

MontBlanc stage compliant Stepping motor controller

KOSMOS series
Model: CRUX/CRUX-A

RoHS

User's Manual

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



CRUX CRUX-A

Kohzu Precision Co., Ltd.

Introduction

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

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

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


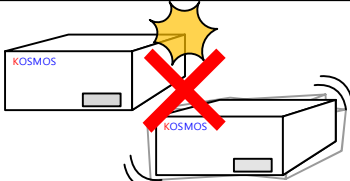

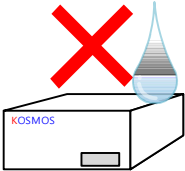

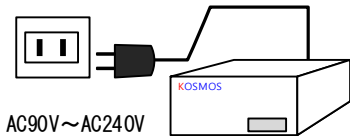

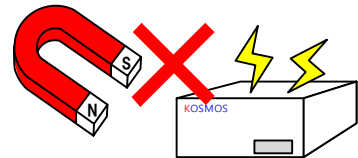



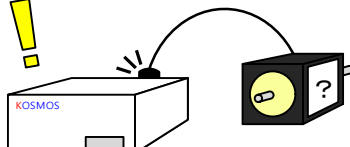

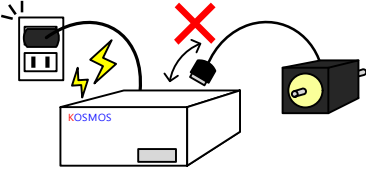
| | | |
|---|---|--|
|  |  | Do not apply severe shock to the product and avoid using in a place with vibration. |
|  |  | Liquid or chemical splashes on this device are dangerous and cause failures. Never use this device that these specified above may occur. |
|  |  | Use 90-240V AC (50/60Hz) as a power supply. *Confirm ratings of the power cable. *Always earth FG (Frame Ground). |
|  |  | This product is precision electronic equipment. Because malfunction may occur near large motors, high voltage electric devices or device that generates strong magnetism, do not use this product under these environment. |
|  |  | 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

| | |
|--|-----------|
| Introduction | 1 |
| Symbols Identifications | 1 |
| Safety Precautions | 2 |
| Table of Contents | 3 |
| 1. Product Summary | 4 |
| 1-1. Features of this Product | 4 |
| 1-2. List of Functions | 5 |
| 1-3. Attachments and Options | 6 |
| 2. Installation and Preparation | 8 |
| 2-1. Proceeding with Installation and Preparation | 8 |
| 2-2. Parts Name of CRUX | 9 |
| 2-3. Parts Name of CRUX-A | 10 |
| 2-4. Driver Settings Procedures of CRUX-A | 11 |
| 2-5. Connecting Method of CRUX | 12 |
| 2-6. Connecting Method of CRUX-A | 13 |
| 2-7. Rotary Switch for Communication Settings | 14 |
| 3. Functions | 15 |
| 3-1. Speed Setting | 15 |
| 3-2. Trapezoidal Drive | 16 |
| 3-3. Driving Current (CRUX) | 16 |
| 3-4. Setting No. of Divisions of Micro-Step (CRUX) | 16 |
| 3-5. Micro-Step Division Switch (CRUX-A) | 17 |
| 3-6. Setting No. of Divisions of Micro-Step (CRUX-A) | 17 |
| 3-7. Setting of Drive Current (CRUX-A) | 17 |
| 3-8. Setting of Current Down (CRUX-A) | 17 |
| 3-9. Emergency Stop Function | 18 |
| 3-10. Origin Return Method | 19 |
| 3-11. EEPROM Save Data Error | 26 |
| 3-12. Powering OFF | 27 |
| 4 Jog Box for Easy Control | 28 |
| 4-1. Description for INCOM Operation .. | 28 |
| 4-2. List of Driving Patterns | 28 |

| | |
|---|-----------|
| 5 Remote Control | 29 |
| 5-1. Proceeding with Installation and Preparation | 29 |
| 5-2. Command List..... | 32 |
| 5-3. Command Details | 33 |
| 5-4. Simple Command Details | 51 |
| 5-5. Error Code | 60 |
| 5-6. System Settings | 62 |
| 5-7. Installation Procedures of USB Driver | 65 |
| 6 Specification | 67 |
| 6-1. Specification | 67 |
| 6-2. Connector | 68 |
| 6-3. Circuit Diagram of Emergency Stop and Sensor | 69 |
| 6-4. Dimensions of CRUX | 70 |
| 6-5. Dimensions of CRUX-A | 70 |
| 7 Maintenance and Service | 71 |
| 7-1. Troubleshooting | 71 |
| 7-2. Maintenance | 72 |
| 7-3. Warranty and Service | 73 |
| 7-4. Contacts..... | 73 |
| Ex Revision History | 74 |

1 Product Summary

1-1. Features of this product

Thank you for purchasing our stage controller, "CRUX"/"CRUX-A".
(Hereinafter, both "CRUX" and "CRUX-A" are referred to as "CRUX").

CRUX consists of the reconfigured conventional small-size stage controller SC-021, and is significant high cost performance equipment actualizing low price while featuring high level functions satisfying needs of customers.

- Completely supports our motor drive precision stage <MontBlanc Series>.
- Micro-step motor driver with 250 divisions at maximum equipped as standard.
- Compact size.
- Lineup of "CRUX" equipped with DC driver and "CRUX-A" equipped with AC driver.
- Supports rectangular and trapezoidal drives.
- Origin return method selectable from 10 kinds (+ORG OFFSET).
- Remote control by USB communication is possible.
- Remote control by RS-232C communication is possible.
- Control is possible through application for stage drive, "Chamonix".
Please download from our company's HP.

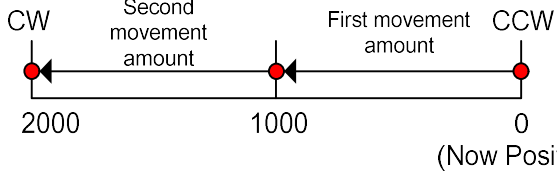
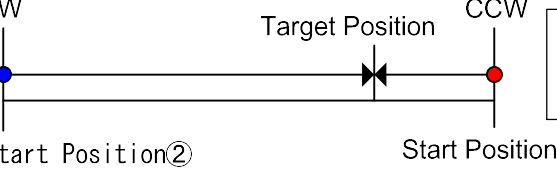
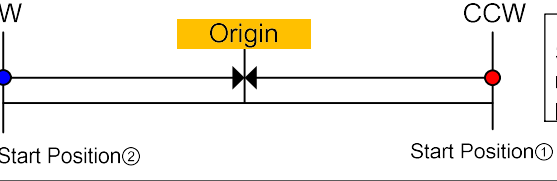
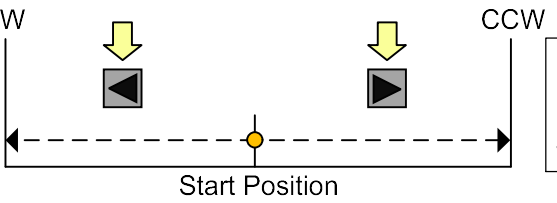
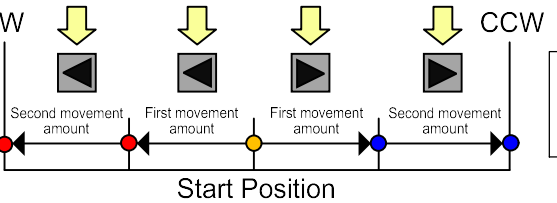
<http://www.kohzu.co.jp/>

■ Out of product scope

This product does not offer the following items.

- CRUX cannot drive motors besides 5-phase stepping motors.
- Not compatible with motors with an electromagnetic brake.
- No automatic operation possible with CRUX only.
*For automatic operation, connect a computer with CRUX and conduct remote control.
- *With the jog box, "INCOM" (Sold separately), a part of functions can be performed.
- Not compatible with remote controls (Sequencer connection, etc.) except for RS-232 and USB communication.

1-2. List of Functions

| | |
|--|--|
| <p>Relative Position Movement (2 axes simultaneous start possible)</p> | <p>Moves toward the specified direction from the present position by a set moving value.</p>  <p>Example : Move to CW angle(1000 pulse)at two times.</p> |
| <p>Absolute Position Movement (2 axes simultaneous start possible)</p> | <p>Moves to the specified target position.</p>  <p>Example : Start position① or Start position② move to target position.</p> |
| <p>Origin Return Movement</p> | <p>Performs origin return with the specified origin return method.</p>  <p>Example : Start position① or ② move return Origin position.</p> |
| <p>Continuous Drive Mode (Optional)</p> | <p>Moves continuously with the free drive mode of the easy control jog box "INCOM".</p>  <p>Starts driving while the button is pushed and stops when released.</p> |
| <p>Relative Position Drive Mode (Optional)</p> | <p>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.</p>  <p>Performs a regulated amount of drive in one operation.</p> |

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.

① Power cable (3P)

Power cable (3P) for AC100 V is included usually.
In addition, a 3P->2P conversion plug comes as an option.

***A power cable for AC200 V must be prepared by customers or contact our sales department.**



② CD-R (Operation manual)



To save paper resources, printed operation manual is not provided. Print the file inside the CD-R if necessary.

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



To view the PDF format file, Adobe Reader from Adobe Systems is necessary.
Adobe Reader is not included in this CD-R.

③ Emergency stop short plug

A short plug to connect when not using the emergency stop signal comes as attachment.



1-3-2. Optional products (Required)

A motor cable for KOSMOS series necessary to drive the MontBlanc product, RS-232C (cross) communication cable and USB cable used to control from a computer are not included in the product.

Purchase a motor cable separately.

Also, purchase a communication cable or USB cable available on the market.

Motor cable list for KOSMOS series

| Connector shape (stage side) | Length | Cable type |
|---------------------------------|--------|------------|
| Rectangular connector | 3m | CA1503A |
| | 5m | CA1505A |
| | 10m | CA1510A |
| Round type connector | 3m | CB1503A |
| | 5m | CB1505A |
| | 10m | CB1510A |

1-3-2. Optional products (Convenient tools)

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.

① Jog box "INCOM" for easy control

Easy jog box that can control the basic operation functions of CRUX.

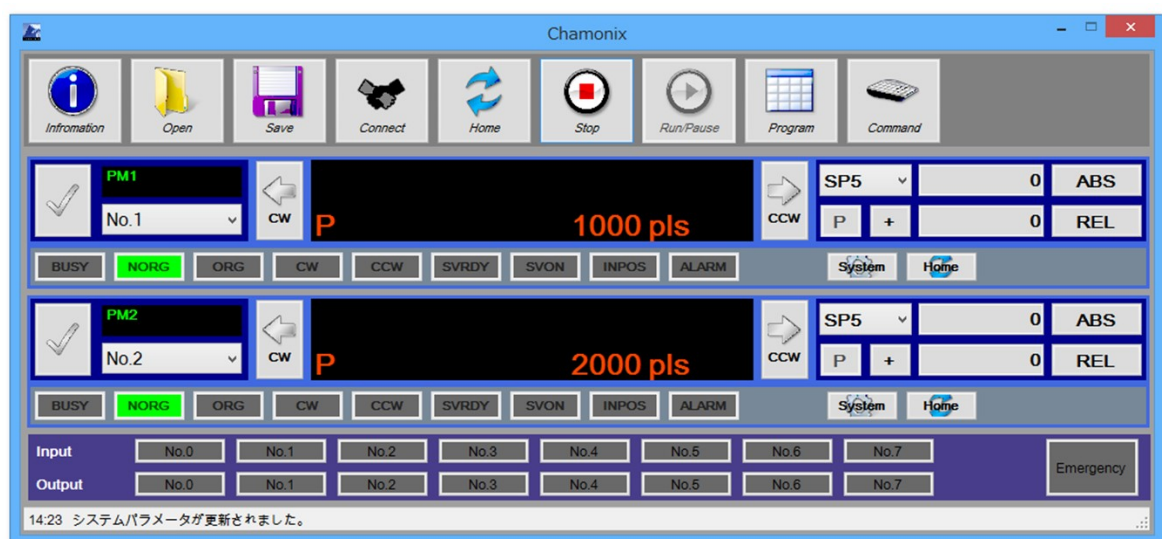
For details, see "4 Easy Control Jog Box" (Page 28).



② Stage control application, "Chamonix"

Application that can control all functions of CRUX from PC.

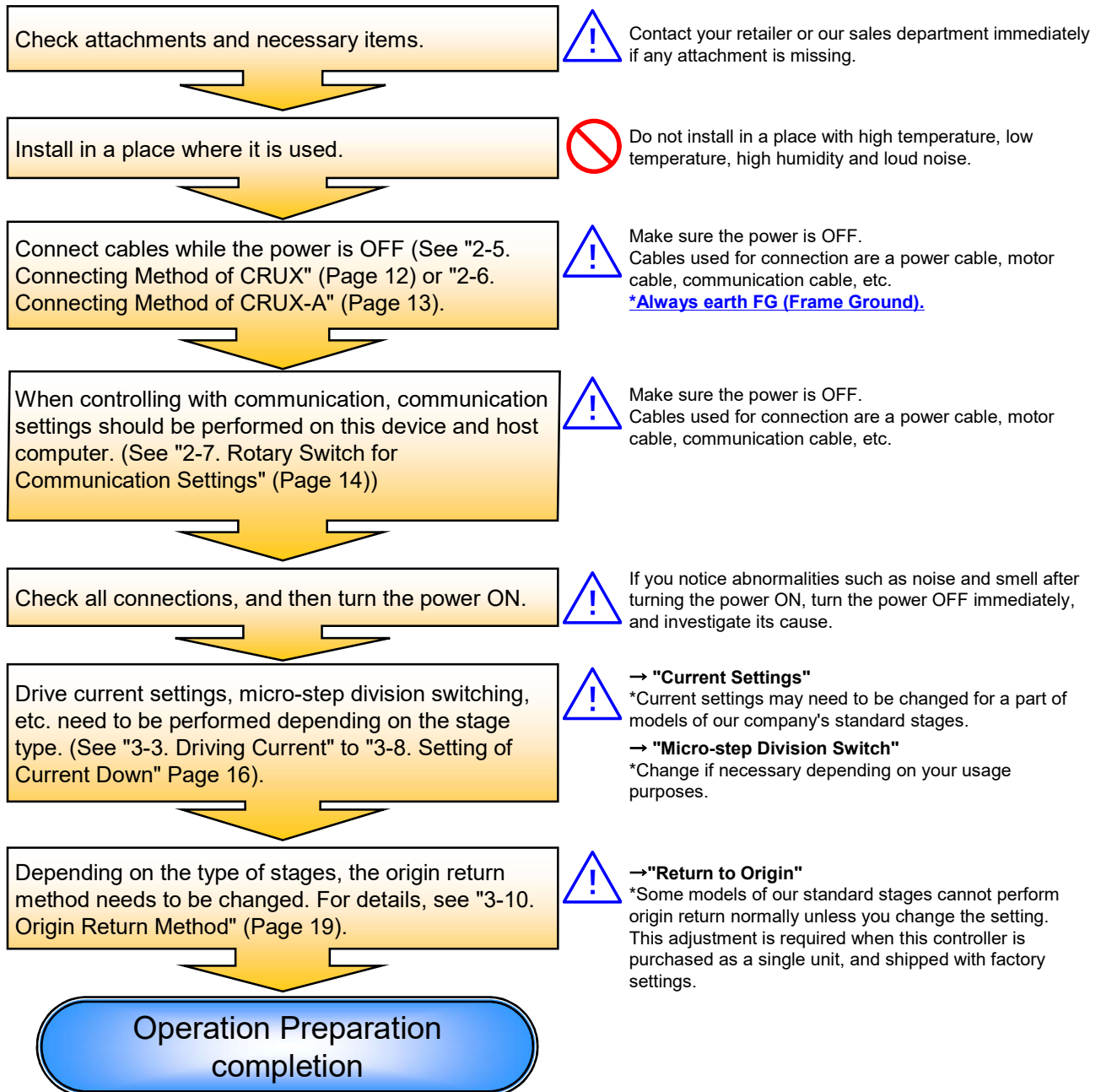
Please download from our company's HP.



2 Installation and Preparation

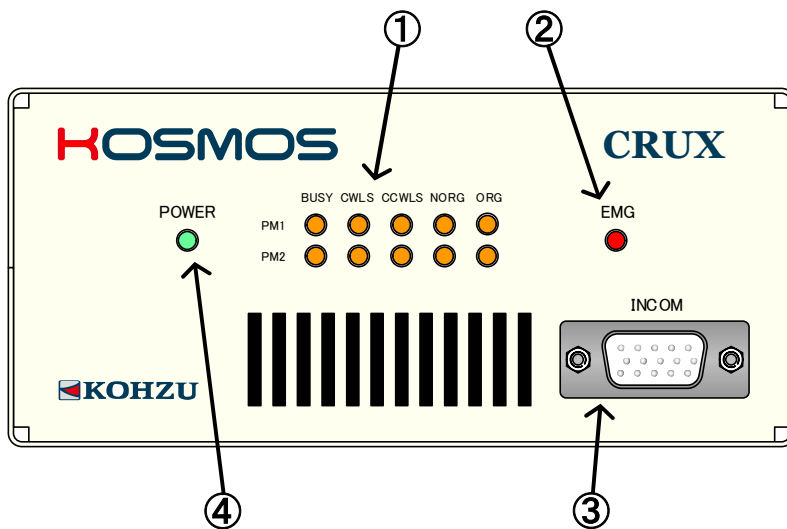
2-1. Proceeding with Installation and Preparation

Always follow the sequence specified next to install the product.



It takes about 3 second for starting to complete, after the power is turned ON.

2-2. Parts Name of CRUX



① Limit and position sensor display LED

Position sensor and driving states are displayed.

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.

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

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

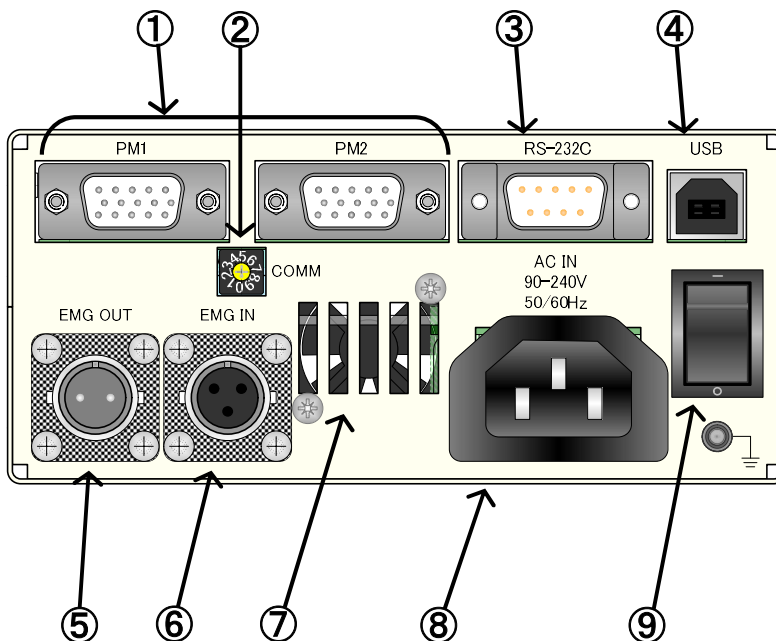
② Emergency stop LED

When the emergency stop is ON, it turns ON red.

③ Connector for "INCOM" connection

④ Power light

Turns ON green when the power is ON.



① Motor connecting connector

Stage driving output, and sensor input

② Rotary switch for communication mode selection

Selects USB or RS-232C (including baud rate setting), selects Normal/Simple command

③ RS-232C connector

Connector 9-pin for RS-232C communication line

④ USB connector

For USB communication line

⑤ Emergency stop signal output connector

⑥ Emergency stop signal input connector

⑦ Heat discharging fan

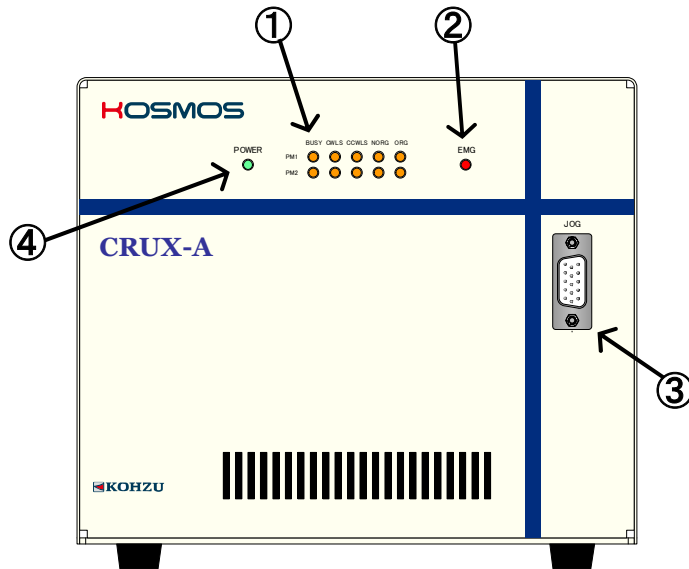
Never block exhaust by placing objects behind the fan.

⑧ Power connector

⑨ Power switch

Turns power ON/OFF.

2-3. Parts Name of CRUX-A



① Limit 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.

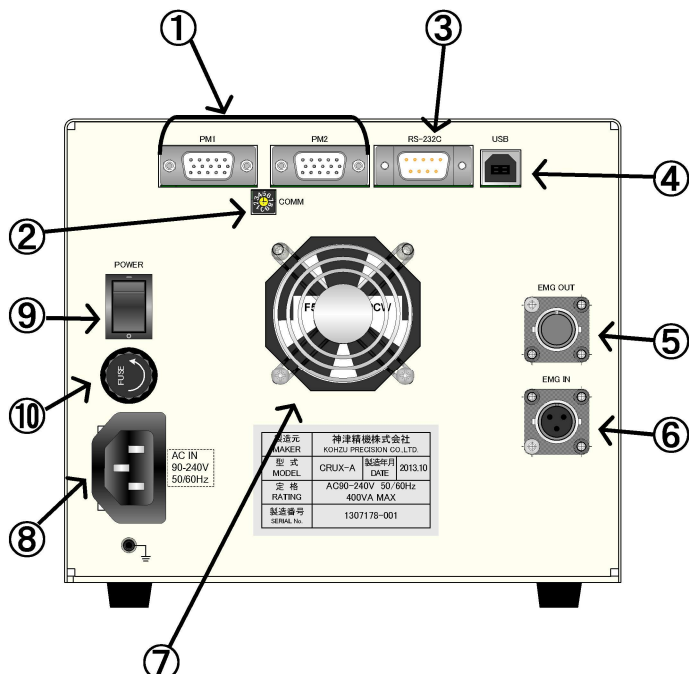
② Emergency stop LED

When the emergency stop is ON, it turns ON red.

③ Connector for "INCOM" connection

④ Power light

Turns ON green when the power is ON.



① Motor connecting connector

Stage driving output, and sensor input

② Rotary switch for communication mode selection

Selects USB or RS-232C (including baud rate setting)

Selects Normal/Simple command

③ RS-232C connector

Connector 9-pin for RS-232C communication line

④ USB connector

For USB communication line

⑤ Emergency stop signal output connector

⑥ Emergency stop signal input connector

⑦ Heat discharging fan

Never block exhaust by placing objects behind the fan.

⑧ Power connector

⑨ Power switch

Turns power ON/OFF.

⑩ Fuse

Fuse for CRUX-A circuit protection is included.

2-4. Driver Settings Procedures of CRUX-A

Steps

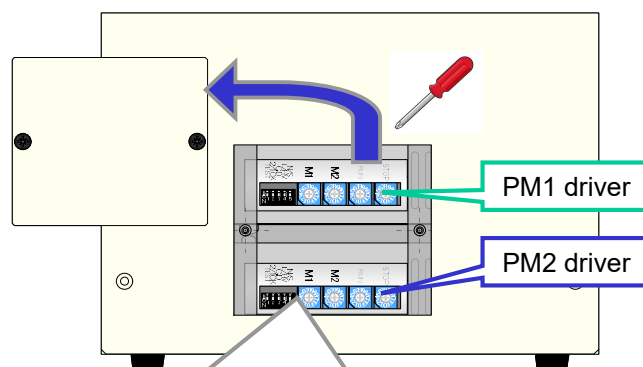
***Turn the power OFF when performing settings.**

① Remove the side panel cover.

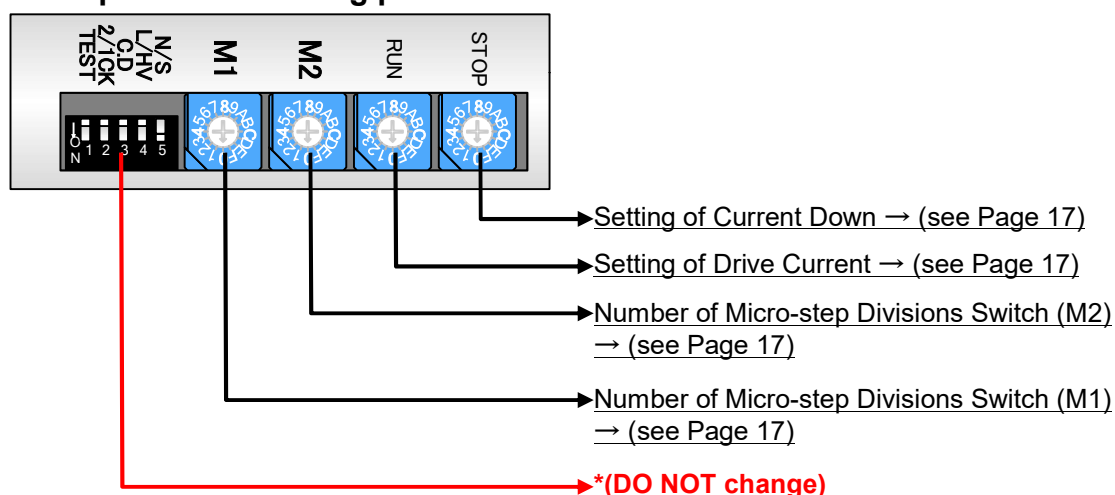
② Set a driver per axis.

For details on settings, see "3-5. Micro-step Division Switch" to "3-8. Setting of Current Down" (Page 17).

③ Attach the side panel cover.



Close-up of driver setting part



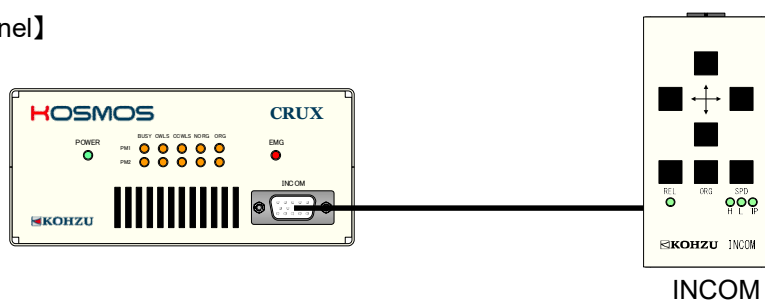
CRUX-A driver settings table

| | | | | | | | | | | | | | | | | | |
|--------|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| M1, M2 | SW No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| | Number of divisions | 1 | 2 | 4 | 5 | 8 | 10 | 20 | 40 | 80 | 16 | 25 | 50 | 100 | 125 | 200 | 250 |
| RUN | SW No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| | Current value (A) | 0.35 | 0.42 | 0.50 | 0.58 | 0.66 | 0.75 | 0.81 | 0.88 | 0.96 | 1.03 | 1.11 | 1.18 | 1.26 | 1.33 | 1.40 | 1.48 |
| STOP | SW No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| | % | 12 | 19 | 23 | 30 | 37 | 44 | 48 | 55 | 57 | 64 | 68 | 75 | 81 | 87 | 92 | 98 |

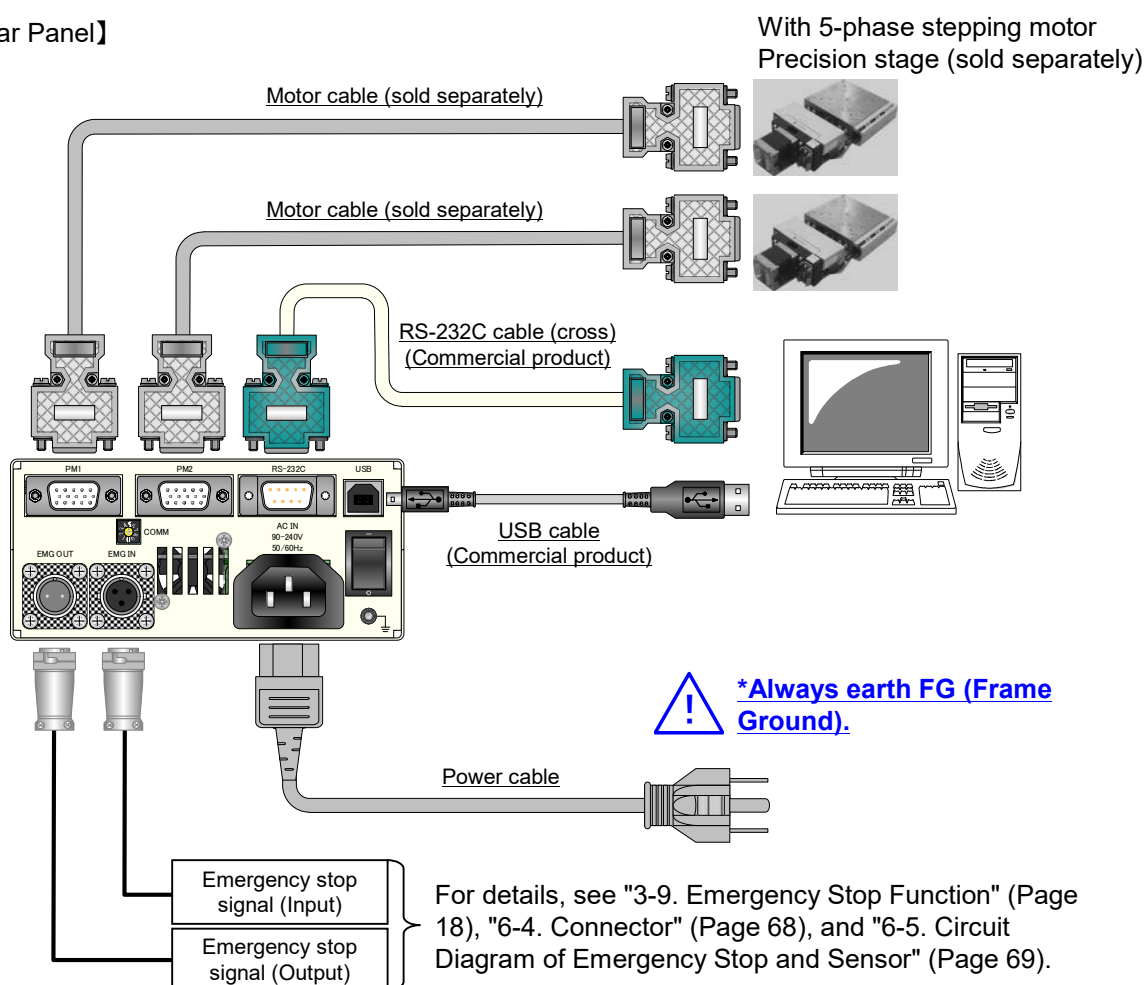
2-5. Connecting Method of CRUX

When pulling out or inserting a connection wire, make sure the power of main body is OFF.
Connection/connecting wires between CRUX and external equipment are explained.

【Front Panel】



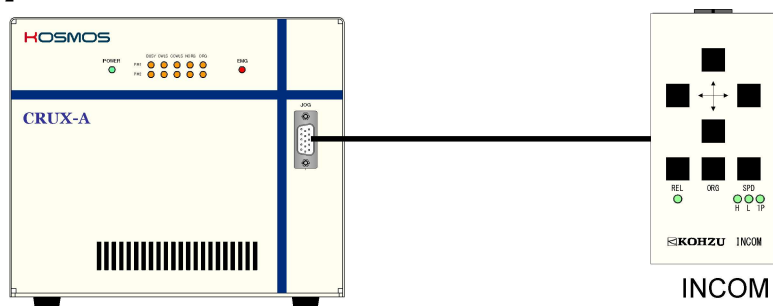
【Rear Panel】



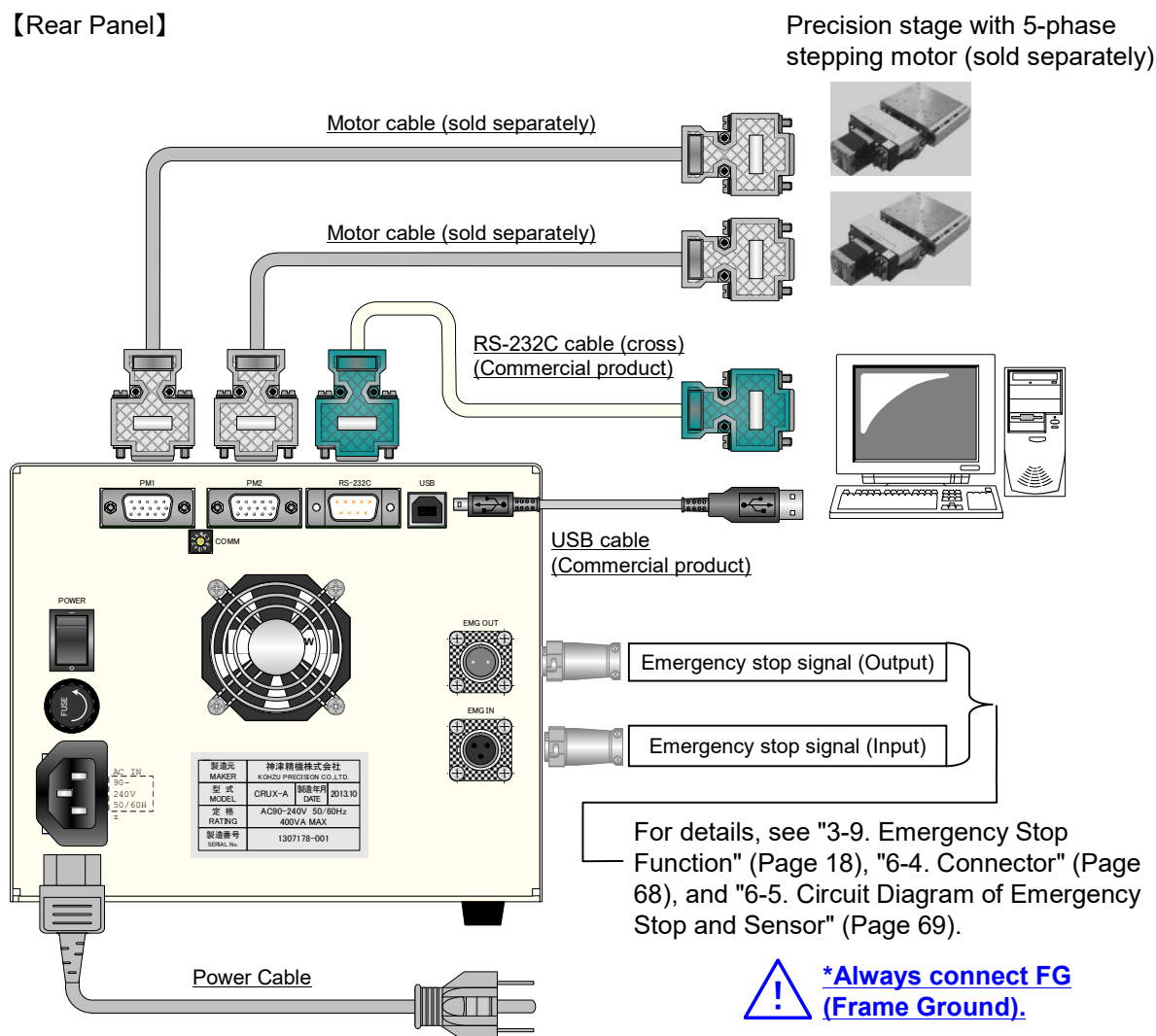
2-6 Connecting Method of CRUX-A

When pulling out or inserting a connection wire, make sure the power of main body is OFF.
Connection/connecting wires between CRUX-A and external equipment are explained.

【Front Panel】



【Rear Panel】



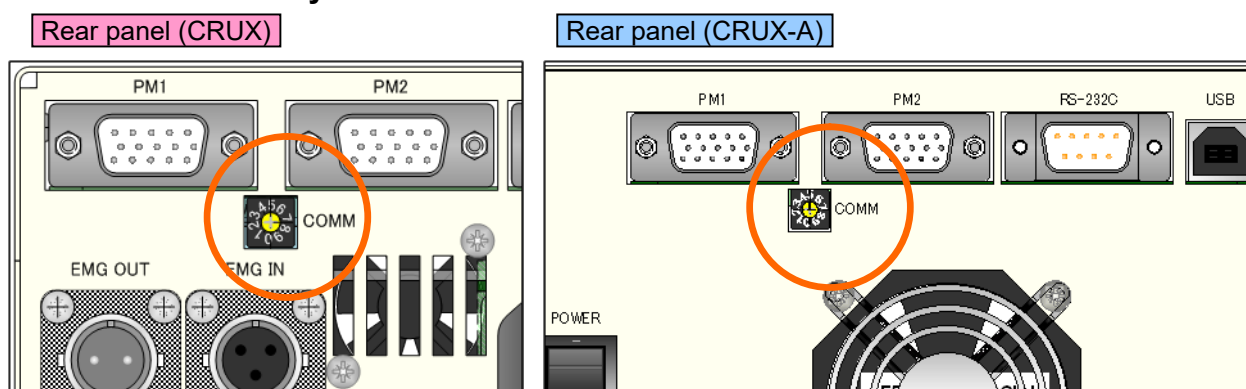
2-7. Rotary Switch for Communication Setting

CRUX 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



■ 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 | USB | |
| 0 | 38400 | * | General Command |
| 1 | 57600 | * | |
| 2 | 19200 | * | |
| 3 | 9600 | * | |
| 4 | * | USB | |
| 5 | 38400 | * | Simple command |
| 6 | 57600 | * | |
| 7 | 19200 | * | |
| 8 | 9600 | * | |
| 9 | * | USB | |

*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 65)).

3 Functions

3-1. Speed Setting

3-1-1. Speed Table

Speed setting of CRUX 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 | Accelerating Time x 10 msec | Decelerating time x 10 msec |
|-----------------|-----------------|-------------------|-----------------------------|-----------------------------|
| 0 | 500 | 500 | 0 | 0 |
| 1 | 500 | 2,000 | 20 | 20 |
| 2 | 500 | 3,000 | 24 | 24 |
| 3 | 500 | 4,000 | 28 | 28 |
| 4 | 500 | 5,000 | 32 | 32 |
| 5 | 500 | 6,000 | 36 | 36 |
| 6 | 500 | 7,000 | 40 | 40 |
| 7 | 500 | 8,000 | 44 | 44 |
| 8 | 500 | 9,000 | 48 | 48 |
| 9 | 500 | 10,000 | 52 | 52 |

3-1-2. Speed Change in Remote Control

In remote control, specify a speed table No. in each moving command.

Command example → STX RPS 1/0/1000/0 CRLF (RPS command example)

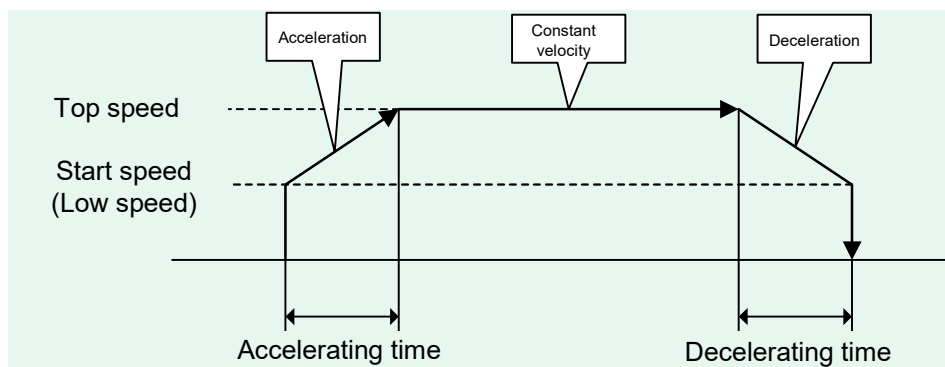
Set the speed table No.0



For settings on the speed table No.0 to 9, use **RTB WTB** command.
For details, see **RTB** (Page 44) and **WTB** (Page 50) in "5-3. Command Details".

3-2 Trapezoidal Drive

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.



By setting the **start speed (Low speed)**, **top speed**, and **acceleration time (Deceleration time)**, CRUX performs internal calculation on the acceleration/deceleration rate and series of acceleration/deceleration operation are conducted automatically.

3-3. Driving Current (CRUX)

CRUX can control 2 types of stepping motors, 0.75A/phase and 0.35A/phase rated current.

According to a target stage, set the applicable phase.

The setting becomes effective by writing to system No.67 with the WSY command (System setting writing). (Standard setting is "0" 0.75A/phase)

| Setting No. | 0 | 1 |
|-------------|------|------|
| Current | 0.75 | 0.35 |

3-4. Setting No. of Divisions of Micro-Step (CRUX)

CRUX can select a number of motor step divisions from 16 types.

The setting becomes effective by writing to system No.66 with the WSY command (System setting writing). (Standard setting is "2" Number of divisions 1/2)

| Setting No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|-------------|---|---|-----|---|---|---|----|----|----|----|----|----|-----|-----|-----|-----|
| Resolution | 1 | 2 | 2.5 | 4 | 5 | 8 | 10 | 20 | 25 | 40 | 50 | 80 | 100 | 125 | 200 | 250 |

3-5. Micro-Step Division Switch (CRUX-A)

CRUX-A can remotely switch the micro-step setting 1 (M1) and the micro-step setting 2 (M2).
The setting becomes effective by writing to system No.65 with the WSY command (System setting writing).
(Standard setting is "0" M1)

| Setting No. | 0 | 1 |
|--------------|----|----|
| MS selection | M1 | M2 |

3-6. Setting No. of Divisions of Micro-Step (CRUX-A) - (See Page 11)

CRUX-A can select a number of motor step divisions from 16 types.
Perform setting by opening the side panel, and using the [M1 or M2] rotary switch.
(Standard setting is M1 = "1" (resolution 1/2), M2 = "6" (No. of divisions 1/20))

| Setting No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---------------------|---|---|---|---|---|----|----|----|----|----|----|----|-----|-----|-----|-----|
| Number of divisions | 1 | 2 | 4 | 5 | 8 | 10 | 20 | 40 | 80 | 16 | 25 | 50 | 100 | 125 | 200 | 250 |

3-7. Setting of Drive Current (CRUX-A) - (See Page 11)

Set the current when the motor is running with the digital switch with RUN display.
Perform setting by opening the side panel, and using the [RUN] rotary switch.
(Standard setting is "5" 0.75A/phase)

| Setting No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-------------------|------|------|-----|------|------|------|------|------|------|------|------|------|------|------|-----|------|
| Current value (A) | 0.35 | 0.42 | 0.5 | 0.58 | 0.66 | 0.75 | 0.81 | 0.88 | 0.96 | 1.03 | 1.11 | 1.18 | 1.26 | 1.33 | 1.4 | 1.48 |

3-8. Setting of Current Down (CRUX-A) - (See Page 11)

When the automatic current is set (C.D switch OFF), current down is executed in set ratio while the motor is stopped.
Perform setting by opening the side panel, and using the [STOP] rotary switch.
(Standard setting is "6", 48%)

| Setting No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| % | 12 | 19 | 23 | 30 | 37 | 44 | 48 | 55 | 57 | 64 | 68 | 75 | 81 | 87 | 92 | 98 |

3-9. Emergency Stop Function

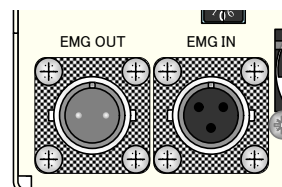
CRUX can execute an emergency stop during driving when the emergency stop signal becomes active. (Normal close method)

- **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 connector method

At emergency stop operation: Output signal OPEN

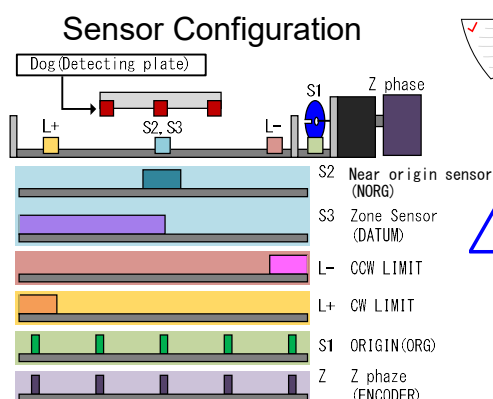
At emergency stop release: Output signal CLOSE (Short)

- **Emergency Stop Release**

After resolving causes of emergency stop, release the prepared emergency stop switch. (Performing origin return is recommended, because pulse shift may happen after an emergency stop is executed).

3-10. Origin Return Method

Origin return method can be selected in CRUX 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.



Though our standard stages can support the default setting, Method 4, for most models, it is necessary to change to Method 3 for the models that equip an origin sensor (S1) in a part of motor axis.

| Method | Sensor Configuration | Description |
|--------|----------------------|---|
| 1 | S1,S3 | The zone sensor (DATUM) determines return direction and the edge of initial origin sensor (ORG) becomes the origin position within the zone sensor. |
| 2 | S3 | The edge of zone sensor (DATUM) is the origin position. |
| 3 | S1,S2,L- | The edge of origin sensor (ORG) located in the near origin sensor (NORG) is the origin position. |
| 4 | S2,L- | The edge of near origin sensor (NORG) is the origin position. (Our standard method) |
| 5 | S1,L+ | Origin sensor (ORG) in proximity of CW limit is the origin position. |
| 6 | S1,L- | Origin sensor (ORG) in proximity of CCW limit is the origin position. |
| 7 | L+ | The edge of CW limit is the origin position. |
| 8 | L- | The edge of CCW limit is the origin position. |
| 9 | S1 | The edge of origin sensor (ORG) is the origin position. |
| 10 | None | Present position is the origin position. (No driving) |



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. (For details, see "5-6-2 System Setting Details" (Page 63))

***In Method 10, "ORG_OFFSET" is invalid.**

1

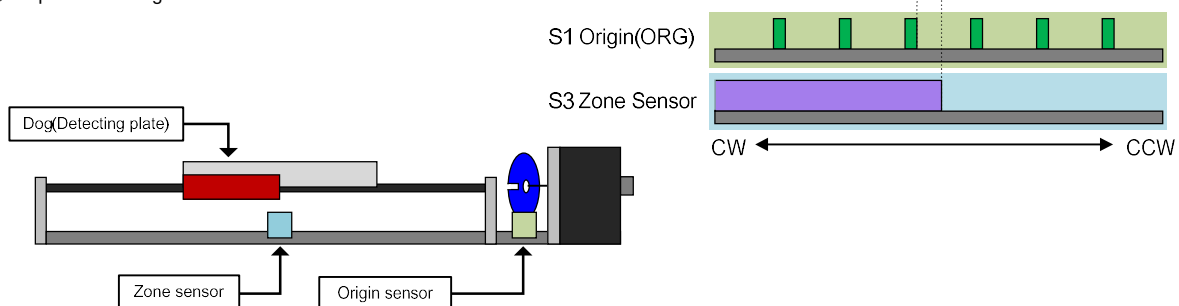
The zone sensor (DATUM) determines return direction and the edge of initial origin sensor (ORG) becomes the origin position within the zone sensor.

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 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

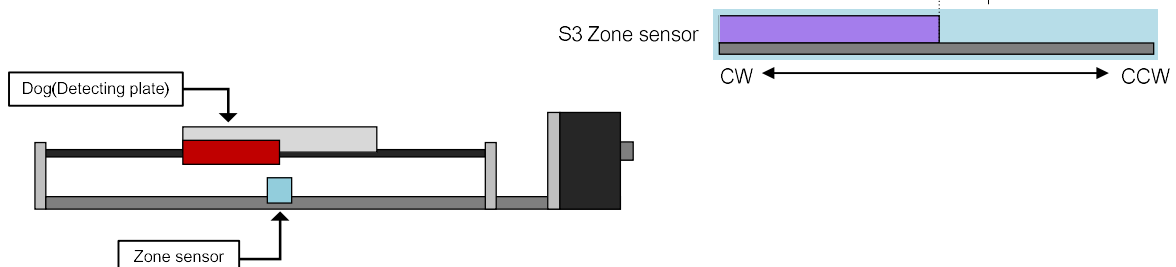
The edge of zone sensor (DATUM) is the origin position.

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 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 passing the 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.



A stage with the origin sensor in its motor shaft requires this method.

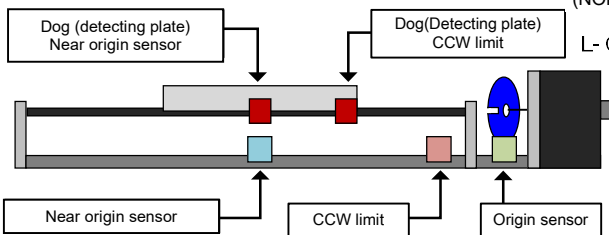
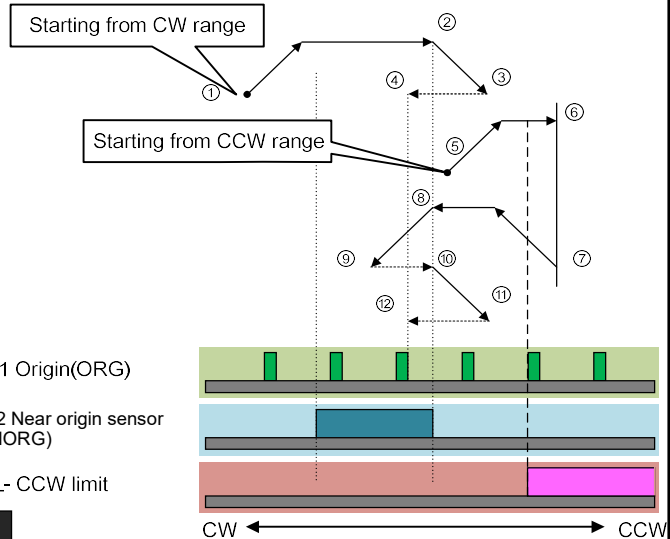
Starting from CW zone

- 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

- ① Detection starts to CCW direction with trapezoidal drive.
- ② 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.

*When starting from the near origin sensor zone, execute from ⑨.



S1 Origin(ORG)

S2 Near origin sensor (NORG)

L- CCW limit

CW ← → CCW

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

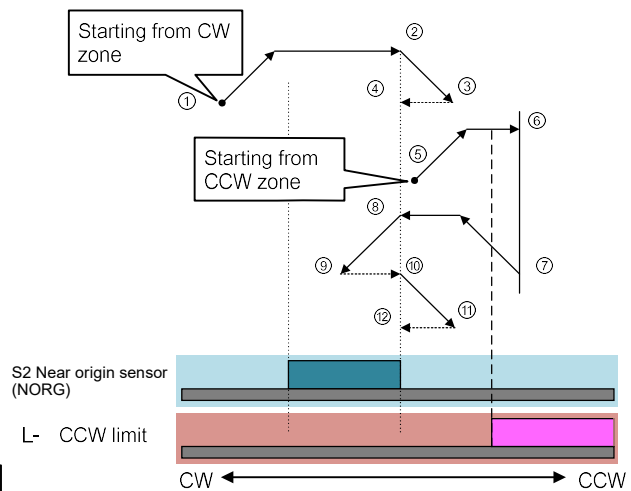
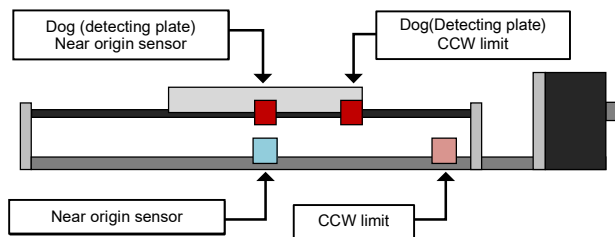
Starting from CW zone

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

Starting from CCW zone

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

*When starting from the near origin sensor zone, execute from ⑨.



5

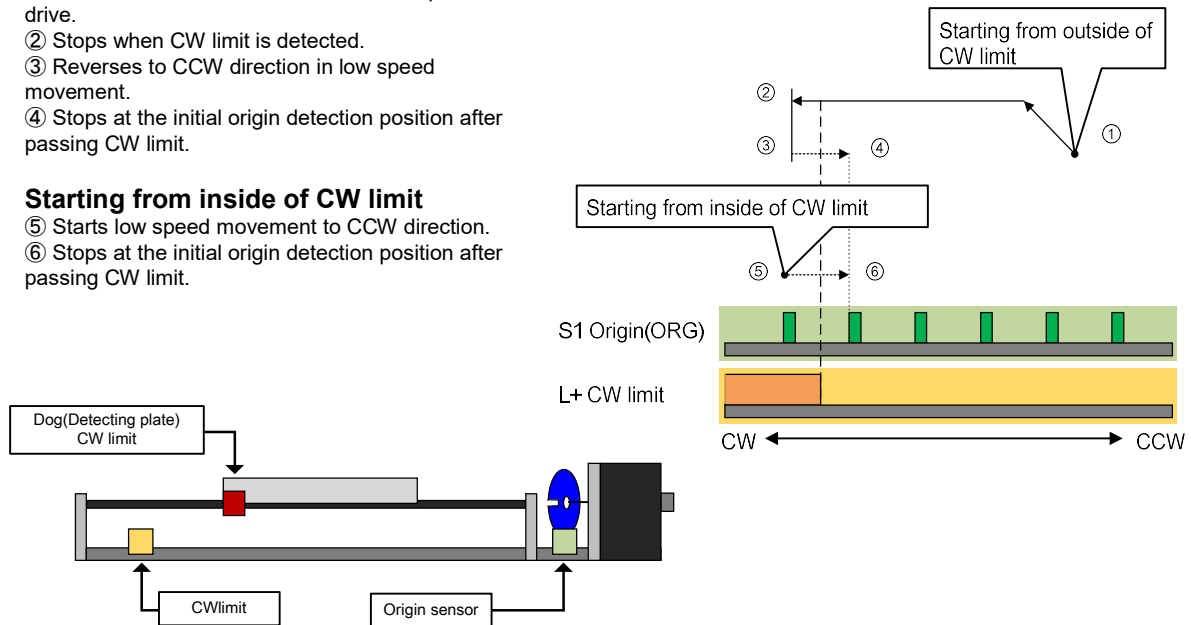
Origin sensor (ORG) in proximity of CW limit is the origin position.

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

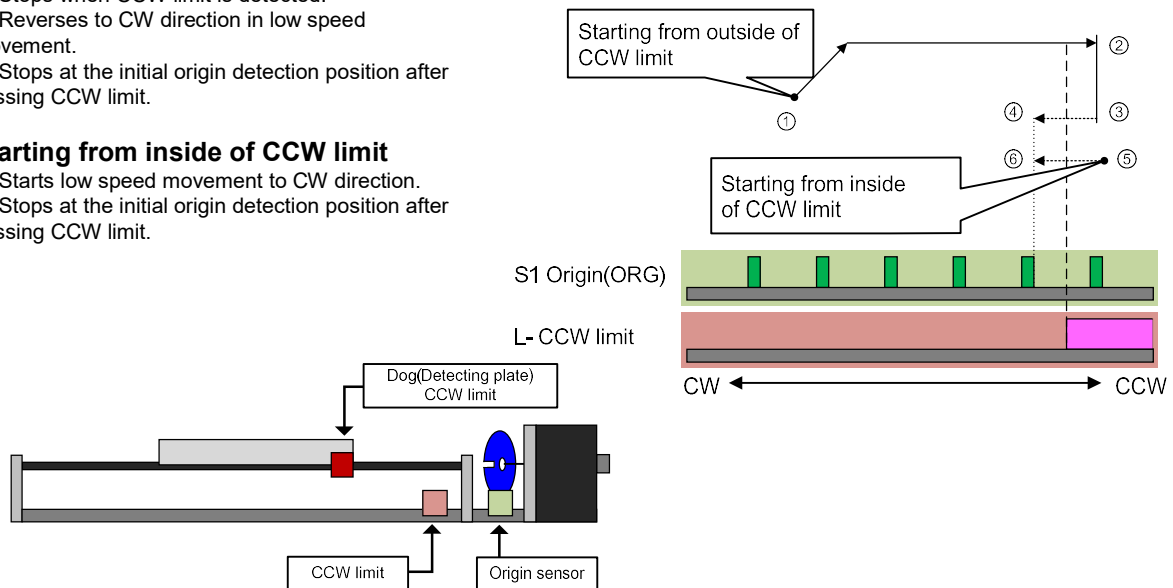
Origin sensor (ORG) in proximity of CCW limit is the origin position.

Starting from outside of CCW 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

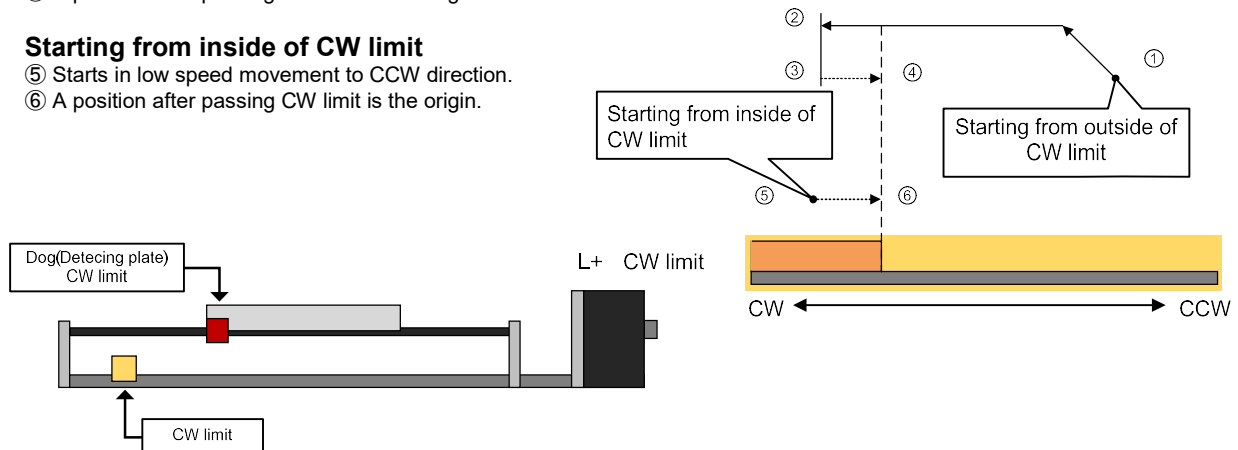
The edge of CW limit is the origin position.

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



8

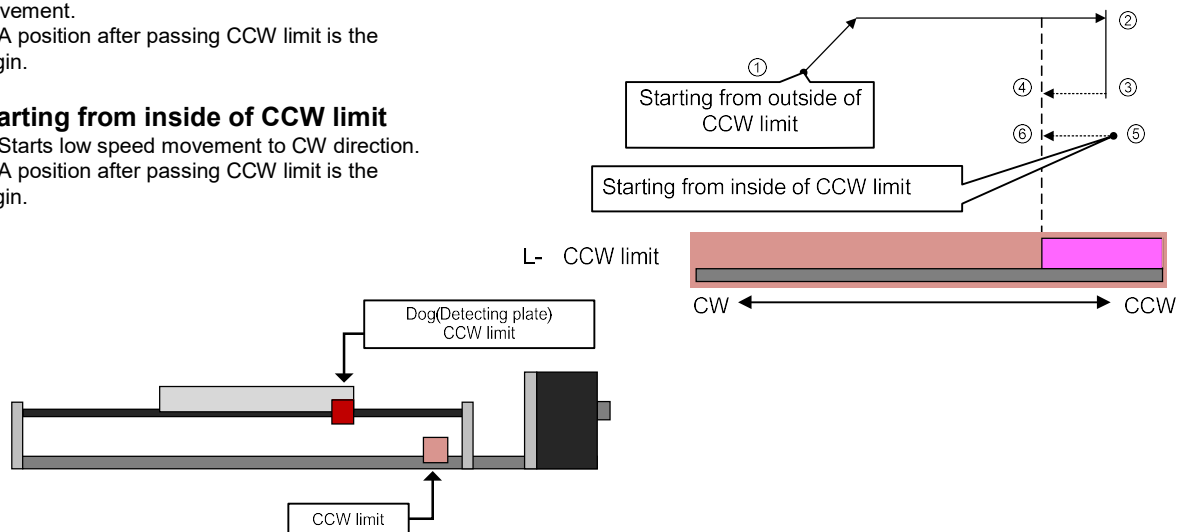
The edge of CCW limit is the origin position.

Starting from outside of CCW 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 A position after passing CCW 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.



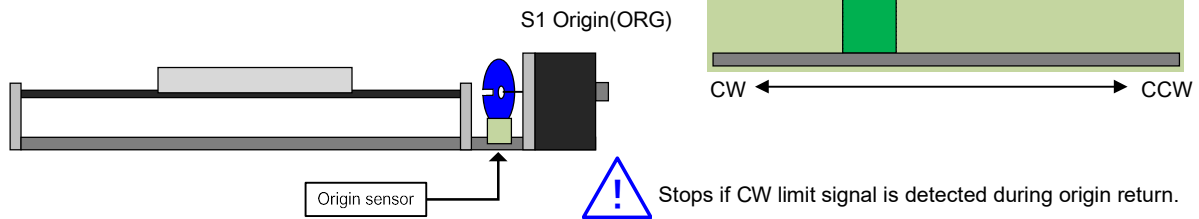
9

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 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.



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.

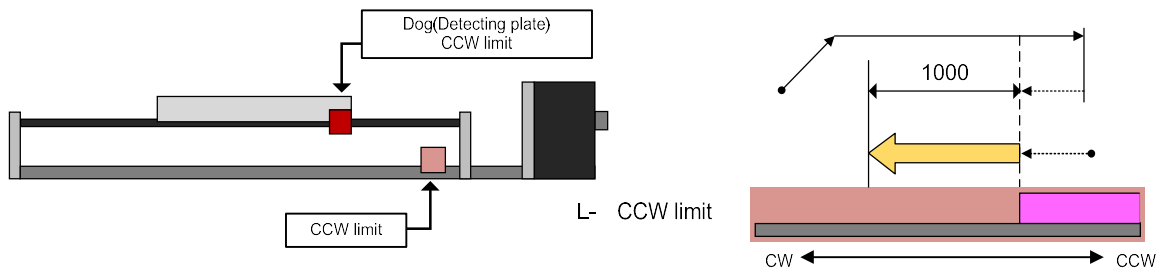


By entering an offset value in System No.1 (**ORG OFFSET**) setting, a position after moving the set value from each origin detection completion point can be also the origin position.

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

Example

After executing origin return with Method 8, moves for the set pulse value (System No.1) from the position which becomes the origin (pulse value "0").
Set "1000" for System No.1 for the diagram below.



3-11. EEPROM Save Data Error

ROM equipped on CRUX and CRUX-A has an upper limit on the number of overwriting. If the limit is exceeded or the save parameter is damaged, the system becomes the following condition.

3-11-1. Starting

When ROM data error is verified in starting check, the EMG lamp on the front panel flashes. Also, all drive modes are in prohibited condition. (Same state with the emergency stop mode)

Example: "INCOM" connected

When the easy control jog box, "INCOM" is connected, "REL", "H", "L", and "1P" lamps are all ON.

Restoration method

When ROM data are damaged, already set data 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

① Send the "RST" command (Reset command) from PC.

② Next, send the following commands.

CRUX: WSY1/66/2
 WSY2/66/2
 WSY1/67/0
 WSY2/67/0 Send the four commands above.

CRUX-A: WSY1/65/0
 WSY2/65/0 Send the two commands.

When overwriting application is necessary, download the remote controller control application, "Chamonix" from our company's HP.

Using "Chamonix"

- ① Connect CRUX/CRUX-A and PC with RS232C or USB, and start "Chamonix".
- ② Push the [Command] button on upper right of the main window to display the manual input screen.
- ③ Send the commands specified above.

After executing the restoration procedure above, turn the power of CRUX/CRUX-A ON.

*If the EEPROM safe data error mode occurs every time the system starts, the number of overwriting on ROM may be exceeded or ROM hardware damage may be the cause.

3-11-2. Normal starting

When a ROM data error is verified during normal starting, warning is generated with remote control. However, all modes can be used as usual.

Warning code [W SYS 51]

ROM may be damaged, but there is no time to stop the equipment!!

For an effective measure in such a case, it is recommend to **create a backup file of changed parameters** if system parameters are changed.

(A backup file creation function is available as standard in our company's application program, [Chamonix])

When the EEPROM save data error happens, perform the restoration procedure, and then read from a backup file.

Driving is possible under the same condition when the method above is performed.

3-12. Powering OFF

When turning the power of CRUX/CRUX-A OFF, wait for three seconds or more after quitting the running control application, and then turn the power OFF.

When the power is turned OFF while application is running, ROM data may be damaged. When data happened to be damaged, follow "3-11-1. EEPROM Save Data Error - Restoration method" (Page 26).

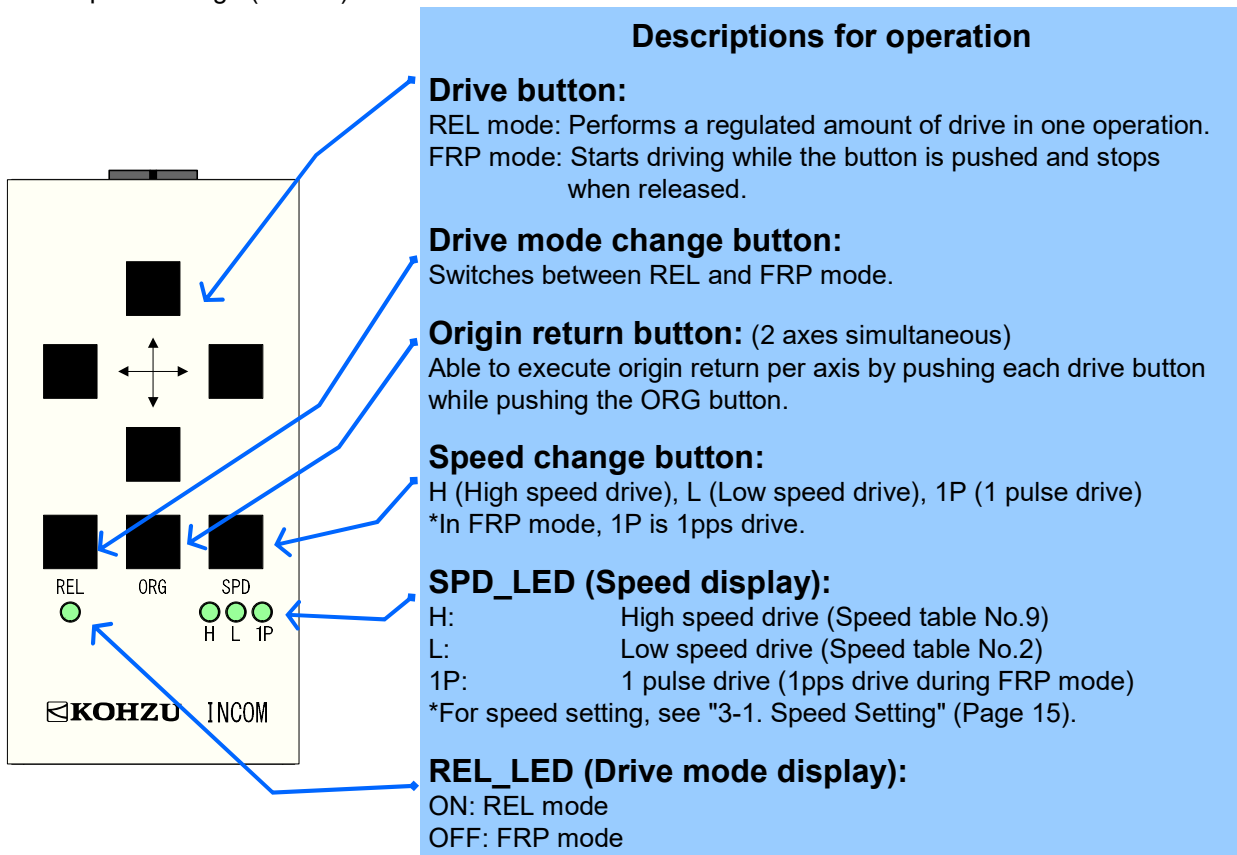
4 Jog Box for Easy Control

INCOM

4-1 Description for INCOM Operation

Functions

1. Free rotation operation (2 axes)
2. Relative position drive *Setting for relative driving amount is from PC only.
3. Return to origin
4. Drive mode change (Free rotation [FRP]/Relative [REL])
5. Speed change (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.

Drive mode change button:

Switches between REL and FRP mode.

Origin return button: (2 axes simultaneous)

Able to execute origin return per axis by pushing each drive button while pushing the ORG button.

Speed change button:

H (High speed drive), L (Low speed drive), 1P (1 pulse drive)
*In FRP mode, 1P is 1pps drive.

SPD_LED (Speed display):

H: High speed drive (Speed table No.9)
L: Low speed drive (Speed table No.2)
1P: 1 pulse drive (1pps drive during FRP mode)
*For speed setting, see "3-1. Speed Setting" (Page 15).

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 | Relative Position Drive (High speed) | Free Rotation Drive (High speed) |
| | L | Relative Position Drive (Low speed) | Free Rotation Drive (Low speed) |
| | 1P | 1 pulse drive | 1 pps drive |

5. Remote Control

5-1 Proceeding with Installation and Preparation

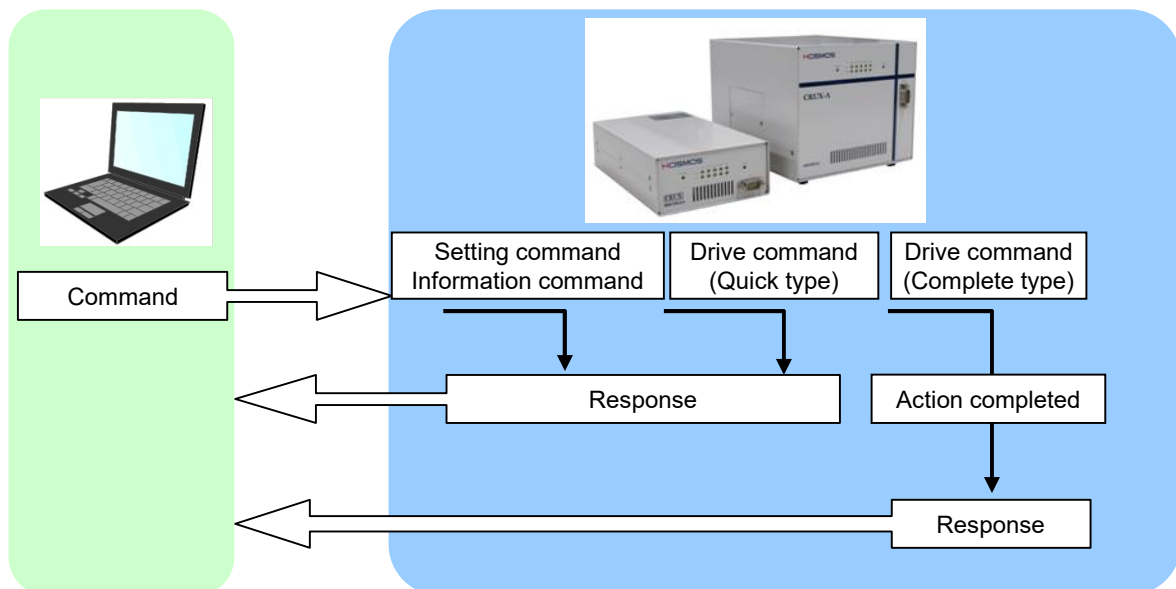
To control from a computer, this device supports USB and RS-232C communication.
For selecting a communication method, see "2-7. Rotary Switch for Communication Setting" (Page 14).

*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 65)).

5-1-1. Transmitting/Receiving

The controller returns one response for one sent command.

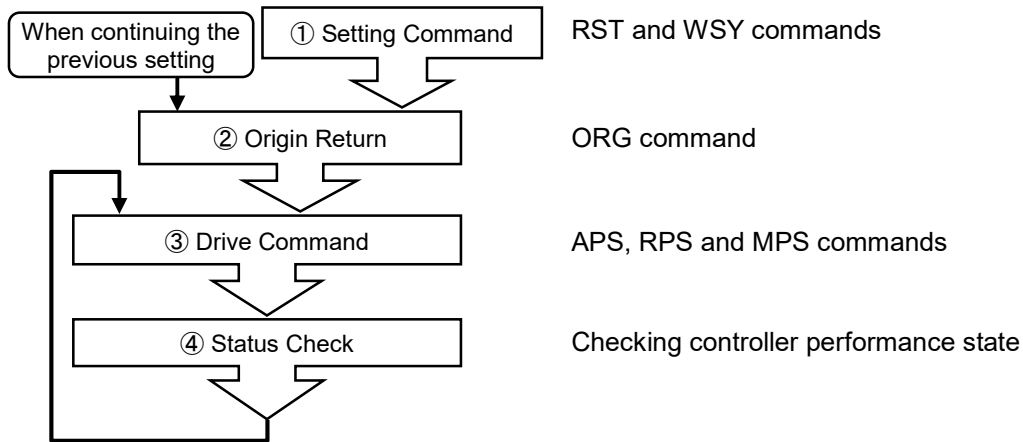
The response timing varies according to the type of command or selection of response method.



- ① **Setting command** The commands as RST and WSY used for setting immediately return a response.
- ② **Drive command** For drive-related commands, one of 2 types of response methods can be selected.
 - 1. Returns a response after completion of operation. (Completion type)
 - 2. Returns a response immediately after receipt of the command, and operation completion is checked by the STR (status check) command. (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.

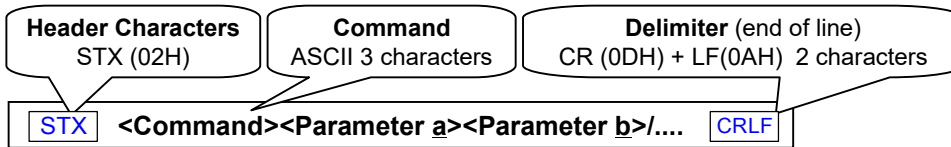


5-1-3. Command Format

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



| 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 (/ , ?).



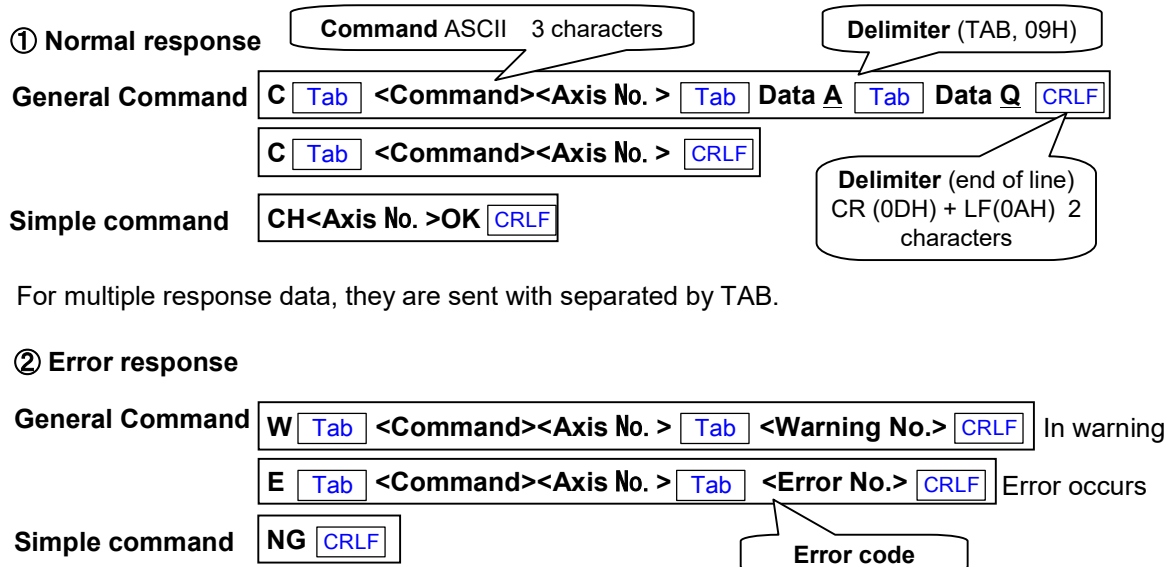
A space (20H) cannot be used in commands.



Parameters are always required. They cannot be omitted.

5-1-4. 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.



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



Lower case letters (a to z) cannot be used.

5-2. Command List

The commands that can be used in CRUX are shown in the table below. For details, see the page of each command.

| Command | | | Page |
|-------------|-------------|-------------------------------------|------|
| Type | Description | Function | |
| Setting | MPI | Multi-axis Position Initial Setting | 37 |
| | RST | System Reset | 42 |
| Drive | APS | Absolute Position Drive | 33 |
| | COF | ON/OFF for Excitation | 34 |
| | FRP | Free Rotation Drive | 35 |
| | MPS | Multi-axis Position Drive | 38 |
| | ORG | Origin Return Drive | 39 |
| | RPS | Relative Position Drive | 41 |
| | STP | Motor Stop | 46 |
| Coordinate | RDP | Read Present Position | 40 |
| | SAV | Position Data Save | 45 |
| | WRP | Write Present Position | 48 |
| Information | IDN | Version Read | 36 |
| | RSY | Read System Setting | 43 |
| | STR | Read Status | 47 |
| | WSY | Write System Setting | 49 |
| Speed Table | RTB | Read Speed Table | 44 |
| | WTB | Write Speed Table | 50 |

■ : Drive command
■ : Setting command (write)
■ : Setting command (read)
■ : Simple command




| | | | |
|----------------|----------|-------------------------|----|
| Simple Command | A | Absolute Position Drive | 51 |
| | C | Read Present Position | 52 |
| | D | Motor Stop | 53 |
| | H | Origin Return Drive | 54 |
| | I | System Reset | 55 |
| | P | Relative Position Drive | 56 |
| | R | Read Status | 57 |
| | S | Speed Setting | 58 |
| | W | Write Present Position | 59 |

Caution: Maintaining position information

Unlike former SC controllers, automatic backup of position information is not performed in CRUX.
 When position information backup is necessary, execute SAV command before turning the power OFF.

5-3. Command Details

The commands that can be used in CRUX are shown next. (Alphabetical order)

| APS | <i>Absolute Position Drive</i> | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------------------|--|----------|---------|---------|---|----------|--------|---|-----------------|--------|---|-----------------|-------------------------|---|-----------------|-----------------------|--------|---------------|--------|---|-------|---|---|
| <p>【Function】 Moves to a target position with absolute position management.</p> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>【Format】 STX APS a/b/c/d CRLF</p> <p style="text-align: center;">No. of parameters = 4</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A space cannot be used between characters. No parameter can be omitted.</p> </div> <div style="border: 1px solid #ccc; padding: 10px; background-color: #f0f0f0;"> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> <div style="border: 1px solid black; padding: 2px; font-size: small;">Current position</div> <div style="border: 1px solid black; padding: 2px; font-size: small;">Target position</div> </div>  </div> </div> <p>Command parameters</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #4a90e2; color: white;"> <th>Function</th> <th>Setting</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>a</td> <td>Axis No.</td> <td>1 to 2</td> </tr> <tr> <td>b</td> <td>Speed table No.</td> <td>0 to 9</td> </tr> <tr> <td>c</td> <td>Movement amount</td> <td>-8,388,607 to 8,388,607</td> </tr> <tr> <td>d</td> <td>Response method</td> <td>0: Completed 1: Quick</td> </tr> </tbody> </table> <p>【Response】 Returns status information.* *Return timing varies depending on the response method.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #fff9c4;"> <th>Status</th> <th>Response data</th> </tr> </thead> <tbody> <tr> <td>Normal</td> <td>C Tab APS <Axis No.> CRLF</td> </tr> <tr> <td rowspan="2">Error</td> <td>W Tab APS <Axis No.> Tab <Warning No.> CRLF</td> </tr> <tr> <td>E Tab APS <Axis No.> Tab <Error No.> CRLF</td> </tr> </tbody> </table> <p>For <Error No.> and <Warning No.>, see "5-5. Error Code" (Page 60).</p> <p>【Example】 Moves No.1 axis with speed table No.0 to 1,000 pulses position.</p> <p style="text-align: center;">STX APS1/0/1000/0 CRLF</p> <p>【Remarks】</p> <div style="display: flex; align-items: center;">  <p>A stop during driving is done with STP command.</p> </div> | | | | Function | Setting | Remarks | a | Axis No. | 1 to 2 | b | Speed table No. | 0 to 9 | c | Movement amount | -8,388,607 to 8,388,607 | d | Response method | 0: Completed 1: Quick | Status | Response data | Normal | C Tab APS <Axis No.> CRLF | Error | W Tab APS <Axis No.> Tab <Warning No.> CRLF | E Tab APS <Axis No.> Tab <Error No.> CRLF |
| Function | Setting | Remarks | | | | | | | | | | | | | | | | | | | | | | | |
| a | Axis No. | 1 to 2 | | | | | | | | | | | | | | | | | | | | | | | |
| b | Speed table No. | 0 to 9 | | | | | | | | | | | | | | | | | | | | | | | |
| c | Movement amount | -8,388,607 to 8,388,607 | | | | | | | | | | | | | | | | | | | | | | | |
| d | Response method | 0: Completed 1: Quick | | | | | | | | | | | | | | | | | | | | | | | |
| Status | Response data | | | | | | | | | | | | | | | | | | | | | | | | |
| Normal | C Tab APS <Axis No.> CRLF | | | | | | | | | | | | | | | | | | | | | | | | |
| Error | W Tab APS <Axis No.> Tab <Warning No.> CRLF | | | | | | | | | | | | | | | | | | | | | | | | |
| | E Tab APS <Axis No.> Tab <Error No.> CRLF | | | | | | | | | | | | | | | | | | | | | | | | |

COF

ON/OFF for Excitation

【Function】 Switches ON/OFF for excitation (current output state of a motor).

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| | Function | Setting | Remarks |
|---|-----------------------|------------|---------|
| a | Axis No. | 1 to 2 | |
| b | ON/OFF for Excitation | 0:OFF 1:ON | |

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

| Status | Response data |
|--------|---|
| Normal | C Tab COF <Axis No.> CRLF |
| Error | E Tab COF <Axis No.> Tab <Error No.> CRLF |

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

【Remarks】



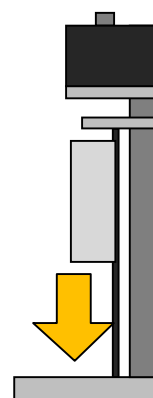
When using with Z axis, be cautious that Z axis may fall at excitation OFF execution.



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



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



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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | 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】 Returns status information. *Returns immediately after receiving the command.

| Status | Response data |
|--------|---|
| Normal | C Tab FRP <Axis No.> CRLF |
| Error | W Tab FRP <Axis No.> Tab <Warning No.> CRLF |
| | E Tab FRP <Axis No.> Tab <Error No.> CRLF |

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

【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.

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 Tab 1000 CRLF "CRUX Ver.1.000"

C Tab IDN Tab CRUX-A Tab 1000 CRLF "CRUX-A 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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | 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】 Returns status information. *Returns immediately after receiving the command.

| 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 60).

【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.

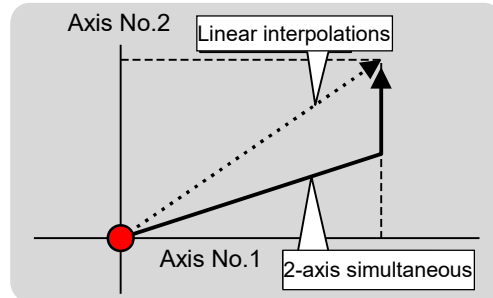
【Description】 In the multi-axis position drive (MPS) command, when moving distance and moving speed differ, time to require moving also differs, and its orbit is folding lines as shown in the right figure.

【Format】 MPS a/b/c/d/e

No. of parameters = 5

Command parameters

| | Function | Setting | Remarks |
|---|--------------------------|---------------------------|---|
| a | 1st axis No. | 1 to 2 | |
| b | 1st axis target position | -16,777,215 to 16,777,215 | For absolute position drive mode: -8, 388,607 to 8,388,607 |
| c | 2nd axis No. | 1 to 2 | |
| d | 2nd axis target position | -16,777,215 to 16,777,215 | For absolute position drive mode: -8, 388,607 to 8,388,607 |
| e | Response method | 0: Completed 1: Quick | |



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

| Status | Response data |
|--------|--|
| Normal | C <input type="text" value="Tab"/> MPS <1st axis No.> <input type="text" value="CRLF"/> |
| Error | W <input type="text" value="Tab"/> MPS <1st axis No.> <input type="text" value="Tab"/> <Warning No.> <input type="text" value="CRLF"/> |
| | E <input type="text" value="Tab"/> MPS <1st axis No.> <input type="text" value="Tab"/> <Error No.> <input type="text" value="CRLF"/> |

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

【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.

MPI1/0/5

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

MPI2/0/8

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

MPS1/1000/2/2000/0

【Remarks】

A stop during driving is done with the STP command.

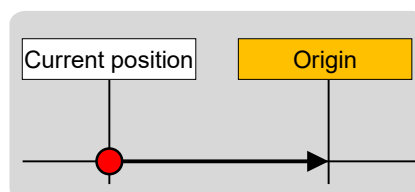
ORG

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).
 Use system settings for origin return method (See Page 62).
 For details, see "3-10. Origin Return Method" (Page 19).

【Format】 STX ORG a/b/c CRLF

No. of parameters = 3



A space cannot be used between characters. No parameter can be omitted.

Command parameters

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

【Response】 Returns status information.*

*Return timing varies depending on the response method.

| Status | Response data | | | |
|--------|---------------|---|--|--|
| Normal | C | Tab | ORG <Axis No.> | CRLF |
| Error | W | Tab | ORG <Axis No.> Tab <Warning No.> | CRLF |
| | E | Tab | ORG <Axis No.> Tab <Error No.> | CRLF |

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

【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 the STP command.

RDP

Read Present Position

【Function】 Reads the present position value (pulse counter value).

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | 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

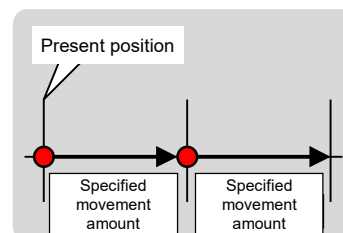
RPS

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | Setting | Remarks |
|-------------------|---------------------------|---------|
| a Axis No. | 1 to 2 | |
| b Speed table No. | 0 to 9 | |
| c Movement amount | -16,777,215 to 16,777,215 | |
| d Response method | 0: Completed 1: Quick | |

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

| Status | Response data |
|--------|---|
| Normal | C Tab RPS <Axis No.> CRLF |
| Error | W Tab RPS <Axis No.> Tab <Warning No.> CRLF |
| | E Tab RPS <Axis No.> Tab <Error No.> CRLF |

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

【Example】

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

STX RPS1/0/1000/0 CRLF

【Remarks】



A stop during driving is done with the STP command.

RST

System Reset

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

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



A space cannot be used between characters. No parameter can be omitted.

【Response】 Returns status information.

| 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).

【Remarks】

About 1 sec is required to complete the reset after transmitting the RST command.

CRUX: No. of micro-step divisions switch (System No.66) and drive current (System No.67) are not reset.

CRUX-A: Micro-step switch (System No.65) is not reset.

RSY

Read System Setting

【Function】 Reads the present set value of the system parameters.

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

Command parameters

| Function | | Setting | Remarks |
|----------|------------|---------|---|
| a | Axis No. | 1 to 2 | |
| b | System No. | 1 to 68 | See "5-6-1. System Setting List" (Page 62). |

【Response】 Returns status information.

| 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 60).

【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】 Reads the current setting value of speed table.

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

Command parameters

| Function | | Setting | Remarks |
|----------|-----------------|---------|---------|
| a | Axis No. | 1 to 2 | |
| b | Speed table No. | 0 to 9 | |

【Response】 Returns status information.

| 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 60).

【Response data】

| Function | | Setting | Remarks |
|----------|-------------------|--|---------------------------|
| a | Axis No. | 1 to 2 | |
| b | Speed table No. | 0 to 9 | |
| c | Start speed | 0 to 400,000 | |
| d | Top speed | 0 to 500,000 | |
| e | Accelerating Time | 0 to 85 | Setting value x 10 [msec] |
| f | Acceleration Mode | 1: Rectangular drive 2: Trapezoidal drive | |

SAV

Position Data Save

【Function】 Saves current position information to ROM.

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

【Response】 Returns the setting value.

| 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 60).

*Caution

① There is a limit on the number of access for ROM equipped on CRUX.
Do not exceed the range of "Number of writings".

Number of writings: No more than 1,000,000 times

② Values written with the SAV command become the current position when the power is turned ON next time.

STP

Motor Stop

【Function】 Stops a driving motor.

【Format】 STP No. of parameters = 2

Command parameters

| Function | | Setting | Remarks |
|----------|---------------------|--|---------|
| a | Axis No. | 1 to 2 | |
| b | Selecting stop mode | 0: Decelerate and stop 1: Emergency stoop | |

【Response】 Returns the setting value.

| Status | Response data |
|--------|--|
| Normal | C <input type="text" value="Tab"/> STP <Axis No.> <input type="text" value="CRLF"/> |
| Error | E <input type="text" value="Tab"/> STP <Axis No.> <input type="text" value="Tab"/> <Error No.> <input type="text" value="CRLF"/> |

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

STR

Read Status

【Function】 Checks the status of each axis.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | Setting | Remarks |
|----------|----------|---------|
| a | Axis No. | 1 to 2 |

【Response】 Returns status information.

| Status | Response data |
|--------|--|
| Normal | <code>C Tab RTB a Tab b Tab c Tab d Tab e Tab f CRLF</code> |
| Error | <code>E Tab STR <Axis No.> Tab <Error No.> CRLF</code> |

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

【Response data】

| Function | Setting | 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 |

WRP

Write position

【Function】 Writes a value of current position (pulse count) of motor pulse.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|-----------|-------------------------|---------|
| a | Axis No. | 1 to 2 | |
| b | Set value | -8,388,607 to 8,388,607 | |

【Response】 Returns status information.

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

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

WSY

Write System Setting

【Function】 Writes the system setting value.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|------------|---------|---|
| a | Axis No. | 1 to 2 | |
| b | System No. | 0 to 68 | |
| c | Set value | x x x x | See "5-6-1. System Setting List" (Page 62). |

【Response】 Returns status information.

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

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

WTB

Write speed table

【Function】 Writes the speed table data.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| | Function | Setting | Remarks |
|---|-------------------|--|---------------------------|
| a | Axis No. | 1 to 2 | |
| b | Speed table No. | 0 to 9 | |
| c | Start speed | 1 to 400,000 | |
| d | Top speed | 1 to 500,000 | |
| e | Accelerating Time | 1 to 85 | Setting value x 10 [msec] |
| f | Acceleration Mode | 1: Rectangular drive 2: Trapezoidal drive | |

【Response】 Returns status information.

| Status | Response data |
|--------|--|
| Normal | C <input type="text" value="Tab"/> WTB <Axis No.> <input type="text" value="CRLF"/> |
| Error | E <input type="text" value="Tab"/> WTB <Axis No.> <input type="text" value="Tab"/> <Error No.> <input type="text" value="CRLF"/> |

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


5-4. Simple Command Details

Simple commands that can be used in CRUX are shown next.

A
Absolute Position Drive

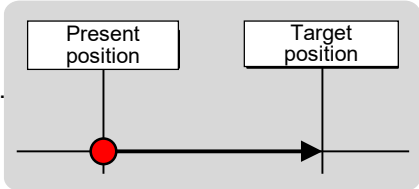
【Function】 Moves from the present position to a position by set relative movement amount.

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



A space cannot be used between characters.

No parameter can be omitted.



Command parameters

| Function | | Setting | Remarks |
|----------|-----------------|-------------------------|---------|
| a | Axis No. | 1 to 2 | |
| b | Movement amount | -8,388,607 to 8,388,607 | |

【Response】 Returns status information.

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

C**Read Position**

【Function】 Reads the present position value (pulse counter value).

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|----------|---------|---------|
| a | Axis No. | 1 to 2 | |

【Response】 Returns the current position.

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

【Example】

1. Reads the current position of No.2 axis.

Command: CH02C CRLF



Response: CH02C Tab 123456 CRLF

D***Motor Stop***

【Function】 Stops a driving motor.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|----------|---------|---------|
| a | Axis No. | 1 to 2 | |

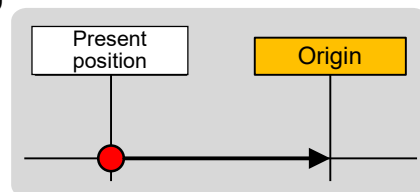
【Response】 Returns the setting value.

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

H

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).
See "5-6. System Settings" (Page 62) for origin return method.
For details, see "3-10. Origin Return Method" (Page 19).



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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|----------|---------|---------|
| a | Axis No. | 1 to 2 | |

【Response】 Returns status information.

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

【Remarks】

A stop during driving is done with the motor stop command, "D".

I

System Reset

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

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



A space cannot be used between characters. No parameter can be omitted.

【Response】 Returns status information.

| Status | Response data |
|--------|---|
| Normal | CH <Axis No. > OK <input type="text" value="CRLF"/> |
| Error | NG <input type="text" value="CRLF"/> |

【Remarks】

Approx. 1 sec is required to complete the reset after transmitting the I command.

CRUX: No. of micro-step divisions switch (System No.66) and drive current (System No.67) are not reset.

CRUX-A: Micro-step switch (System No.65) is not reset.

P

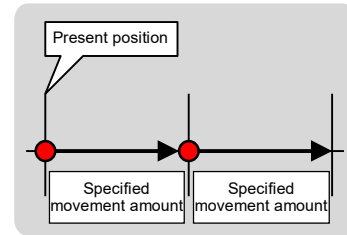
Relative Position Drive

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

【Format】 CH 0a P b [CRLF](#) No. of parameters = 2



A space cannot be used between characters.
No parameter can be omitted.



Command parameters

| Function | | Setting | Remarks |
|----------|-----------------|---------------------------|---------|
| a | Axis No. | 1 to 2 | |
| b | Movement amount | -16,777,215 to 16,777,215 | |

【Response】 Returns status information.

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

R**Read Status**

【Function】 Checks status of the controller.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|----------|---------|---------|
| a | Axis No. | 1 to 2 | |

【Response】 Returns status information.

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

S**Speed Setting**

【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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

| Function | | Setting | Remarks |
|----------|-------------|---------|---------|
| a | Axis No. | 1 to 2 | |
| b | Speed Table | 0 to 9 | |

【Response】 Returns status information.

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

W

Write position

【Function】 Writes a value of current position (pulse counter value) of motor pulse.

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



A space cannot be used between characters. No parameter can be omitted.

Command parameters

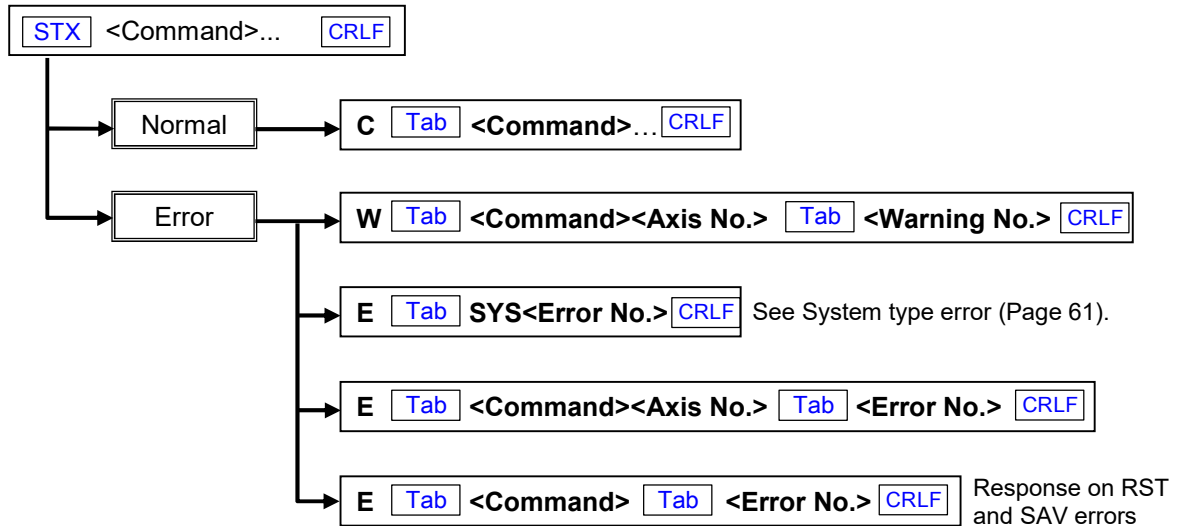
| Function | | Setting | Remarks |
|----------|-----------|-------------------------|---------|
| a | Axis No. | 1 to 2 | |
| b | Set value | -8,388,607 to 8,388,607 | |

【Response】 Returns status information.

| Status | Response data |
|--------|---|
| Normal | CH <Axis No.> OK <input type="text" value="Tab"/> <Setting value> <input type="text" value="CRLF"/> |
| Error | NG <input type="text" value="CRLF"/> |

5-5. Error Code

If an error is confirmed when transmitting a command, the controller returns a response with an error code.



5-5-1. Error Code

When normal, **C** is attached at the first character and when an error happens, **E** or **W** is attached and an error code is returned.

5-5-2. Error Code List

System type error (*Independent from command types)

| Error code | Description | Remarks |
|------------|--|---------|
| 1 | No STX on the head of the command. | |
| 2 | Total number of commands is short. | |
| 4 | Characters other than specified characters and numbers are included. | |
| 5 | No applicable command. | |
| 11 | Parameter value to save is out of range. | |
| 12 | Damaged save data | |

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 |
| 120 | Specified a value that exceeds a movable value at one time. | |

Command type error

| Error No. | Description | Remarks |
|-----------|--|---------|
| 212 | ORG OFFSET value is NG to CW direction. | |
| 213 | ORG OFFSET value is NG to CCW direction. | |

Drive system error

| Error No. | Description | Remarks |
|-----------|--|-------------------------|
| 300 | PMG is in use (PMG -> Motor drive IC). | Inside IC related error |
| 301 | Speed setting is 0 in rectangular drive. | |
| 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. | |
| 305 | Stopped at CCW limit during driving. | |
| 306 | Some MPS driving axes stopped at limit. | |
| 307 | Both CW and CCW limiters are included. | |
| 308 | Tried to move an axis with its excitation OFF. | |

WTB command calculation error

| Error No. | Description | Remarks |
|-----------|---|---------|
| 600 | No. of acceleration pulses or accelerating pulse time is large. | |

Controller Error

| Error No. | Description | Remarks |
|-----------|---|---------|
| 700 | No. of acceleration pulses or accelerating pulse time is large. | |

Warning

| Warning No. | Description | Remarks |
|-------------|--|---------|
| 1 | The target position and present position are the same. | |
| 51 | ROM data error | |

5-6. System Settings

5-6-1. 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 | Function | Setting range | Initial value | Remarks |
|------------|---------------------|---|----------------------------|---------------|---|
| 1 | ORG OFFESET | Coordinate value after return to origin/Origin offset value | -16,777,215 to +16,777,215 | 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. | -8,388,607 to +8,388,307 | 0 | See "5-6-2 System Setting Details" (Page 63). |
| 7 | PM ROTATE CHANGE | Change of motor rotating direction | 0: Standard 1: Reverse | 0 | |
| 8 | LIMIT SWAP | Limit signal switch | 1: Switch | 0 | |
| 21 | LIMIT LOGIC | Change of limit signal logic | 0: NO 1: NC | 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 | |
| 65 | MICROSTEP SELECT | Micro-step switch | 0: M1 1: M2 | 0 | CRUX-A Only |
| 66 | MICROSTEP SET | Setting of the number of micro-step divisions | 1 to 16 | 2 | CRUX only |
| 67 | CURRENT | Motor driver current value | 0: 0.75A 1: 0.35A | 0 | CRUX only |
| 68 | Jog Movement amount | Jog box (RPS mode) movement amount | -16,777,215 to +16,777,215 | 2000 | |

* NC -> Normal close
NO -> Normal open

5-6-2. 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 -134,217,728 to 134,217,727

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 3

Setting range 1 to 15

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

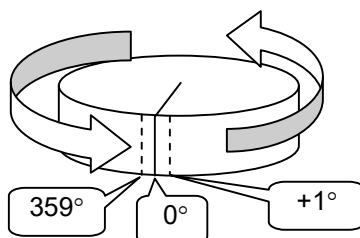
When a setting value is exceeded, the motor pulse value is returned to '0'.

Initial value 0

Setting range 0 to -134,217,727

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: A motor drives to CW direction with + direction pulse.

1: Reverse rotation: A motor drives to 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

1: Switch

System No.21 LIMIT LOGIC (Change limit 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)

ORG 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)

0: Excitation OFF

1: Excitation ON

System No.65 MICROSTEP SELECT (Selection of micro-step M1/M2) CRUX-A only

Built-in driver and micro-step mode can be selected from 2 patterns (M1/M2).

Initial value 0

Selects 0: M1

Selects 1: M2

System No.66 MICROSTEP SELECT (Setting the number of micro-step divisions) CRUX only

Sets the number of micro-step divisions.

Initial value 2

Setting range 1 to 16

| Setting No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|-------------|---|---|-----|---|---|---|----|----|----|----|----|----|-----|-----|-----|-----|
| Resolution | 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) CRUX only

Motor application current of the built-in driver can be selected from 2 patterns (0.75A/phase or 0.35A/phase).

Initial value 0

0: Selects 0.75A/phase

1: Selects 0.35A/phase

System No.68 Jog Movement amount (Moving amount of the jog box (RPS mode))

Sets movement amount at one time on RPS mode (Relative value movement mode) in the jog box, "INCOM".

Initial value 2000

Setting range -16,777,215 to 16,777,215

5-7. Installation Procedures of USB Driver

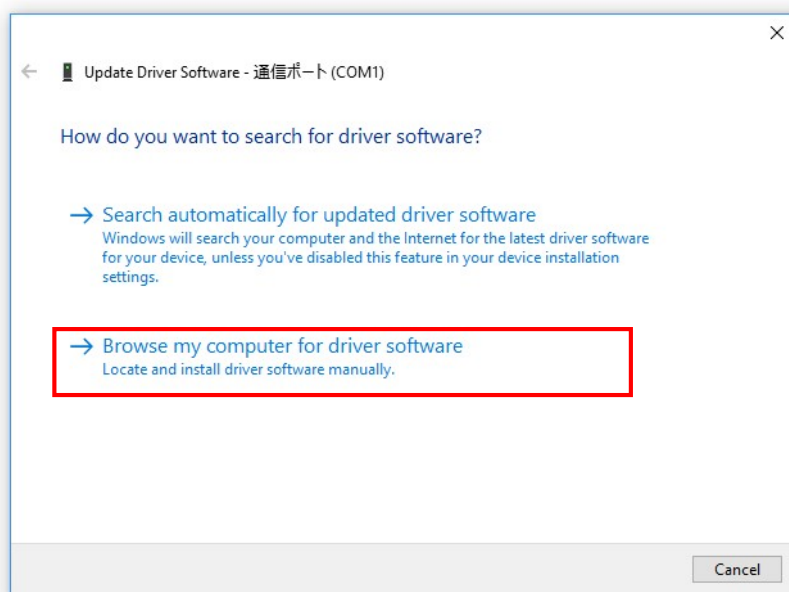
When using USB communication in CRUX, USB driver corresponding to the version of Windows OS needs to be installed.

- ① Set the communication setting to USB communication mode, and connect CRUX in power ON state to PC.
(See "2-7. Rotary Switch for Communication Setting" (Page 14) regarding communication setting)

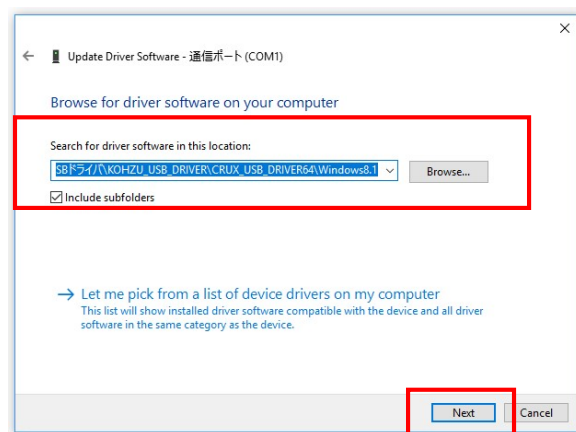
- ② The driver installer starts.

*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...".

- ③ Select "Browse my computer for driver software. Locate and install driver software manually."



- ④ Set a search folder to applicable OS of USB driver folder that comes with the product, and select "Next".



Contents of USB driver folders that come with the product:

- For CRUX USB DRIVER32 (Windows 32bit)
 - Driver file for Windows7
 - Driver file for Windows8
 - Driver file for Windows8.1
- CRUX USB DRIVER64 (For 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.

- ⑤ The driver for CRUX is installed and "CRUX USB Serial Port" is displayed.

This is the end of instillation procedures.

6. Specification

6-1. Specification

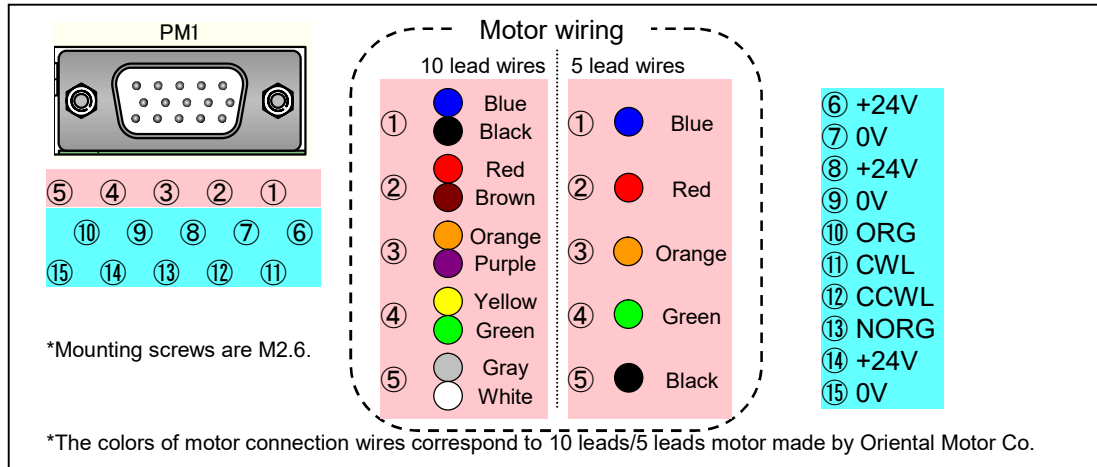
| | | CRUX | CRUX-A |
|--------------------------------------|----------------------------|--|---|
| General Specifications | Product | Stepping motor controller (Built-in DC power driver) | Stepping motor controller (Built-in AC power driver) |
| | Exterior dimensions (mm) | W128.4 x H58.4 x D220 | W180 x H158 x D214 |
| | Number of axes controlled | 2 | |
| | Input power | AC 90 to 240 V 50Hz/60Hz | |
| | Power consumption | 60 VA MAX (For AC100 V supply) | 430 VA MAX (For AC100 V supply) |
| | Operating environment | Operating temperature: 0 to 40°C, Operating humidity: 30 to 85 % (Should be no condensation) | |
| | Weight (kg) | 1.4 | 3.3 |
| Performance Specifications | Driving Function | Absolute position drive, relative position drive, origin return drive, 2 axes simultaneous drive, free rotation drive | |
| | Speed control | <ul style="list-style-type: none"> • Drive pulse frequency: 1 to 500 kpps • Acceleration/deceleration pattern: Rectangular drive and trapezoidal drive (Asymmetry for acceleration/deceleration) • Others: 10 kinds of speed tables | |
| | Set Movement Amount | -16,777,215 to 16,777,215 pulses | |
| | Origin Return Method | 10 methods (Combination of ORG, NORG, CW limit, and CCW limit) | |
| | Output signal | <ul style="list-style-type: none"> • Motor excitation signal • Emergency stop signal [Open collector output] | |
| | Input signal | <ul style="list-style-type: none"> • Sensor signal (CW limit, CCW limit, NORG "Near origin sensor", ORG "Origin") [12 V pull up photo-coupler input] • Emergency stop signal [24 V pull up photo coupler input] | |
| | Display monitor | Sensor status, BUSY state, and emergency stop status LED | |
| | Communication interface | RS-232C and USB | |
| | Optional | INCOM (Jog Box for Easy Control) | |
| Built-in Motor Driver Specifications | Model | DS507F-2 (x 2) | MD-551E (x 2) |
| | Drive motor | 5-phase stepping motor | |
| | Driving Type | Bipolar constant current pentagon method | |
| | Driving current | Switch 0.35A/phase and 0.75A/phase (Parameter setting) | Select from 16 types between 0.35A and 1.48A/phase (Rotary switch 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 | 16 types, Rotary switch setting (Two types, M1 and M2) 1/2/4/5/8/10/16/20/25/40/50/80/100/125/200/250 |
| | Other Functions | Excitation OFF, Stop current adjustment | Excitation OFF, Stop current setting |

6-2. Connector

The pin arrangement diagram is from the connector side.

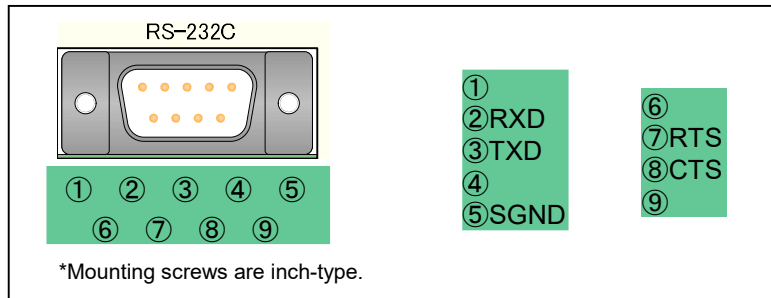
6-2-1. Motor connecting connector

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



6-2-2. RS-232C Connector

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

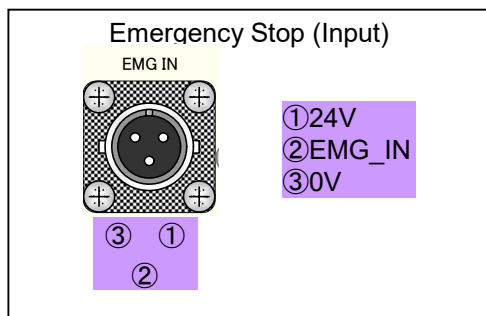


6-2-3. Emergency Stop Signal (Input/Output) Connector

Connector type: RM12BRB-3S _(Hirose)

Compatible connector:

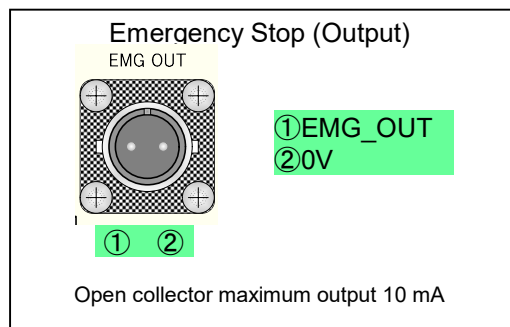
RM12BPE-3PH(71) _(Hirose)



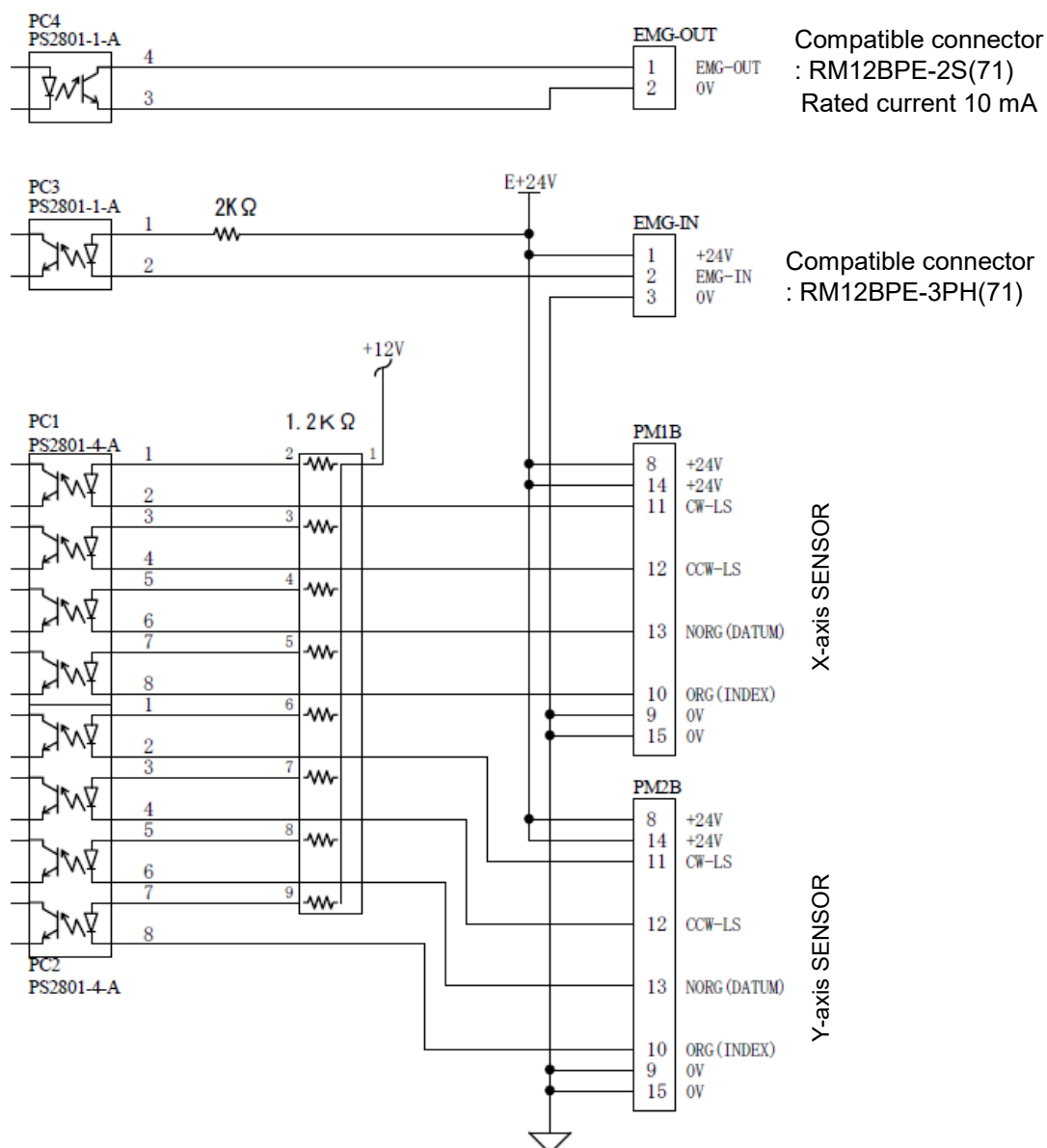
Connector type: RM12BRB-2PH _(Hirose)

Compatible connector:

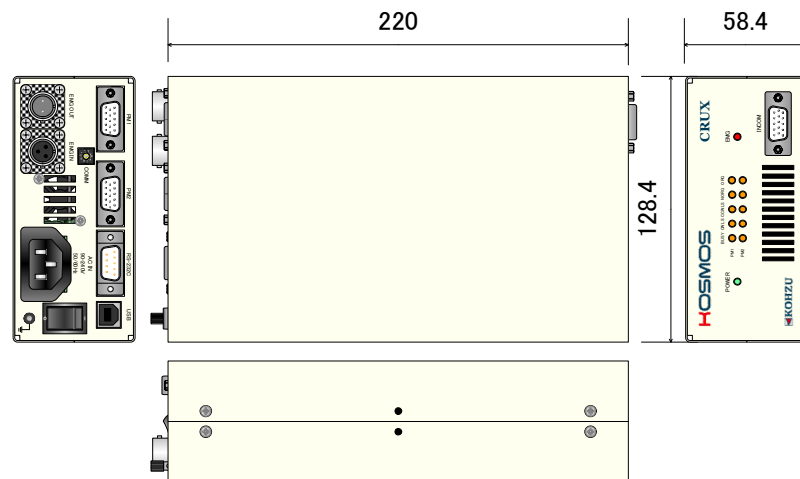
RM12BPE-2S(71) _(Hirose)



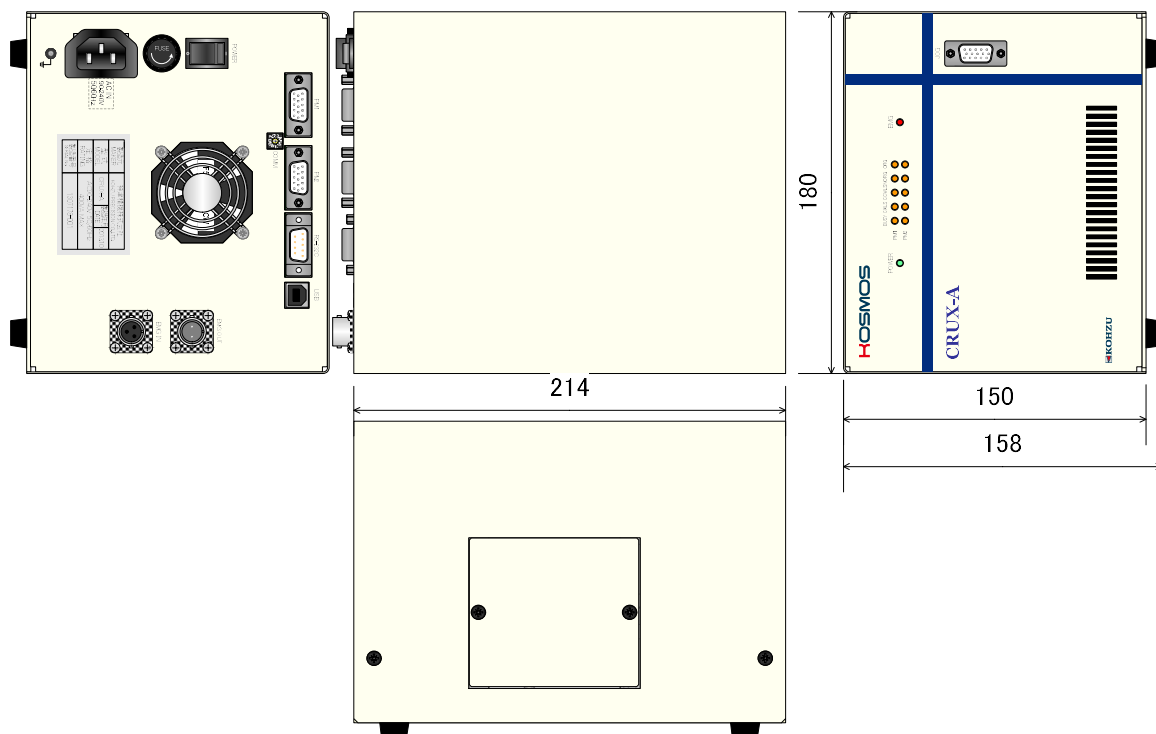
6-3. Circuit Diagram of Emergency Stop and Sensor



6-4. Dimensions of CRUX



6-5. Dimensions of CRUX-A



7. Maintenance and Service

7-1. Troubleshooting

■ Power cannot be turned ON.

- ◇ Is the power cord pulled out or loosened?
-> Plug the power cord into the main body securely.
- ◇ Is power conducted to the outlet?
-> Plug the power cord of other electric appliance into the outlet to check if it works.
-> Check electrification with a voltmeter such as a tester.
- ◇ Is the power cord broken en route?
-> Check conductivity between both ends of the cord if you have a tester.
- ◇ LED in the front panel does not become ON, though the heat release fan is rotating.
-> After turning OFF the power, turn the power ON again. If the same phenomenon persists, internal error can be considered.

■ The stage does not move.

- ◇ Do you hear rotation sound? Do you hear abnormal sound?
-> An out of adjustment may be considered. Change the speed or adjust the output current of driver.
- ◇ (When you hear rotating sound) Is the motor rotating?
-> If the device has been used for a long period of time, it is rare but the coupling of the motor shaft may be loose.
- ◇ (When you don't hear rotating sound) Is the limit display ON?
-> It is stopped by the limit switch. Move in the reverse direction and move through the limit zone.
- ◇ (When you don't hear rotating sound) Is the motor cable pulled out or loose?
-> Securely plug the cable connector into the main body connector.
- ◇ (For multi-axis specification) Are all 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.

■ Origin return operation cannot be performed.

- ◇ Doesn't the motor operate completely?
-> Check if it operates with other driving methods.
- ◇ (Stops at non-origin position) Check the origin return method is correct.
-> See "3-10. Origin Return Method" (Page 19) and set to match the stage's sensor configuration.
For a part of standard stage, it is necessary to set the origin return method to 3 in the system setting.
- ◇ (Stops at non-origin position) Is the origin sensor installed properly?
-> Adjust the origin sensor.
-> When a movement range is narrow, the limit sensor range and origin sensor range may overlap.
In this case, it does not operate normally. Adjust for the origin sensor range to be out of the limit range.
- ◇ (Stops at non-origin position) Is the logic of origin sensor set properly?
-> Switch the input logic for the sensor (Normal open and normal close).

■ Positional deviation happens.

- ◇ Are the settings like movement volume correct?
-> Check each setting according to the Operation Manual.
- ◇ Is the motor properly operating? Do you hear abnormal sound?
-> An out of adjustment may be considered. Change the speed or adjust the output current of driver.
- ◇ Is the load exceeding the rating applied?
-> Check the load. Also, try to lower the speed.
- ◇ 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.
- ◇ Does the assembly between the motor and driving part show problems?
-> If the device has been used for a long period of time, the coupling of the motor axis may become loose.

■ Remote control (Communication) does not operate correctly.

- ◇ Is the communications cable pulled out or loose?
-> Plug the connector of the communications cable into the connector of the main body properly.
- ◇ Are communication parameter settings done correctly?
-> See and check "2-7. Rotary Switch for Communication Setting"(Page14).
(Turn the power of CRUX OFF and conduct dip switch setting).
- ◇ Is correct communication cable used?
-> Check the arrangement of the connector pins on the communication cable.
- ◇ During communication, is error code sent?
-> Take measures for the error on the host computer.
- ◇ 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.
- > Are commands transmitted and received properly? Make sure to receive data for commands which return response (For example, status read, etc.).
- ◇ Check with the stage control application, "Chamonix".
We have application available that can be operated easily.
- > If proper operation can be performed by application, software on the user's side may not be written correctly.
- ◇ Is communication forcedly interrupted in mid-stream?
-> Turn the power ON again.

■ EMG lamp flashes (EEPROM data may be damaged)

- ◇ Data inside EEPROM are damaged.
- > See the restoration method in "3-11. EEPROM Save Data Error" (Page 26 and 27), and initialize the data.

7-2. Maintenance

■ Maintenance of Controller

- When used in a dusty room, perform internal cleaning periodically.
- 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.

Warranty period 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.

Revision History

| Date | Version |
|------------|--|
| 2014/04/01 | 1.10 |
| 2015/04/01 | 1.15 (FG earth added) |
| 2015/06/17 | 1.20 (ROM check added) |
| 2015/08/20 | 1.30 (Document edited) |
| 2016/09/22 | 1.36 (Data error restoration method added) |
| | |

Recording Column

Purchased Date Year Month Date

Purchased from

Person in charge

TEL

Production No.

Special note

| | | |
|---|---|--|
| ▪ | ▪ | |
| ▪ | ▪ | |
| ▪ | ▪ | |
| ▪ | ▪ | |
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| ▪ | ▪ | |
| ▪ | ▪ | |

CRUX CRUX-A



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