KOHZU

operation manual

Rev1.04

MontBlanc stage compliant
Stepping motor controller

KOSMOS series
Model: CRUX-D

RoHS

User's Manual

Read this manual before using this product.
Keep in a convenient place for future reference.

CRUX-D

CRUX-D

Kohzu Precision Co.,Ltd.

Introduction

Thank you for purchasing our stage controller, “CRUX-D”.

In this document, information and operation method for the stepping motor controller, "CRUX-D", are explained.

Read this manual carefully and understand the functions thoroughly before using "CRUX-D".

In addition, keep this document in a convenience place for future reference.

Symbols Identifications

In this document, noted items that should be followed to prevent danger to people and damage to the device are divided as shown next.

Prohibited

This symbol indicates prohibited items. Do not conduct actions specified under this symbol.

Warning (Caution)

This symbol indicates items that require warning (caution). If operation is conducted ignoring noted contents, it may cause injury or physical damage.

Note/Remarks

This symbol indicates items to provide further understanding or useful information.

Safety Precautions

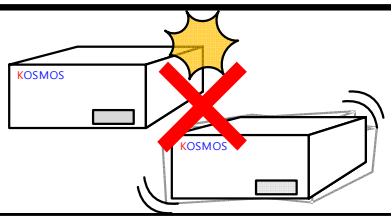
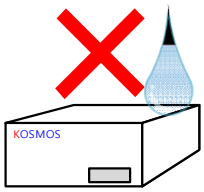
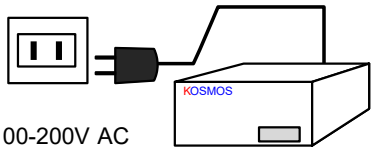
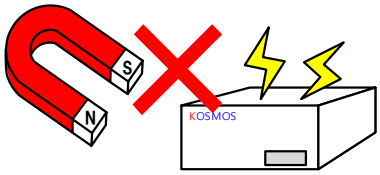
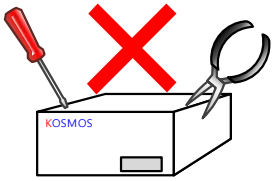
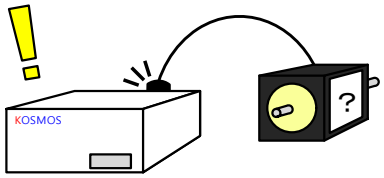
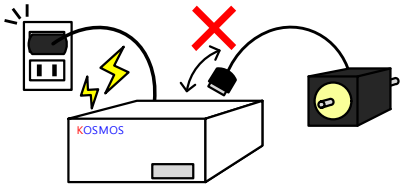
			Do not apply severe shock to the product and avoid using in a place with vibration.
			Do not use this device in places where there is risk of liquid or chemical splashes. Doing so may cause failure.
		 100-200V AC	Use 100-240V AC (50/60Hz) as a power supply. *Confirm ratings of the power cable. *Always earth FG (Frame Ground).
			Do not use near large motors, high voltage electric devices or devices that generate strong magnetism. Doing so may lead to malfunction.
			Do not disassemble or modify the product.
			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 pull out or insert cables.

Table of Contents

1 Product Summary

1-1. Features of this Product

Providing advanced functions suited to the needs of customers at a low price, this product offers excellent cost performance.

●Completely supports our motor drive precision stage <MontBlanc Series>.

●Micro-step motor driver with 250 divisions at maximum equipped as standard.

●Driving current can be selected from three options: 0.35A/phase, 0.75A/phase, or 1.4A/phase.

●Compact size.

●Supports rectangular and trapezoidal drives.

●10 kinds of settings can be set from the optional speed table.

●Origin return method selectable from 10 kinds (+ORG OFFSET).

●By using the “INCOM” (sold separately), it is possible to conduct debugging operations, such as test operation and adjustment, without requiring a PC.

●Remote control is possible via USB communication/RS-232C communication.

●Control can be performed through the control software “Chamonix”. *Please use the latest version.
Chamonix is an original application developed by this company on the theme of intuitive operation.
Please download from our company's website.

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

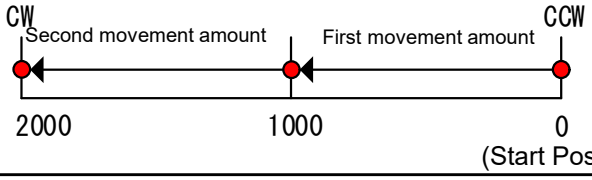
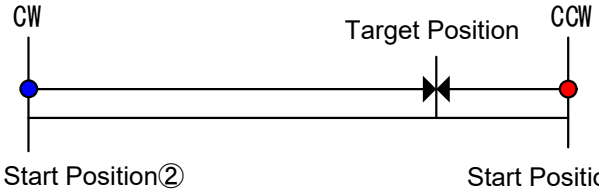
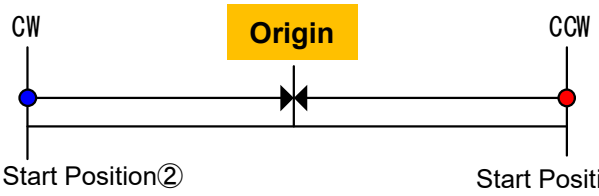
■Out of product scope

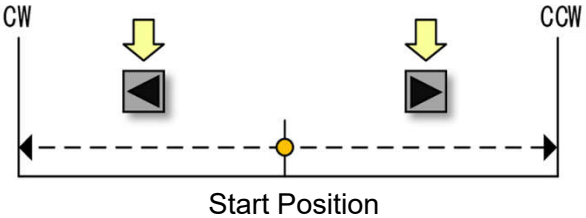
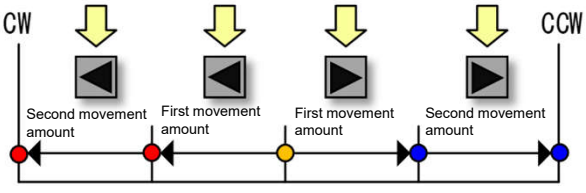
This product does not offer the following items.

- Driving of 2-phase stepping motor.
- Driving of motor with servo motor specifications. *1
- Reading of encoder signals.*1
- Ethernet communication.*1
- Multi-axis simultaneous control using multiple devices.*1
- Automatic operation using this device only.* 2

*1 This can be done on the high-end model ARIES/LYNX. Because ARIES/ LYNX has a separable driver, it is used with a separate driver.
By using multiple devices, it is possible to connect up to 32 axes and conduct multi-axis simultaneous drive on up to 4 axes.
*2 Remote control is possible via USB/RS-232C communication.

1-2.List of Functions

Relative Position Drive (2 axes simultaneous start possible)	Moves toward the specified direction from the present position by a set moving value.  Example: Move to CW angle (1000 pulse) at two times.
Absolute Position Movement (2 axes simultaneous start possible)	Moves to the specified target position.  Example: Start Position① or Start Position② move to target position.
Origin Return Movement	Performs origin return with the specified origin return method.  Example: Start Position ① or ② move return Origin position.

Continuous Drive Mode (Optional)	Moves continuously with the free drive mode of the easy control Handy Terminal "INCOM".  Start driving while the button is pushed and stops when released.
Relative Position Drive Mode (Optional)	Moves for the specified moving amount with the relative position drive mode of the easy control jog box "INCOM". *Moving amount is set from PC.  Performs a regulated amount of drive in one operation.

1-3.Attachments and Options

1-3-1. Attachments

The following items are included to the product. Make sure to check that all items are included. Immediately contact your retainer or our sales department if there are missing or damaged parts.

①3-pin power cable 2m (with 3-pin→2-pin conversion plug)

The provided power cable is for use in Japan (125V).

If using with 200V power inside or outside of Japan, you need to prepare a separate power cable.

②Emergency stop short plug

This short plug is connected if the emergency stop signal is not used.

③Clear Bumpon x 4

This is a transparent nonslip pad. Please attach according to the need.

1-3-2. Other Items to Be Prepared (Essential)

The following items are not attached. Please prepare separately.

①KOSMOS series motor cable (for driving MontBlanc products) (sold separately)

Please purchase separately according to the purpose of use.

Motor cable list for KOSMOS series (For 5 motor lead wire)

Stage side Connector shape	Length	Cable type	
		Fixed cable	Moving cable
Round type connector	3m	CB1503	RCB1503
	5m	CB1505	RCB1505
	10m	CB1510	RCB1510

*Other types of cable (for 10-lead and square connector) can also be manufactured.
For details, see our company's website.

②PC communication cable (Commercial product)

Please prepare one of the following for connecting this product to a PC.

- USB cable (USB2.0 A to B)
- **RS-232C** (**cross**) communication cable

③"CRUX-D Operation Manual" (Acrobat (PDF) format)

To save on resources, a printed operation manual is not attached. Please download from our company's website.

1-3-3. Optional Products

The following optional products are available to make this product easier to use.
Purchase or download as necessary.
For questions about the following products, please contact your retainer or our sales department.

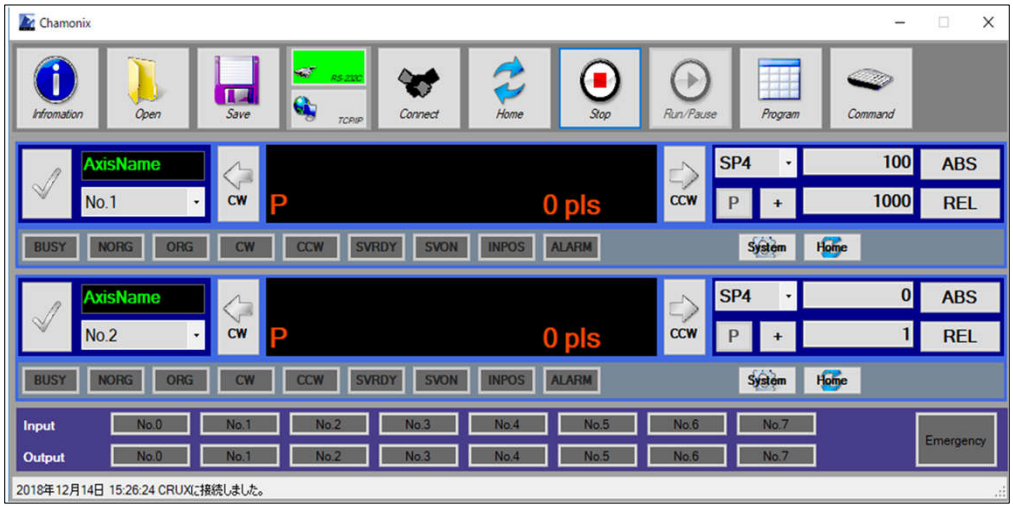
①CRUX handy terminal “INCOM” (sold separately)

This handy terminal can control the basic operating functions of this product.

For details, see “4 Handy Terminal for Easy Control” (Page 25).

②Stage control application “Chamonix”

This application allows all functions of this device to be controlled from a PC.
Please download from our company's website.
*Please use the latest version. It cannot operate on the old version.



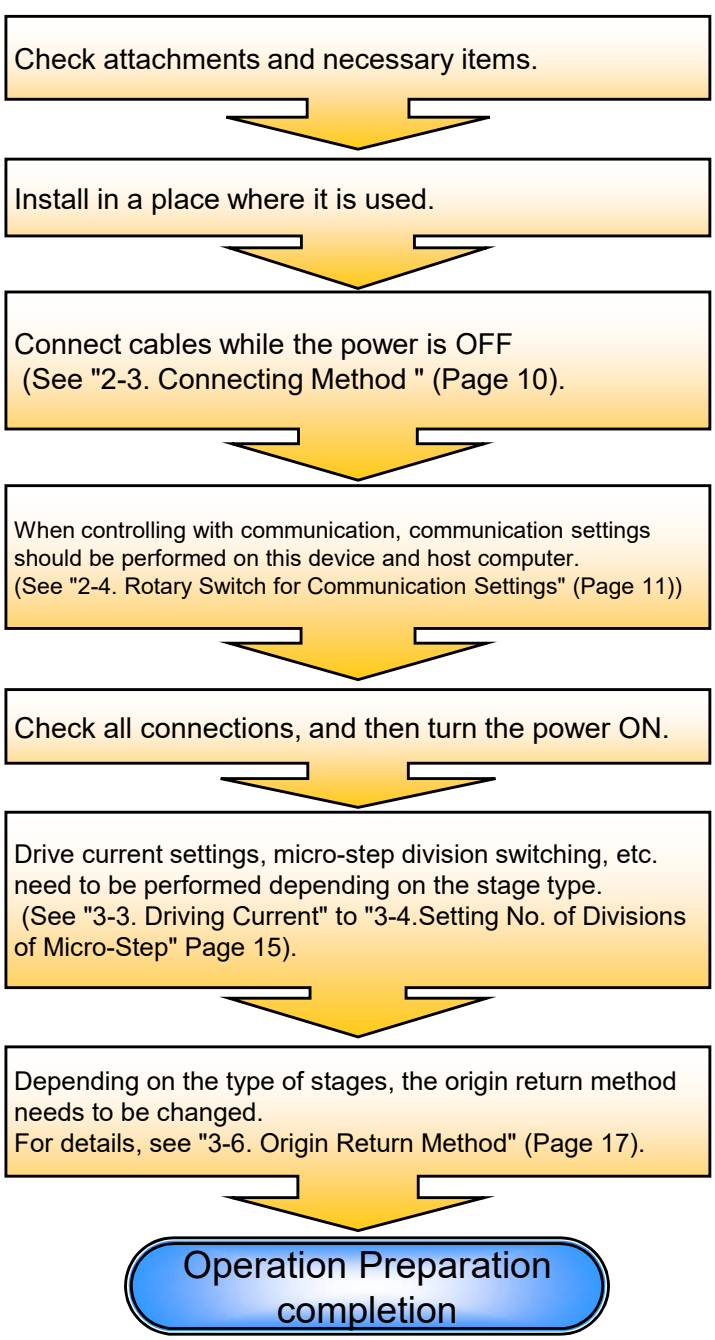
③USB driver

On Windows8.1 or earlier OS, it is necessary to install a driver.
Please download from our company's website.
For details, see "5-7. Installation Procedures of USB Driver" (Page 62).

2 Installation and Preparation

2-1.Proceeding with Installation and Preparation

Be sure to follow the procedure given below when installing this device.



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

Do not install in a place with high temperature, low temperature, high humidity and loud noise.

Make sure the power is OFF.
Cables used for connection are a power cable, motor cable, communication cable, etc.

***Always earth FG (Frame Ground).**

Make sure the power is OFF.
Also, please install a USB driver according to necessity.
For details, see "**5-7.USB Driver Installation Procedure**" (Page **62).**

If you notice abnormalities such as noise and smell after turning the power ON, turn the power OFF immediately, and investigate its cause.

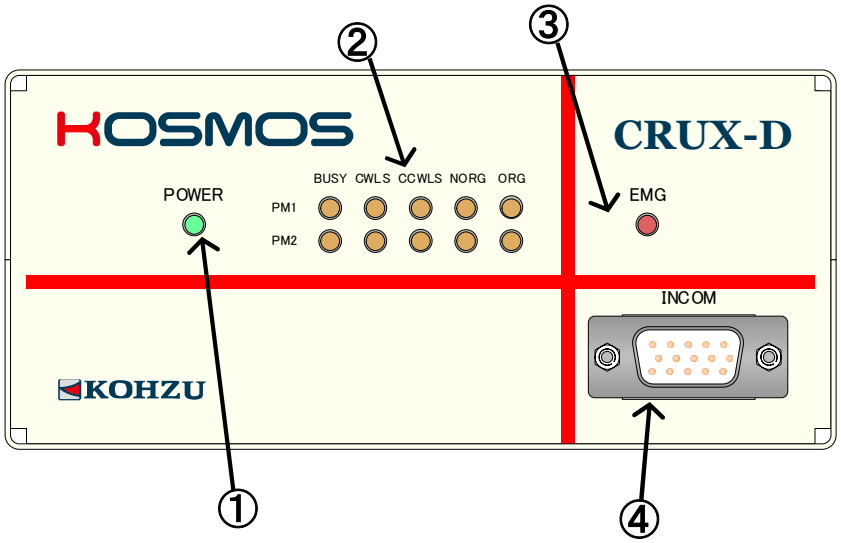
→**"Current Settings"**
*Some models of our standard stages cannot perform origin return normally unless you change the setting.
*Current settings may need to be changed for a part of models of our company's standard stages.

→**"Micro-step Division Switch"**
*Change if necessary depending on your usage purposes.

→**"Return to Origin"**
*Some models of our standard stages cannot perform origin return normally unless you change the setting.
This adjustment is required when this controller is purchased as a single unit, and shipped with factory settings.

2-2.Part Names

【Front Panel】



①Power light
Turns ON green when the power is ON.

②Limit and position sensor display LED
Displays the position sensor state and driving state.

BUSY: Turns ON yellow during motor driving.

CWLS: When the CW limit sensor is in the detection state, it turns ON yellow.

CCWLS: When the CCW limit sensor is in the detection state, it turns ON yellow.

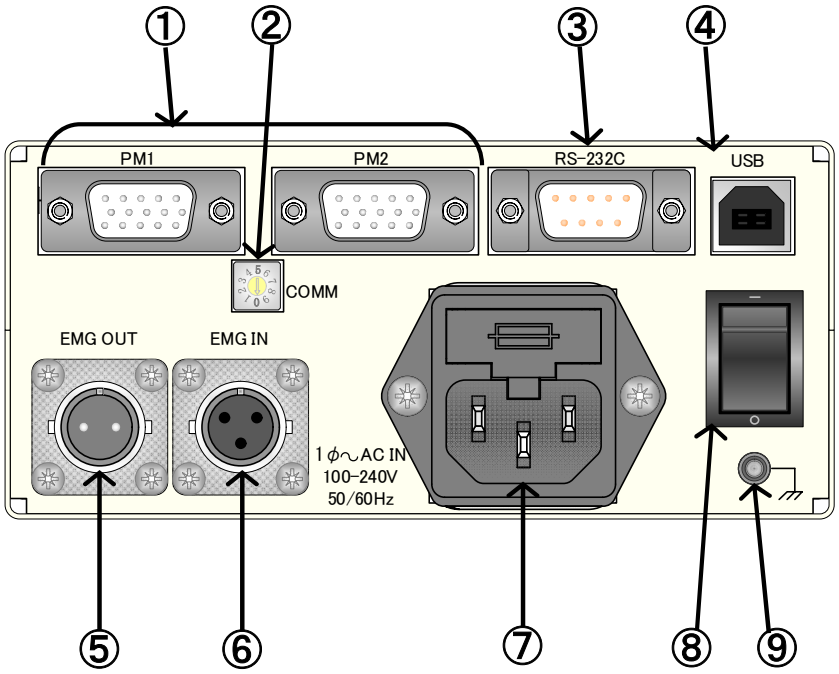
NORG: When the NORG sensor is in the detection state, it turns ON yellow.

ORG: When the ORG sensor is in the detection state, it turns ON yellow.

③Emergency stop LED
When the emergency stop is ON, it turns ON red.

④Connector for "INCOM" connection

【Rear Panel】



①Motor connecting connector
Stage driving output, and sensor input

②Rotary switch for communication mode selection
Selects USB or RS-232C (including baud rate setting)
Selects Normal/Simple command

③RS-232C connector
Connector 9-pin for RS-232C communication line

④USB connector(USB2.0 Type-B)
For USB communication line,
Full-Speed(12Mbps)

⑤Emergency stop signal output connector

⑥Emergency stop signal input connector

⑦Power supply connector (including fuse)

⑧Power switch
Turns power ON/OFF.

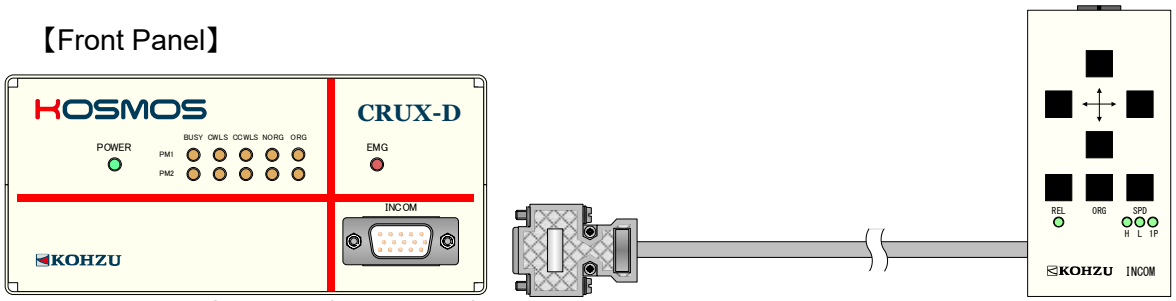
⑨FG terminal

For details concerning each connector, please see “6-2 Connector” (Page 65); and for external dimensions, please see “6-4 CRUX-D External Dimensions” (Page 67).

2-3.Connecting Method

When pulling out or inserting a connection wire, make sure the power of main body is OFF.
Connections between this device and external devices are explained.

【Front Panel】

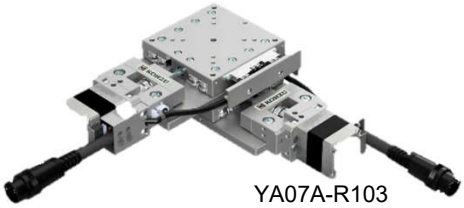


CRUX-D (this device)

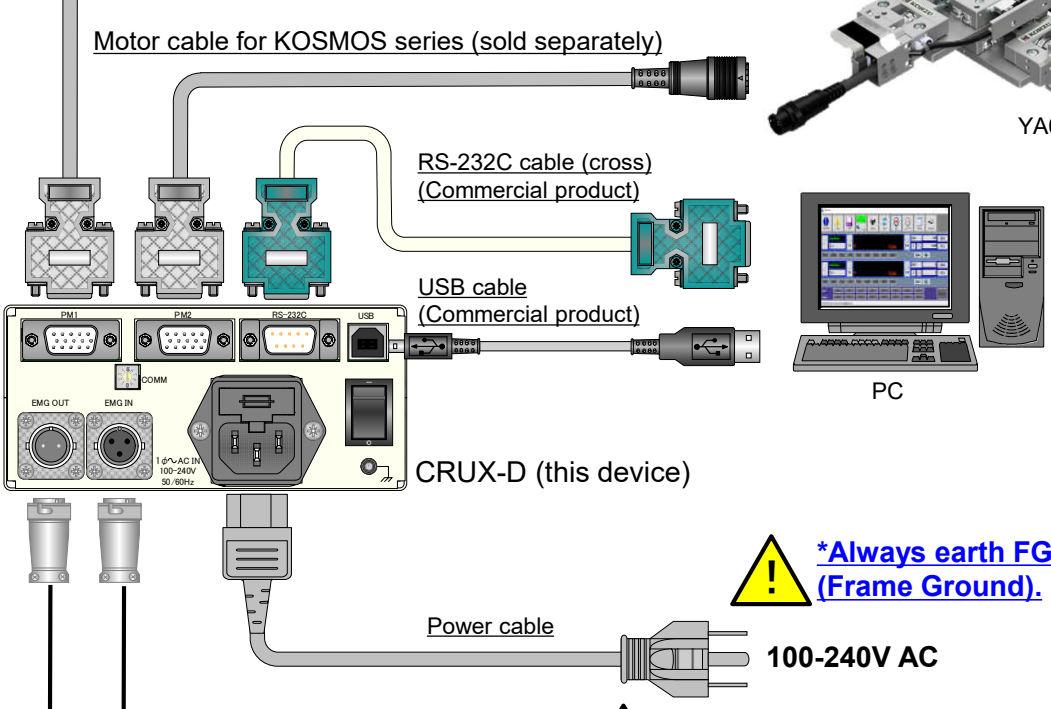
INCOM (sold separately)

【Rear Panel】

With 5-phase stepping motor
Precision stage (sold separately)



YA07A-R103



For details,
see "3-5. Emergency Stop Function" (Page 16),
"6-2. Connector" (Page 65), and
See “6-3. Input/Output Signal Interface” (Page 66).

When not using emergency stop, **be sure to connect the attached short plug.**

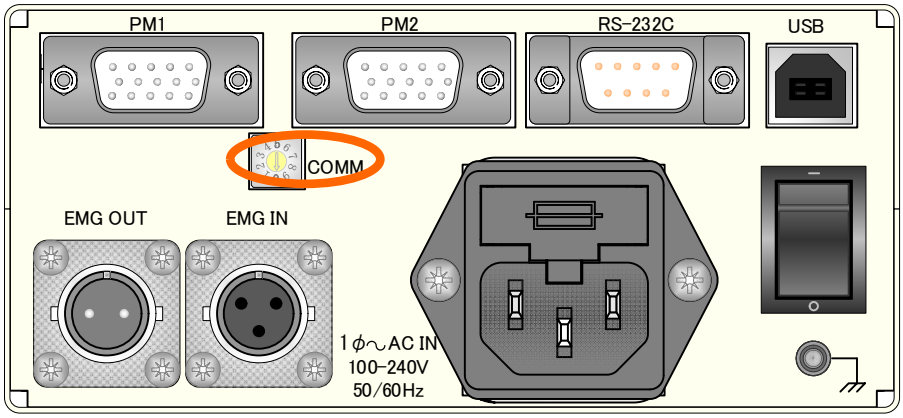
2-4. Rotary Switch for Communication Setting

This product can set or change communication conditions with the rotary switch (COMM) in the rear panel.
Default setting is Communication mode 4 (Normal command USB mode).

*Settings of RS-232C communication except for speed (baud):
Parity : NON
Word length : 8bit
Stop bit : 1
The settings are fixed.

■ Position of Rotary Switch

【Rear Panel】



■ Settings

Settings are as shown in the table below.
(Mode 0 to 4 are General command specification, and 5 to 9 are Simple command specification)

Communication mode	Communications settings		
	RS-232C speed [baud]	USB	
0	38400	USB	General command
1	57600		
2	19200		
3	9600		
4	115200		
5	38400	USB	Simple command
6	57600		
7	19200		
8	9600		
9	115200		

In USB communication, it is possible to communicate with any switch. However, since the command format differs between simple commands and general commands, please set according to the commands being used.

3 Functions

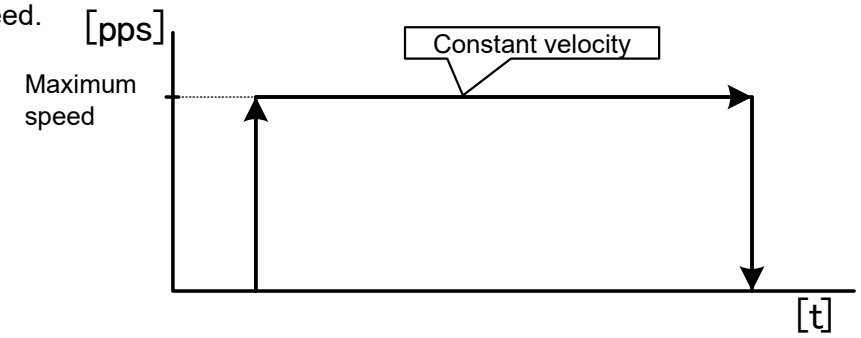
3-1. Acceleration Patterns

This product can set 2 types of acceleration/deceleration pattern: rectangular drive and trapezoidal drive. By setting the **start speed, maximum speed, and acceleration/deceleration time**, the acceleration/deceleration rate is internally calculated and the series of acceleration/deceleration operations is automatically conducted.

Pulse speed [pps] : The number of pulses sent per second (pulses per second).
Start speed [pps] : The pulse speed that is sent when the motor starts running from the still state.
Maximum speed [pps]: The pulse speed when the motor is running at the fastest rate.
Acceleration/deceleration time [10msec]: The acceleration time from start speed to maximum speed, and the deceleration time from maximum speed to stop.

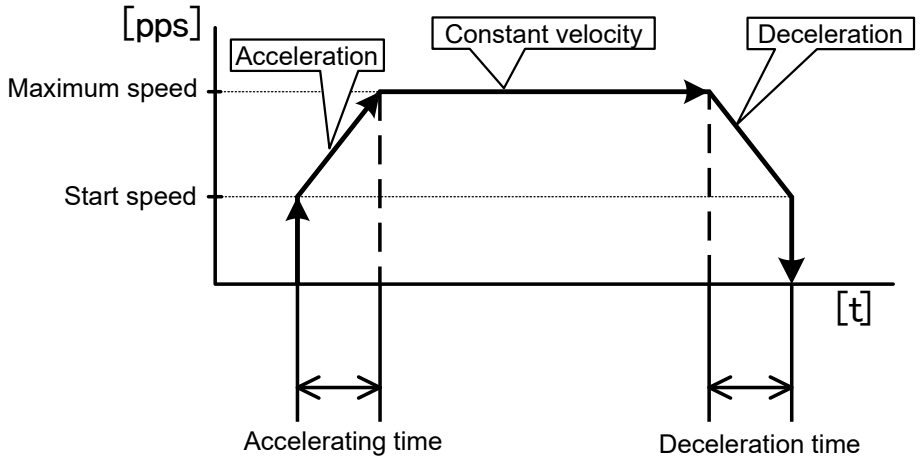
Rectangular Drive

This is the drive mode for operating at maximum speed immediately after start without having any acceleration/deceleration time. This mode conducts driving at maximum speed regardless of the start time and acceleration/deceleration time. Accordingly, it is selected when operating at low speed and so on. There is a risk of out-of-adjustment occurring if this mode is applied at high speed.



Trapezoidal Drive

This mode entails setting the acceleration/deceleration time and attaining the maximum speed at a uniform acceleration/deceleration ratio. When moving an object, it cannot be moved in high speed abruptly due to inertial force. In case of the stepping motor also, it normally starts in low speed, and then achieve the maximum speed after gradual acceleration. Speed settings can be made within the range shown in the speed table (Page 14).



(Accelerating time＝Decelerating time)

3-2.Speed Setting

3-2-1.Speed Table

Speed Table Speed setting of this product is possible in the range of 1 to 500,000 (pulse/second). However, because few cases generally require to define speed change in detail, CRUX adopts a method to select from the **10 patterns speed table**.

Also, since each speed table can be set freely, necessary drive speed can be set to 10 patterns.

■Speed table

*Setting values in the table below are default values (Table No.0 is only for rectangular drive)

Speed Table No.	Start speed [pps]	Maximum speed [pps]	Acceleration/Deceleration time [10msec]	Acceleration Patterns
0	500	500	1	Rectangular Drive
1	500	2,000	20	Trapezoidal Drive
2	500	3,000	24	Trapezoidal Drive
3	500	4,000	28	Trapezoidal Drive
4	500	5,000	32	Trapezoidal Drive
5	500	6,000	36	Trapezoidal Drive
6	500	7,000	40	Trapezoidal Drive
7	500	8,000	44	Trapezoidal Drive
8	500	9,000	48	Trapezoidal Drive
9	500	10,000	52	Trapezoidal Drive

*Acceleration time and deceleration time are the same. They cannot be set separately.
*The above cannot be changed with simple commands. Selection can only be made from the speed table.

3-2-2. Speed Change in Remote Control

In remote control, specify a speed table No. in each moving command.
For settings on the speed table No.0 to 9, settings can be changed using **WTB commands.**
For confirmation, settings can be read with **RTB commands.**
(For details, see **RTB** (Page 40) and **WTB** (Page 47) in “5-3 Command Details”.

Concerning speed of “INCOM”, low-speed drive is set in speed table №2, and high-speed drive is set in speed table №9. If changing the INCOM drive speed, please change №2/№9.

3-2-3. Speed Setting Regulations

Regulations exist concerning the acceleration/deceleration time, maximum speed and start speed in addition to the setting range of the speed parameters.
Concerning the maximum speed setting range, the minimum unit that can be set is limited according to the size of the range.
Units range from 1 to 100 and are adjusted to be close to the setting unit. The start speed setting unit is the same as the maximum speed setting unit.

Case of rectangular drive

①When 1 to 99 [pps] is selected for maximum speed, rectangular drive is conducted.
②Operation is conducted at maximum speed immediately after the start.
③Start speed and acceleration/deceleration time values are disregarded.
④If the maximum speed is too high, there is a risk of out-of-adjustment occurring.

Case of trapezoidal drive

①Start speed, maximum speed, and acceleration/deceleration time are set.
②The start speed can be set over the range up to 80% of the maximum set speed.
③The bigger the maximum speed becomes, the larger is the correction of the set value for the minimum unit of speed setting.
When speed table settings are made with WTB commands, values close to the transmitted parameters are set within the feasible setting range.
④The unit for acceleration/deceleration time is [10msec]. Therefore, (set value) x 10 [msec] is set.
*Since rectangular drive is forcibly adopted for maximum speed of 99pps or less, trapezoidal drive operation is not possible.

Speed table

Maximum speed setting range [pps]	Speed setting minimum unit X [pps] (X=1~100)	Acceleration/deceleration time setting	
		Range [10msec]	Set value [msec]
1 - 99	1	–	Rectangular drive only
100 - 8191	1	1–85	10–850
8192 - 16382	2		
16384 - 32764	4		
32765 - 40955	5		
40960 - 81910	10		
81920 - 163820	20		
163840 - 327640	40		
327650 - 409550	50		
409600 - 500000	100		

The set value is pulse speed. The actual drive speed differs according to each stage. Since it also differs according to the micro-step divisions (Page 15), we recommend also setting the micro-step divisions according to the purpose of use.

For example, in the case where the following contents are set in speed table "4" for the first axis in trapezoidal drive:
Start speed 5005 [pps]/ maximum speed 50005 [pps]/ acceleration/deceleration time 55 [10msec].

STX WTB 1/4/5005/50005/55/2 CRLF WTB command (Page 47)

①Since the maximum speed setting unit is 10[pps], it is corrected to 50010[pps].
②Since the start speed setting unit is 10[pps] (the same as for maximum speed), it is corrected to 5010.
③Since the acceleration/deceleration time is set at 55[10msec], the set value becomes 550[msec].

Reading in the set values

STX RTB 1/4 CRLF RTB command (Page 41)

C Tab RTB Tab 4 Tab 5010 Tab 50010 Tab 55 Tab 2 CRLF

Settings are indicated like: start speed 5010 [pps], maximum speed 50010[pps], and acceleration/deceleration time 55[10msec].

3-3. Driving Current

This product can control three types of stepping motor, i.e. rated current 0.75A/phase, 0.35A/phase, and 1.4A/phase. According to a target stage, set the applicable phase.
Settings can be changed by writing in system No.67 with WSY command (system setting write).
(Initial value: "0"　Current: 0.75A/phase)

Setting value	0	1	2	3	4	5
Current	0.75	0.35	1.4	Reserved	Reserved	Reserved

Using with the wrong current can cause failure. Be sure to confirm if setting is needed.

Never use 3 to 5. Since higher current values than usual are set for 3 to 5, there is a possibility of motor failure occurring.

3-4. Setting No. of Divisions of Micro-Step

This product can select a number of motor step divisions from 16 types.
Settings can be changed by writing in system No.66 with WSY command (system setting write).
(Initial value: "2" divisions "2"＝1/2)

Setting value	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of divisions	1	2	2.5	4	5	8	10	20	25	40	50	80	100	125	200	250

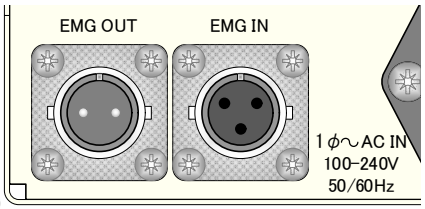
Caution!

Current Setting of the number of micro-step divisions
When changing the current value and divisions, there is a risk of positional deviation. Be especially careful when changing the micro-step divisions. The maximum deviation width is an angle corresponding to roughly half of the motor step angle.
For example, if the basic step angle is 0.72°, it is a maximum of 0.36°.

3-5.Emergency Stop Function

This product can execute an emergency stop during driving when the emergency stop signal becomes active. (Normal close method)

- **EMG IN** (Emergency stop signal input)



Connect the emergency stop signal (Normal close method) between 2-3 pin on EMG IN.
At emergency stop operation: Between 2-3 pin OPEN
At emergency stop release: Between 2-3 pin CLOSE (Short)

When not using the emergency stop, make sure to connect the short connector that comes with this product.

- **EMG OUT** (Emergency stop status signal output)

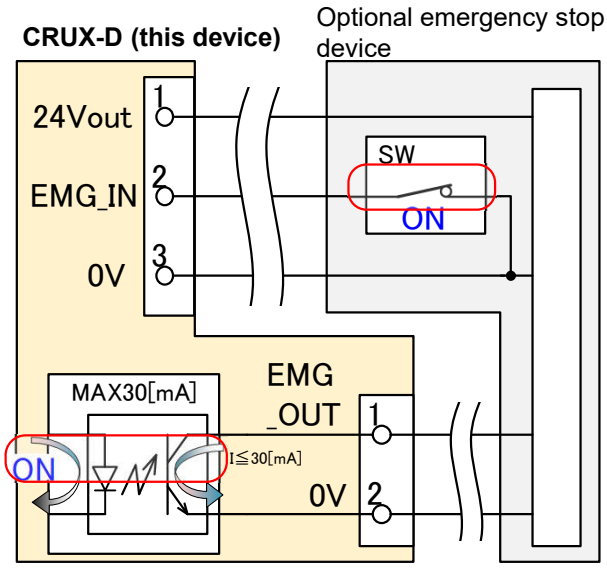
Signal output port of open collector. Follows the emergency stop status on the EMG-IN side.
At emergency stop operation: Output signal OPEN
At emergency stop release: Output signal CLOSE (Short)

- **Emergency Stop Release**

After resolving causes of emergency stop, release the prepared emergency stop switch. (Following execution of emergency stop, since there is a possibility that the position has deviated, we recommend that you implement return to origin).

Example of emergency stop circuit composition

Emergency stop ***"release time"***



Emergency stop ***"operation time"***

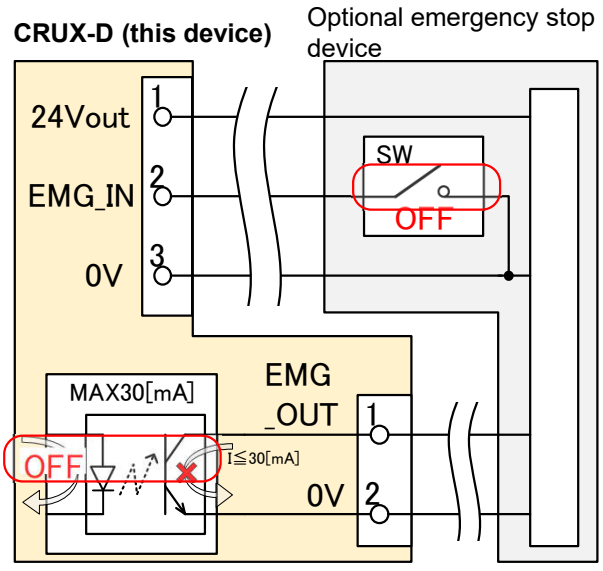


Photo-coupler permissible value: Rated VCEO:80[V], VECO:5[V], IC:30[mA]

Concerning emergency stop signal, see "6-2. Connector" (Page 65),
See "6-3. Input/Output Signal Interface" (Page 66).

3-6. Origin Return Method

Origin return method can be selected in this product according to the combination of sensor of the positioning device used. Based on the set origin return method, after moving near the specified sensor at the maximum speed of the specified speed table, it moves to the origin at the same speed with the starting speed of the speed table (Default: 500pps) and stops.

Please select according to the sensor board and connection type stated in our company's catalog.

Setting is required in the following stages:

- **When using DATUM.**

→Select 1 or 2.

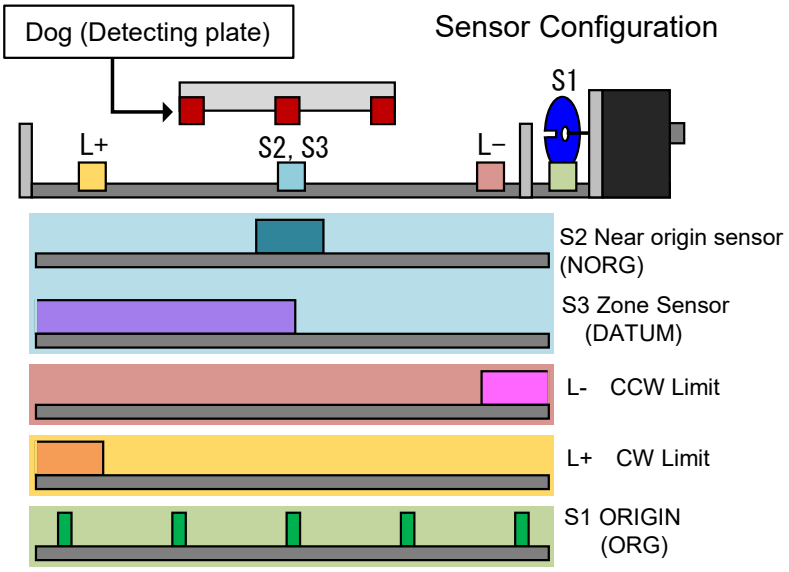
- **If the connection type is "V4".**

→Select 7 or 8 according to the purpose of use.

- **If the connection type is "X1".**

→Select 3.

*If using the origin point sensor, select according to the stage being used among those where "●" is marked for ORG in the table below.



List of origin return methods (Default: 4)

Method	Sensor Configuration					Description
	ORG	NORG	DATUM	CCW Limit	CW Limit	
1	●		●			The zone sensor (DATUM) determines return direction and the edge of initial origin sensor (ORG) becomes the origin position within the zone sensor.
2			●			The edge of zone sensor (DATUM) is the origin position.
3	●	●		●		The edge of origin sensor (ORG) located in the near origin sensor (NORG) is the origin position.
4		●		●		The edge of near origin sensor (NORG) is the origin position.
5	●				●	Origin sensor (ORG) in proximity of CW limit is the origin position.
6	●			●		Origin sensor (ORG) in proximity of CCW limit is the origin position.
7					●	The edge of CW limit is the origin position.
8				●		The edge of CCW limit is the origin position.
9	●					The edge of origin sensor (ORG) is the origin position.
10	-	-	-	-	-	Present position is the origin position.

Setting with System No.1 ORG OFFSET

After executing each origin return operation, it moves just as much as the set value in System No.1 "ORG_OFFSET" and the position is set as 0 coordinate value.

See (Page 22) for an example of use.

(For details concerning the system settings, see "5-6-1. System Setting Details (Page 59)).

*In Method 10, "ORG OFFSET" is invalid.

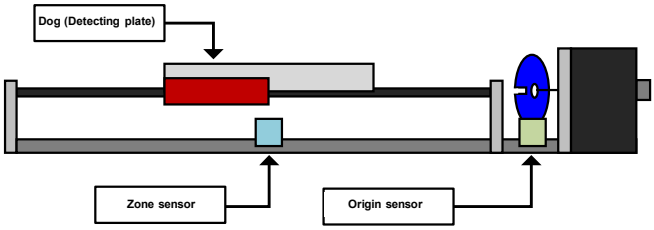
1 The zone sensor (DATUM) determines return direction and the edge of initial origin sensor (ORG) becomes the origin position within the zone sensor.

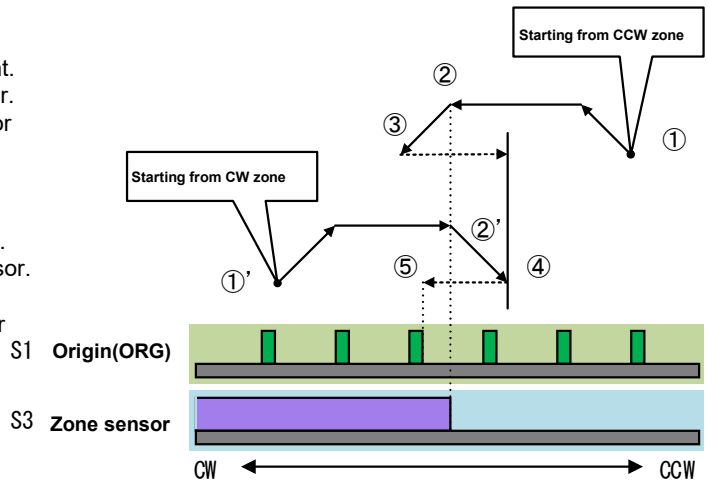
Starting from CCW zone

① Detection starts to CW direction with trapezoidal drive.
② Decelerates and stops when zone sensor is detected.
③ Reverses to CCW direction and in low speed movement.
④ Reverses to CW direction after passing the zone sensor.
⑤ Stops at initial origin sensor detection after zone sensor detection.

Starting from CW zone

①'Detection starts to CCW direction with trapezoidal drive.
②'Stops with deceleration after moving through zone sensor.
④ Reverses to CW direction in low speed movement.
⑤ Stops at initial origin sensor detection after zone sensor detection.





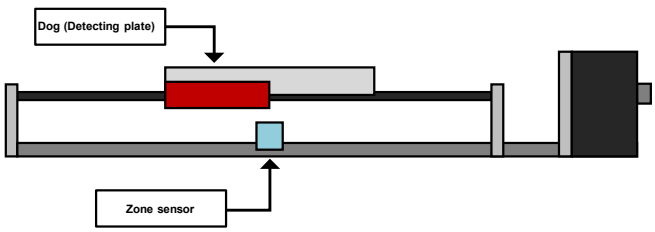
2 The edge of zone sensor (DATUM) is the origin position.

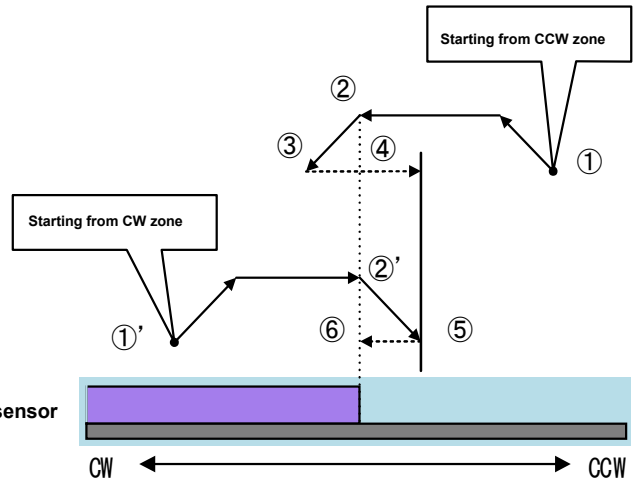
Starting from CCW zone

① Detection starts to CW direction with trapezoidal drive.
② Decelerates and stops when zone sensor is detected.
③ Reverses to CCW direction and in low speed movement.
④ Stops with deceleration after passing the zone sensor.
⑤ Reverses to CW direction in low speed movement.
⑥ Stops at the edge detection of zone sensor.

Starting from CW zone

①'Detection starts to CCW direction with trapezoidal drive.
②'Stops with deceleration after moving through zone sensor.
⑤ Reverses to CW direction in low speed movement.
⑥ Stops at the edge detection of zone sensor.





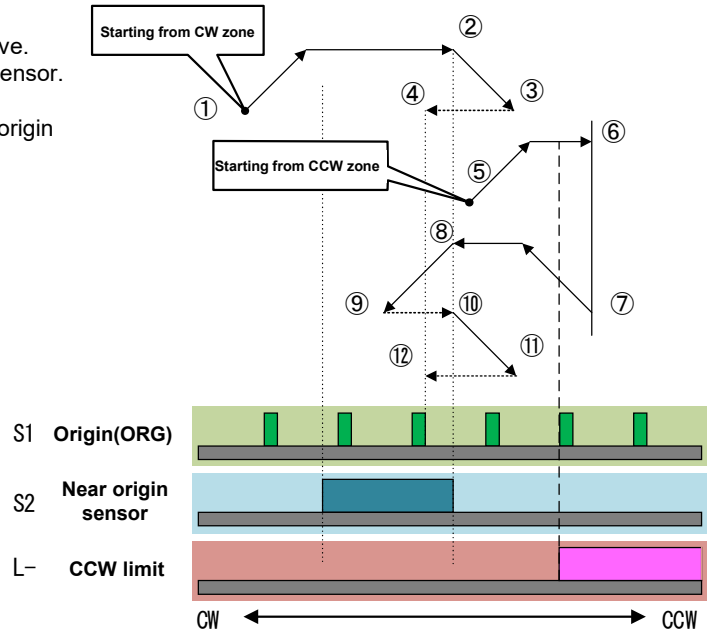
3 The edge of origin sensor (ORG) located in the near origin sensor (NORG) is the origin position.

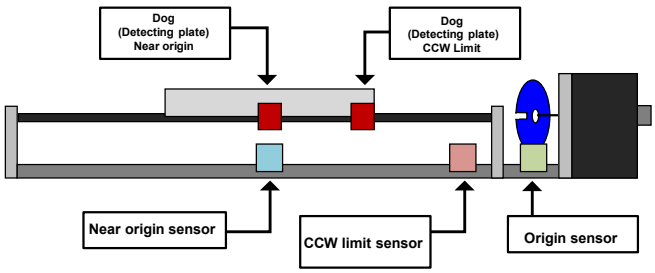
Starting from CW zone

① Detection starts to CCW direction with trapezoidal drive.
② Decelerates and stops after passing the near origin sensor.
③ Reverses to CW direction in low speed movement.
④ After near origin sensor detection, stops at the initial origin detection.

Starting from CCW zone

⑤ Detection starts to CCW direction with trapezoidal drive.
⑥ Stops when CCW limit is detected.
⑦ Reverses to CW direction and starts trapezoidal drive.
⑧ Decelerates and stops after detecting the near origin sensor.
⑨ Reverses to CCW direction in low speed movement.
⑩ Decelerates and stops after passing through the near origin sensor again.
⑪ Reverses to CW direction in low speed movement.
⑫ After near origin sensor detection, stops at the initial origin detection.
*If starting from near origin, execute from ⑨.





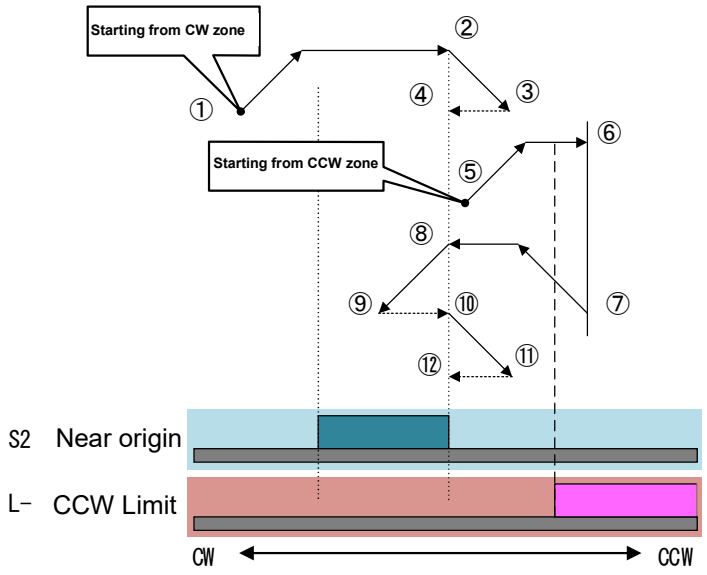
4 The edge of near origin sensor (NORG) is the origin position. (Our standard method)

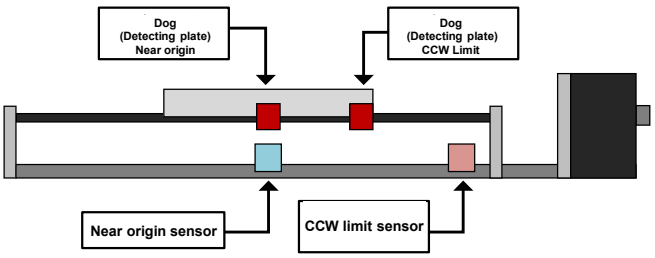
Starting from CW zone

①Detection starts to CCW direction with trapezoidal drive.
②Decelerates and stops when passing the near origin sensor.
③Reverses to CW direction in low speed movement.
④Stops when the near origin sensor is detected.

Starting from CCW zone

⑤Detection starts to CCW direction with trapezoidal drive.
⑥Stops CCW limit is detected.
⑦Reverses to CW direction and starts trapezoidal drive.
⑧Decelerates and stops when the near origin sensor is detected.
⑨Reverses to CCW direction in low speed movement.
⑩Decelerates and stops again after moving through the near origin sensor.
⑪Reverses to CW direction in low speed movement.
⑫Stops when the near origin sensor is detected.
*When starting from the near origin sensor zone, execute from ⑨.





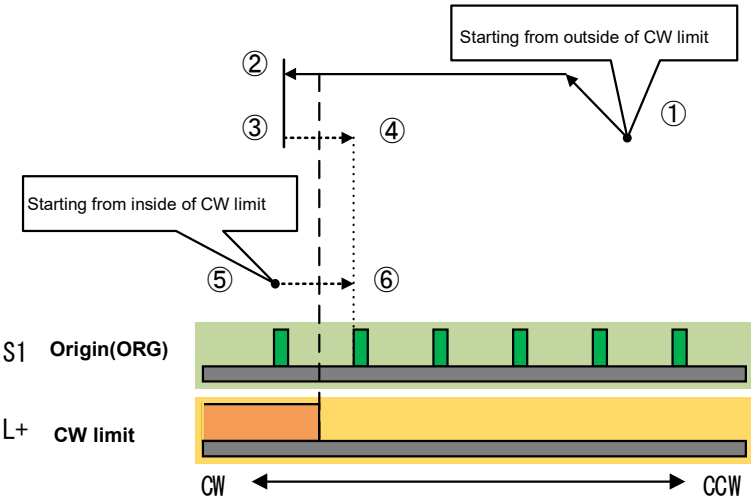
5 Origin sensor (ORG) in proximity of CW limit is the origin position.

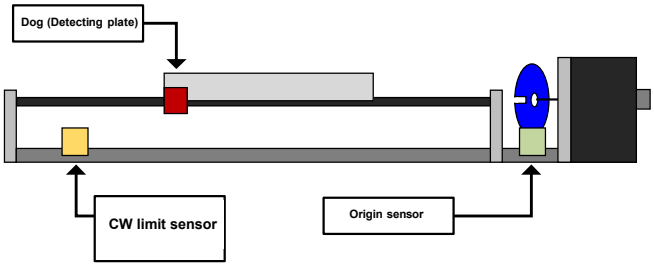
Starting from outside of CW limit

① Detection starts to CW direction with trapezoidal drive.
② Stops when CW limit is detected.
③ Reverses to CCW direction in low speed movement.
④ Stops at the initial origin detection position after passing CW limit.

Starting from inside of CW limit

⑤ Starts low speed movement to CCW direction.
⑥ Stops at the initial origin detection position after passing CW limit.





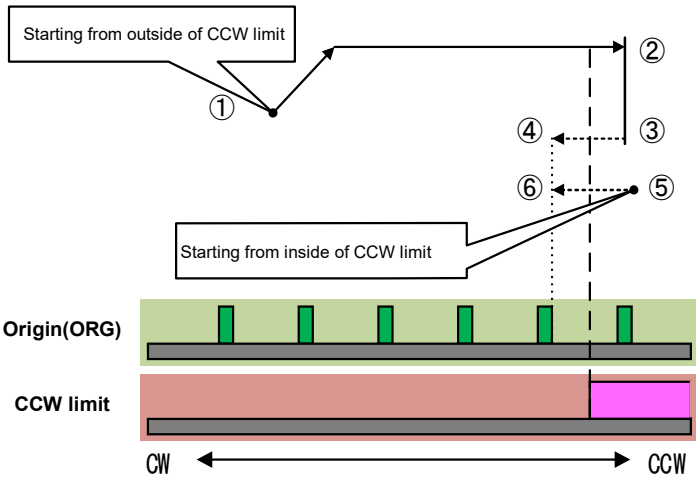
6 Origin sensor (ORG) in proximity of CCW limit is the origin position.

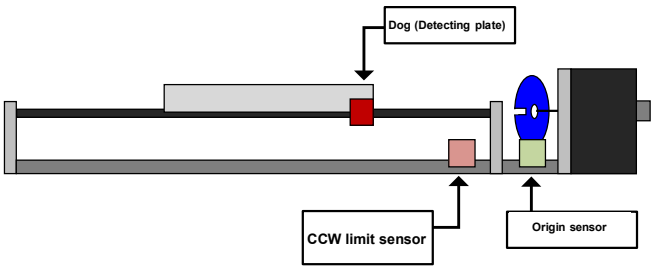
Starting from outside of CW limit

① Detection starts to CCW direction with trapezoidal drive.
② Stops when CCW limit is detected.
③ Reverses to CW direction in low speed movement.
④ Stops at the initial origin detection position after passing CCW limit.

Starting from inside of CCW limit

⑤ Starts low speed movement to CW direction.
⑥ Stops at the initial origin detection position after passing CCW limit.





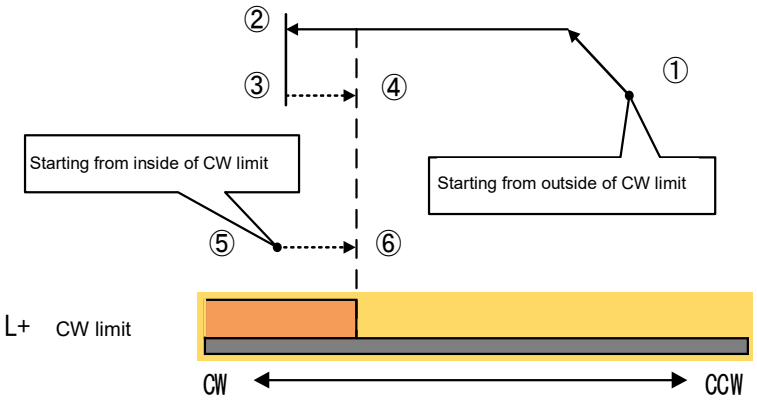
7 The edge of CW limit is the origin position.

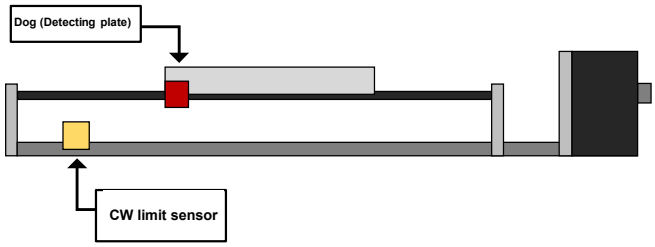
Starting from outside of CW limit

① Detection starts to CW direction with trapezoidal drive.
② Stops when CW limit is detected.
③ Reverses to CCW direction and in low speed movement.
④ A position after passing CW limit is the origin.

Starting from inside of CW limit

⑤ Starts low speed movement to CCW direction.
⑥ A position after passing CW limit is the origin.





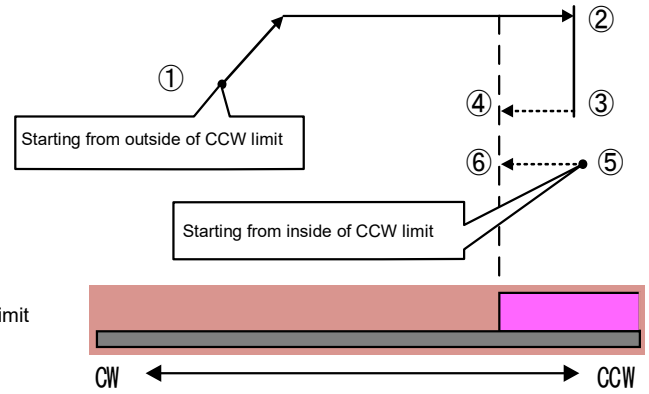
8 The edge of CCW limit is the origin position.

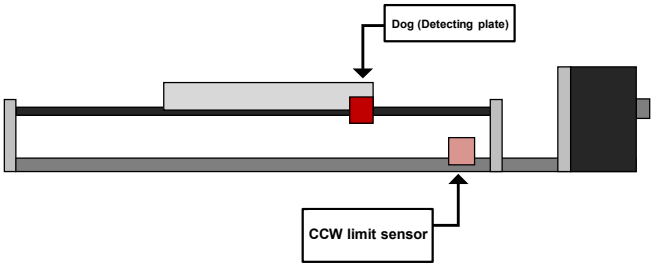
Starting from outside of CW limit

① Detection starts to CCW direction with trapezoidal drive.
② Stops when CCW limit is detected.
③ Reverses to CCW direction in low speed movement.
④ A position after passing CW limit is the origin.

Starting from inside of CCW limit

⑤ Starts low speed movement to CW direction.
⑥ A position after passing CCW limit is the origin.

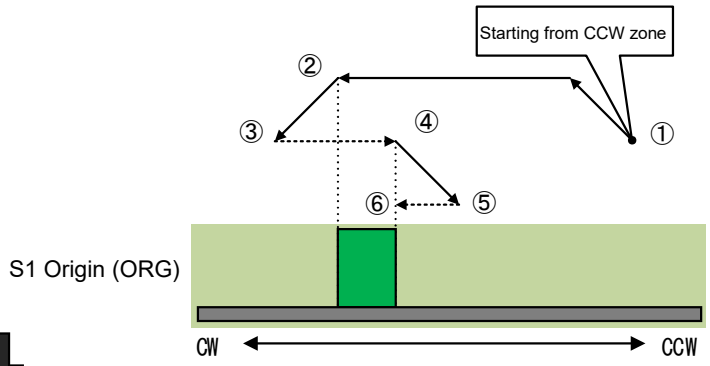


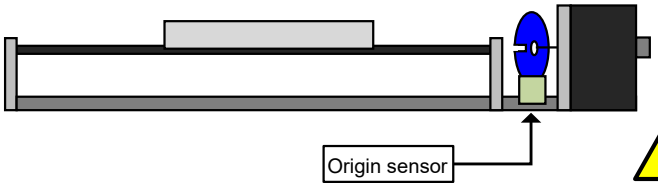


9 The edge of origin sensor (ORG) is the origin position.

Starting from CCW zone

① Detection starts to CW direction with trapezoidal drive.
② Stops with deceleration after passing the ORG sensor.
③ Reverses to CCW direction and in low speed movement.
④ Decelerates and stops after passing the ORG sensor again.
⑤ Reverses to CW direction in low speed movement.
⑥ Stops at ORG sensor detection.
*When starting from the ORG zone, execute from ③.





Stops if CW limit signal is detected during origin return.

10 Present position is the origin position. (No driving)

The current position is set as the origin position without driving in this mode and it is regarded as origin return detection is completed.

System functions "ORG OFFSET"

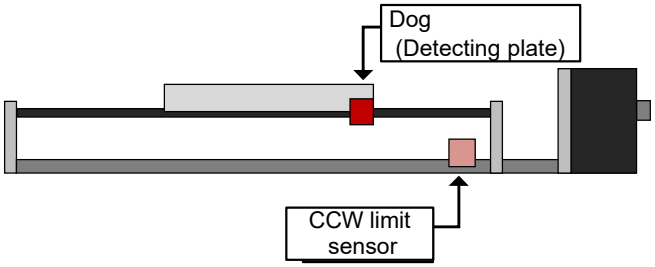
*In Method 10, "ORG OFFSET" is invalid.

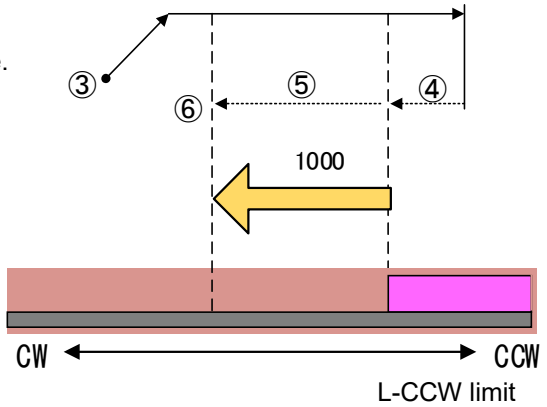
System No.1 (**ORG OFFSET**) Following origin return, the set value is moved to, and this is regarded as the origin coordinates.

Through inputting the offset value for the system №1 (**ORG OFFSET**) setting, it is possible to make the point moved to by the amount set from each origin return completion point as the origin.
Using this function, following origin return, the coordinate is becomes “0” assuming the specified position to be the origin.

For example, when stopping at a position 1000pps in the CW direction from the CCW limit edge

①In system №2, set the origin return method as No. 8.
②In system №1, set the offset value as “1000”.
③Start origin return from the CW side.
④For the origin return stop position, stop once at the CCW edge.
⑤Transfer by the set pulse value “1000”.
⑥Make this position coordinate “0”.



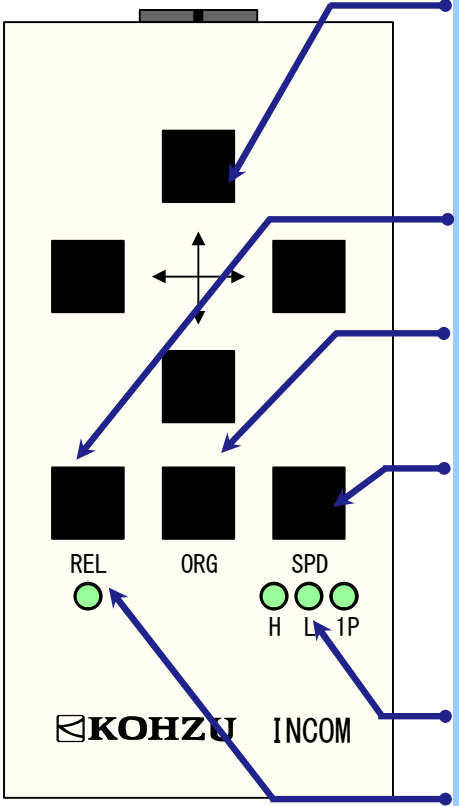


4-1.Description for INCOM Operation

Functions

① Switching of 2 drive modes: This switches between continuous [FRP] mode and relative [REL] mode.
② Continuous operation [FRP] mode: While the button is pressed, it continues to move at the selected speed.
③Relative position drive [REL] mode: Relative movement can be done by the amount of relative drive set by PC.
④ Operation stop (deceleration stop): Deceleration and stop can be performed in the acceleration/deceleration time that is set with the speed button.
⑤ Origin return (2 axes simultaneous): Origin return can be done either for 2 axes simultaneously or 1 axis at a time.
⑥ Speed change (H/L/1P): Speed can be changed in 3 stages, i.e. H/L/1P.

Descriptions for operation



Drive button:
REL mode: Performs a regulated amount of drive in one operation.
FRP mode: Starts driving while the button is pushed and stops when released.
Operation stop: With respect to the axes that are being driven by INCOM and command operation, drive of the axis that is pressed decelerates and stops.
*For rotating axes/direction, see “4-2. List of Driving Patterns”.

Drive mode change button:
Switches between REL and FRP mode.
*The amount of movement in REL mode is the value that is set in system №68.

Origin return button: (2 axes simultaneous)
Able to execute origin return per axis by pushing each drive button while pushing the ORG button.
*The origin return speed is the speed selected from ‘H/L/1P’.

Speed change button:
Speed is changed each time the button is pressed.
H (high-speed drive) …speed table: No.9
L (low-speed drive)…speed table: No.2
1P (1 pulse drive)… REL mode: 1 pulse drive
FRP mode: Continuous drive at speed of 1pps
*For speed setting, see "3-2. Speed Setting" (Page 13).

SPD_LED (Speed display):
The LED of the selected speed comes on.

REL_LED (Drive mode display):
ON (REL mode)
OFF (FRP mode)

4-2.List of Driving Patterns

		REL_LED	
		ON (REL mode)	OFF (FRP mode)
SPD_LED	H (High-speed drive)	Relative Position Drive	Free Rotation Drive
	L (Low-speed drive)	Relative Position Drive	Free Rotation Drive
	1P	1 pulse drive	1 pps drive

	Drive direction			
	Axis 1		Axis 2	
System No.7	←	→	↑	↓
0: (Normal)	CW	CCW	CCW	CW
1: (Switch)	CCW	CW	CW	CCW

5 Remote Control

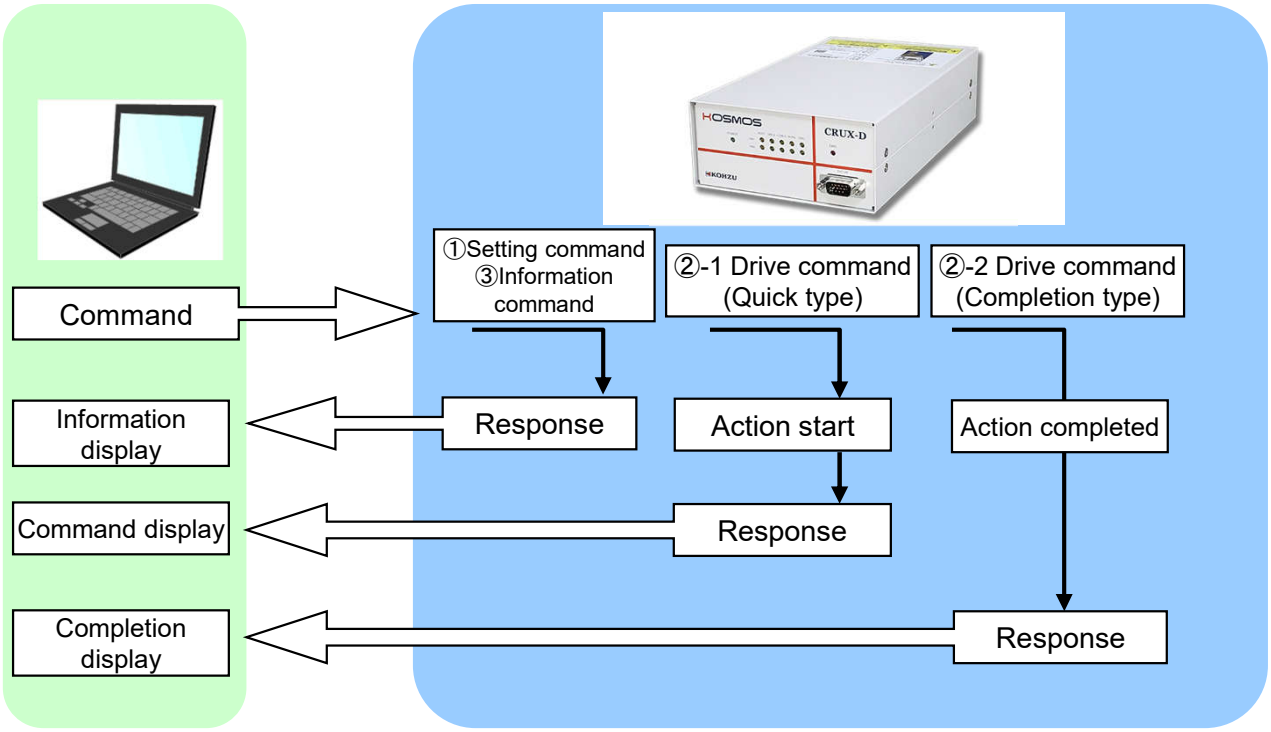
5-1.Proceeding with Installation and Preparation

To control from a computer, this device supports USB and RS-232C communication.
For selecting a communication method, see “2-7. Rotary Switch for Communication Setting” (Page 11).

*For the USB driver, use "CRUX_USB_DRIVERxx" in the disk that comes with the product.
(For driver installation steps, see "5-7. Installation Procedures of USB Driver" (Page 62)).

5-1-1.Transmitting/Receiving

The controller returns one response for one sent command.
The response timing varies according to the type of command or selection of response method.



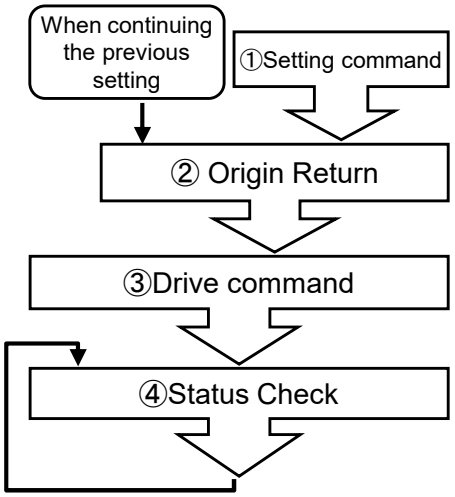
① Setting commands Commands for conducting settings, such as RST and WSY commands, immediately give a response.

② Drive command With drive-related commands, you can select from 2 types of response.
1. Returns a response after completion of operation. (Completion type)
2. When a command is received, response is returned immediately. (Quick type)

③ Information command Requested information is returned for a command.

5-1-2.Remote Control Procedures

When used for the first time or when the settings are changed, it is necessary to send the setting command first.



RST and WSY commands

ORG command

APS, RPS and MPS commands

STR command, etc. for confirming the controller operation status

5-1-3.Command Format

A command can be selected from 2 types, general command and simple command.

・General command consists of header characters (STX) and command, parameters and delimiter (CRLF).

・Simple command consists of command, parameters and delimiter (CRLF).

General Command

Header Characters STX(02H)

Command ASCII 3 characters

Delimiter (end of line) CR(0DH)+LF(0AH) 2 characters

STX **<Command><Parameter a><Parameter b>/....** CRLF

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

Simple command

CH <Parameter a> <Command> <Parameter b> CRLF *Parameter b is not required for some commands.

Sequence	1	2	3	4	5	6, 7
Command	**C**	**H**	**0**	**1**	**R**	CRLF
Hexadecimal	43	48	30	31	52	0D, 0A

STX Tab CRLF These are control characters in ASCII code.

Characters which can be used in commands are numerical values (0 to 9), upper case alphabet (A to Z), signs (+, -), and symbols (/, ?).

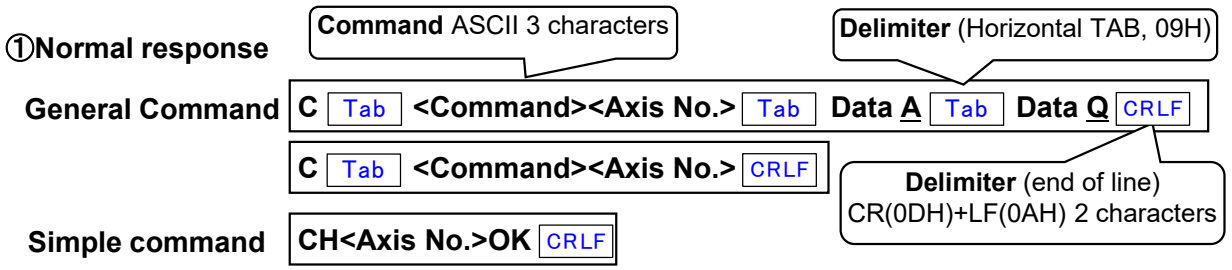
Lower case letters (a to z) and spaces (20H) cannot be used in commands.
Parameters are always required. They cannot be omitted.

Because the command format differs between simple commands and general commands, please confirm settings in “2-7. Rotary Switch for Communication Setting” (Page 11).

Response

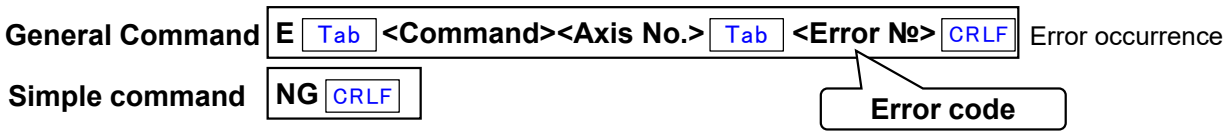
Format for response is as follows. When an error occurs, an error response is returned.
Because responses are different per command, see the details page of each command.

①Normal response



For multiple response data, they are sent with separated by Horizontal TAB.

②Error response



5-1-5.Characters to Use

Characters shown in the table below can be used for communication.

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

Lower case letters (a to z) and spaces (20H) cannot be used.

5-2.Command List

The commands that can be used in this product are shown in the table below. There are general commands that can control all functions, and simple commands that omit some functions. For details, see the page of each command.

General Command :Drive command :Setting command (write) :Setting command (read)

Command			Page	
Type	Descriptio	Functions		
System Settings	**MPI**	Multi-axis Position Initial Setting		33
	RST	System Reset		38
	WSY	Write System Setting		46
Drive	**APS**	Absolute Position Drive		29
	FRP	Free Rotation Drive		31
	MPS	Multi-axis Position Drive		34
	ORG	Origin Return Drive		35
	RPS	Relative Position Drive		37
	STP	Motor Stop		42
Coordinate	**RDP**	Current motor pulse value Read		36
	SAV	Current motor pulse value Store		41
	WRP	Current motor pulse value Write		45
Information	**IDN**	Version Read		32
	RSY	Read System Setting		39
	STR	Read Status		43
Speed Table	**RTB**	Read Speed Table		40
	WTB	Write Speed Table		47

Simple command :Simple command

Command			Page	
Type	Description	Functions		
Drive	**A**	Absolute Position Drive		48
	D	Motor Stop		50
	H	Origin Return Drive		51
	P	Relative Position Drive		53
Coordinate	**W**	Current motor pulse value Write		56
	C	Current motor pulse value Read		49
Information	**I**	System Reset		52
	R	Read Status		54
Setting	**S**	Speed Setting		55

~The following items cannot be used in simple commands~

- Continuous drive, multi-axis simultaneous drive
- Speed table and system setting read/write
- Call of version read

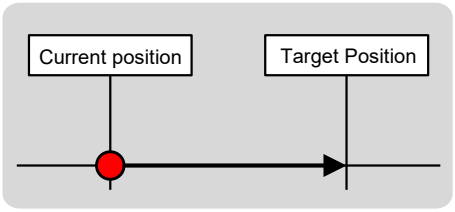
5-3.Command Details

Details concerning the general commands that can be used with this product are as follows. (Alphabetical order)

APS

Absolute Position Drive

【Function】 Moves to a target position with absolute position management.



【Format】 STX APS a/b/c/d CRLF

No. of parameters = 4

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Specified movement amount	-8,388,608 to 8,388,607	
d	Response method	0: Completed 1: Quick	

【Response】

Status	Response data
Normal	**C** Tab **APS** <Axis No.> CRLF
Error	**E** Tab **APS** <Axis No.> Tab <Error №> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

Moves No.1 axis with speed table No.0 to 1,000 pulses position.

STX **APS1/0/1000/0** CRLF

【Remarks】

A stop during driving is done with STP command.

<<MEMO>>

FRP

Free Rotation Drive

【Function】Free rotation drive is performed until the stop command (STR) is issued.

【Format】 STX FRP a/b/c CRLF No. of parameters = 3

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Rotating direction	0: CW direction 1: CCW direction	

【Response】

Status	Response data
Normal	**C** Tab **FRP** <Axis No.> CRLF
Error	**E** Tab **FRP** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

Performs free rotation drive on No.1 axis to CW direction with speed table No.0.

STX **FRP1/0/0** CRLF

【Remarks】

A stop during driving is done with STP command.

The symbol is inverted when the managed pulse range (-8388608 to 8388607) is exceeded.
When moving from the current position: -8388608 in the CCW direction,
It becomes: +83…7, +83…6, +83…5, +83…4.

IDN

Version Read

【Function】Reads the model name of the controller body and returns the version of the program.

【Format】 STX IDN CRLF No. of parameters = 0

【Response】 **C** Tab **IDN** Tab <Model name> Tab <Version> CRLF

【Response example】

C Tab **IDN** Tab **CRUX-D** Tab **1000** CRLF “CRUX-D Ver.1.000”

MPI

Multi-axis Position Initial setting

【Function】Sets a drive method and speed necessary for multi-axis simultaneous drive (MPS) command.

【Format】 STX MPI a/b/c CRLF No. of parameters = 3

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Driving Type	0 : Absolute Position Drive 1 : Relative Position Drive	
c	Speed Table	0 to 9	

【Response】

Status	Response data
Normal	**C** Tab **MPI** <Axis No.> CRLF
Error	**E** Tab **MPI** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

1. Set No.1 axis to move with absolute position drive and speed table No.5.

STX **MPI1/0/5** CRLF

2. Set No.2 axis to move with absolute position drive and speed table No.8.

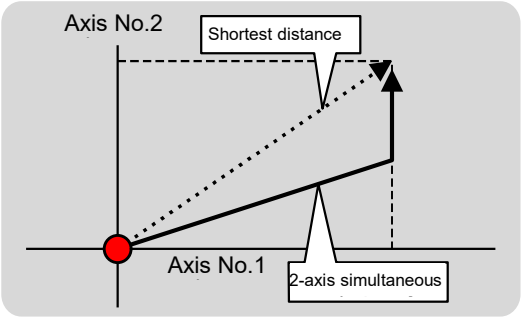
STX **MPI2/0/8** CRLF

MPS

Multi-axis Position Drive

【Function】Performs simultaneous drive of 2 axes.

【Description】In the multi-axis position drive (MPS) command, when moving distance and moving speed differ, time to require moving also differs, and its orbit is folding lines as shown in the right figure.



【Format】 STX MPS a/b/c/d/e/f CRLF

No. of parameters = 5

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	First axis target position Relative (absolute)	-16,777,215 to 16,777,215 (-8,388,608 to 8,388,607)	Relative movement between the first axis target position is possible within the managed pulse range. -8,388,608 to 8,388,607
c	2nd axis No.	1 to 2	
d	Second axis target position Relative (absolute)	-16,777,215 to 16,777,215 (-8,388,608 to 8,388,607)	Relative movement between the second axis target position is possible within the managed pulse range. -8,388,608 to 8,388,607
e	Response method	0: Completed 1: Quick	

【Response】

Status	Response data
Normal	**C** Tab **MPS** <Axis No.1> CRLF
Error	**E** Tab **MPS <Axis No.1>** Tab **<Error No.>** CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

Move the 1st axis 1,000 pulses position and 2nd axis 2,000 pulses position with the MPS command.

1. Set the 1st axis to absolute position drive and speed table No.5 with the MPI command.

   STX **MPI1/0/5** CRLF

2. Set the 2nd axis to absolute position drive and speed table No.8 with the MPI command.

   STX **MPI2/0/8** CRLF

3. Set the 1st drive to 1,000 and 2nd drive to 2,000 and start driving with the MPS command.

   STX **MPS1/1000/2/2000/0** CRLF

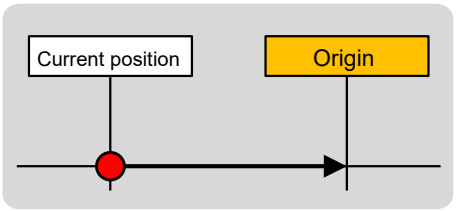
【Remarks】

- Setting with the “MPI” command is required in advance.
- A stop during driving is done with the STP command.

ORG

Origin Return Drive

【Function】Performs origin position detection according to a selected method.
Origin return method can be selected from 10 kinds + (System No.1 ORG OFFSET).



【Format】 STX ORG a/b/c CRLF

No. of parameters = 3

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Response method	0: Completed 1: Quick	

【Response】

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

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

Make Axis No.1 return to origin with speed table No.5.

STX **ORG1/5/0** CRLF

【Remarks】

A stop during driving is done with STP command.

Set the origin return method that fits with your stage of use in advance.
Use system settings for origin return method (See Page 59).
For details, see "3-10. Origin Return Method" (Page 17).

RDP

Read Present Position

【Function】Reads current position motor pulse values.

【Format】 STX RDP a CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	

【Response】Returns the current position.

【Example】

Reads the current position of No.2 axis.

Command: STX **RDP2** CRLF

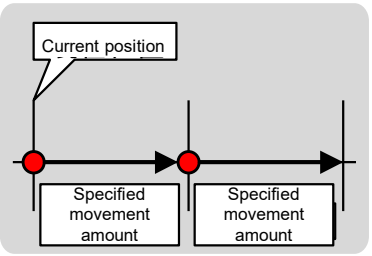
Response: **C** Tab **RDP2** Tab **123456** CRLF

For writing of current position, see “WRP” Commands (Page 45).

RPS

Relative Position Drive

【Function】 Moves from the present position to a position by set relative movement amount.



【Format】 STX RPS a/b/c/d CRLF

No. of parameters = 4

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Specified movement amount	-16,777,215 to 16,777,215	Stated below
d	Response method	0: Completed 1: Quick	

【Response】

Status	Response data
Normal	**C** Tab **RPS <Axis No.>** CRLF
Error	**E** Tab **RPS <Axis No.>** Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

1. Move No.1 axis in speed table No.0 with 1,000 pulses.

STX **RPS1/0/1000/0** CRLF

【Remarks】

Settings can be made within the managed pulse range (-8388608 to 8388607).

A stop during driving is done with STP command.

RST

System Reset

【Function】 Returns the settings inside controller to default state (default value).

The following items are initialized.

・**System settings (excluding №66, №67) go back to default settings.**

→For details concerning system settings, see “5-6. System Settings” (Page 59).

・**Speed table values revert to default.**

→For details concerning speed table, see “3-1-1. Speed Table “ (Page 12).

・**The current motor pulse value becomes “0”.**

→The current pulse count becomes “0”.

The following items are not reset.

・**Switching of micro-step divisions** (System No.66)

・**Driving current** (System No.67)

【Format】 STX RST CRLF No. of parameters = 0

【Response】

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

For <Error No.> , see "5-5. Error Code" (Page 60).

RSY

Read System Setting

【Function】 System setting values are read.

【Format】 STX RSY a/b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	System No.	1 to 68	See "5-6-2. System Setting List" (Page 61).

【Response】

Status	Response data
Normal	**C** Tab **RSY** <Axis No.> Tab <System No.> Tab <Setting value> CRLF
Error	**E** Tab **RSY** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Example】

1. Check the excitation output status ON/OFF of No. 1 axis.
   STX **RSY1/61** CRLF → **C** Tab **RSY1** Tab **61** Tab **1** CRLF ・・・Excitation ON
2. Check the origin return method of No. 2 axis.
   STX **RSY2/2** CRLF → **C** Tab **RSY2** Tab **2** Tab **3** CRLF ・・・Setting 3

RTB

Read Speed Table Setting

【Function】 Speed table set values are read.

【Format】 STX RTB a/b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	

【Response】

Status	Response data
Normal	**C** Tab **RTB** a Tab b Tab c Tab d Tab e Tab f CRLF
Error	**E** Tab **RTB** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Response data】

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Start speed	1 to 400,000	
d	Maximum speed	1 to 500,000	
e	Acceleration/ Deceleration time	1 to 85	Setting value x 10 [msec]
f	Acceleration Mode	1: Rectangular drive 2: Trapezoidal drive	

For speed table writing, see “WTB” command (Page 47).

SAV

Position Data Save

【Function】 The current motor pulse value is saved.

【Format】 STX SAV CRLF No. of parameters = 0

【Response】

Status	Response data
Normal	**C** Tab **SAV** CRLF
Error	**E** Tab **SAV** Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Remarks】

This command has been prepared to preserve past compatibility.
In CRUX-D, position is automatically saved on completion of an action.
When starting up, the previous position is read.

STP

Motor Stop

【Function】Stops a driving motor.

Deceleration stop: Deceleration and stop is performed in accordance with the acceleration/deceleration time in the set speed table.
Emergency stop: The motor is stopped immediately regardless of the setting.

【Format】 STX STP a/b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	0, 1 to 2	"0": All axes are stopped
b	Selecting stop mode	0: Decelerate and stop 1: Emergency stoop	

【Response】

Status	Response data
Normal	**C** Tab **STP** <Axis No.> CRLF
Error	**E** Tab **STP** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

STR

Read Status

【Function 1】

Checks the status of each axis.

・Checking of the detection status of the CW limit, CCW limit, ORG sensor, and NORG sensor.

・Checking of drive/stop status.

【Format】 STX STR a CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	Status check of each axis

【Response】

Status	Response data
Normal	**C** Tab **STR** a Tab b Tab c Tab d Tab e Tab f CRLF
Error	**E** Tab **STR** <Axis No.> Tab <Error No.> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Response data】

【Function 1】		Response contents	Remarks
a	Axis No.	1 to 2	
b	Driving state	0: Stop 1: Operating	
c	ORG signal	0: OFF 1:ON	ON: Detection state
d	NORG signal	0: OFF 1:ON	ON: Detection state
e	CCW limit signal	0: OFF 1:ON	ON: Detection state
f	CW limit signal	0: OFF 1:ON	ON: Detection state

【Function 2】

The emergency stop signal detection status can be checked.

【Format】 STX STR a CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Checking of EMG signal	0	

【Response】

Status	Response data
Normal	C Tab **STR0** Tab a CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Response data】

【Function 2】		Response contents	Remarks
a	EMG signal	0: OFF 1:ON	ON: Detection state

WRP

Write position

【Function】 Writes the current motor pulse value.

【Format】 STX WRP a/b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Setting value	-8,388,608 to 8,388,607	

【Response】

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

For <Error No.> , see "5-5. Error Code" (Page 57).

WSY

Write System Setting

【Function】 Writes the system setting value.

【Format】 STX WSY a/b/c CRLF No. of parameters = 3

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	System No.	1 to 68	
c	Setting value	Following each system setting	See "5-6. System Setting" (Page 60).

【Response】

Status	Response data
Normal	**C** Tab **WSY** <Axis No.> Tab <System No.> Tab <Setting value> CRLF
Error	**E** Tab **WSY** <Axis No.> Tab <Error №> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Remarks】

If the following items are not set appropriately, operation will not be conducted normally. Set according to the stage you are using.

System № 2: Origin return method
System №67: motor driver current value

WTB

Write speed table

【Function】 Writes the speed table data.

【Format】 STX WTB a/b/c/d/e/f CRLF No. of parameters = 6

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed table No.	0 to 9	
c	Start speed	1 to 400,000	
d	Maximum speed	1 to 500,000	
e	Acceleration/ Deceleration time	1 to 85	Setting value x 10 [msec]
f	Acceleration Mode	1: Rectangular drive 2: Trapezoidal drive	

【Response】

Status	Response data
Normal	**C** Tab **WTB** <Axis No.> CRLF
Error	**E** Tab **WTB** <Axis No.> Tab <Error №> CRLF

For <Error No.> , see "5-5. Error Code" (Page 57).

【Details】

Values that can be set are limited. The start speed cannot be set in excess of 80% of the maximum speed. Details concerning speed settings are stated in “3-1.Speed Setting”–“3-2.Trapezoidal drive” (Page 12~14).

【Remarks】

To return speed table values to default, use the “RST” command (Page 38).

For speed table reading, see “RTB” command (Page 40).

5-4.Simple Command Details

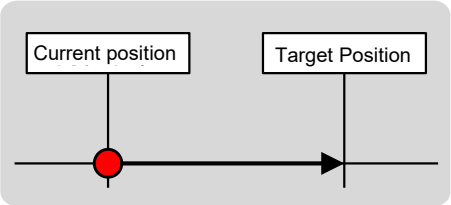
Simple commands that can be used in this product are shown next. (Alphabetical order)

A

Absolute Position Drive

【Function】 Moves from the present position to a position by set relative movement amount.

【Format】 CH 0a A b CRLF No. of parameters = 2



Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Specified movement amount	-8,388,608 to 8,388,607	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

【Remarks】

If not performing speed setting with the “S” command, speed table №5 is selected.
A stop during driving is done with “D” command.

C

Read Position

【Function】 Reads the current motor pulse value.

【Format】 CH 0a C CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **C** Tab <Current position> CRLF
Error	**NG** CRLF

D

Motor Stop

【Function】Stops a driving motor.

【Format】 CH 0a D CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

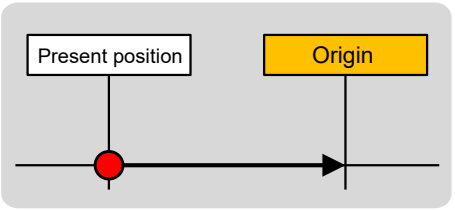
【Remarks】

Decelerates and stops according to the speed table acceleration/deceleration time.

H

Origin Return Drive

【Function】 Performs origin position detection according to a selected method.
With simple commands, since the origin return method cannot change the system setting, origin return is conducted using the default value “4” method.



【Format】 CH 0a H CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

【Remarks】

If not performing speed setting with the “S” command, speed table №5 is selected.
A stop during driving is done with “D” command.

With simple commands, since the system setting cannot be changed, if using an origin return method other than 4, use general commands.
If setting has already been done using general commands, other modes will also activate.

I

System Reset

【Function】Returns the settings inside controller to default state (default value).

With simple commands, the system setting cannot be changed, however, it is possible to return parameters apart from certain items to default values in the same way as with general commands.

The following items are reset.

- **System settings (excluding №66, №67) go back to default settings.**

→For details concerning system settings, see “5-6. System Settings” (Page 59).

- **Speed table values revert to default.**

→For details concerning speed table, see “3-1-1. Speed Table “ (Page 12).

- **The current motor pulse value becomes “0”.**

The following items are not reset.

- **Switching of micro-step divisions** (System No.66)
- **Driving current** (System No.67)

【Format】 CH 01 I CRLF No. of parameters = 0

【Response】

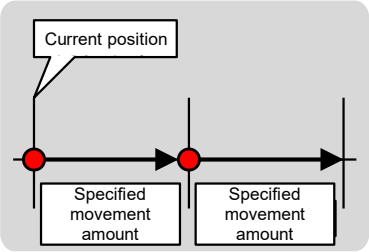
Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

P

Relative Position Drive

【Function】 Moves from the present position to a position by set relative movement amount.

【Format】 CH 0a P b CRLF No. of parameters = 2



Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Specified movement amount	-16,777,215 to 16,777,215	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

【Remarks】

If not performing speed setting with the “S” command, speed table №5 is selected.
A stop during driving is done with “D” command.

R

Read Status

【Function】Checks status of the controller.

The following status is checked.
- CW and CCW limit detection status
- Origin position detection (origin return method 3 only)
- Check of drive conditions

【Format】 CH 0a R CRLF No. of parameters = 1

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF **CH** <Axis No.> **CW_LIMIT** CRLF **CH** <Axis No.> **CCW_LIMIT** CRLF **CH** <Axis No.> **HOME (Displayed when both NORG and ORG signal are ON)** CRLF **CH** <Axis No.> **BUSY (Displayed during driving)** CRLF
Error	**NG** CRLF

【Remarks】

In stages where the origin return method is other than “3”, “HOME” response is not given.
Moreover, since the origin return method cannot be changed with simple commands, it is necessary to change with general commands.

The emergency stop status cannot be detected.

S

Speed Set

【Function】 Determines a drive speed used with A, H, and P commands.
(When the S command is not issued, the speed table No.5 is set)

【Format】 CH 0a S b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Speed Table	0 to 9	

【Response】

Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

【Remarks】

Speed table values cannot be changed with simple commands.

W

Write position

【Function】 Writes the current motor pulse value.

【Format】 CH 0a W b CRLF No. of parameters = 2

Command parameters

Functions		Setting	Remarks
a	Axis No.	1 to 2	
b	Setting value	-8,388,608 to 8,388,607	

【Response】

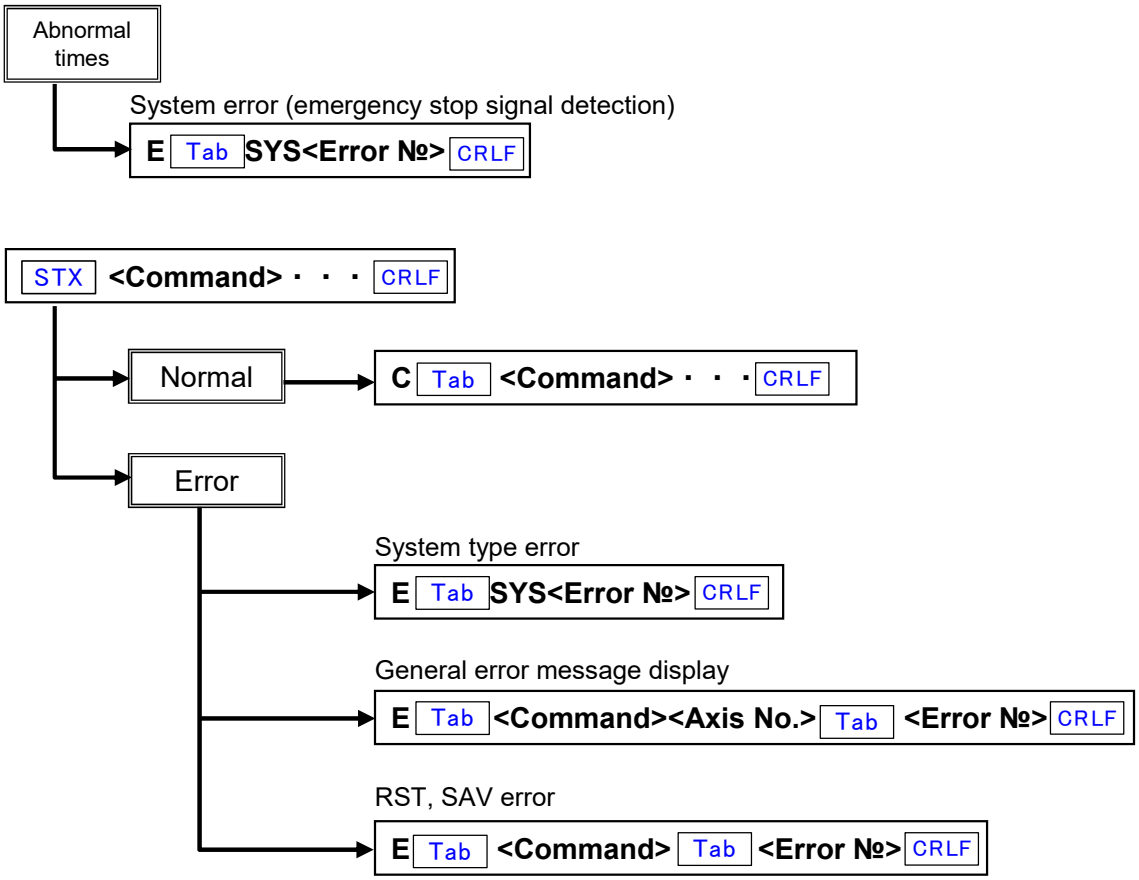
Status	Response data
Normal	**CH** <Axis No.> **OK** CRLF
Error	**NG** CRLF

5-5.Error Code

Concerning the error code format

If an error is confirmed when transmitting a command, the controller returns a response with an error code.
At normal times, an error code prefixed by "**C**" is returned, while at times of error occurrence, the error code is prefixed by "**E**" or **"SYS"**.

Moreover, when an emergency stop signal has been detected, an error code is autonomously returned.



Error code

System error (* Not dependent on the type of command)

Error No.	Description	Remarks
0	Emergency stop status is detected (not dependent on the drive conditions)	Autonomous response is given.
1	No STX on the head of the command.	
4	Characters other than specified characters and numbers are included.	
5	No applicable command.	

Parameter error

Error No.	Description	Remarks
100	Total number of parameters is incorrect.	
10n	Parameter value on Xth parameter is out of range.	n=1 to 6
121	There is no applicable system №.	
130	Due to system settings being made, commands cannot be executed.	

Drive system error

Error No.	Description	Remarks
300	Tried to turn excitation of the axis being driven OFF.	
302	Tried to operate while axes are driving.	
303	Tried to write the present value of the axis during driving.	
304	Stopped at CW limit during driving.	Case of completion
	Tried to drive in the CW direction in the CW limit detection state.	
305	Stopped at CCW limit during driving.	Case of completion
	Tried to drive in the CCW direction in the CCW limit detection state.	
306	Some MPS driving axes stopped at limit.	Case of completion
	Tried to conduct MPS driving in the limit detection state direction.	
307	Both CW and CCW limiters are included.	
308	Tried to move an axis with its excitation OFF.	
310	Coordinates of the movement destination are outside of the manageable range.	
313	Tried to write the system settings of the axis being driven.	
314	The axis being driven was stopped due to emergency stop detection.	Case of completion
325	The axis being driven was stopped by INCOM due to a command.	Case of completion

MPS command error

Error No.	Description	Remarks
500	Tried to drive in MPS with the MPI command not issued.	
505	Coordinates of the first axis movement destination are outside of the manageable range.	
506	Coordinates of the second axis movement destination are outside of the manageable range.	
511	The first axis and second axis are the same axis.	

WTB command calculation error

Error No.	Description	Remarks
605	Tried to set the start speed in excess of 80% of the maximum speed	

System setting errors (WSY command errors)

Error No.	Description	Remarks
700	Tried to change an incompatible system setting №.	

Other

Error No.	Description	Remarks
800	Tried to execute a drive command during emergency stop.	
804	Tried to execute an RST command during drive.	

5-6.System Settings

5-6-1.System Setting Details

System No.1 ORG OFFSET (Origin offset)

After completion of origin return drive, driving for set pulse is performed and the stop position is regarded as 0 (Origin).
Initial value 0
Setting range -8,388,608 to 8,388,607

System No.2 ORG TYPE (Origin detection method)

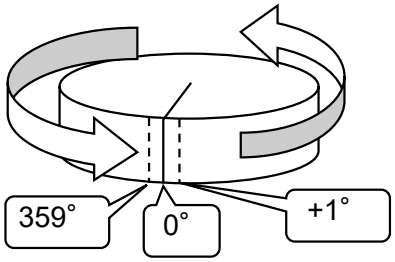
An origin detection method is selected. For details, see "3-10. Origin Return Method" (Page 19).
Initial value 4
Setting range 1 to 10

System No.6 PM PRESCALE (Motor pulse value prescale)

When a setting value is exceeded, the motor pulse value is returned to '0'.
Initial value 0
Setting range 0 to 8,388,607

Example

When placing an coordinate value 0° after turning 360° using the stage of 360° = 3600 pulses rotation system, set the movement amount corresponding to the movement amount of one round (In this case, 3600 pulses) minus 1. (3600 pulses - 1 pulse = 3599 pulses)
This rewrites the current position information from 360° to 0° .



System No.7 PM ROTATE CHANGE (Change motor rotation direction)

A relationship between pulse command direction and motor rotation direction is changed.
Initial value 0
0: Regular rotation…the motor rotates in the CW direction with + direction pulse.
1: Reverse rotation…the motor rotates in the CCW direction with + direction pulse.

System No.8 LIMIT SWAP (Switch limit signal)

CW limit sensor and CCW limit switch are swapped.
Initial value 0
0: Normal …Normally use this.
1: Switch…CW limit sensor and CCW sensor are swapped

System No.21 NORG SIGNAL LOGIC (Change NORG sensor signal logic)

CW and CCW limit signal logics are changed.
Initial value 0
0: NC: Normal close
1: NO: Normal open

System No.22 NORG SIGNAL LOGIC (Change NORG sensor signal logic)

NORG signal logic is changed.
Initial value 0
0: NO: Normal open
1: NC: Normal close

System No.23 ORG SIGNAL LOGIC (Change ORG sensor signal logic)

NORG signal logic is changed.
Initial value 0
0: NO: Normal open
1: NC: Normal close

System No.61 EXCITATION (Motor excitation ON/OFF)

Changes the motor excitation state.
Initial value 1 (Excitation ON) *When power is turned on, startup always occurs with excitation ON.
0: Excitation OFF
1: Excitation ON

System No.66 MICROSTEP SET (Setting the number of micro-step divisions)

Sets the number of micro-step divisions.
Initial value 2
Setting range 1 to 16

Setting value	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of divisions	1	2	2.5	4	5	8	10	20	25	40	50	80	100	125	200	250

System No.67 CURRENT (motor driver current value)

In-built driver motor phase current can be selected from 3 patterns (0.75A/phase or 0.35A/phase or 1.4 A/phase).
Initial value 0
0 : 0.75A/phase…Set when a DC 0.75A motor is connected.
1 : 0.35A/phase…Set when a DC 0.35A motor is connected.
2 : 1.4 A/phase…Set when a DC 1.4 A motor is connected.
3 to 5: Reserved … Prohibited from use

Never use 3–5. Because the current value is set higher than normal, there is a risk the motor will fail.

System No.68 Jog Movement amount (handy terminal (REL mode) movement amount)

This sets the movement amount per time with the handy terminal “INCOM” in REL mode (relative movement amount).
Initial value 2000
Setting range 1 to 16,777,215

5-6-2.System Setting List

It is necessary to perform system setting depending on a model to be used.
Conduct setting with WSY and RSY commands.
*System numbers are same with KOSMOS-ARIES.

System No.	Display	Functions	Setting range	Initial value	Remarks
1	ORG OFFESET	Coordinate value after return to origin/Origin offset value	-8,388,608 to 8,388,607	0	See "3-10. Origin Return Method" (Page 19).
2	ORG TYPE	Origin Return Method	1 to 10	4	
6	PM PRESCALE	Returns 0 when pulse value prescale/set value is exceeded.	0 to 8,388,607	0	Used in the rotation stage, etc.
7	PM ROTATE CHANGE	Change of motor rotating direction	0: Regular rotation 1: Reverse rotation	0	
8	LIMIT SWAP	Limit signal switch	0: Normal 1: Switch	0	
21	LIMIT LOGIC	Change of limit signal logic	0: NC 1: NO	0	See below.
22	NORG SIGNAL LOGIC	Change of NORG sensor signal logic	0: NO 1: NC	0	See below.
23	ORG SIGNAL LOGIC	Change of ORG sensor signal logic	0: NO 1: NC	0	See below.
61	EXCITATION	Motor excitation ON/OFF	0:OFF 1:ON	1	When power is turned on, startup always occurs with excitation ON.
66	MICROSTEP SET	Setting of the number of micro-step divisions	1 to 16	2	Divisions: 1–250
67	CURRENT	Motor driver current value	0:0.75 A 1:0.35 A 2:1.4 A 3:Reserved 4:Reserved 5:Reserved	0	Do not use 3–5.
68	Jog Movement amount	Jog box (REL mode) movement amount	1 to 16,777,215	2000	

NC → Normal close
NO → Normal open

5-7.Installation Procedures of USB Driver

When using USB communication in this product, USB driver corresponding to the version of Windows OS needs to be installed.
On Windows8.1 or earlier OS, it is necessary to install a driver.
Download the driver from our company's website.

①Download the driver from our company's website.
KOHZU_USB_DRIVER.zip

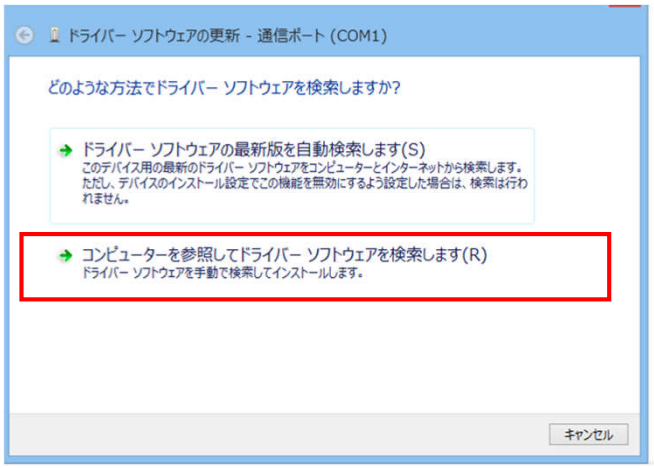
After downloading, unzip the ZIP files.

②Set communication to USB communication and connect CRUX-D with power ON to a PC.
(See "2-7. Rotary Switch for Communication Setting" (Page 11) regarding communication setting)

③The driver installer starts.

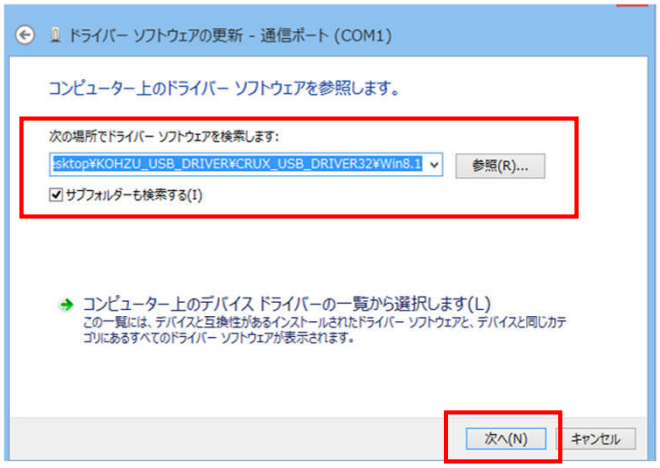
*When the driver installer does not start, go to "Control Panel" -> "Hardware and Sound" -> "Device Manager", right click where Unknown device is displayed, and select "Update Driver Software...".

④Select "Browse my computer for driver software. Locate and install driver software manually."



If it cannot be installed by the above procedure, check whether or not your PC's security software, etc. is limiting USB devices.

⑤Set the search folder to the applicable OS in the KOHZU_USB_DRIVER and select “Next”.



Contents of USB driver folders that come with the product:

KOHZU_USB_DRIVER.zip

- For CRUX USB DRIVER32 (Windows 32bit)
  - Driver file for Windows7
  - Driver file for Windows8
  - Driver file for Windows8.1

- For CRUX USB DRIVER64 (Windows 64bit)
  - Driver file for Windows7
  - Driver file for Windows8
  - Driver file for Windows8.1

*For Windows10, use the driver file for Windows8 or Windows8.1.

⑥The driver for CRUX is installed and "CRUX USB Serial Port" is displayed.

This is the end of instillation procedures.

In case of Windows10, even if a driver is not installed, operation is not impeded, however, “CRUX USB Serial Port” is not displayed on the device manager.

6 Specification

6-1.Specification

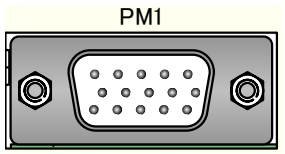
		CRUX-D
General Specifications	Product	Stepping motor controller (Built-in DC power driver)
	Exterior dimensions [mm]	W128.4xH58.4xD220
	Number of axes controlled	2
	Input power	100–240 V AC 50Hz/60Hz
	Power consumption	100VA MAX (AC100V 1 φ supply)
	Operating environment	Operating temperature: 0 to 40°C, Operating humidity: 30 to 85 % (Should be no condensation)
	Weight [kg]	1.3
Performance Specifications	Driving Function	Absolute position drive, relative position drive, origin return drive, 2 axes simultaneous drive, free rotation drive
	Speed control	・Drive pulse frequency: 1 to 500 kpps ・Acceleration/deceleration pattern: Rectangular drive and trapezoidal drive (Symmetry for acceleration/deceleration) ・Others: 10 kinds of speed tables
	Managed pulse range	-8,388,608 to 8,388,607
	Origin Return Method	10 methods (Combination of ORG, NORG, CW limit, and CCW limit)
	Output signal	・Motor excitation signal ・Emergency stop signal [Open collector output]
	Input signal	・Sensor signal (CW limit, CCW limit, NORG “near origin”, ORG “Origin”) [12V pull-up photo-coupler input] Compatible sensor: NPN sensor
		・Emergency stop signal [24 V pull up photo coupler input]
	Monitor LED	Sensor status, BUSY state, and emergency stop status LED
	Communication interface	RS-232C and USB(USB2.0 Type-B,Full-Speed(12Mbps))
	Optional	INCOM (Handy Terminal for Easy Control)
Built-in Motor Driver Specifications	Model	Onboard DC driver
	Drive motor	5-phase stepping motor
	Driving Type	Bipolar constant current pentagon method
	Driving current	Switch 0.35A/phase , 0.75A/phase and 1.4A/phase (Parameter setting)
	Micro Step Division Number	16 types, Parameter setting 1/2/2.5/4/5/8/10/20/25/40/50/80/100/125/200/250
Other Functions		Excitation OFF/For motor with brake

6-2.Connector

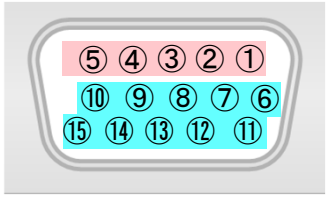
The pin arrangement diagram is from the connector side.

6-2-1.Motor connecting connector

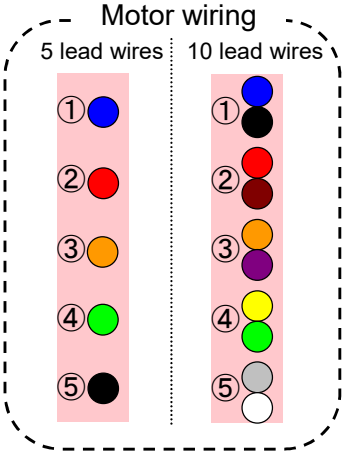
Connector type: D02-M15SAG-13L9E(JAE)



Pin positions enlarged view



*Mounting screws are M2.6.

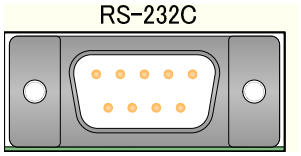


Pin	Terminal name	Signal name
①	Motor line	Blue (Blue/Black)
②		Red (Red/Brown)
③		Orange (Orange/Purple)
④		Green (Yellow/Green)
⑤		Black (Gray/white)
⑥	+24V_OUT	+24V power supply
⑦	0V(24)	GND (for +24V)
⑧	+24V_OUT	+24V power supply
⑨	0V(24)	GND (for +24V)
⑩	ORG	ORG sensor
⑪	CW-LS	CW sensor
⑫	CCW-LS	CCW sensor
⑬	NORG	NORG/DATUM sensor
⑭	+24V(B)_OUT	For motor with brake
⑮	0V(B)	For motor with brake

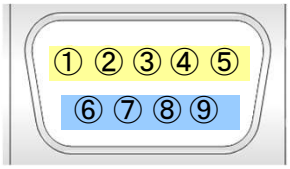
*The colors of motor connection wires correspond to 10 leads/5 leads motor made by Oriental Motor Co.

6-2-2.RS-232C Connector

Connector type: CD6109PA1G0(Cvilux): D-sub9 pin male



Pin positions enlarged view



*Mounting screws are inch-type.

*⑦, ⑧ are internally shorted.

Pin	Terminal name	Signal name
①	Unused	
②	RXD	RS-232C input terminal
③	TXD	RS-232C output terminal
④	Unused	
⑤	SGND	GND (for ＋5V)
⑥	Unused	
⑦	RTS	Connecting prohibited
⑧	CTS	Connecting prohibited
⑨	Unused	

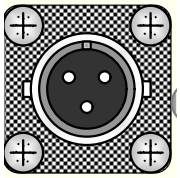
6-2-3.Emergency Stop Signal (Input/Output) Connector

Connector type: RM12BRB-3S_(Hirose)
Compatible connector: RM12BPE-3PH(71) _(Hirose)

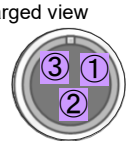
Connector type: RM12BRB-2PH (Hirose)
Compatible connector: RM12BPE-2S(71) _(Hirose)

Emergency Stop Signal(Input)

EMG IN



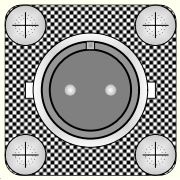
Pin positions enlarged view



Pin	Terminal name	Signal name
①	24V	+24V output(Max50mA)
②	EMG_IN	Emergency stop signal output (normal close)
③	0V	24V GND

Emergency Stop Signal(Output)

EMG OUT



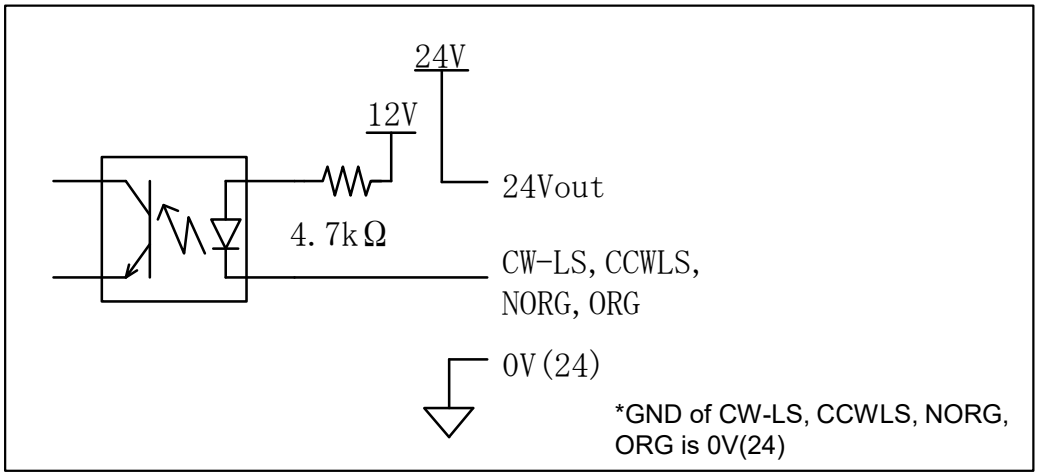
Pin positions enlarged view

Pin	Terminal name	Signal name
①	EMG_OUT	Emergency stop signal output (normal close)
②	0V	24V GND

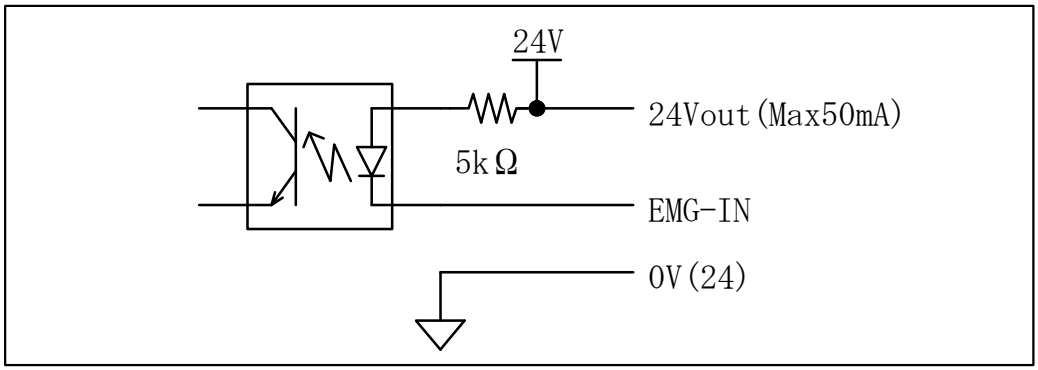
6-3. Input/Output Signal Interface

All the figures below show the inside of the CRUX-D.

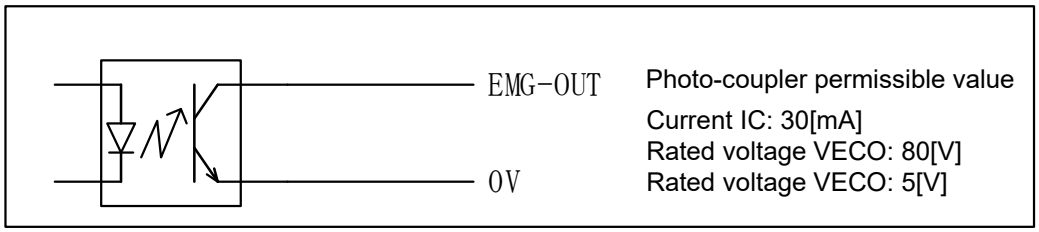
Motor connection terminal “PM1/PM2”



Emergency stop signal input terminal “EMG_IN”

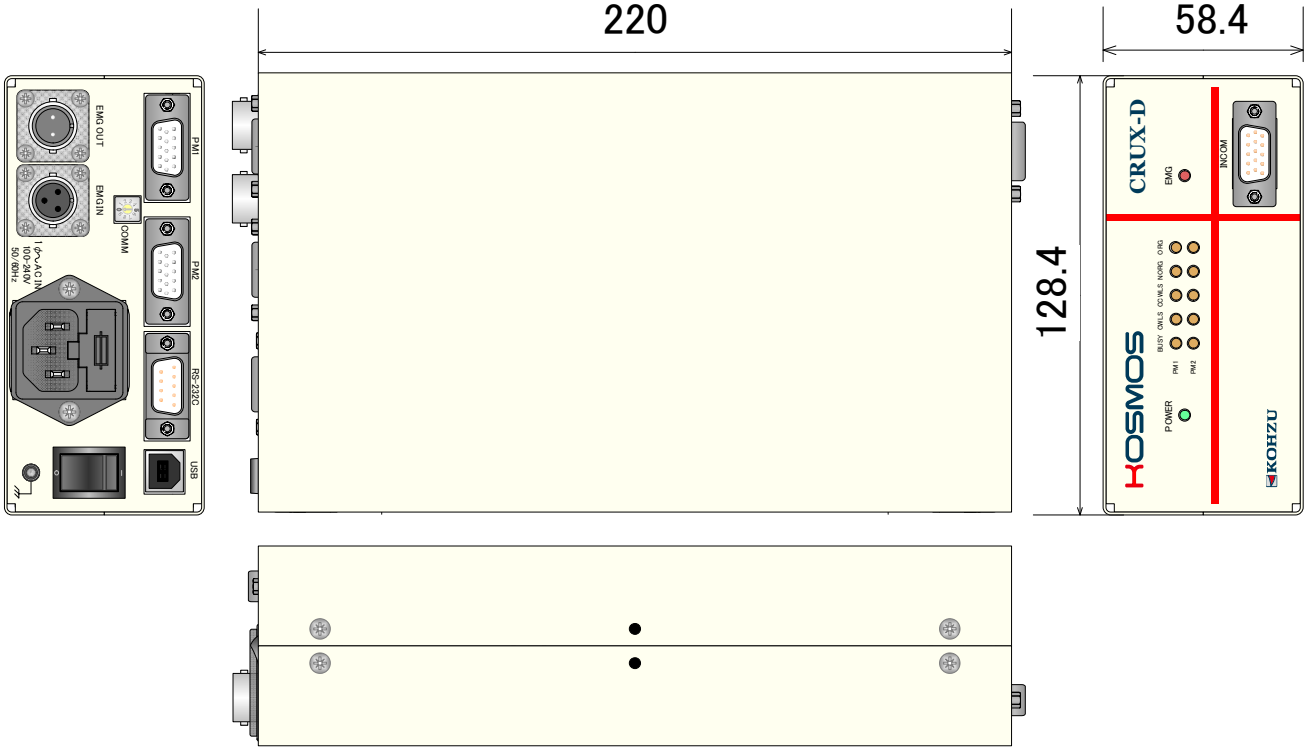


Emergency stop signal output terminal “EMG_OUT”

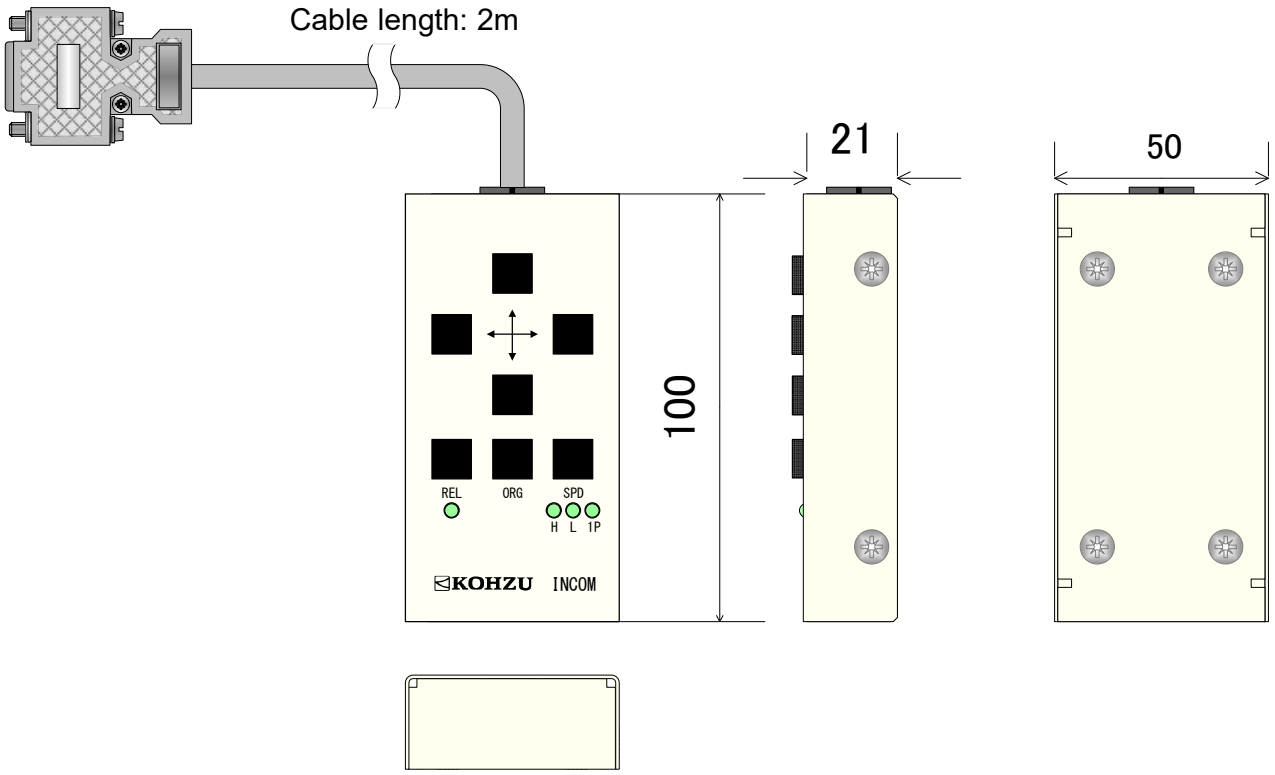


6-4.Dimensions

6-4-1.Dimensions of CRUX



6-4-2.INCOM external dimensions



7 Maintenance and Service

7-1.Troubleshooting

Solutions are indicated for each symptom. Please check before making an inquiry.

■ Power cannot be turned ON.

Things to be checked	Solution	Relevant pages
Is the power cable pulled out or loosened?	Plug the power cable into the main body securely.	10
Is the fuse broken?	Disconnect all connected cables and check whether the fuse is broken inside the power plug. If a fuse is broke, it is necessary to replace with a new one.	9
Is the power cable broken en route?	Check conductivity between both ends of the cable if you have a tester.	—
Is power conducted to the outlet?	Plug the power cable of other electric appliance into the outlet to check if it works.	—
	Check electrification with a voltmeter such as a tester.	—

■ The stage does not move.

Things to be checked	Solution	Relevant pages
Is the motor generating any strange noise? (High, dull noise)	Out-of-adjustment may have occurred due to the following reasons. ➡If drive speed is too fast. Our company's stages cater to speed up to 10[kpps] in half-step. Check the micro-step divisions and speed table settings. ➡If the driving current is too big. Set the driver output current.	12 to 14
Is the limit display (CWLS/CCWLS) light on?	It is stopped by the limit switch. Move in the reverse direction and move through the limit zone.	9
Is the emergency stop signal LED (EMG) on?	Emergency stop signal is detected. Release the emergency stop switch after resolving the cause of the emergency stop. If emergency stop is not used, connect the short plug.	9,10 to 16
Is the emergency stop signal LED (EMG) flashing?	System abnormality. Refer to "System Abnormality Return Method" and initialize the data	70
Is the motor cable detached or loose?	Securely plug the cable connector into the main body connector.	9, 10
Are all the axes not moving?	If some axes move and the others do not, exchange the connection connector of each axis (Motor) to judge if the problem is on the main body side or motor side.	9, 10
Aren't you trying to move an excitation OFF axis?	Set system №61 to "1", turn excitation ON.	59

■ Origin return action is not conducted correctly. (1/2)

Things to be checked	Solution	Relevant pages
Doesn't the motor operate completely?	Check if it operates with other driving methods.	29
	Check the command format.	25 to 27, 35
Check the origin return method is correct.	See "3-6. Origin Return Method" and set to match the stage's sensor configuration.	17

■ Origin return action is not conducted correctly. (2/2)

Things to be checked	Solution	Relevant pages
Is the origin sensor logic set correctly?	Check the setting of the limit sensor input logic (normal open/normal close). Also, check the logic values of other sensors too.	59 to 61
Is the origin offset at “0”?	When origin offset is set, it moves only by the set amount following origin return. Set system №1 to"0".	59

■ Positional deviation occurs.

Things to be checked	Solution	Relevant pages
Is the motor properly operating? Do you hear abnormal sound?	Out-of-adjustment may have occurred due to the following reasons. ➡If drive speed is too fast. Our company's stages cater to speed up to 10[kpps] in half-step. Check the micro-step divisions and speed table settings. ➡If the driving current is too large. Set the driver output current.	12 to 15
Is the load exceeding the rating applied?	Check the load. Also, try to lower the speed.	12 to 15
Is the axis in the limit range?	Stopping position and counter value cannot be guaranteed when it is within the limit range. Use it out of the limit range.	—

■Remote operation (communication) cannot be done.

Things to be checked	Solution	Relevant pages
Are USB devices limited by the security software?	Change the security settings to enable communication. Inquire with the security manager concerning security settings.	—
◇Is the communications cable pulled out or loose?	Plug the connector of the communications cable into the connector of the main body properly.	10
Is the driver installed?	If Windows OS 8.1 or an earlier OS is used, it is essential to install a driver.	62
Is the communication rotary switch correct?	Check “2-4. Communication Rotary Switch”. In the case of RS232C communication, it is necessary to adopt the same communication speed setting as on the software side. (Always turn power OFF before performing settings).	11
Is correct communication cable used?	Check the arrangement of the connector pins on the communication cable. Use a cross-type RS232C cable.	6, 10, 65
During communication, is error code sent?	Take measures for the error on the host computer.	57, 58
Are there any errors 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.	26, 27
Are commands transmitted and received properly?	Make sure to receive data for commands which return response (For example, status read, etc.).	25 to 27
Is communication possible in the stage control application “Chamonix”?	We have application available that can be operated easily. If this application operates normally, it is possible that the application on the user side is not described correctly.	7
Is communication forcedly interrupted in mid-stream?	Turn the power ON again.	—

■ Operation is not possible on INCOM

Symptom	Solution	Relevant pages
Isn't it possible to operate all buttons?	Check that the connector is properly inserted into the main unit.	10
Is there no action at all when the origin return button is pressed?	While pressing the ORG button, check that each axis can return to origin by pressing "←/→" for the first axis and " ↑ / ↓ " for the second axis.	24
Does the speed remain unchanged when the speed change button is pressed?	Check whether speed in speed tables №2 and №9 is the same. It is necessary to set speed in advance with a PC.	40
Are the operated axis and direction correct?	INCOM can operate the first axis with "←/→" and the second axis with " ↑ / ↓ " . Usually, the +(CW) direction is operated with "←/ ↑ " and the (CCW) direction with "→/ ↓ ". If you want to reverse the action, change system No.7.	24, 60
Is the setting at the drive mode you want to operate?	Press the drive mode and select FRP mode. If REL_LED is not lit, it is the FRP mode.	24

■ EMG lamp is flashing (system abnormality) and operation cannot be conducted

If abnormality is confirmed in the startup check, the EMG lamp on the front panel will flash.
In this state, all drive modes are prohibited. (Same state as the emergency stop mode)
Restore the system according to the following procedure.

~System abnormality return method~

If a system abnormality occurs, the data that has already been set cannot be restored.
By performing the following restoration procedure, data are overwritten to the factory state (Default value), and the system is restored to normal state.

Remote control

①Send the "RST" command (Reset command) from PC.
②Next, send the following commands.

WSY1/66/2
WSY2/66/2
WSY1/67/0
WSY2/67/0

Send the four commands above.
After executing the above restoration method, turn the CRUX-D power on again.

Restoration Procedure from Our Company's Application "Chamonix"

①Start "Chamonix" and check the connection.
②Click the "Command" at the top right of the screen.
③Input the command in the command inputting field by following the above remote control procedure.
④After completing inputting of the command, turn the CRUX-D power on again.
*See the Chamonix Operation Manual for the Chamonix operation method.

7-2.Maintenance

■ Maintenance of Controller

・When not using or storing for a long period of time, always remove the power cable from outlet and other cables.
・Maintenance service shall be carried out only by our company.
For details, please contact our sales department.

7-3.Warranty and Service

If the product fails within the warranty period, we provide a free repair according to the regulations of our company.

One year from the date of shipment

■ Request for a repair within warranty period

Please contact the sales agent, commercial firm and our sales department from which you purchased our product.

■ Request a repair after warranty period has expired

Even if the warranty period has elapsed Repairs shall be carried out depending on failure at cost.

■ Maintenance for repair 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 met due to some reasons of parts distribution manufacturers.

7-4.Contacts

If you have questions about our products, please contact our sales department via phone or email.

Telephone inquiries:
Head Office (Sales Department)
Tel: +81-44-981-2131
Fax: +81-44-981-2181

Osaka branch
Tel: +81-6-6398-6610
Fax: +81-6-6398-6620

E-mail inquiries here
E-mail: sale@kohzu.co.jp
Website
Web: https://www.kohzuprecision.com/i/
(From the homepage, please inquire through the inquiry form.)

Revision History

Date	Version	Remarks
14-Feb-20	Edition 1.00	First edition
23-Apr-20	Edition 1.01	Corrected the description of accessories.
29-Sep-20	Edition 1.02	Added description of the communication method.
16-Feb-23	Edition 1.03	Added description of emergency stop function and USB specifications. Also fixed some typos.
05-Sep-24	Edition 1.04	Deleted COF command, corrected response to STR0 command, etc.

Recording Column

Purchased Date Year Month Date

Purchased from

Person in charge TEL

Production No.

Special note

CRUX-D

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