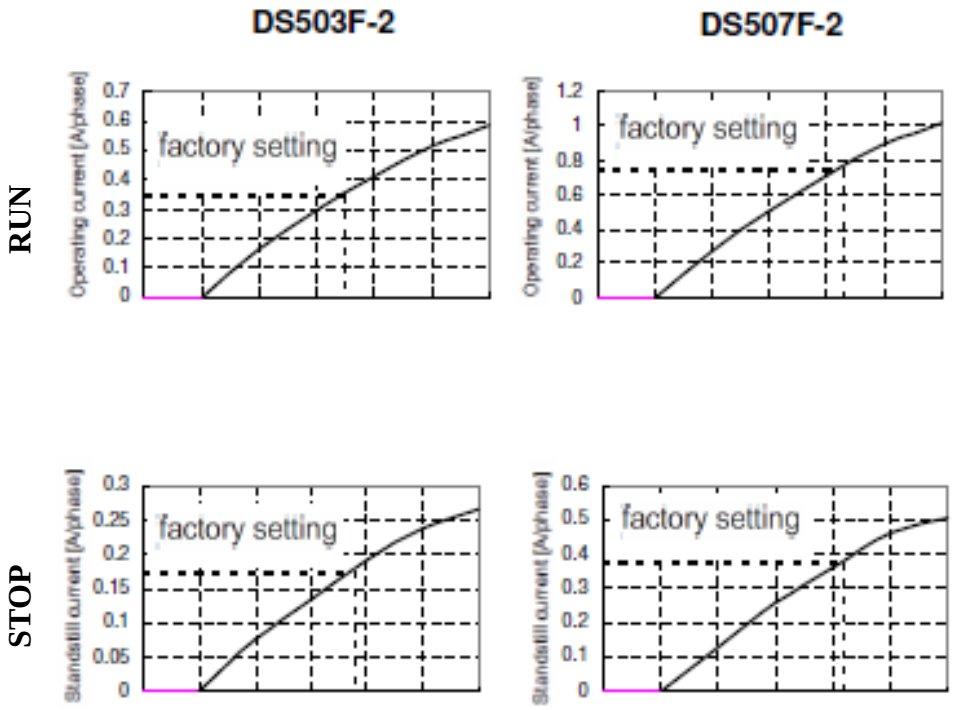
◇Setting of Drive Current and Stop Current.

Set the current when the motor is running and stop with the current trimmer switch indicated as RUN and Stop. (Don't use ECO switch)

The setting and the current value is as in the following graph.

■ Ranges of current setting

＜Microstep＞



6-4. Change in Encoder Input System

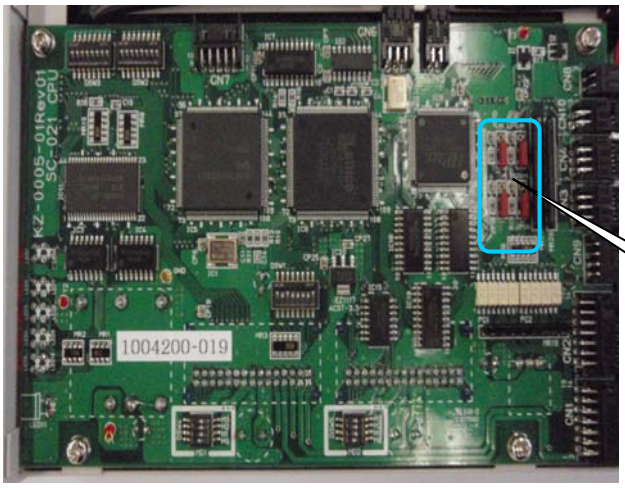
In SC-021, the encoder input method can be selected from differential input/open collector input. When the encoder input method is changed, it is necessary to replace the jumper pin. The setting when shipping it is a differential input setting.

《encoder signal input》

Do not plug into the controller for your safety when you will open the housing.

1. Open Enclosure (refer to P.117), please remove top cover after removing 4 hexagon socket screw at the body side. And set the jumper-pin on the main board

Front Panel side

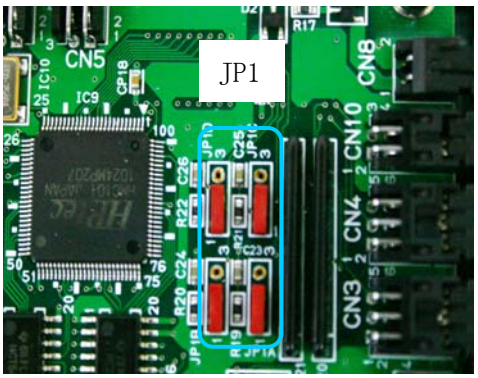


Rear Panel side

JP1

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 (four 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.

Front Panel side



Open collector

Rear Panel side

Differential

The setting of the photograph is Differential.

7. Maintenance and After-Service

7-1. 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.

7-2. 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】

7-3. 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

<table>
<tr><td colspan="3">Product name SC-</td><td colspan="2">Contact date
Serial No. Date / / ( )</td></tr>
<tr><td rowspan="3">Customer</td><td>Name</td><td></td><td>TEL
Extension</td><td>FAX</td></tr>
<tr><td>Name of company, school or institution</td><td></td><td colspan="2">E-mail</td></tr>
<tr><td>Department, Affiliation</td><td></td><td colspan="2">Address 〒</td></tr>
<tr><td colspan="5">Reason for contact ☐Failure ☐How to use ☐Hardware ☐Software</td></tr>
</table>

※ Please do not hesitate to notify us of your questions and opinions about our company and our products.

7-4. 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.

8. Specification

8-1. General Specifications

	SC-021
Number of axes controlled	2 axes
Number of axes controlled simultaneously	2 axes
Drive motor	5 phases stepping motor
Driver type	Micro step drive
Power for driver	DC24V DC5V
Power	AC100V、50/60Hz
electricity consumption	80VA (2 axes motion at 0.75A)
Operating environment	Temperature 0°C to 40°C Humidity 0 to 85%
Exterior dimensions (mm)	W107×H44×D220
Weight	1180g

8-2. Performance Specifications

	SC-021
Driving Function	2 axes simultaneously/independently, 2 axes linear interpolation, Trapezoidal/asymmetric trapezoidal drive, S-shaped/asymmetric S-shaped drive
Micro Step Division Number	16 stages 1/2/2.5/4/5/8/10/20/25/40/50/80/100/125/200/250
Set Movement amount	1 to 16,777,215 pulse
Driving Frequency	1 to 500 Kpps（according to driver）
Origin Return Method	14 methods
Display Type	Display by pulse, Display by conversion pulse, Display by encoder, Display by conversion encoder
Communications Function	RS-232C
Others	Continuous drive, Swing drive

8-3. Connector

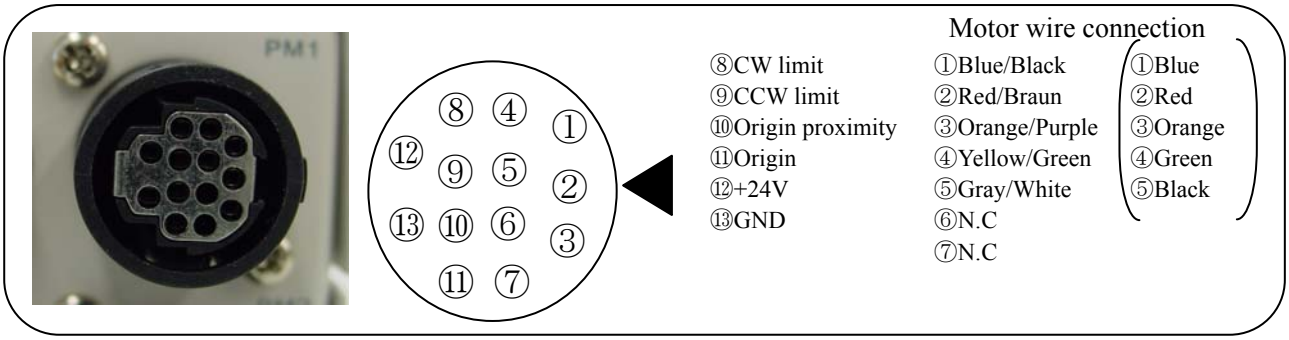
9-3-1. Motor Connecting Connector

The bellow pin arrangement figure is the figure which is shown from the connector side.

Connector model : RP13A-12R-13SC made by HIROSE ELECTRIC Co.,Ltd.

(Conformity connector：RP13A-12PA-13PC made by HIROSE ELECTRIC Co.,Ltd.)

(Conformity contact：RP19-PC-122)

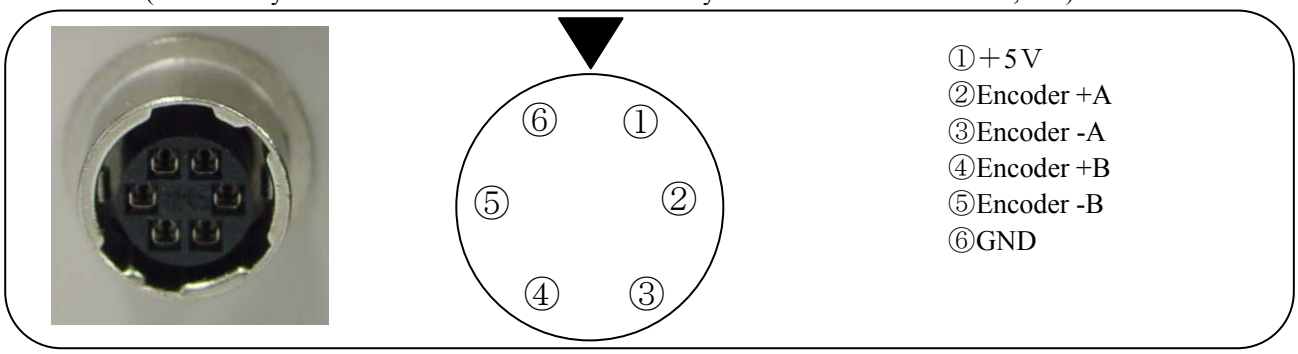


The colors of motor line are those of ten lead motors made in Oriental Motor Co.,Ltd..
The colors of motor line bound with a parenthesis are those of five lead motor made in Oriental Motor Co.,Ltd. or Tamagawa Seiki Co.,Ltd..

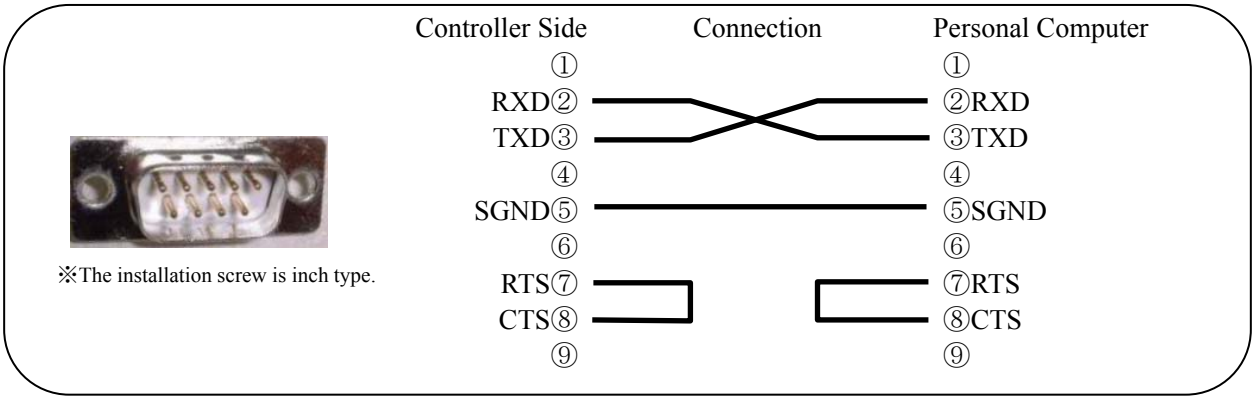
9-3-2. Encoder Connecting Connector

Connector model : HR10A-7R-6SC made by HIROSE ELECTRIC Co.,Ltd.

(Conformity connector：HR10A-7P-6PC made by HIROSE ELECTRIC Co.,Ltd.)

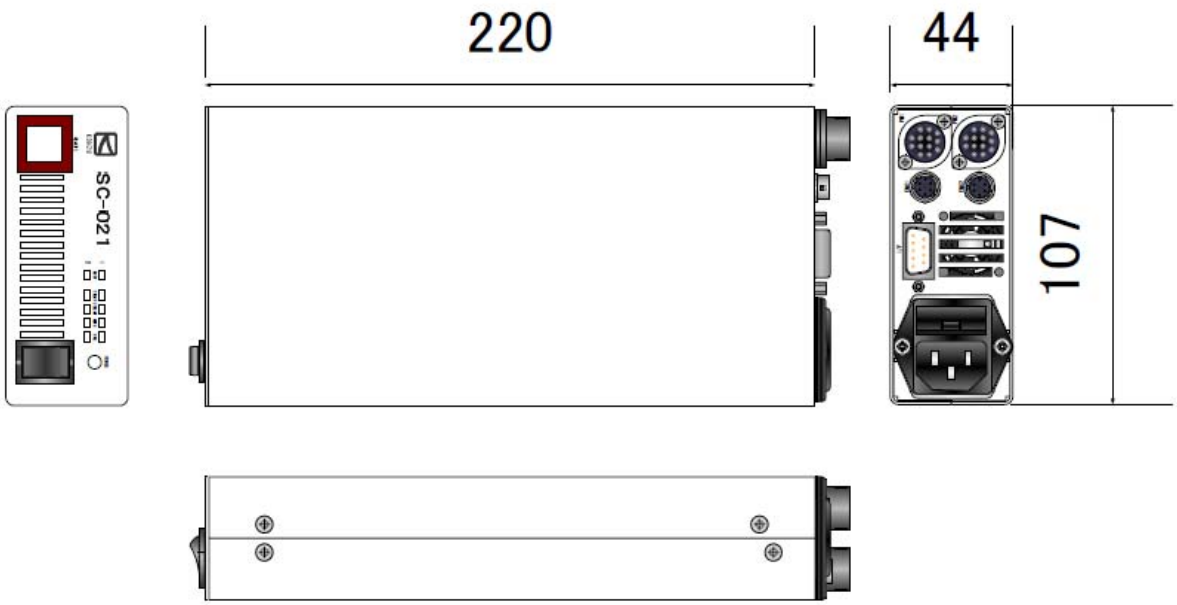


9-3-2. RS-232C Connector



8-4. Exterior Dimensions

SC-021



9. Attached CD-R

9-1. Configuration

The description of the attached CD-R is as follows.

Description	Remarks
SC-021 Operation manual	This reference

※ Descriptions may be subject to change without prior notice.

9-2. 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-scalar 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	DSP Line No1 Axis_No Select	RC-010s LCD panel Axis No.(First Line) displayed in second line	1, 2	1
38	DSP Line No1	Selection of conversion display (First Line) 0: Pulse display 1: Encoder display 2: Conversion Pulse display 3: Conversion Encoder display	0 to 3	0
39	DSP Line No2 Axis_No Select	RC-010s LCD panel Axis No.(Second Line) displayed in second line	1,2	2
40	DSP Line No2	Selection of conversion display (Second Line) 0: Pulse display 1: Encoder display 2: Conversion Pulse display 3: Conversion Encoder display	0 to 3	0
41	Manual Hi Speed (speed table)	Manual Hi Speed change. (SCAN MODE)	0 to 9	7
42	Manual Low Speed (speed table)	Manual Low Speed change. (SCAN MODE)	0 to 9	1
43	SCAN Pulse Value	Setting of amount of movement pulse by operation once. (SCAN MODE)	0 to 999,999	1

●List of Commands

The commands that are usable in SC-021 are as in the table below.
For details,refer to the pages for respective commands.

Command			Applicable model SC-		Page
Type	Descriptio	Function	021	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
	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		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		89
	TMS	Teaching Function Position Information Set	2 axes		90
	RDT	Teaching Function Position Data Read	2 axes		92
	WRT	Teaching Function Position Data Write	2 axes		92
	TPS	Teaching Function Teaching Drive Teaching	2 axes		91

(To be continued to next page)

Commands that are usable in SC-021 are as in the table below. For details,refer to the pages for respective commands.

(Continuance of previous page)

Command			Applicable model SC-021	Page
Type	Description	Function		
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

MEMO

【Revision History】

Date	Version	Contents of revision
2011.02.14	1.00	First version release
2011.06.27	1.01	Stage drive application is release.
2013.11.01	1.02	Driver spec 800KHz → 500KHz

Pioneering the door to the future with a commitment to technology

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E- mail: sale@kohzu.co.jp

Web Site: http://www.kohzu.co.jp/

●Section for recording

Purchased Date Year Month Date

Purchased from

Person in charge TEL

Production No.

Special note

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Kohzu Precision Co., Ltd.