

# D 2 5 0

## Stepping Motor Controller Operation Manual

Suruga Seiki Co., Ltd.  
OST Division

## For Your Safety / Cautions

Thank you for choosing a Suruga Seiki product. For proper use, please read this operation manual thoroughly prior to using this product. Failure to use controller properly as explained in the instruction manual may cause damage or injury. After reading, please keep this manual for your reference.

### **Basic Cautions**

To avoid fire, burns, electrical shock and injuries, please follow the instructions below.

- Use a power cable with proper power source voltage. Do not put any heavy item on a power cable.
- Turn off a power switch when you plug a power cable. Plug tightly.
- When you unplug a power cable, turn off a power switch. Do not unplug by holding power code, nor handle with a wet hand.
- Check if controller's voltage meets a supplied power source voltage at operating environment before use.
- Connect a power cable to a power outlet which comes with protective earth terminal. In case of using an extension cable without protective earth terminal, protective earth will be of no effect.
- Use a standardized fuse that meets controller requirement.
- Operate controller in the required operating environment.
- Do not put any vase or container of chemicals on or close to controller.
- Do not place or drop any flammable item or metal at vent holes.
- Avoid dropping by using belts when controller is on a carrier.
- Turn off power switch when connecting with external equipment.
- Place controller on a flat ground.
- DO NOT disassemble or alternate or make any improper repairing of controller.

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## 1. INTRODUCTION

Thank you for purchasing D250 series Micro-Stepping Motor Controller.

- The content of this operation manual may be subject to change without advance notice.
- In despite of our careful examination in preparing this operation manual, you may find misspelling, ambiguous and questionable descriptions. Please contact us for correct information.
- All rights reserved. No part of this document may be reproduced in any form, including photocopying or translation to another language, without the prior written consent of Suruga Seiki Co., Ltd.

### 1.1. Features

The D250 series Micro-Stepping Motor Controller (Hereafter: controller) are micro-stepping controllers with built-in 5 phase stepping motor driver (0.75A/phase, 1.4A/phase) and a capability of driving axis of 1 ~ 6 by switching one from another (single axis driving).

- 1.4A/phase Driver is a custom-made model
- Refer to 5.2 for model name and the number of controlling axis

Maximum 250 Micro-steps, 16 channels for Micro-step type

Applicable Interface: GP-IB, USB, RS232C

D200 Handy Terminal is required when no external control is applied.

### 1.2. Accessory

D250 series contains the following items. Please check all the items at the time of unpacking.

If there are is any item missing, please contact us immediately.

- D250 Main body: 1
- Power source cable: 1
- Operation manual (this manual): 1

### 1.3. Option

Controller can be connected to D200 Handy Terminal.

- When controller is not driven by external control, the Handy Terminal will be needed.
- D200 Handy Terminal is not equipped with operation manual. Please refer to 1.6.5 and Chapter 3 of this manual for instructions.

## 1.4. Operating Environment

### 1.4.1. Environment Conditions

Install controller at the environment of the following conditions.

- Ambient Temperature & Humidity  
0 ~ 40 (Within operation temperature range)  
20 ~ 80% RH ( Without condensation)
- Setting Position  
There is ventilating cooling fan at the back panel. Please install controller at 10cm (3 inches) away from wall or whatever might block the back panel of controller.

Avoid using controller under the following conditions.

- Directly under sunlight
- Areas that have much dust or metallic particles
- Near fire
- Much Noise, Much Vibration
- In case of using controller in the vibrating conditions, please use noise-removal filter.  
Also, keep a distance of 10cm and more between the back side of controller and a wall in order to avoid blocking an exit of a cooling fan at the back side.

### 1.4.2. Power Source Conditions

Power Source Specification

- Input Voltage: AC100 ~ 240 V  $\pm 10\%$  (Wide-range Input)
- Frequency: 50 / 60Hz
- Consuming Electrical Power:

	D251	D252	D253	D254	D255	D256
Number of Controlling Axis	1	2	3	4	5	6
Max. Consuming Electrical Power	60W	100W	140W	180W	220W	260W

**Caution:** In order to avoid damage to controller, do not use any input voltage or frequency over the specifications.

### 1.4.3. Power Source Fuse

Power source fuse is installed in a fuse holder of the rear panel (See 1.6.2). In case fuse burns out, replace it with new fuse of the following standard.

- Size:  $\phi 6.35 \times 31.8$  (mm)
- Fuse: Standard Type 10A 250V AC (UL/CSA approved)

**Caution:** Power source fuse must be the fuse of the same model in order to avoid fire.

#### Inspection and replacement instruction for power source fuse

1. Turn off Power Switch.
2. Unplug Power Cable from AC inlet or power source outlet.
3. Open a fuse holder at the rear panel.
4. Check and replace a fuse, and put it back.

### 1.4.4. Power Cable

Controller comes with a 3-pin plug power cable that connects to power source and a protective earth terminal. Earth terminal of 3-pin plug is connected to metallic part of controller through power cable. In order to protect from electrical shock, plug the power cable to an protective earth terminal outlet which is appropriately connected to ground. In case of using an extension cable without protective earth terminal, protective earth will be of no effect.

## 1.5. Cleaning and Storage

### 1.5.1. Cleaning

Use a soft cloth to wipe off dirt on controller. Use a wet cloth with detergent for tough dirt.

**Caution:** Turn the power off, and unplug power cable from AC inlet or power outlet.

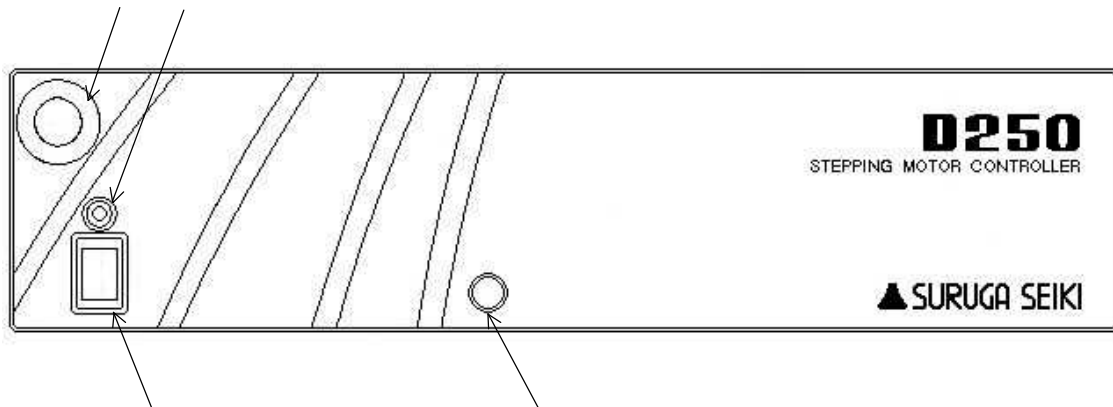
- Do not let water come inside controller.
- Do not use organic solvent such as Benzene or Toluene.
- Do not use cleanser.

### 1.5.2. Storage

Store controller at the temperature of  $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ . When not in use for long time, leave the power off and disconnect the power cable and store controller in a cool and not under direct sunlight.

## 1.6. Explanation of Parts & Functions

### 1.6.1. D250 Front Panel



#### POWER SWITCH

Power Supply Switch

#### POWER LIGHT

Light on when power is on

#### TERMINAL

Connector for D200 Handy Terminal: When connected with D200 Handy Terminal, the power will be supplied to D200 Handy Terminal (See 2.1.4).

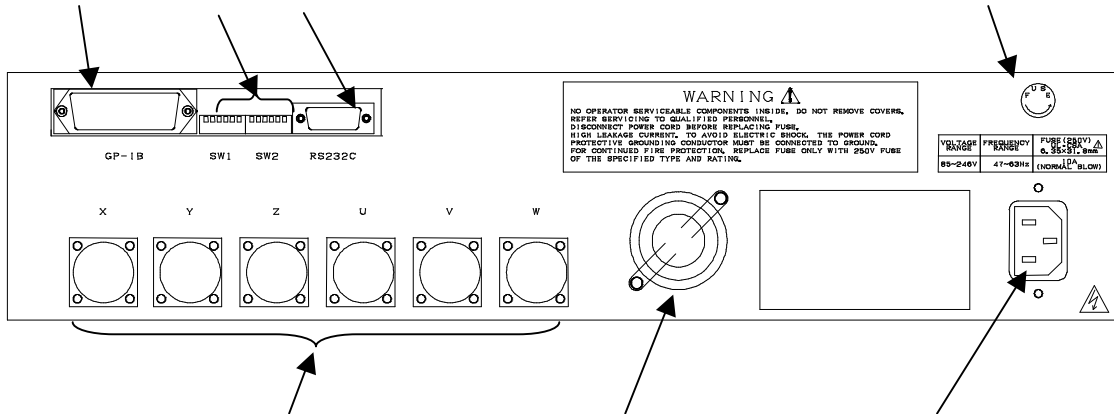
When the power is turned on, if D200 Handy Terminal is connected it becomes CONTINUE mode. Otherwise, it becomes REMOTE mode.

\* See 3.1 for details of motion mode.

#### EMERGENCY STOP

Push to turn off the power of the D250 controller in case of emergency. In order to release Emergency Stop, turn the button in the direction of the arrow so that the button will be lifted up and be released.

## 1.6.2. D250 Rear Panel



### GP-IB Connector

GP-IB interface port (See 2.1.2)

### Dip SW: 6bits x 2

For setting GP-IB address (5 bits), GP-IB Delimiter selection (2 bits), and RS232C (1 bit). (See 2.2)

### RS232C Connector

RS232C interface port (See 2.1.3)

### Fuse Holder

250V 10A Glass fuse is used. (See 1.4.3)

### Stage Connection

Connection for each axis of X, Y, Z, U, V, and W. Connect various types of motorized stages. (See 2.1.1)

### Fan

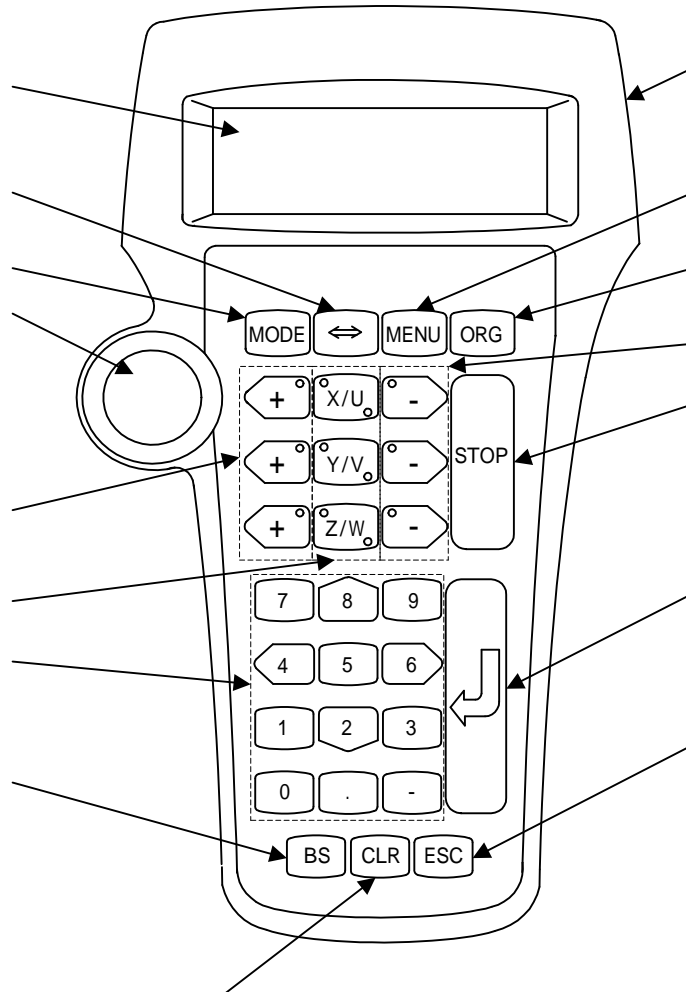
Fan motor for internal cooling

### AC Inlet

Input AC100 ~ 240V 50/60Hz (See 1.4.2)

Connect an accessory power cable (1.4.4)

### 1.6.3. D200 Handy Terminal (Option)



Backlight SW

ON/OFF switch for Backlight

Display Screen

LCD with Backlight/ 4 lines for 20 digits

**MODE** Button

For switching motion mode from CONTINUE→STEP→POINT→CONTINUE...

\* See 3.1 for details of motion mode.

**CHANGE** Button

Effective only when controller operates more than 4 axes. When all the axes are not in motion and motion mode is NOT at REMOTE Mode, it changes controlling axes as following. (See 3.2.2)

D254: Controlling axes **XYZ** **U** axis

D255: Controlling axes **XYZ** **UV** axes

D256: Controlling axes **XYZ** **UVW** axes

**MENU** Button

When it is Main Screen and all the axes are not in motion, and motion mode is NOT at REMOTE Mode, press **MENU** to switch from Main Screen (See 3.2.2) → Parameter Setting Screen (See 3.2.2) → Memory SW Setting Screen (See 3.2.4) → and back to Main Screen.

**ORG** Button

Press **ORG** to switch between ORIGIN Mode and HOME Mode. See 3.1 for details of motion mode.

#### EMERGENCY STOP

Push to turn off the power of D200 and D250 in case of emergency. In order to release Emergency Stop, turn the button in the direction of the arrow so that the button will be lifted up and be released.

**+** Button

Driving in the CW (Clockwise) direction. In any type of Motion Mode, LED lights on as green while controlling axis is being driven in the + (CW) direction.

**-** Button

Driving in the CCW (Counter Clockwise) direction. In any type of Motion Mode, LED lights on as green while controlling axis is being driven in the - (CCW) direction.

**X/U**, **Y/V**, **Z/W** Button

Axis selection button for each axis.

When a controlling axis is selected while motion mode is at either of POINT/ ORIGIN / HOME Mode, LED lights on as green. When controller operates more than 4 axes, axis function can be changed by using **□**.

#### TEN KEY

- When it is Main screen and motion mode is at either of CONTINUE and STEP Mode, **2** / **4** / **6** / **8** keys will function as Driving button by setting a function of TEN KEY Axis-Control (See 3.2.4.6).
- **2** / **4** / **6** / **8** keys can function as a cursor at various setting screens.
- Changing current position (See 3.3.1) can be done by pressing **□** while pressing Axis Selection button.

**BS** Button

Backspace button for various setting.

- Setting of Constant Step Pulse travel distance (See 3.2.3.2) can be done by pressing

**BS** button while  
pressing Axis Selection button.

**CLR** Button

Clear button for various setting.

- Setting of home position (See 3.2.3.4) can be done by pressing **CLR** button while pressing Axis Selection button.

**ESC** Button

Escape button for various setting.

- Setting of point (See 3.2.3.5) can be done by pressing **ESC** button while pressing Axis Selection button.

**ENTER** Button

Enter button for various setting.

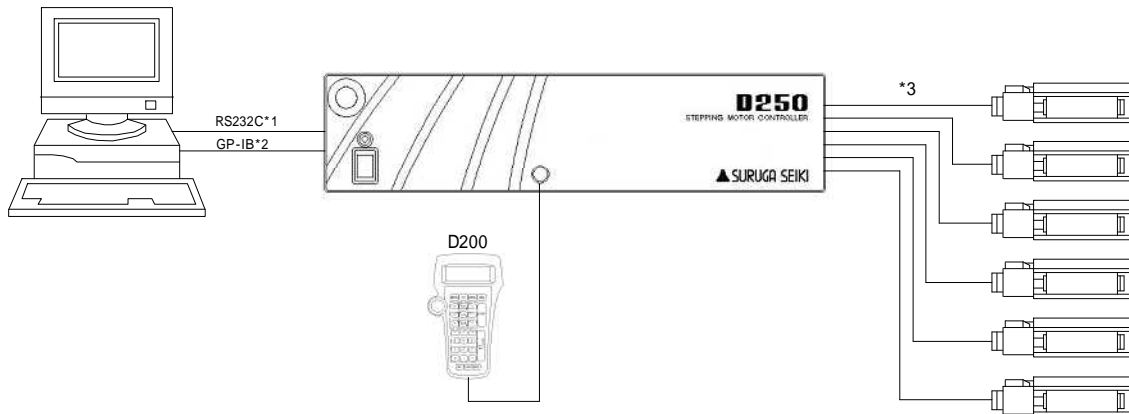
**STOP** Button

Stop all the axis in motion immediately.

## 2. Connection & Dip Switch Setting

- Refer to 1.6.1 and 1.6.2 for the positions of Connector and Dip switch.

### 2.1. D250 System Configuration (Connection with External Equipment)



\* 1: RS232C Cable (sold separately) : D100-R9-2

\*2 : GP-IB Cable (sold separately) : D70-G2

\*3 : Motorized Stage Connection Cable:

Use the following connection cables.

- 2m Cable: D214-1-2E / D214-2-2E  
(\* Suruga Seiki's motorized stage is equipped with the above connection cable.)
- 4m Cable: D214-1-4E / D214-2-4E
- Robot cables are also available. Please contact us for details.
- For custom-made product employing 1.4A driver, type of cable is D216-1-2E / D216-1-4E (Robot cable is also available).

#### Caution:

- Connecting with external equipment should be done BEFORE turning the power on.
- DO NOT plug or unplug while the power of the controller is on.
- Follow the instruction on pin-arrangement of each connector for proper wiring. See 2.1.1 to 2.1.4 for pin-arrangement instructions.
- DO NOT use these cables for controlling products other than Suruga Seiki's motorized stages and holders.

### 2.1.1. Motorized Stage Connection

Connect motorized stage connection cable (See 2.1) to stage connector at controller's rear panel.

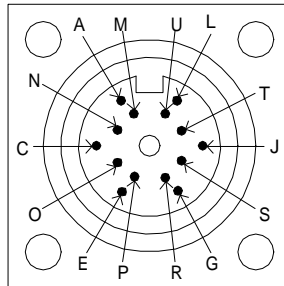
**Caution:** Before connecting controller and a motorized stage, make sure to turn off the power of controller and peripherals. DO NOT connect or disconnect motorized stages while the power of controller and peripherals is on.

#### [ Stage Connector (at 0.75A / phase)]

Connector Model Number: 09 - 0054 - 00 - 14 (Female: Manufactured by Binder)

Matching Plug: 09 - 0341 - 02 - 14 (Manufactured by Binder)

Matching Contact: 09 - 0341 - 92 - 14 (Manufactured by Binder)



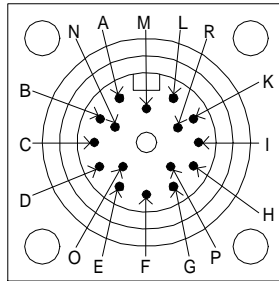
Pin Number	Terminal Function
A	Lead Motor / Blue
C	Lead Motor / Red
E	Lead Motor / Orange
G	Lead Motor / Green
J	Lead Motor / Black
L	CW side Limit Sensor Input
M	CCW side Limit Sensor Input
N	Near Origin Sensor Input
O	Origin Sensor Input
P	Sensor Power Source (DC5V+)
R	Sensor Power Source (DC5V --)
S	Electromagnetic Brake Source (DC24+)
T	Electromagnetic Brake Source (DC24 --)
U	Frame Ground

**[ Stage Connector (at 1.4A / phase: Custom-Ordered) ]**

Connector Model Number: 09 - 0340 - 00 - 16 (Female: Manufactured by Binder)

Matching Plug: 09 - 0337 - 02 - 16 (Manufactured by Binder)

Matching Contact: 09 - 0337 - 92 - 14 (Manufactured by Binder)



Pin Number	Terminal Function
A	Lead Motor / Blue
B	Lead Motor / Red
C	Lead Motor / Orange
D	Lead Motor / Green
E	Lead Motor / Black
F	CWLS Input
G	CCWLS Input
H	NORG Input
I	ORG Input
K	Sensor Power Source (DC5V+)
L	Sensor Power Source (DC5V --)
M	Electromagnetic Brake Source (DC24+)
N	Electromagnetic Brake Source (DC24 - )
O	Frame Ground
P	Open
R	Open

### 2.1.2. GP-IB Interface Connection (Subject to IEEE-488.2 Standard)

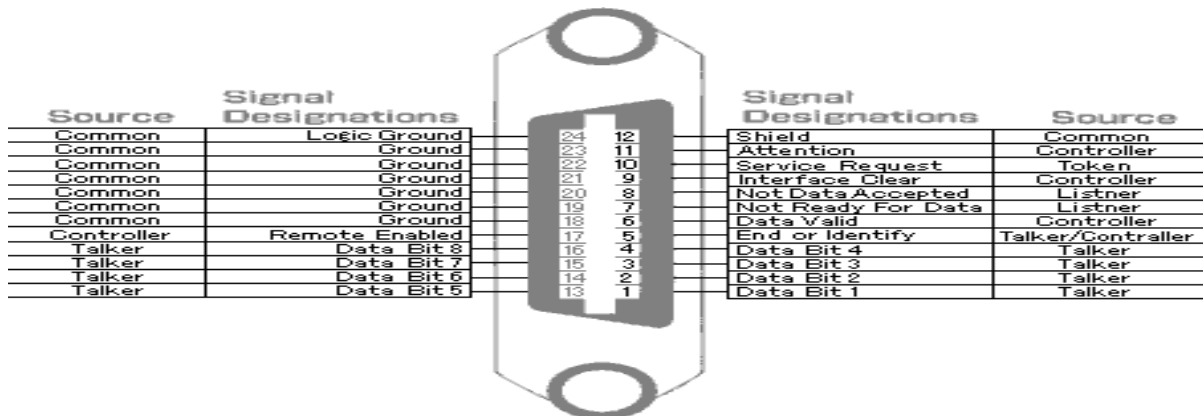
Use Dip switch at rear panel of controller in order to set GP-IB address Delimiter (See 2.2) and connect GP-IB interface connector and PC's GP-IB board by using GP-IB cable (See 2.1).

**Caution:** Complete the setting of Dip SW BEFORE turning on the power of controller. Any change of Dip SW made AFTER the power is of no effect. Make sure to turn off the power of controller and peripherals before connecting cable. DO NOT connect or disconnect cables while the power of the controller and peripherals is on.

Refer to an operation manual of each GP-IB board for its setting instructions.

#### [Connector ]

57LE - 20240 - 73C0D35E (Manufactured by DDK)



PIN #	Code	Direction	Function	PIN #	Code	Direction	Function
1	DIO1	T→L	Data I/O LSB	13	DIO5	T→L	Data I/O
2	DIO2	T→L	Data I/O	14	DIO6	T→L	Data I/O
3	DIO3	T→L	Data I/O	15	DIO7	T→L	Data I/O
4	DIO4	T→L	Data I/O	16	DIO8	T→L	Data I/O MSB
5	EOI	T→L	End of Information	17	REN	C→L	Remote Enable
6	DAV	T→L	Not Available	18	GND		DAV GND
7	NRFD	L→T	Not Ready for Data	19	GND		NRFD GND
8	NDAC	L→T	Not Data Accepted	20	GND		NDAC GND
9	IFC	C→L	Interface Clear	21	GND		IFC GND
10	SRQ	C→L	Service Request	22	GND		SRQ GND
11	ATN	C→L	Attention	23	GND		ATN GND

12	earth		Shield		24	GND		EOI GND
----	-------	--	--------	--	----	-----	--	---------

**[ Interface Function ]**

Source Handshake	Yes
Acceptor Handshake	Yes
Talker	Yes
Listener	Yes
Service Request	Yes
Remote Local	No
Parallel Poll	No
Device Clear	No
Device Trigger	No
Controller	No
Delimiter	CRLF+EOI / EOI / CR+EOI / LF+EOI (Switching over by Dip SW)

### 2.1.3. RS232C Interface Connection

Use Dip SW at the rear panel of controller for setting Baud Rate (See 2.2), and connect RS232C interface connector and PC's RS232C interface connector by using RS232C cable (See 2.1).

**Caution:** Complete the setting of Dip SW BEFORE turning on the power of controller. Any change of Dip SW made AFTER the power is of no effect. Make sure to turn off the power of controller and peripherals before connecting cable. DO NOT connect or disconnect cables while the power of the controller and peripherals is on.



#### [Connector]

XM2C - 0912 - 132 (Male: Manufactured by Omron)

Pin Number	Code	Function
1	-	No connection yet
2	RxD (RD)	Receiving Data (Input)
3	TxD (SD)	Transmitting Data (Output)
4	DTR (ER)	Data Terminal Ready (Output)
5	GND (SG)	Ground for Signal
6	DSR (DR)	Data Set Ready (Input)
7	-	Not Connected
8	-	Not Connected
9	-	Not Connected

#### [Communication Parameter]

Communication Method	asynchronous
Baud Rate	19200/9600bps (Switching over by Dip SW )
Data Length	8 bits
Parity	None
Stop Bit	1 bit
X Parameter	None
Handshake	Depend on Controlling Line

Delimiter	CR
-----------	----

#### 2.1.4. D200 Handy Terminal (Option) Connection

Connect D200 Handy Terminal connector to terminal connector at the front panel of controller.

**Caution:** Make sure to turn off the power of controller and peripherals before connecting with D200 Handy Terminal. DO NOT connect or disconnect with D200 Handy Terminal while the power of controller and peripherals is on.

#### 【Connector】

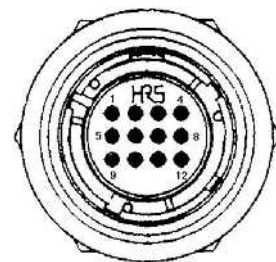
Connector Model Number: HR25-9R-12S (Female: Manufactured by HRS)

Matching Plug: HR25-9R-12P (Manufactured by HRS)

PIN #	SIGNAL	DESCRIPTION
1	P 2 4 V	D C 2 4 V POWER SUPPLY
2	P 2 4 G	
3	N . C .	NOT CONNECTED
4	E M C 1	E M C 2 · E M C 3 COMMON
5	E M C 2	D200 Emergency stop signal contacts controller
6	E M C 3	Not in use of D200: Emergency stop signal is in short-circuit
7	C T S	CAPABLE OF TRANSMITTING DATA
8	R X D	RECEIVING DATA
9	R T S	REQUEST TRANSMITTING DATA
10	T X D	TRANSMITTING DATA
11	G N D	5V SYSTEM GROUND
12		SHIELD LINE

#### 【Communication Parameter between Controller & Handy Terminal】

Communication Method	asynchronous
Baud Rate	9600bps
Data Length	8bits
Parity	None
Stop Bit	1bit
X Parameter	None



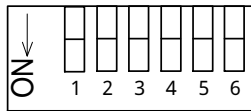
Handshake	Depend on controlling line
Delimiter	CR

## 2.2. Dip Switch Setting

Dip Switch employs PIANO type switch. By lowering down a lever of each bit, it becomes ON.

**Cautions:** Complete the setting of Dip SW BEFORE turning on the power of controller. Any change of Dip SW made AFTER the power is of no effect. When operating Dip SW setting, static electricity may cause controller glitch or damage. Please be cautious when operating Dip SW setting.

(1) SW1... GP-IB address setting



BIT	NAME	CONTENT
1 ~ 5	GP-IB Address	1 ~ 30 Set GP-IB address (Default: 7)
6	Reserve	

	ON	OFF
Bit 1	1	0
Bit 2	2	0
Bit 3	4	0
Bit 4	8	0
Bit 5	16	0

Example) To set address of controller as 10

Bit 1 → OFF : 0

Bit 2 → ON : 2

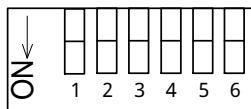
Bit 3 → OFF : 0

Bit 4 → ON : 8

Bit 5 → OFF : 0

\* Total of each number is address 10

(2) SW 2 ...GP-IB Delimiter & RS232C Baud Rate Setting



BIT	NAME	CONTENT	
1 ~ 2	GP-IB Delimiter Setting	0	CRLF (Default)
		1	None
		2	CR
		3	LF
3	RS232C Baud Rate Setting	OFF	9600bps (Default)
		ON	19200bps

4 ~ 6	Not-in-Use	All OFF	Function in normal condition (Default)
-------	------------	---------	--

**Caution:** 4 ~ 6 bit of SW 2 are to be used for maintenance and adjustment. Please do not change the default (All OFF).

### 3. Driving by D200 Handy Terminal (Option)

Explanation for driving motorized stage by controller and D200 Handy Terminal (Hereafter: Handy Terminal).

- See 1.6.3 for information on control buttons of Handy Terminal (those described in ).

#### 3.1. Motion Mode

In case that controller is connected with Handy Terminal, you can drive a motorized stage at various motion modes of CONTINUE / STEP / POINT / ORIGIN mode, which can be switched by pressing  or  buttons of Handy Terminal.

- Setting of various parameters (display unit, driving speed and etc.) can be done by pressing  button of Handy Terminal. (See 3.2.3)
- Setting of various memory switches (type of origin return, logic of limit switch and etc.) can be done by pressing  button of Handy Terminal twice. (See 3.2.4)
  - When the power of controller is turned on, it becomes CONTINUE mode.
  - When the power of controller is turned on without connection to Handy Terminal, it becomes REMOTE mode.
  - See Chapter 4 for information on REMOTE mode.

##### 3.1.1. CONTINUE MODE

As long as  or  key of the axis you want to drive is being pressed, motorized stage keeps driving.

- In order to switch to CONTINUE mode, press  button and change motion mode of main screen (See 3.2.2) to <CONTINUE MODE>.
- While  or  key is being pressed, motorized stage will be driven by following the instruction of parameter and memory switch settings.
- Motorized stage will be immediately stopped at the moment when  or  key is released.
- When pressing time is less than 0.5 second, motorized stage is driven only for 1 pulse.

### 3.1.2. STEP MODE

By pressing  or  key of the axis you want to drive for once, motorized stage will be driven by a constant amount of pulse.

- In order to switch to STEP mode, press  button and change motion mode of main screen (See 3.2.2) to <STEP MODE>.
- See 3.2.3.2 for setting of driving by a constant amount of pulse.
- When  or  key is being pressed, motorized stage will be driven by a contact amount of pulse following parameter and memory switch settings, and slow down to stop.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please conduct origin return to check a position prior to turning off the power.

### 3.1.3. POINT MODE

By pressing Axis Selection button you want to drive (, , ) and , it drives motorized stage to the position of the set point.

- In order to switch to POINT mode, press  button and change motion mode of main screen (See 3.2.2) to <POINT MODE>.
- See 3.2.3.5 for POINT setting.
- Select an axis you want to drive (, , ) and press . Motorized stage will be driven to the position of the set point following parameter and memory switch settings, and slow down to stop. (This method can be used as same method as HOME mode (See 3.1.5).)
- This can be used as the second origin other than origin limit.  
After completing origin return, conduct positioning to an operating point, set that point by using POINT mode. Thereafter, positioning can be quickly conducted by reaching directly to the set point after origin return.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

### 3.1.4. ORIGIN MODE

By pressing Axis Selection button you want to conduct origin return ( $\overline{X/U}$ ,  $\overline{Y/V}$ ,  $\overline{Z/W}$ ) and  $\overline{ENTER}$ , it conducts origin return of motorized stage.

- In order to switch to ORIGIN mode, press  $\overline{ORG}$  button and change motion mode of main screen (See 3.2.2) to <ORIGIN MODE>.
- See 3.2.4.1 for setting a type of origin return.  
There are 12 types of origin return methods. Please select one suitable to a motorized stage in use.
- Select an axis you want to conduct origin return ( $\overline{X/U}$ ,  $\overline{Y/V}$ ,  $\overline{Z/W}$ ) and press  $\overline{ENTER}$ . Motorized stage will conduct origin return by following the chosen origin return method, parameter and memory switch settings.  
LED of Axis Selection button lights on during the operation, and lights off when finished.
- Default of origin return types is set to "0", which does not conduct origin return.

### 3.1.5. HOME MODE

By pressing Axis Selection button you want to drive ( $\overline{X/U}$ ,  $\overline{Y/V}$ ,  $\overline{Z/W}$ ) and  $\overline{ENTER}$ , it drives motorized stage to the set HOME position.

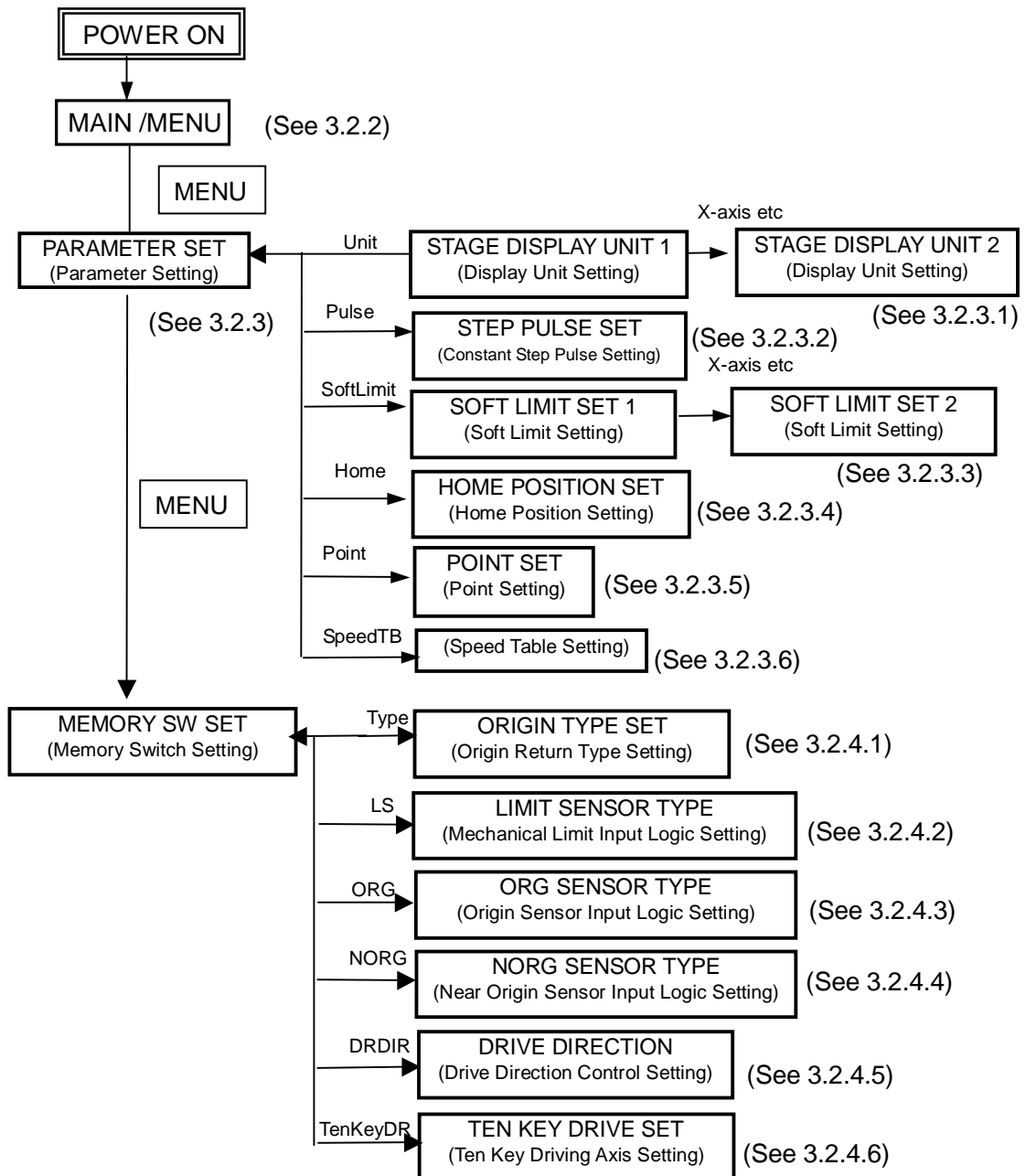
- In order to switch to HOME mode, press  $\overline{ORG}$  button and change motion mode of main screen (See 3.2.2) to <HOME MODE>.
- See 3.2.3.5 for HOME setting.
- Select an axis you want to drive ( $\overline{X/U}$ ,  $\overline{Y/V}$ ,  $\overline{Z/W}$ ) and press  $\overline{ENTER}$ . Motorized stage will be driven to the set HOME position by following parameter and memory switch settings, and slow down to stop. (This method can be used as same as POINT mode (See 3.1.3).)
- This can be used as the second origin other than origin limit.  
After completing origin return, conduct positioning to an operating point and set that point as HOME position. Thereafter, positioning can be quickly conducted by reaching directly to the set HOME position after origin return.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

## 3.2. Screen Display

Screen Display with 4 lines of 20 digits LCD becomes available when Handy Terminal is connected to controller.

### 3.2.1. Screen Configuration



- **MENU** indicates button of D200 Handy Terminal.
- Words outside bold-line squares are menu selections of Handy Terminal.

- Words in capital letters inside bold-line squares are what to be appeared on Handy Terminal.

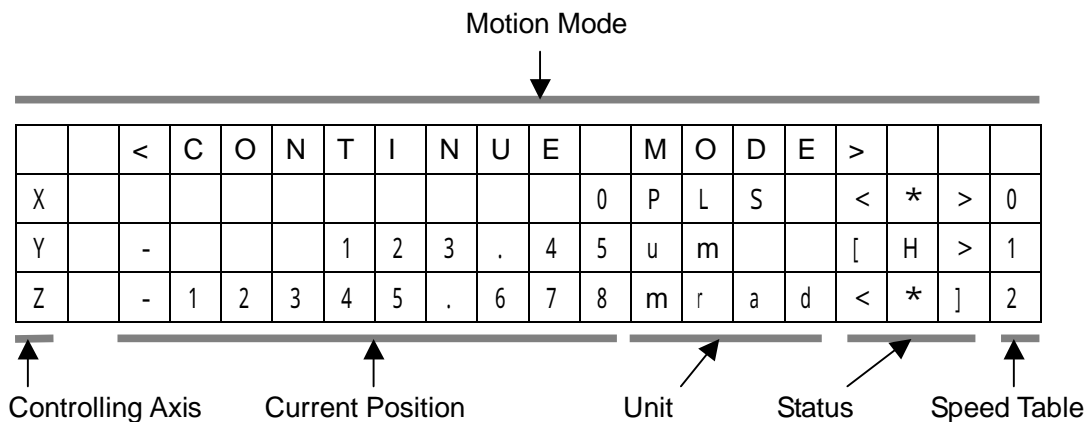
### 3.2.2. MAIN MENU

Main menu appears after the power of controller is turned on.

Each axis is driven when motion mode is either of CONTINUE / STEP / POINT / ORIGIN / HOME mode.

Once a command through external interface is received, it will switch motion mode to REMOTE mode.

- When emergency button of controller or Handy Terminal is pressed, main menu will not appear. Please release emergency button before turning the power on. See 1.6.1 and 1.6.3 for how to release emergency button.
- See Chapter 4 for information on REMOTE mode.



#### **[Motion Mode]**

Display a current motion mode selected by **MODE** or **ORG** button.

(CONTINUE / STEP / POINT / ORIGIN / HOME / REMOTE)

- REMOTE mode appears when a command through external interface is received.

#### **[Controlling Axis]**

Display an axis receiving command. (X, Y, Z, U, V, W)

- When all of more than four controlling axes are stopped while motion mode is REMOTE mode, controlling axes will be switched as following by pressing  button.

D254 → Controlling axes XYZ U

D255 → Controlling axes XYZ UV

D256 → Controlling axes XYZ UVW

**[Current Position]**

Display current position of controlling axis

**[Unit]**

Display a unit selected by parameter (PLS, um, mm, deg, mrad)

**[Status]**

Display status of axis receiving command.

- < : Detecting Mechanical Limit at + (CW) side
- > : Detecting Mechanical Limit at - (CCW) side
- [ : Detecting Software Limit at + (CW) side
- ] : Detecting Software Limit at - (CCW) side
- \* : Mechanical Origin is detected by Origin Return process and at halt
- H : At Home position
- When mechanical limit and software limit were detected at the same time, mechanical limit will be displayed prior to software limit.
- When display of origin detection and home position display occurs at the same time, display of origin detection comes prior to home position display.

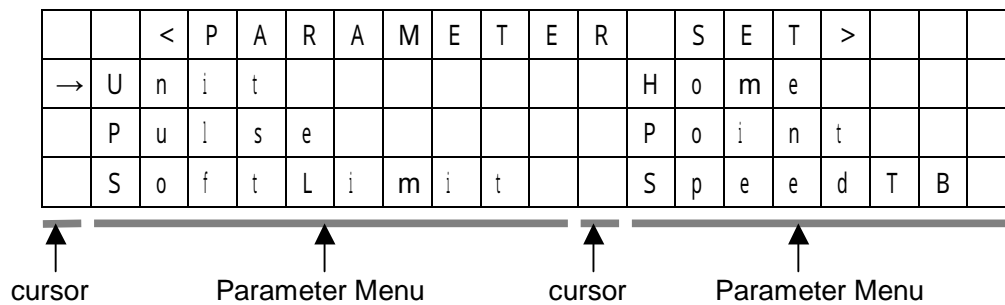
**[Speed Table]**

Display In-selection Speed Table number for each axis (0 ~ 9)

### 3.2.3. Parameter Setting Screen

When it is Main screen and all the axes are not in motion and motion mode is at other than REMOTE MODE, press **MENU** to go to Parameter Setting Screen in order to change parameter setting.

- On receipt of command from external interface, it does NOT switch to REMOTE MODE.
- Axes cannot be driven when you are at Main screen.
- All parameters are backed up on memory by EEPROM.



<b>Unit</b>	Go to Unit Setting screen
<b>Pulse</b>	Go to Pulse Setting screen
<b>SoftLimit</b>	Go to Soft Limit Setting screen
<b>Home</b>	Go to Home position Setting screen
<b>Point</b>	Go to Point Setting screen
<b>SpeedTB</b>	Go to Speed Table Setting screen

~ Setting Process ~

Bring a cursor to a parameter menu you want to change by using ten key (**2**, **4**, **6**, **8**). Press **MODE** or **ORG** in order to go back to a previous motion mode that is right before parameter setting is done.

**ENTER** to choose.

Parameter setting screen will appear.

### 3.2.3.1 Unit Setting Screen 1 & 2 <STAGE DISPLAY UNIT>

When unit setting is done, travel amount of motorized stage can be indicated in arbitrary unit. With this setting, you can skip a process of “calculating how many  $\mu\text{m}$  has it traveled per 1 pulse”.

At parameter setting screen (See 3.2.3), bring a cursor to Unit by using ten key (2, 4, 6, 8). Press **ENTER** and see Unit Setting Screen 1 appearing as below.

<	S	T	A	G	E		D	I	S	P	L	A	Y		U	N	I	T	>
	→	X	a	x	i	s													
		Y	a	x	i	s													
		Z	a	x	i	s													

cursor

Controlling axis

Set a cursor to an axis you want for unit settings. Use cursor key 2, 8.

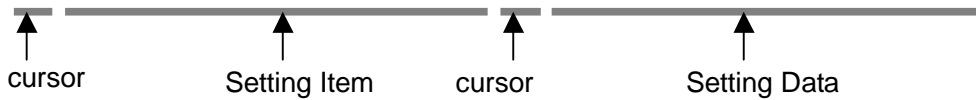
- Press **ESC** key to return to Parameter Setting screen.

**ENTER** to choose.

After completing the above setting process, Unit Setting Screen 2 for the selected axis will appear as in the next page.

Example) Unit Setting Screen for X-axis

→	X	s	t	a	n	d	a	r	d		0	.	0	0	0	0	0	0	1
	X	u	n	i	t						m	m							
	X	d	r	d	i	v					1	/	1						
	X	r	e	s	o	l	u	t			0	.	0	0	0	0	0	0	1



Setting Item	Content	Setting Data Range	Default
X standard	Set travel distance per pulse for full step of X-axis * Suit a setting to the resolution of stage in use.	0.0000001~ 99999999	1
X unit	Set Unit of X-axis * Travel distance per pulse varies by stages. Change it in accordance with setting of X standard. * mrad can be used as customer's arbitrary unit.	PLS / um / mm / deg / mrad	PLS
X drdiv	Set the number of steps (the number of division) of a driver	1/1 ~ 1/250	1/1
X resolut	Display travel distance per pulse for X-axis X standard (travel distance) ÷ X drdiv ( the number of steps)	No setting is available	1

\* Decimal place of each axis is determined by the minimum unit of driving (travel distance per pulse), which is determined by stage's travel distance and the setting of number of steps.

Example: Stage's travel distance = 1um

Number of Steps = 1/2 (Half-step)

Travel distance per pulse = 0.5 μm (one digit after decimal point)

The following is the unit setting process for the selected axis.

~ Setting Process ~

Bring a cursor to setting item you want to change by using ten key (2, 8)

- When a cursor is at setting item, press **ESC** to return to Unit Setting Screen 1.

**ENTER** to choose. (A cursor moves to front of setting data.)

- Press **ESC** to return a cursor to setting item.

Input setting data. (□ means a type of axis.)

- □standard Input (Travel distance per pulse of motorized stage / full-step)  
Input arbitrary number by ten key (Setting Range: 0.0000001 ~ 99999999) (Default:1)
  - □unit Input (Unit)  
Select arbitrary unit (PLS/um/mm/deg/mrad) by ten key (**2**, **8**) (Default:PLS)  
Every time when **2** is pressed, unit switches from PLS → mrad→ deg →mm → um → PLS.  
Every time when **8** is pressed, unit switches from PLS → um→ mm→ deg →mrad →PLS.
  - □drdiv Input (Number of driver's dividing steps)  
Select arbitrary number by ten key (2, 8) (Default: 1/1)  
Every time when 2 is pressed, number switches from 1/1 →1/250→1/200 ··· 1/2 → 1/1.  
Every time when 8 is pressed, number switches from 1/1 →1/2 ··· 1/200→1/250→ 1/1.
    - At □resolut, a number that is calculated from numbers of □standard and □drdiv will appear. Ex.) When □standard is 0.02 and □drdiv is 1/2, □resolut becomes 0.01.
    - When □unit is PLS, regardless of the number of □drdiv, the number of □standard and □resolut becomes 1.
- Press ENTER to register setting data and return a cursor to setting item.
- In case of continuing input process to other setting items, go back to process 1 .
  - Input and correction of setting data can be done as following.

**<When data input is not done yet>**

<b>BS</b>	Does not function
<b>CLR</b>	Does not function
<b>ESC</b>	Return cursor to axis without changing data

**<When data input is done by ten key>**

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

**3 . 2 . 3. 2 Constant Step Pulse Setting Screen <STEP PULSE SET>**

When constant pulse setting is done, you can drive a stage by a set amount simply by pressing **+** or **-** button once. With this function, repeated motion of driving a certain distance can be easily operated.

- Setting can be also changed through shortcut key.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

**<When Not Using Shortcut>**

At Parameter Setting Screen (See 3.2.3), bring a cursor to Pulse by using ten key (2, 4, 6, 8). Press **ENTER** and see Constant Step Pulse Setting Screen appearing as below.

	<	S	T	E	P		P	U	L	S	E		S	E	T	>	
→	X								1	0	0		P	L	S		
	Y					1	2	.	3	4	5		u	m			
	Z					0	.	0	1	2	3		d	e	g		

↑ cursor      ↙ Axis      ↘ cursor      ↑ Setting Data

~ Setting Process ~

- Set a cursor to an axis you want for pulse setting. Use ten key 2, 8.
- When a cursor is at Axis, press **ESC** to return to Parameter Setting Screen. Press **ENTER** to choose. (A cursor will move to front of setting data.)
- Press **ESC** or **ENTER** to return a cursor to Axis. Input setting data by ten key. Setting Range: 0 ~ 99999999 (Default:: 1) Unit can be selected by parameter at Unit Setting Screen (See 3.2.3.1). Press **ENTER** to register the setting data and return a cursor to Axis.
- In case of continuing input process to other setting items, go back to process1.

**<When Using Shortcut>**

When it is Main screen and all the axes are not in motion and motion mode is at other than REMOTE MODE, an amount of constant step pulse can be set without going through Parameter Setting Screen (See 3.2.3) by following the setting process below.

~ Setting Process ~

Press **BS** key while pressing Axis Selection button that you want to change (one of **X/U**, **Y/V**, **Z/W**).

Constant Step Pulse Setting Screen will appear.

- A cursor is in front of setting data of the axis selected.
- Press **ESC** to return a cursor to Axis.
- Press **ENTER** to quit setting process and return to Main menu.

Input setting data by ten key.

- Setting Range is the same as **<When Not Using Shortcut>**.  
Press **ENTER** to register the setting data and return to Main menu.

#### <Common Items>

- When setting data is not multiplied number of travel distance per pulse, data needs to be adjusted.

$$k = \text{Setting Data} \div \text{travel distance per pulse (resolut)}$$

(Round decimal number of k)

$$\text{Adjusted Value} = k \times \text{travel distance per pulse (resolut)}$$

- Input and correction of setting data is as following.

#### <When data input is not done yet>

<b>BS</b>	Does not function
<b>CLR</b>	Does not function
<b>ESC</b>	Return cursor to axis without changing data

#### <When data input is done by ten key>

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

### 3 . 2 . 3 . 3 Soft Limit Setting Screen 1 & 2 <SOFT LIMIT SET>

When Soft Limit Setting is done, you can set a limit of a set value in addition to mechanical limit. With this function, the motion range of motorized stage can be controlled and it can be used as a supplemental function for safety protection.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

Do not use Soft Limit as final function for system protection. Use mechanical limit as system protection.

At Parameter Setting Screen (See 3.2.3), bring a cursor to SoftLimit by using ten key (2, 4, 6, 8). Press **ENTER** and see Soft Limit Setting Screen 1 appearing as below.

	<	S	O	F	T		L	I	M	I	T		S	E	T	>	
→	X	a	x	i	s												
	Y	a	x	i	s												
	Z	a	x	i	s												

↑
↑  
 cursor                      Setting Axis

~ Setting Process ~

Set a cursor to an axis you want to change settings. Use ten key 2, 8. **ENTER** to choose.

- Press **ESC** to return to Parameter Setting Screen.

After completing the setting process above, Soft Limit Setting Screen 2 for the selected axis will appear as below.

Example) X-axis Soft Limit Setting Screen

→	X	+	S	L							1	0	0	P	L	S
	X	+	S	E		O	N									
	X	-	S	L		-					1	0	0	P	L	S
	X	-	S	E		O	F	F								

↑
↑
↑
↑  
 cursor    Setting                      cursor                      Setting Data

Setting Item	Content	Setting Range	Default
X + SL	Set Soft Limit number in the + (CW) direction of X-axis.	-99999999 ~ 99999999 -9.9999999 ~ 9.9999999	99999999
X + SE	Enable (ON) / Unable (OFF) Soft Limit in the + (CW) direction of X-axis	ON / OFF	OFF
X - SL	Set Soft Limit number in the - (CCW) direction of X-axis.	-99999999 ~ 99999999 -9.9999999 ~ 9.9999999	-99999999
X - SE	Enable (ON) / Unable (OFF) Soft Limit in the - (CCW) direction of X-axis	ON / OFF	OFF

Following process can do unit setting of the selected axis.

~ Setting Process ~

Set a cursor to setting item you want to change. Use ten key **[2]**, **[8]**.

- When a cursor is at setting item, press **[ESC]** to return to Soft Limit Setting Screen 1. **[ENTER]** to choose. (A cursor will move to front of setting data.)
- Press **[ESC]** or **[ENTER]** to return a cursor to setting item.

Input setting data as following. (□ means a type of axis.)

- □+SL, □-SL Input

Use ten key to input a number.

Setting range is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

(Default: □+SL is 99999999 / □-SL is -99999999 )

Unit can be selected by parameters of Unit Setting Screen (See 3.2.3.1).

- □+ SE, □-SE Input

Use cursor key **[2]**, **[8]** to enable (ON) and unable (OFF). (Default:: OFF)

Setting can be switched between ON and OFF by pressing **[2]** or **[8]**.

Press **[ENTER]** to register the setting data and return a cursor to setting item.

- In case of continuing input process to other setting items, go back to process 1.
- When Soft Limit is detected, it stops immediately.
- Positional accuracy of stopped position in result of detecting Soft Limit is within 10 pulses at the time of MAX speed.
- Soft Limit does not function when origin return is in operation.
- When setting data is a not multiplied number of travel distance per pulse, the data needs to be adjusted.

$$k = \text{Setting Data} \div \text{travel distance per pulse (resolut)}$$

(Round decimal number of k)

$$\text{Adjusted Value} = k \times \text{travel distance per pulse (resolut)}$$

- Input and correction of setting data is as following.

**<When data input is not done yet>**

<b>[BS]</b>	Does not function
<b>[CLR]</b>	Does not function
<b>[ESC]</b>	Return cursor to axis without changing data

**<When data input is done by ten key>**

<b>[BS]</b>	Delete one letter being input right before
<b>[CLR]</b>	Clear number to 0
<b>[ESC]</b>	Recover original data

### 3.2.3.4 Home Position Setting Screen <HOME POSITION SET>

When Home Position Setting is done, you can drive a motorized stage to a set position of Home by pressing Axis Selection button of the axis you want to drive (one of **X/U**, **Y/V**, **Z/W**) and **ENTER**. With this function, Home Position can be used as the second origin other than origin limit.

After completing origin return, conduct positioning to an operating point and set that point as HOME position. Thereafter, positioning can be quickly conducted by reaching directly to the set HOME position after origin return. (This method can be used as same as POINT mode.)

- Setting can be also changed through shortcut key.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

#### <When Not Using Shortcut>

At Parameter Setting Screen (See 3.2.3), bring a cursor to Home by using ten key (**2**, **4**, **6**, **8**). Press **ENTER** and see Home Position Setting Screen appearing as below.

<	H	O	M	E		P	O	S	I	T	I	O	N		S	E	T	>	
→	X									1	0	0	P	L	S				
	Y					1	2	.	3	4	5	u	m						
	Z					0	.	0	1	2	3	d	e	g					

↑ cursor    ↙ Axis    ↘ cursor    ↑ Setting Data

Setting of Home Position can be done with the following process.

~ Setting Process ~

Set a cursor to an axis you want for setting. Use ten key **2**, **8**.

When a cursor is at Axis, press **ESC** to return to Parameter Setting Screen.

Press **ENTER** to choose. (A cursor will move to front of setting data.)

Press **ESC** or **ENTER** to return a cursor to Axis.

Input setting data by ten key.

Setting Range: 0 ~ 99999999, -9.9999999 ~ 9.9999999 (Default: 0)

Unit can be selected by parameters at Unit Setting Screen (See 3.2.3.1).

Press **ENTER** to register the setting data and return a cursor to Axis.

- In case of continuing input process to other setting items, go back to process 1 .

**<When Using Shortcut>**

When it is Main screen and all the axes are not in motion and motion mode is at other than REMOTE MODE, Home Position can be set without going through Parameter Setting Screen (See 3.2.3) by following the setting process below.

~ Setting Process ~

Press **CLR** key while pressing Axis Selection button that you want to change (one of **X/U**, **Y/V**, **Z/W**).

Home Position Setting Screen will appear.

- A cursor is in front of setting data of the axis selected.
- Press **ESC** to return a cursor to Axis.
- Press **ENTER** to quit setting process and return to Main menu.

Input setting data by ten key.

- Setting Range is the same as **<When Not Using Shortcut>**.

Press **ENTER** to register the setting data and return to Main menu.

**<Common Items>**

- When setting data is not multiplied number of travel distance per pulse, data needs to be adjusted.

$$k = \text{Setting Data} \div \text{travel distance per pulse (resolut)}$$

(Round decimal number of k)

$$\text{Adjusted Value} = k \times \text{travel distance per pulse (resolut)}$$

- Input and correction of setting data is as following.

**<When data input is not done yet>**

<b>BS</b>	Does not function
<b>CLR</b>	Does not function
<b>ESC</b>	Return cursor to axis without changing data

**<When data input is done by ten key>**

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

### 3.2.3.5 Point Setting Screen <POINT SET>

When Point Position Setting is done, you can drive a motorized stage to a set position of Point by pressing Axis Selection button of the axis you want to drive (one of **X/U**, **Y/V**, **Z/W**) and **ENTER**. With this function, Point Position can be used as the second origin other than origin limit.

After completing origin return, conduct positioning to an operating point and set that point as Point position. Thereafter, positioning can be quickly conducted by reaching directly to the set Point position after origin return. (This method can be used as same as Home mode.)

- Setting can be also changed through shortcut key.

**Caution:** When the power of controller is turned off, current position will be 0 (cleared). In order to avoid conflict between controller and peripheral when the power is turned on, please operate origin return to check a position prior to turning off the power.

#### <When Not Using Shortcut>

At Parameter Setting Screen (See 3.2.3), bring a cursor to Point by using ten key **[2]**, **[4]**, **[6]**, **[8]**. Press **ENTER** and see Point Setting Screen appearing as below.

					<	P	O	I	N	T		S	E	T	>				
→	X									1	0	0	P	L	S				
	Y						1	2	.	3	4	5	u	m					
	Z						0	.	0	1	2	3	d	e	g				

↑ cursor    ↙ Axis    ↘ cursor    ↑ Setting Data

Setting of Point Position can be done with the following process.

~ Setting Process ~

Set a cursor to an axis you want for setting. Use ten key **[2]**, **[8]**.

- When a cursor is at Axis, press **ESC** to return to Parameter Setting Screen.  
Press **ENTER** to choose. (A cursor will move to front of setting data.)
- Press **ESC** or **ENTER** to return a cursor to Axis.

Input setting data by ten key.

Setting Range: 0 ~ 99999999, -9.9999999 ~ 9.9999999 (Default: 0)

Unit can be selected by parameters at Unit Setting Screen (See 3.2.3.1).

Press **ENTER** to register the setting data and return a cursor to Axis.

- In case of continuing input process to other setting items, go back to process 1.

#### <When Using Shortcut>

When it is Main screen and all the axes are not in motion and motion mode is at other than REMOTE MODE, Point Position can be set without going through Parameter Setting Screen (See 3.2.3) by following the setting process below.

~ Setting Process ~

Press **ESC** key while pressing Axis Selection button that you want to change (one of **X/U**, **Y/V**, **Z/W**).

Point Position Setting Screen will appear.

- A cursor is in front of setting data of the axis selected.
- Press **ESC** to return a cursor to Axis.
- Press **ENTER** to quit setting process and return to Main menu.

Input setting data by ten key.

- Setting Range is the same as <When Not Using Shortcut>.

Press **ENTER** to register the setting data and return to Main menu.

#### <Common Items>

- When setting data is not multiplied number of travel distance per pulse, data needs to be adjusted.

$k = \text{Setting Data} \div \text{travel distance per pulse (resolut)}$

(Round decimal number of k)

Adjusted Value =  $k \times \text{travel distance per pulse (resolut)}$

- Input and correction of setting data is as following.

<When data input is not done yet>

<b>BS</b>	Does not function
<b>CLR</b>	Does not function
<b>ESC</b>	Return cursor to axis without changing data

<When data input is done by ten key>

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

### 3.2.3.6 Speed Table Setting Screen <SPEED TB SET>

Speed table can be set among 10 types (No.0 ~ No.9).  
 When Speed Table Setting is done, you can input No. of Speed Table by ten key while pressing Axis Selection button of the axis you want to drive (one of **X/U**, **Y/V**, **Z/W**).  
 With this function, motorized stage be can be driven without going through details speed setting since the setting can be selected from 10 types of Speed Tables.

**Caution:** When a set speed is driving speed (F) of more than MAX speed for a motorized stage, motor may result in stepping-out.

When an input speed for Start-up velocity (L) is larger than driving speed (F), the speed for driving speed (F) becomes a speed for Star-up velocity (L). (Display content does not indicate the change.)

At Parameter Setting Screen (See 3.2.3), bring a cursor to Speed TB by using ten key **2**, **4**, **6**, **8**). Press **ENTER** and see Speed Table Setting Screen appearing as below.

N	o	L	p	p	s	F	p	p	s	R	m	s	e	c
0	→			1	0				1	0				1
1				5	0				5	0				1
2		1	0	0				1	0	0				1

↑  
Table No..

↑  
cursor

↑  
L Setting Data

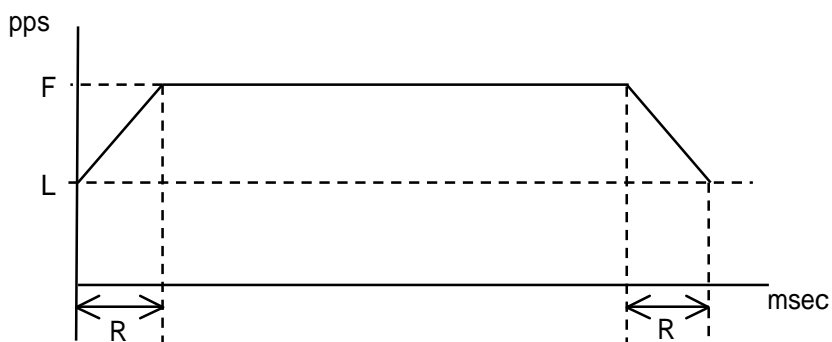
↑  
cursor

↑  
F Setting Data

↑  
cursor

↑  
R Setting Data

- Relationship among Start-up Velocity (Lpps), Driving speed (Fpps), and Rate of Acceleration & Deceleration (Rmsec) is indicated in the below figure.



Speed Table No. is as following.

	Content	Setting Range	Default
Speed TB No. 0	Start-up Velocity (L)	1 ~ 9999 pps	10 pps
	Driving Speed (F)	1 ~ 999999 pps	10 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	1 msec
Speed TB No. 1	Start-up Velocity (L)	1 ~ 9999 pps	50 pps
	Driving Speed (F)	1 ~ 999999 pps	50 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	1 msec
Speed TB No. 2	Start-up Velocity (L)	1 ~ 9999 pps	100 pps
	Driving Speed (F)	1 ~ 999999 pps	100 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	1 msec
Speed TB No. 3	Start-up Velocity (L)	1 ~ 9999 pps	100 pps
	Driving Speed (F)	1 ~ 999999 pps	500 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	100 msec
Speed TB No. 4	Start-up Velocity (L)	1 ~ 9999 pps	100 pps
	Driving Speed (F)	1 ~ 999999 pps	1000 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	100 msec
Speed TB No. 5	Start-up Velocity (L)	1 ~ 9999 pps	100 pps
	Driving Speed (F)	1 ~ 999999 pps	2000 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	100 msec
Speed TB No. 6	Start-up Velocity (L)	1 ~ 9999 pps	100 pps
	Driving Speed (F)	1 ~ 999999 pps	5000 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	100 msec
Speed TB No. 7	Start-up Velocity (L)	1 ~ 9999 pps	1000 pps
	Driving Speed (F)	1 ~ 999999 pps	10000 pps
	Rate of Acceleration & Deceleration (R)	1 ~ 9999 msec	100 msec

	Content	Setting Range	Default
Speed TB No. 8	Start-up Velocity(L)	1 ~ 9999 pps	1000 pps
	Driving Speed(F)	1 ~ 999999 pps	20000 pps
	Rate of Acceleration & Deceleration(R)	1 ~ 9999 msec	100 msec
Speed TB No. 9	Start-up Velocity(L)	1 ~ 9999 pps	1000 pps
	Driving Speed(F)	1 ~ 999999 pps	50000 pps
	Rate of Acceleration & Deceleration(R)	1 ~ 9999 msec	100 msec

Depending on specifications of pulse controller, speed setting that is more than 32768 pps results in difference between a setting speed and actual speed.

Set(ting) Speed	Interval of Speed	Actual Speed
1 ~ 32767 pps	1 pps	Every 1 pps (set speed = actual speed)
32768 ~ 65534 pps	2 pps	Every 2 pps (32768, 32770, ----)
65534 ~ 98301 pps	3 pps	Every 3 pps (65534, 65537, ----)
98302 ~ 163835 pps	5 pps	Every 5 pps (98302, 98307, ----)
163836 ~ 327670 pps	10 pps	Every 10 pps (163836, 163846, ----)
327671 ~ 983010 pps	30 pps	Every 30 pps (327671, 327701, ----)
983011 ~ 999999 pps	50 pps	Every 50 pps (983011, 983061, ----)

When setting speed is 59999, actual driving speed is 59998pps.

$59999 / 2 = 29999$  (cut off digit below decimal)  $29999 * 2 = 59998$

Speed Table Setting can be done with the following process.

~ Setting Process ~

Set a cursor (\*) at setting data you want to change. Use ten key (2, 4, 6, 8).

- Every time when 2, 8 is pressed, it scrolls a screen up and down.
- When cursor is \*, press ESC to return to Parameter Setting Screen.

Press ENTER to choose. (Cursor changes from "\*" to "→".)

- Press ESC or ENTER to change a cursor back to "\*".

Input setting data by using ten key.

L Data Setting Range: 1 ~ 9999, unit is pps

F Data Setting Range: 1 ~ 999999, unit is pps

R Data Setting Range: 1 ~ 9999, unit is msec

Press **ENTER** to register the setting data.

- In case of continuing input process to other setting items, go back to process 1
- Input and correction of setting data is as following.

**<When data input is not done yet>**

<b>BS</b>	Does not function
<b>CLR</b>	Does not function
<b>ESC</b>	Return cursor to axis without changing data

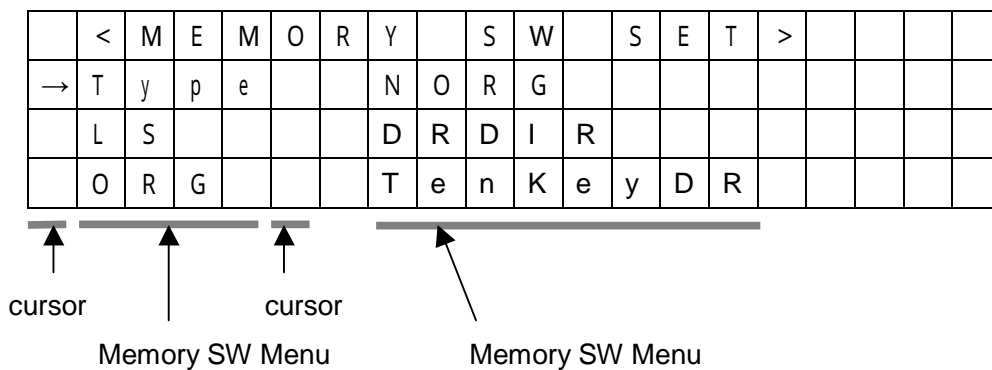
**<When data input is done by ten key>**

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

### 3.2.4. Memory Switch Setting Screen

When it is Main screen and all the axes are not in motion and when motion mode is other than REMOTE MODE, press **MENU** to go to Parameter Setting Screen. Press **MENU** again to go to Memory Switch Setting Screen in order to change memory switch setting.

- On receipt of command through external interface, it does not change motion mode to REMOTE mode.
- While you are at Memory Switch Setting Screen, axis cannot be driven.
- All parameters will be backed up on memory by EEPROM.



Memory SW	Content	Setting Range	Default
Type	Open <ORIGIN TYPE SET> screen	0 ~ 12	0
LS	Open <LIMIT SENSOR TYPE> screen	A, B	B
ORG	Open <ORG SENSOR TYPE > screen	A, B	B
NORG	Open <NORG SENSOR TYPE> screen	A, B	B
DRDIR	Open <DRIVE DIRECTION> screen	POSITIVE / NEGATIVE	POSITIVE
TenKeyDR	Open <TEN KEY DRIVE SET> screen	N, X, Y, Z or N, U, V, W	N

Memory Switch Setting can be done by the following setting process.

~ Setting Process ~

- Set a cursor key to Memory SW menu that you change settings by ten key (**2**, **4**, **6**, **8**).
- Press **MODE** or **ORG** to return to previous motion mode of which is before Memory SW setting is done.  
Press **ENTER** to choose.  
Setting screen of each Memory SW menu will appear.

### 3.2.4.1 Origin Return Setting Screen <ORG TYPE SET>

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to Type by ten key (2, 4, 6, 8). Then, press ENTER so that origin type setting screen will appear as following.

- See the following pages for information on types of origin return.

	<	O	R	I	G	I	N		T	Y	P	E		S	E	T	>		
→	X		1																
	Y		2																
	Z		3																

↑ cursor      ← Axis      ← cursor      ← Setting

~ Setting Process ~

- Set a cursor to Axis you want to change settings. Use ten key 2, 8.
- When a cursor is at Axis, press ESC to return to Memory SW Setting Screen. Press ENTER to choose.
- Press ESC or ENTER to bring a cursor back to Axis.
  - Select a type of origin return (0 ~ 12) by ten key 2, 8. (Default: 0)
  - Every time when 2 is pressed, type No. switches from 0 → 12 → 11 → ... → 2 ( 1 ( 0.
  - Every time when 8 is pressed, type No. switches from 0 ( 1 ( 2 ( ... ( 11 ( 12 ( 0.
- When type No. 0 is selected, there will be no origin return motion.
- When there is an incorrect input, use ESC.
- Press ENTER to register setting data and return a cursor to Axis.
- In case of continuing input process to other setting items, go back to process 1

**Table of Origin Return Type**

Type	Motion	Applied Sensor
0	No Origin Return	---
1	Begin to detect in the CCW direction and detect CW side edge of NORG signal. Then detect CCW side edge of ORG signal.	CWLS/NORG /ORG/CCWLS
2	Begin to detect in the CW direction and detect CCW side edge of NORG signal. Then detect CW side edge of ORG signal.	CWLS/NORG /ORG/CCWLS
3	Detect in the CCW direction and detect CCW side edge of ORG signal.	CWLS /ORG/CCWLS
4	Detect in the CW direction and detect CW side edge of ORG signal.	CWLS /ORG/CCWLS
5	Detect in the CCW direction and detect CW side edge of CCWLS signal.	CWLS/CCWLS
6	Detect in the CW direction and detect CCW side edge of CWLS signal.	CWLS /CCWLS
7	After operating Type 1, detect CCW side edge of TIMING signal.	CWLS/NORG /ORG/CCWLS
8	After operating Type 2, detect CW side edge of TIMING signal.	/ CWLS/NORG /ORG/CCWLS
9	After operating Type 3, detect CCW side edge of TIMING signal.	CWLS /ORG/CCWLS
10	After operating Type 4, detect CW side edge of TIMING signal.	CWLS /ORG/CCWLS
11	After operating Type 5, detect CCW side edge of TIMING signal.	CWLS/CCWLS
12	After operating Type 6, detect CW side edge of TIMING signal.	CWLS/CCWLS

- We recommend you to read catalogs of motorized stages

**Recommended Origin Return Method**

<Table of recommended origin return methods for Suruga Seiki's motorized stages>

Type of Origin Return	Motorized Stage Model
1, 2, 7, 8	KS102, KS103, KS111, KS112, KS121, KS122
3, 4, 9, 10	PG-Series, KX-Series, KS101, KS161, KS162, KS332, KS401, KS402, KS501-60, KG05, KG07, KGB07, KH06, KH07, KS332, KS421, KS451
5, 6, 11, 12	KS501-40, KR04-B, KR06-B

- 3 sensor stage cannot use 1,2,7,8 type , and 4 sensor stage cannot use 3,4,9,10 type. However, When it uses Standard cable, PG-Series, KX-Series, KG05, KG07, KGB07, KH06, KH07 becomes 3 sensor stage.

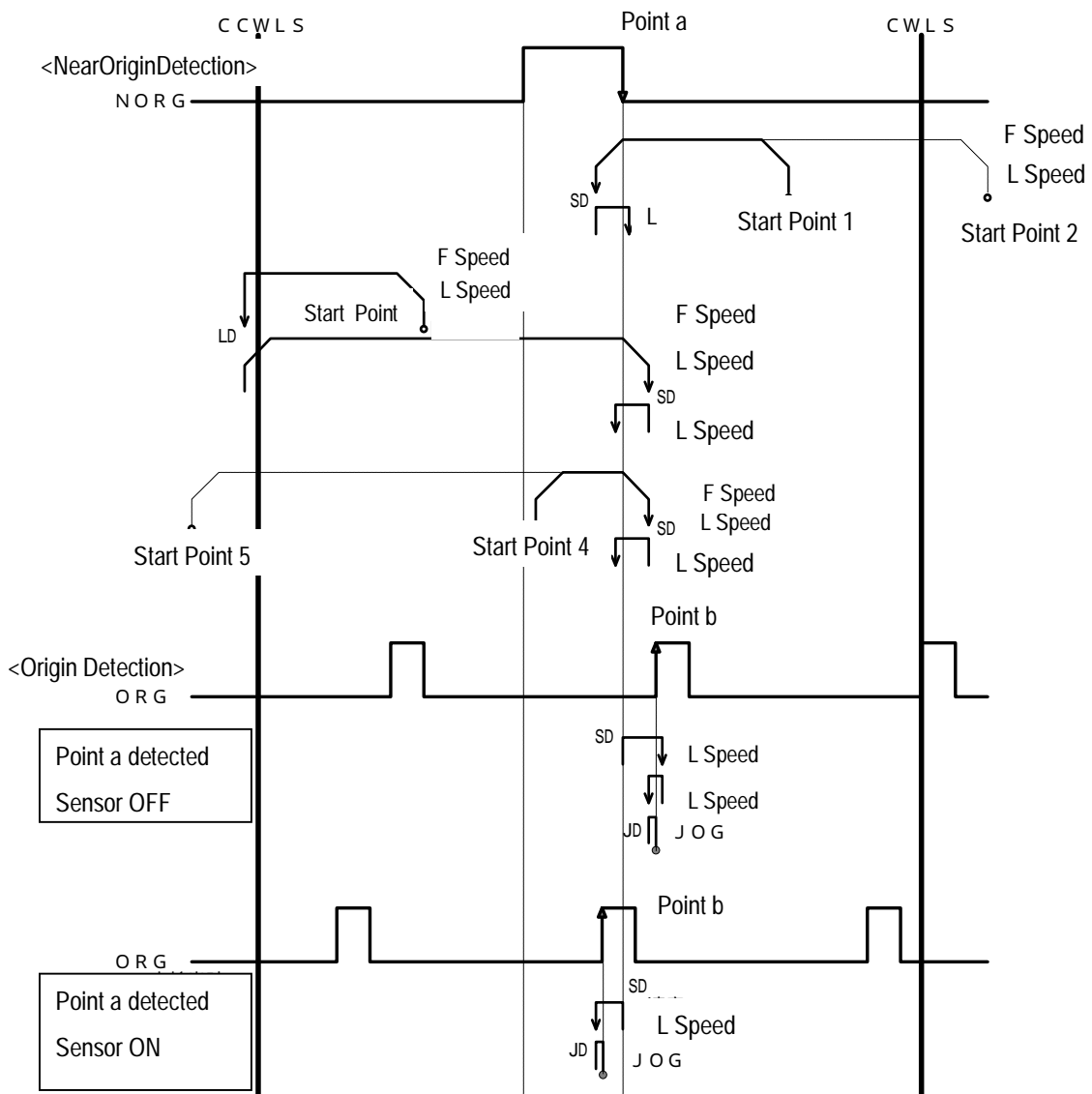
Sequence of Origin Return is as following.

[Type 0]

No Origin Return

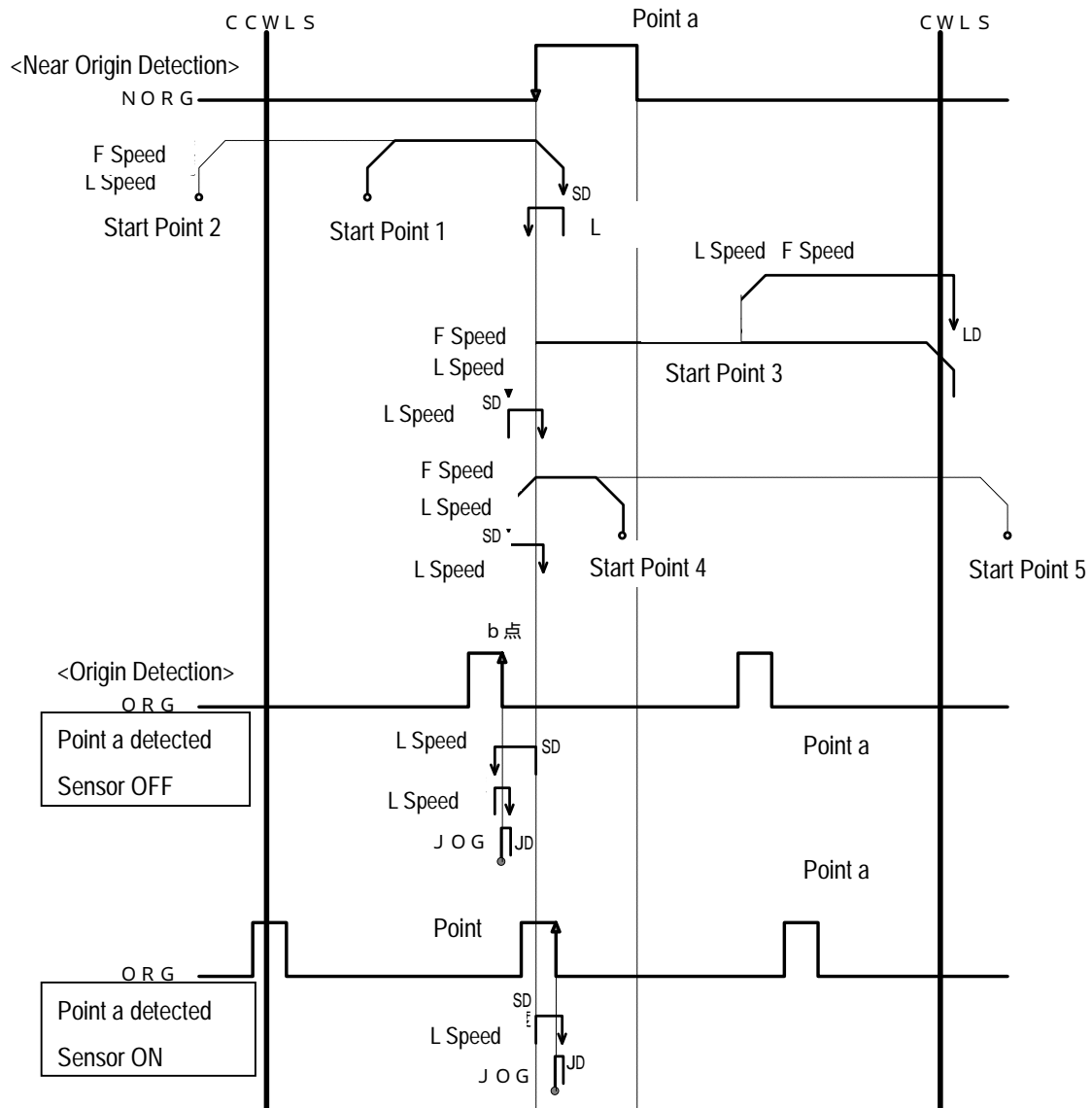
[Type 1]

Begin to detect in the CCW direction and detect CW side edge (point a) of NORG signal. Then, detect CCW side edge (point b) of ORG signal.



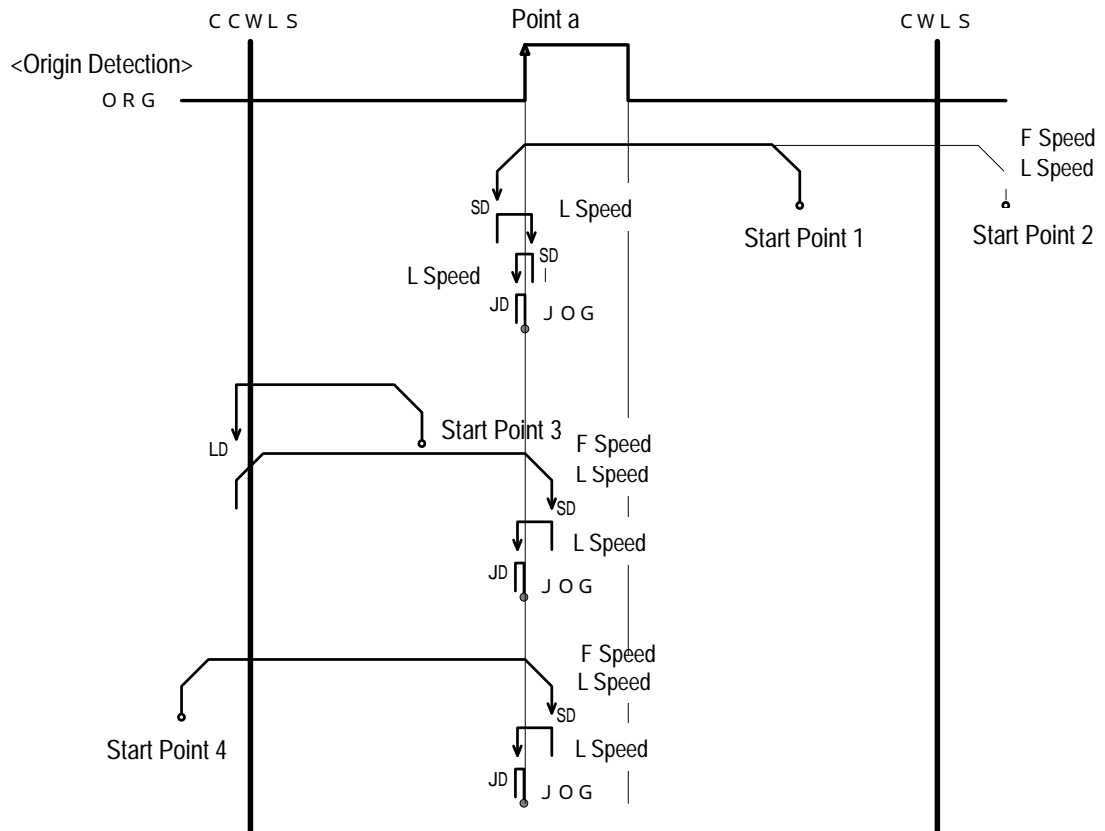
[Type 2]

Begin to detect in the CW direction and detect CCW side edge (point a) of NORG signal. Then detect CW side edge (point b) of ORG signal.



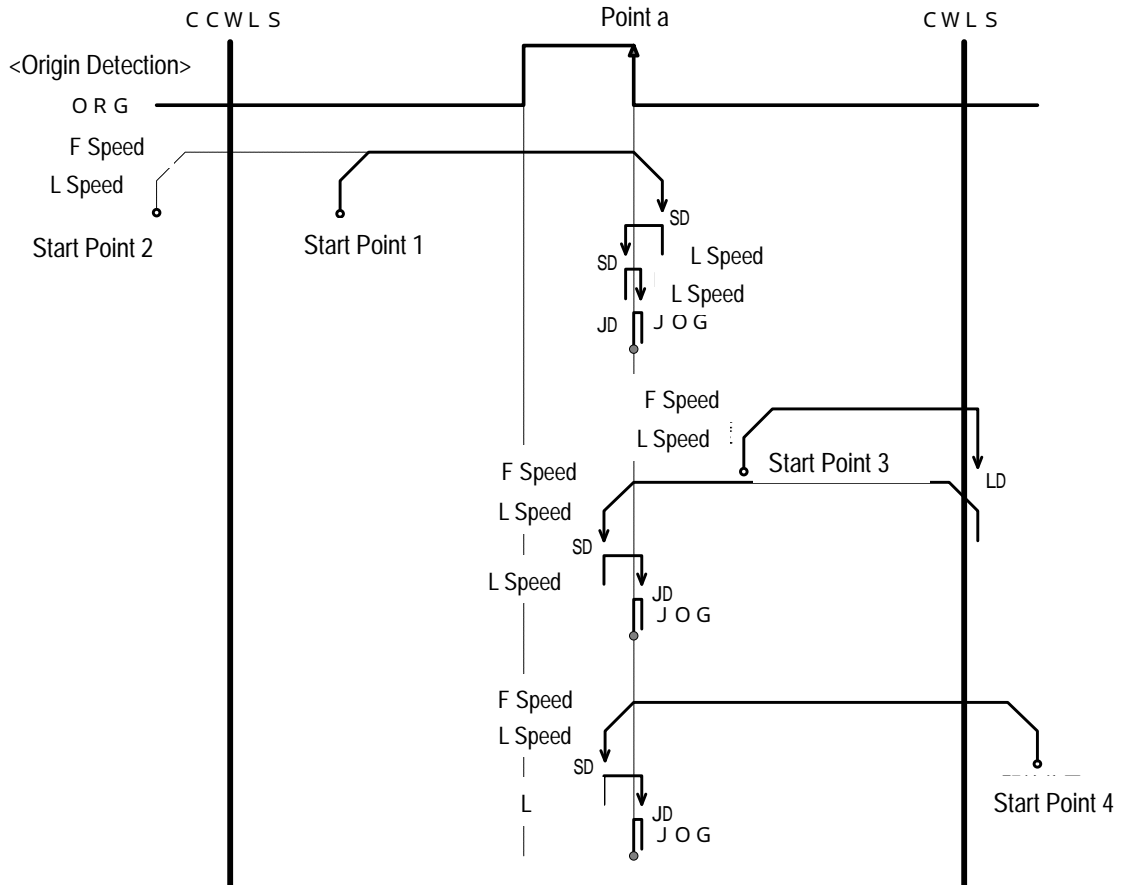
[Type 3]

Detect in the CCW direction and detect CCW side edge (point a) of ORG signal.



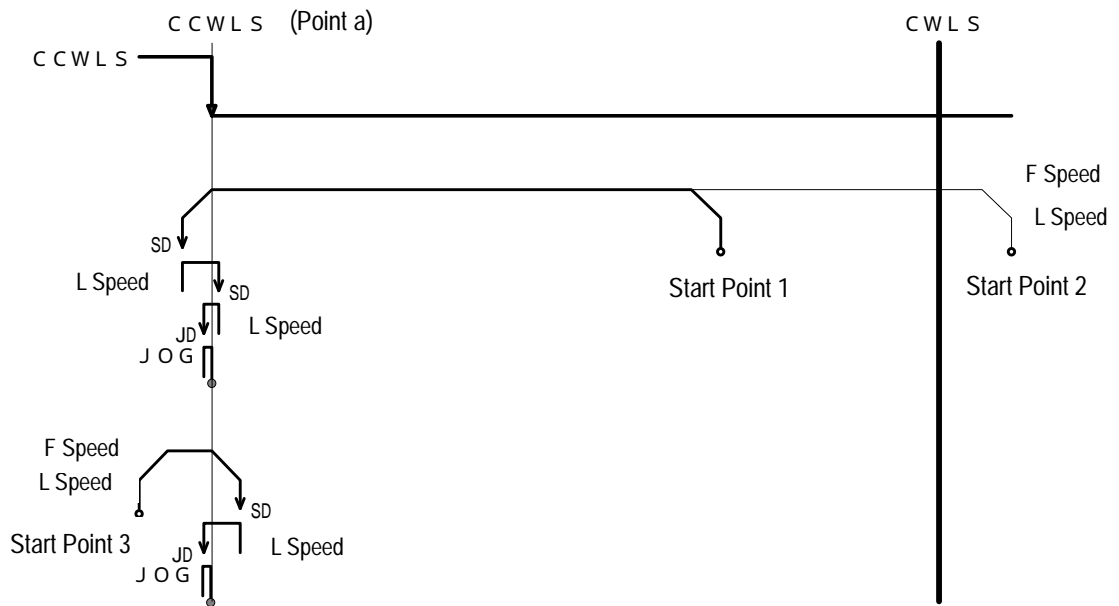
[Type 4]

Detect in the CW direction and detect CW side edge (point a) of ORG signal.



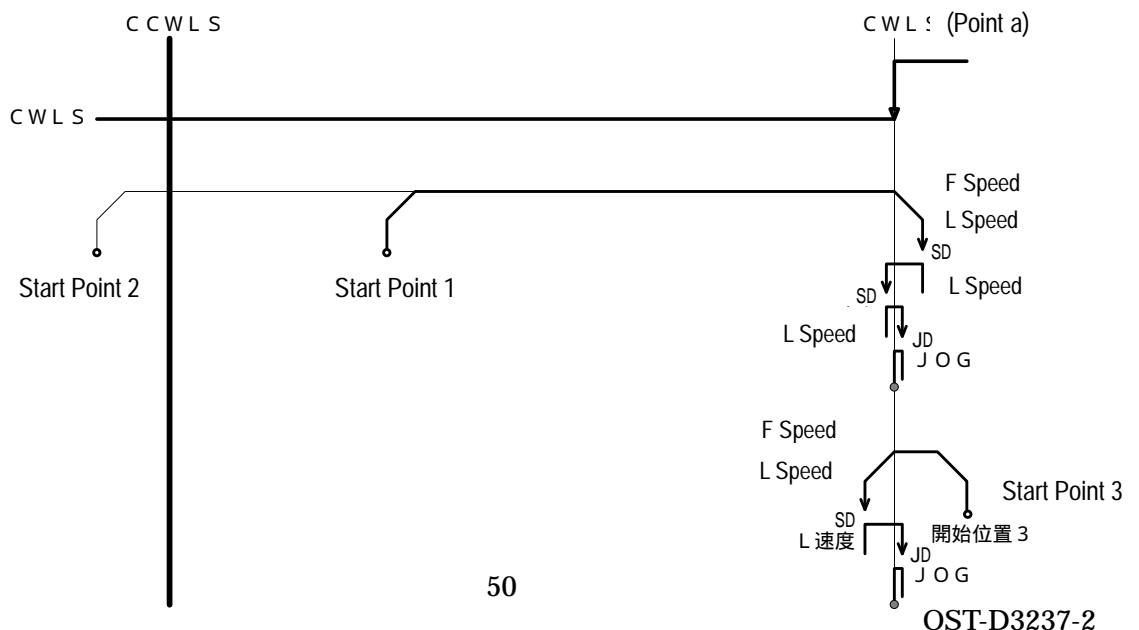
[Type 5]

Detect in the CCW direction and detect CW side edge (point ) of CCWLS signal.



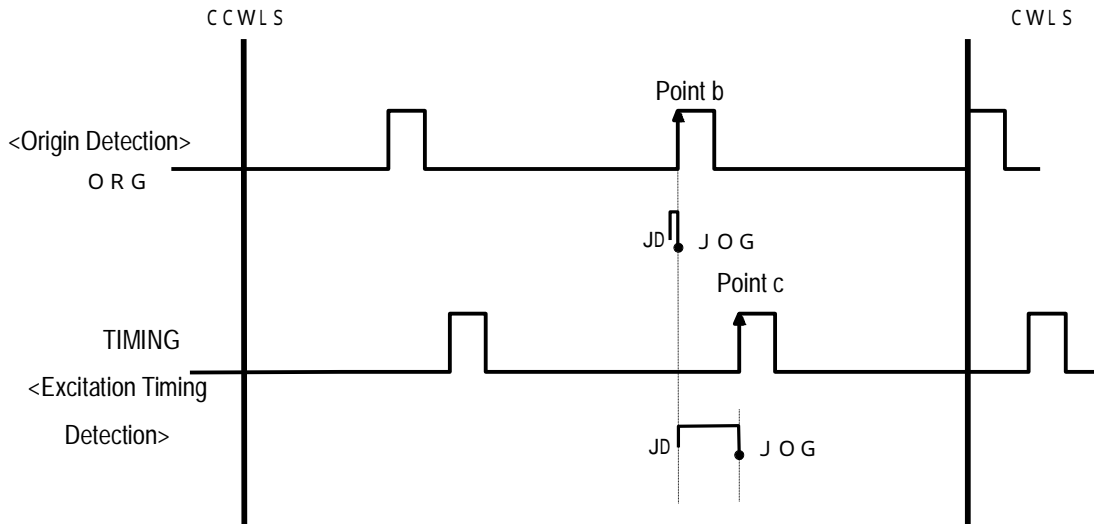
[Type 6]

Detect in the CW direction and detect CCW side edge (point a) of CWLS signal.



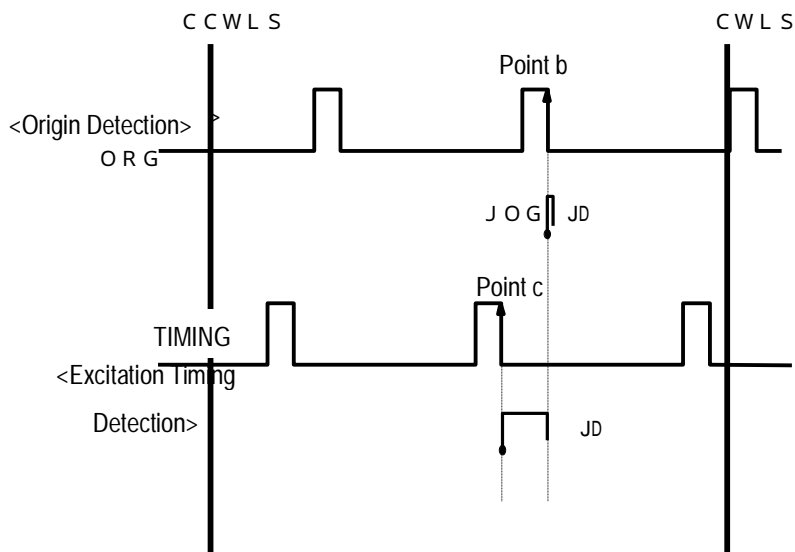
[Type 7]

After operating Type 1, detect CCW side edge (point c) of TIMING signal.



[Type 8]

After operating Type 2, detect CW side edge (point c) of TIMING signal.



[Type 9]

After operating Type 3, detect CCW side edge of TIMING signal.

[Type 10]

After operating Type 4, detect CW side edge of TIMING signal.

[Type 11]

After operating Type 5, detect CCW side edge of TIMING signal.

[Type 12]

After operating Type 6, detect CW side edge of TIMING signal.

○	Detection starting position
●	Detection ending position
F Speed	Driving Speed (Set Speed)
L Speed	Start-up Velocity (Set Speed)
JD (JOG)	Detect JOG interval delay time (JD = L Speed)
LD	Delay time from Limit detection to halt (300 msec)
SD	Delay time from Sensor detection to halt (300 msec)

### 3.2.4.2 Mechanical Limit Input Logic Sensor Setting Screen <LIMIT SENSOR TYPE>

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to LS by ten key (2, 4, 6, 8). Then, press **ENTER** so that Mechanical Limit setting screen will appear as following.

- When mechanical limit sensor is detected, it stops immediately.
- When origin return process is being operated, it follows the sequence of origin return.

<	L	I	M	I	T		S	E	N	S	O	R		T	Y	P	E	>	
→	X		B																
	Y		B																
	Z		B																

↑ cursor      ↙ Axis      ↘ cursor      ↖ Setting Data

<Input Logic for Setting Data>

Setting Data	Content
A	Input logic is Normal-open (Contact Point A)
B	Input logic is Normal-Closed (Contact Point B). For connecting with Suruga's motorized stage, this is the setting to be chosen.

Setting of Mechanical Limit Sensor Input Logic can be done by the following setting process.

~ Setting Process ~

Set a cursor to Axis you want to change settings. Use ten key 2, 8.

- When a cursor is at Axis, press **ESC** to return to Memory SW Setting Screen.

Press **ENTER** to choose. (A cursor moves to front of setting data.)

- Press **ESC** or **ENTER** to bring a cursor back to Axis.

Select a setting of Input Logic (A / B) by ten key 2, 8. (Default: B)

- When there is an incorrect input, use **ESC**.

Press **ENTER** to register setting data and return a cursor to Axis.

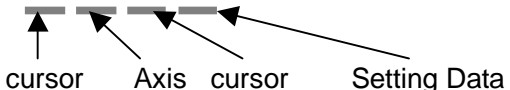
- In case of continuing input process to other setting items, go back to process 1

### 3.2.4.3 Origin Sensor Input Logic Setting Screen <ORG SENSOR TYPE>

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to ORG by ten key (2, 4, 6, 8). Then, press **ENTER** so that Origin Sensor setting screen will appear as following.

- When origin return process is being operated, it follows the sequence of origin return.

	<	O	R	G		S	E	N	S	O	R		T	Y	P	E	>	
→	X		B															
	Y		B															
	Z		B															



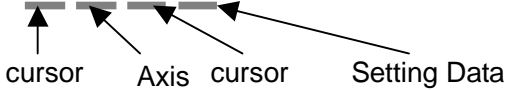
- Input Logic of setting data is the same as Mechanical Limit Sensor Input Logic. (See 3.2.4.2)
- Setting of Origin Sensor Input Logic is the same setting process as Mechanical Limit Sensor Input Logic.

### 3.2.4.4 Near Origin Sensor Input Logic Setting Screen <NORG SENSOR TYPE>

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to NORG by ten key (2, 4, 6, 8). Then, press **ENTER** so that Near Origin Sensor setting screen will appear as following.

- When origin return is being operated, it follows the sequence of origin return.

	<	N	O	R	G		S	E	N	S	O	R		T	Y	P	E	>	
→	X		B																
	Y		B																
	Z		B																



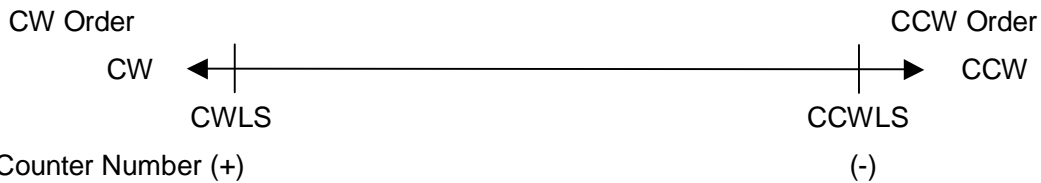
- Input Logic of setting data is the same as Mechanical Limit Sensor Input Logic. (See 3.2.4.2)
- Setting of Near Origin Sensor Input Logic is the same setting process as Mechanical Limit Sensor Input Logic.

### 3.2.4.5 Driving Direction Setting Screen <DRIVE DIRECTION>

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to DRDIR by ten key (2, 4, 6, 8). Then, press ENTER so that Driving Direction setting screen will appear as following.

- Rotation of motor can be reversed. POSITIVE operates a normal rotation and when NEGATIVE is set it operates reversed rotation.

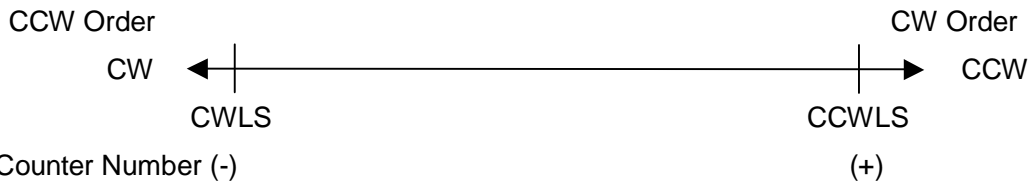
#### {POSITIVE}



Under CW order, motor rotates in CW direction. Counter is count up and stops at CWLS.

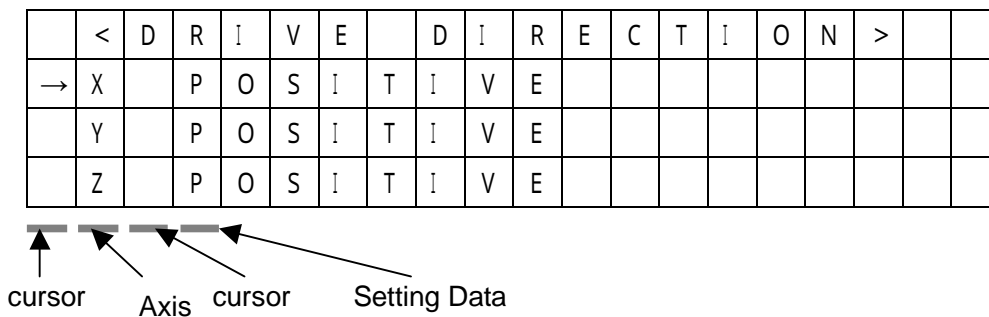
Under CCW order, motor rotates in CCW direction. Counter is count down and stops at CCWLS.

#### {NEGATIVE}



Under CW order, motor rotates in CCW direction. Counter is count up and stops at CCWLS.

Under CCW order, motor rotates in CW direction. Counter is count down and stops at CWLS.



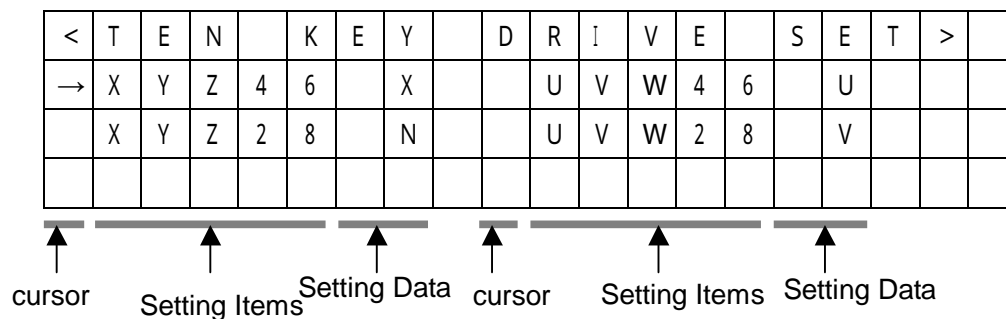
Select a setting of Drive Direction Control (POSITIVE / NEGATIVE) by ten key **[2]**, **[8]**.  
(Default: POSITIVE)

- When there is an incorrect input, use **[ESC]**.
- Press **[ENTER]** to register setting data and return a cursor to Axis.
- In case of continuing input process to other setting items, go back to process 1

### 3.2.4.6 TEN Key Driving Axis Setting Screen <TEN KEY DRIVE SET>

When Main screen is at CONTINUE or STEP mode, you can drive a motorized stage by using ten key.

When it is at Memory SW Setting Screen (See 3.2.4), bring a cursor to TenKeyDR by ten key (**[2]**, **[4]**, **[6]**, **[8]**). Then, press **[ENTER]** so that TEN Key Driving Axis setting screen will appear as following.



Setting Item	Content
XYZ 4 6	Drive motorized stage by using ten key <b>[4]</b> (CW direction) and <b>[6]</b> (CCW direction). Setting Range N: No Axis is selected (Default) X: Drive X-axis of stage by using ten key <b>[4]</b> and <b>[6]</b> Y: Drive Y-axis of stage by using ten key <b>[4]</b> and <b>[6]</b> Z: Drive Z-axis of stage by using ten key <b>[4]</b> and <b>[6]</b>
XYZ 2 8	Drive motorized stage by using ten key <b>[8]</b> (CW direction) and <b>[2]</b> (CCW direction). Setting Range N: No Axis is selected (Default) X: Drive X-axis of stage by using ten key <b>[8]</b> and <b>[2]</b> Y: Drive Y-axis of stage by using ten key <b>[8]</b> and <b>[2]</b> Z: Drive Z-axis of stage by using ten key <b>[8]</b> and <b>[2]</b>
UVW 4 6	Drive motorized stage by using ten key <b>[4]</b> (CW direction) and <b>[6]</b> (CCW direction). Setting Range

	<p>N: No Axis is selected (Default)</p> <p>U: Drive U-axis of stage by using ten key <b>4</b> and <b>6</b></p> <p>V: Drive V-axis of stage by using ten key <b>4</b> and <b>6</b></p> <p>W: Drive W-axis of stage by using ten key <b>4</b> and <b>6</b></p>
U V W 2 8	<p>Drive motorized stage by using ten key <b>8</b> (CW direction) and <b>2</b> (CCW direction).</p> <p>Setting Range</p> <p>N: No Axis is selected (Default)</p> <p>U: Drive U-axis of stage by using ten key <b>8</b> and <b>2</b></p> <p>V: Drive V-axis of stage by using ten key <b>8</b> and <b>2</b></p> <p>W: Drive W-axis of stage by using ten key <b>8</b> and <b>2</b></p>

Note: Switching over XYZ and UVW can be done by **↔**.

Setting of TEN Key Driving Axis can be done by the following setting process.

~ Setting Process ~

Set a cursor to Axis you want to change settings. Use ten key **2**, **4**, **6**, **8**.

- When a cursor is at Axis, press **ESC** to return to Memory SW Setting Screen.

Press **ENTER** to choose. (A cursor moves to front of setting data.)

- Press **ESC** or **ENTER** to bring a cursor back to Axis.

Select a setting of Driving Direction (N / X / Y / Z) by ten key **2**, **8**. (Default: N)

- When there is an incorrect input, use **ESC**.

Press **ENTER** to register setting data and return a cursor to Axis.

- In case of continuing input process to other setting items, go back to process 1

### 3.3. Other Functions





When it is Main screen and all the axes are not in motion and when motion mode is other than REMOTE MODE, you can change settings of current position, and initialize parameter and Memory Switch (recover factory setting).

#### 3.3.1. Changing Current Position

When it is Main screen and all the axes are not in motion and when motion mode is other than REMOTE MODE, you can change a current position of an axis by pressing Axis Selection button that you want to change (one of **X/U**, **Y/V**, **Z/W**) and pressing **□** button simultaneously.

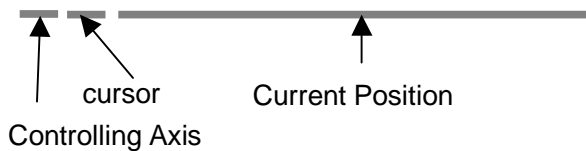
- On receipt of command through external interface, it does not change motion mode to REMOTE mode.
- While you are at Memory Switch Setting Screen, axis cannot be driven.
- When the power of controller is turned off, current position will be cleared (0).



~ Setting Process~

Press  button while pressing Axis Selection button that you want to change (one of , , ).

- A cursor will appear in front of Position of the Axis you want to change and be ready to input new data.

	<	C	O	N	T	I	N	U	E		M	O	D	E	>				
X	→										0	P	L	S					0
Y		-				1	2	3	.	4	5	u	m						1
Z		-	1	2	3	4	5	.	6	7	8	m	r	a	d				2



- Press  or  to have a cursor disappeared and go back to previous motion mode.

Input setting data by ten key.

Setting Range: -99999999 ~ 99999999, -9.9999999 ~ 9.9999999

Unit can be selected by parameter at STAGE UNIT SET (See 3.2.3.1).

Press  to register setting data and to have a cursor disappeared.

- When setting data is not a multiplied number of travel distance per pulse, data needs to be adjusted.




$$k = \text{setting data} / \text{travel distance per pulse (resolut)}$$

(cut off digit below decimal of k)

$$\text{Adjusted value} = k * \text{travel distance per pulse (resolut)}$$

- Input and correction of setting data is as following.

**<When data input is not done yet>**

	Does not function
	Does not function
	Return cursor to axis without changing data

**<When data input is done by ten key>**

<b>BS</b>	Delete one letter being input right before
<b>CLR</b>	Clear number to 0
<b>ESC</b>	Recover original data

**3.3.2. Initialization of Parameter & Memory Switch**

When it is Main screen and all the axes are not in motion and when motion mode is other than REMOTE MODE, you can initialize parameter and Memory Switch (recover factory setting).


Initialization process of parameter and Memory Switch is as following.

~ Setting Process ~


Press **ENTER** while pressing **STOP**.

- Main screen turns to <Parameter Initialize> screen.

P	A	R	A	M	E	T	E	R			I	N	I	T	I	A	L	I	Z	E
D	2	0	0												D	2	5	0		
V	E	R	1	.	0	4								V	E	R	1	.	0	5



ROM version of Handy Terminal



ROM version of Controller

Press **ENTER** for more than 5 seconds while pressing **STOP**.

- If these buttons are released before 5 seconds, go back to Main screen and redo it from process 1.
- When initialization setting is completed, "FIN" appears on screen.

P	A	R	A	M	E	T	E	R			I	N	I	T	I	A	L	I	Z	E
					F	I	N													
D	2	0	0												D	2	5	0		
V	E	R	1	.	0	4								V	E	R	1	.	0	5

Press **MODE** or **MENU** or **ORG** to return to Main screen.

**Note: After completing the initialization setting, turn off the power once and restart .**

## 4. REMOTE MODE

Controller can be operated through GP-IB, RS232C and USB interface.

### (When controller is NOT connected with D200 Handy Terminal)

Motion mode is REMOTE mode at all time.

### (When controller is connected with D200 Handy Terminal)

- When a display of Handy Terminal is at Main screen and all the axes are not in motion, REMOTE mode will start on receipt of any command.
- When it is not at Main screen or any axis is in motion, received command will be ignored by setting Standard Event Status Register (SESR)'s BIT3 DDE (Device-dependent Error).
- When Handy Terminal is at REMOTE mode, press MODE or ORG to go back a motion mode that is previous to REMOTE mode.

\* When Handy Terminal is at REMOTE mode, any operation except emergency stop button, **MODE**, **ORG**, ON/OFF switch of backlight, and **STOP** will be invalid. (**STOP** is effective only when a stage is in motion.)

## 4.1. Specification of Communication Command

### 4.1.1. Types of Command

Command	Description
Motion Control Command	Command to control motion: Driving command, Stop Command etc.
Data Setting Command	Command to set Parameter, Memory SW Setting etc. * When the selected axis is in motion, the command is of no effect.
Inquiry Command	Command to read Setting Data or circumstances of controller. This command is effective in any circumstances.

### 4.1.2. Communication Data

All communication data are sent as ASCII codes except Status Byte Register which is made by GP-IB service request. In case of using GP-IB interface, make service request from controller to PC (superior) and transmit the content of Status Byte Register through serial polling. Status Byte Register is binary data of 1 byte.

#### 4.1.3. Delimiter

The last one of commands and response data comes with Delimiter.

Interface	Delimiter
RS232C	CR (Hex 0D) Fix
GP-IB	Select by Dip SW (See 2.2). All the EOI signals output at the time of setting. CRLF CR (Hex 0D)LF(Hex 0A) + EOI None EOI CR CR (Hex 0D) + EOI LF LF (Hex 0A) + EOI

\* With EOI signal, it will be determined as completion of receiving command. The selected Delimiter will determine the effective range of receiving letters. When the selected Delimiter is CRLF, the last two letters of receiving letters are not counted as data. Therefore, when PC's Delimiter is CR and Controller's Delimiter is CRLF, one letter in front of CR will be dropped at the receipt of command.

#### 4.1.4. Invalid Command

Commands that are with grammatical error and/or data is out of setting range and/or the selected axis is in motion, those commands will be invalid. Error content will be kept on memory at Standard Event Status Register (SESR).

Error content can be referred by \* ESR? command.

- Selected axis is in Motion: BIT3 DDE (Device-dependent Error) ( Device Origin Error
- Out of Setting Range: BIT4 EXE (Execution Error) ( Error at Practice
- Grammatical Error: BIT5 CME (Command Error) ( Command Error

When there is an error found among the connected commands, the error content will be kept on memory at SESR, and the entire connected command becomes invalid.

## 4.2. Content of Command

- □ in command represents Setting Data.
- \_\_ in command represents Space.
- : in command is for connection of commands
- Capital and small letters are both valid in command. (Combination of both letters is possible.)
- Small letters displayed with Command can be omitted.

<List of Command>

Type	Command	<Data>	<Reference /Note>
<b>Axis</b>	AXIs□ (or AXI□)	1 ~ 6 or X, Y, Z,U, V, W or ALL	See 4.2.1 Axis Selection
<b>Parameter Setting</b>	:CWSoftLimitEnable_□ (or :CWSLE_□)	0 ~ 1	See 4.2.2.1 CW Side Soft Limit Setting
	:CWSoftLimitPoint_□ (or :CWSLP_□)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.2.2 CW Side Soft Limit Setting
	:CCWSoftLimitEnable_□ (or :CCWSLE_□)	0 ~ 1	See 4.2.2.3 CCW Side Soft Limit Setting
	:CCWSoftLimitPoint_□ (or :CCWSLP_□)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.2.4 CCW Side Soft Limit Setting
	:DRiverDIVision_□ (or:DRDIV_□)	0 ~ 15	See 4.2.2.5 Motor Driver Steps Setting
	:HOMEPosition_□ (or :HOMEP_□)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.2.6 Home Position Setting
	:POSition_□ (or:POS_□)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.2.7 Current Position Setting
	:PULSe_□ (or:PULS_□)	0.0000001 ~ 99999999	See 4.2.2.8 Constant Step Pulse Setting

	:SElectSPeed_□ (or:SELSP_□)	0 ~ 9	See 4.2.2.9 Speed TB Setting
	:STANDARdresolution_□ (or:STANDARD_□)	0.0000001 ~ 99999999	See 4.2.2.10 Full-step Travel Distance/Pulse Setting
	:UNIT_□	0 ~ 4 or PULSe, UM, MM, DEG, MRAD	See 4.2.2.11 Unit Display Setting
<b>Memory SW Setting</b>	:MEMorySWitch0_□ (or:MEMSW0_□)	0 ~ 12	See 4.2.3.1 Memory SW 0 Setting
	:MEMorySWitch1_□ (or:MEMSW1_□)	0 ~ 1	See 4.2.3.2 Memory SW 1 Setting
	:MEMorySWitch2_□ (or :MEMSW2_□)	0 ~ 1	See 4.2.3.3 Memory SW 2 Setting
	:MEMorySWitch3_□ (or:MEMSW3_□)	0 ~ 1	See 4.2.3.4 Memory SW 3 Setting
	:MEMorySWitch5_□ (or :MEMSW5_□)	0 ~ 1	See 4.2.3.5 Memory SW 5 Setting
<b>Speed Table Setting</b>	Lspeed0_□ (or L0_□)	1 ~ 9999	See 4.2.4 Setting of Start-up Velocity:Lspeed, Driving Speed: Fspeed, and Rate of Acceleration & Deceleration: Rate
	Fspeed0_□ (or F0_□)	1 ~ 999999	
	Rate0_□ (or R0_□)	1 ~ 9999	
	Lspeed1_□ (or L1_□)	1 ~ 9999	
	Fspeed1_□ (or F1_□)	1 ~ 999999	
	Rate1_□ (or R1_□)	1 ~ 9999	
	Lspeed2_□ (or L2_□)	1 ~ 9999	
	Fspeed2_□ (or F2_□)	1 ~ 999999	
	Rate2_□ (or R2_□)	1 ~ 9999	
	Lspeed3_□ (or L3_□)	1 ~ 9999	
	Fspeed3_□ (or F3_□)	1 ~ 999999	
	Rate3_□ (or R3_□)	1 ~ 9999	
	Lspeed4_□ (or L4_□)	1 ~ 9999	
	Fspeed4_□ (or F4_□)	1 ~ 999999	
	Rate4_□ (or R4_□)	1 ~ 9999	
Lspeed5_□ (or L5_□)	1 ~ 9999		
Fspeed5_□ (or F5_□)	1 ~ 999999		

	Rate5_□ (or R5_□)	1 ~ 9999	
	Lspeed6_□ (or L6_□)	1 ~ 9999	
	Fspeed6_□ (or F6_□)	1 ~ 999999	
	Rate6_□ (or R6_□)	1 ~ 9999	
	Lspeed7_□ (or L7_□)	1 ~ 9999	
	Fspeed7_□ (or F7_□)	1 ~ 999999	
	Rate7_□ (or R7_□)	1 ~ 9999	
	Lspeed8_□ (or L8_□)	1 ~ 9999	
	Fspeed8_□ (or F8_□)	1 ~ 999999	
	Rate8_□ (or R8_□)	1 ~ 9999	
	Lspeed9_□ (or L9_□)	1 ~ 9999	
	Fspeed9_□ (or F9_□)	1 ~ 999999	
	Rate9_□ (or R9_□)	1 ~ 9999	
<b>Driving</b>	:GO_□ (or :GO_□)	0 ~ 3 or CW, CCW, ORG, HOME	See 4.2.5.1 Driving Command
	:GOABSolute_□ ( or :GOABS_□)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.5.2 Absolute Position Driving Command
<b>Stop</b>	:STOP_□	0 ~ 1 or Emergency, Reduction	See 4.2.6 Stop Command
	STOP_□	0 ~ 1 or Emergency, Reduction	

Type	Command	<Data>	<Reference /Note>
<b>Parameter Setting Request</b>	:CWSoftLimitEnable? (or :CWSLE?)	0 ~ 1	See 4.2.7.1 CW Side Soft Limit Setting Request
	:CWSoftLimitPoint? (or :CWSLP?)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.7.2 CW Side Soft Limit Setting Request
	:CCWSoftLimitEnable? (or :CCWSLE?)	0 ~ 1	See 4.2.7.3 CCW Side Soft Limit Setting Request
	:CCWSoftLimitPoint? (or :CCWSLP?)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.7.4 CCW Side Soft Limit Setting Request
	:DRiverDIVision? (or:DRDIV?)	0 ~ 15	See 4.2.7.5 Motor Driver Steps Setting Request
	:HOMEPosition? (or :HOMEP?)	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.7.6 Home Position Setting Request
	:POSition? (or:POS? )	- 99999999~99999999, -9.9999999~9.9999999	See 4.2.7.7 Current Position Setting Request
	:PULSe? (or:PULS? )	0.0000001 ~ 99999999	See 4.2.7.8 Constant Step Pulse Setting Request
	:RESOLUTion? (or: RESOLUT?)	0.0000001 ~ 99999999	See 4.2.7.9 Travel Amount/Pulse Request
	:SElectSPeed? (or:SELSP?)	0 ~ 9	See 4.2.2.10 Speed TB Setting Request
	:STANDARDresolution? (or:STANDARD?)	0.0000001 ~ 99999999	See 4.2.2.11 Full-step Travel Distance/Pulse Setting Request

<b>Memory SW Setting</b>	:MEMorySWitch0? (or:MEMSW0?)	0 ~ 12	See 4.2.8.1 Memory SW 0 Setting Request
	:MEMorySWitch1? (or:MEMSW1?)	0 ~ 1	See 4.2.8.2 Memory SW 1 Setting Request
	:MEMorySWitch2? (or :MEMSW2?)	0 ~ 1	See 4.2.8.3 Memory SW 2 Setting Request
	:MEMorySWitch3? (or:MEMSW3?)	0 ~ 1	See 4.2.8.4 Memory SW 3 Setting Request
	:MEMorySWitch5? (or :MEMSW5?)	0 ~ 1	See 4.2.8.5 Memory SW 5 Setting Request

Type	Command	<Data>	<Reference /Note>
<b>Speed Table Setting Request</b>	Lspeed0? (or L0?)	1 ~ 9999	See 4.2.9 Setting of Start-upVelocity:Lspeed, Driving Speed: Fspeed, and Rate of Acceleration & Deceleration: Rate
	Fspeed0? (or F0?)	1 ~ 999999	
	Rate0? (or R0?)	1 ~ 9999	
	Lspeed1? (or L1?)	1 ~ 9999	
	Fspeed1? (or F1?)	1 ~ 999999	
	Rate1? (or R1?)	1 ~ 9999	
	Lspeed2? (or L2?)	1 ~ 9999	
	Fspeed2? (or F2?)	1 ~ 999999	
	Rate2? (or R2?)	1 ~ 9999	
	Lspeed3? (or L3?)	1 ~ 9999	
	Fspeed3? (or F3?)	1 ~ 999999	
	Rate3?(or R3?)	1 ~ 9999	
	Lspeed4? (or L4?)	1 ~ 9999	
	Fspeed4? (or F4?)	1 ~ 999999	
	Rate4? (or R4?)	1 ~ 9999	
	Lspeed5? (or L5?)	1 ~ 9999	
	Fspeed5? (or F5?)	1 ~ 999999	
	Rate5?(or R5?)	1 ~ 9999	
	Lspeed6? (or L6? )	1 ~ 9999	
	Fspeed6? (or F6?)	1 ~ 999999	
	Rate6? (or R6?)	1 ~ 9999	
	Lspeed7? (or L7? )	1 ~ 9999	
	Fspeed7? (or F7? )	1 ~ 999999	
	Rate7?(or R7?)	1 ~ 9999	
	Lspeed8? (or L8? )	1 ~ 9999	
	Fspeed8? (or F8?)	1 ~ 999999	
	Rate8?(or R8?)	1 ~ 9999	
Lspeed9? (or L9?)	1 ~ 9999		
Fspeed9? (or F9?)	1 ~ 999999		
Rate9?(or R9?)	1 ~ 9999		

Type	Command	<Data>	<Reference /Note>
Status Request	:COURSE?	0 ~ 1	See 4.2.10.1 Motion Direction Status
	:CWSoftLimitSET? (or :CWSLSET?)	0 ~ 1	See 4.2.10.2 CW Side Soft Limit Status
	:CCWSoftLimitSET? (or :CCWSLSET?)	0 ~ 1	See 4.2.10.3 CCW Side Soft Limit Status
	:DISCONinue? (or : DISCON?)	0 ~ 1	See 4.2.10.4 Discontinue Status
	:DRiverTYPE? (or:DRTYPE?)	0 ~ 1	See 4.2.10.5 Driver Type Status
	:HOME?	0 ~ 1	See 4.2.10.6 Home Position Detection Status
	:LIMIT?	0 ~ 1	See 4.2.10.7 Mechanical Limit Sensor Detecting Status
	:MOTION?	0 ~ 1	See 4.2.10.8 In-motion Status
	:ORiGin? (or:ORG?)	0 ~ 1	See 4.2.10.9 Origin Detecting Status
	: READY?	0 ~ 1	See 4.2.10.10 Axis Selection Ready Status
	:SoftLIMIT? (or: SLIMIT?)	0 ~ 3	See 4.2.10.11 SoftLimit Detecting Status
: StatusBinary1? (or: SB1?)	Conversion of one byte binary code into ASCHII code	See 4.2.10.12 Status 1 Request	
: StatusBinary2? (or: SB2?)	Conversion of one byte binary code into ASCHII code	See 4.2.10.13 Status 2 Request	

	: StatusBinary3? (or: SB3?)	Conversion of one byte binary code into ASCII code	See 4.2.10.14 Status 3 Request
	:CONTrolAxis? (or:CONTA?)	0 ~ 6	See 4.2.10.15 Number of Controlling Axis Status
	:MOTIONAll? (or :MOTIONA?)	Conversion of one byte binary code into ASCII code	See 4.2.10. 16 All Axes in-motion Status

#### 4.2.1. Axis Selection Command: AXIs<Data>

This command appoints an axis when you make a request on the following items.

<Each axis parameters / Setting, driving, stopping and parameters of Memory SW / Memory SW's setting number / Status Request>

- Once receiving Axis Selection Command, it continues to command the axis until another Axis Selection Command is received.

Command	Content of Command	<Data>
AXIs□ (or AXI□)	Axis Selection Command	1 ~ 6, or X, Y, Z, U, V, W

- No space is needed between command and setting data.
- Content of data is as following.

<Data>	Content
X or 1	Select X-axis
Y or 2	Select Y-axis
Z or 3	Select Z-axis
U or 4	Select U-axis
V or 5	Select V-axis
W or 6	Select W-axis

#### 4.2.2. Parameter Setting Command

This commands conducts various settings of the following items.

< Soft Limit of CW, CCW side, Number of motor driver's steps, Home position data, Current position, Travel amount of constant step pulse, Speed table, Travel amount of one pulse at full step, Unit display>

- Connection of Axis Selection Command, Parameter Setting Command and Driving command is available
- Use : (colon) to connect commands
- Orders of connection has to begin with Axis Selection Command: Parameter Setting Command: Driving Command
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.
- 

Parameter setting command is configured as following.

- When selecting axis and setting parameter only  
Axis Selection Command<Data>: Parameter Setting Command\_\_<Data>

- When selecting axis and setting multiple parameters at once  
Axis Selection Command<Data>: Parameter Setting Command\_\_<Data> : • • • • :  
Parameter Setting Command\_\_<Data>
- When selecting axis, setting parameter and having it driven  
Axis Selection Command<Data>: Parameter Setting Command\_\_<Data>: Driving  
Command\_<Data>

#### 4 . 2 . 2 . 1 **CWSoftLimitEnable\_\_<Data>**

Command to enable / disable CW side Soft Limit of each axis.

<Data>	Content
0	Disable CW Software Limit
1	Enable CW Software Limit

#### 4 . 2 . 2 . 2 **CWSoftLimitPoint\_\_<Data>**

Command to set CW side Software Limit of each axis.

Setting Data is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)
- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.
  - 1) Multiple = Data ÷ Travel distance per pulse
  - 2) Delete a decimal number of multiple
  - 3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4 . 2 . 2 . 3 **CCWSoftLimitEnable\_\_<Data>**

Command to enable / disable CCW side Software Limit of each axis.

<Data>	Content
0	Disable CCW Software Limit
1	Enable CCW Software Limit

#### 4 . 2 . 2 . 4 **CCWSoftLimitPoint\_\_<Data>**

Command to set CCW side Software Limit of each axis.

Setting Data is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)

- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.

1) Multiple = Data ÷ Travel distance per pulse

2) Delete a decimal number of multiple

3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4 . 2 . 2 . 5 **DRiverDIVision\_<Data>**

Command to set a dividing number of drivers for each axis.

<Data>	(Number of Division/Steps)
0	1 / 1
1	1 / 2
2	1 / 2 . 5
3	1 / 4
4	1 / 5
5	1 / 8
6	1 / 1 0
7	1 / 2 0
8	1 / 2 5
9	1 / 4 0
1 0	1 / 5 0
1 1	1 / 8 0
1 2	1 / 1 0 0
1 3	1 / 1 2 5
1 4	1 / 2 0 0
1 5	1 / 2 5 0

- When Display Unit is other than PULSe, a change on the dividing number of Driver correspondingly change travel distance per pulse, which may become not a multiple of the following parameters.
- Setting of Constant Step Pulse
- Setting of Soft Limit
- Setting of Home Position
- Current Position

In this case, adjust those parameters with the following process.

- 1 ) Multiple = Data ÷ Travel distance per pulse
- 2 ) Delete a decimal number of Multiple
- 3 ) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of Driver

#### 4 . 2 . 2 . 6 HOMEPosition\_\_<Data>

Command to set Home Position of each axis.

Setting Data is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)
- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.

- 1) Multiple = Data ÷ Travel distance per pulse
- 2) Delete a decimal number of multiple
- 3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4 . 2 . 2 . 7 POSition\_\_<Data>

Command to set Current position of each axis.

Setting Data is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)
- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.

- 1) Multiple = Data ÷ Travel distance per pulse
- 2) Delete a decimal number of multiple
- 3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4 . 2 . 2 . 8 PULSe\_\_<Data>

Command to set Constant Step Pulsen of each axis.

<Data>is 0.0000001 ~ 99999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)
- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.
  - 1) Multiple = Data ÷ Travel distance per pulse
  - 2) Delete a decimal number of multiple
  - 3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4 . 2 . 2 . 9 **SElectSPeed\_\_<Data>**

Command to set Speed Table of each axis.

<Data>	Content
0 ~ 9	Number of Speed Table

#### 4 . 2 . 2 . 10 **STANDARDresolution\_\_<Data>**

Command to set Standard Resolution of motorized stage (travel distance per pulse at full step) for each axis.

<Data> is 0.0000001 ~ 99999999

- When Display Unit is other than PULSe, a change on the dividing number of Driver correspondingly change travel distance per pulse, which may become not a multiple of the following parameters.
  - Setting of Constant Step Pulse
  - Setting of Soft Limit
  - Setting of Home Position
  - Current Position

In this case, adjust those parameters with the following process.

- 1 ) Multiple = Data ÷ Travel distance per pulse
- 2 ) Delete a decimal number of Multiple
- 3 ) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of Driver

#### 4.2.2.11 UNIT\_\_<Data>

Command to set Display Unit of each axis.

<Data>	Content
0 or PULSe	Set a unit of pulse
1 or UM	Set a unit of $\mu\text{m}$
2 or MM	Set a unit of mm
3 or DEG	Set a unit of deg
4 or MRAD	Set a unit of mrad

#### 4.2.3. Memory SW Setting Command

This command conducts settings of Memory SW 0 (Origin Return type), 1 (Mechanical Limit Sensor Input Logic), 2 (Origin Sensor Input Logic), 3(Near Origin Sensor Input Logic), and 5 (Motion Direction Switching).

- Connecting Axis Selection command and Memory SW Setting command is available.
- Use: (colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command: Memory SW Setting Command.
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.

Parameter Setting Command is configured as following.

- When selecting axis and setting Memory SW only  
Axis Selection Command<Data>: Memory SW Setting Command\_\_<Data>
- When selecting axis and setting multiple Memory SW at once  
Axis Selection Command<Data>:Memory SW Setting Command\_\_<Data>: ••• :  
Memory SW Setting Command\_\_<Data>

#### 4.2.3.1 MEMorySWitch0\_\_<Data>

Command to set Memory SW 0 (Origin Return Type) for each axis

<Data>	Content	<Data>	Content
0	Origin Return Type 0	7	Origin Return Type 7
1	Origin Return Type 1	8	Origin Return Type 8
2	Origin Return Type 2	9	Origin Return Type 9
3	Origin Return Type 3	10	Origin Return Type 10

4	Origin Return Type 4	11	Origin Return Type 11
5	Origin Return Type 5	12	Origin Return Type 12
6	Origin Return Type 6		

- Regarding types of origin returns, refer to Table of Origin Return Type. (See 3.2.4.1)

#### 4.2.3.2 MEMorySWitch1\_\_<Data>

Command to set Memory SW 1 (Mechanical Limit Sensor Input Logic)

<Data>	Content
0	Select Point B of Mechanical Limit Sensor Input Logic (Normal Close) <b>Use this setting for connecting with Suruga Seiki's motorized stage</b>
1	Select Point A of Mechanical Limit Sensor Input Logic (Normal Open)

#### 4.2.3.3 MEMorySWitch2\_\_<Data>

Command to set Memory SW 2 (Origin Sensor Input Logic) for each axis

<Data>	Content
0	Select Point B of Origin Sensor Input Logic (Normal Close) <b>Use this setting for connecting with Suruga Seiki's motorized stage</b>
1	Select Point A of Origin Sensor Input Logic (Normal Open)

#### 4.2.3.4 MEMorySWitch3\_\_<Data>

Command to set Memory SW 3 (Near Origin Sensor Input Logic) for each axis

<Data>	Content
0	Select Point B of Near Origin Sensor Input Logic (Normal Close) <b>Use this setting for connecting with Suruga Seiki's motorized stage</b>
1	Select Point A of Near Origin Sensor Input Logic (Normal Open)

#### 4.2.3.5 MEMorySWitch5\_\_<Data>

Command to set Memory SW 5 (Driving Direction Switching) for each axis

<Data>	Content
0	Normal Direction (POSITIVE)
1	Reversed Direction (NEGATIVE)

- See 3.2.4.5 for directions of motion.

4.2.4.

#### 4.2.5. Speed Table Setting Command

This command conducts settings of Start-up Velocity (L), Driving Speed (F), and Rate of Acceleration & Deceleration (R) of Speed Table No. 0 ~ 9.

- Connecting different Speed Table Setting Commands is available.
- Use: (colon) to connect commands.
- See 3.2.3.6 for relationship among Start-up Velocity (L), Driving Speed (F), and Rate of Acceleration & Deceleration (R).
- Start-up Velocity (L) and Driving Speed (F) are in unit of pps. Rate of Acceleration & Deceleration (R) is in unit of msec.

**Caution:** When an input driving speed (F) is more than MAX speed of motorized stage, a motor may be stepping-out. When an input start-up velocity (L) is more than driving speed (F), the driving speed (F) becomes actual start-up velocity (L).

Speed TB Setting Command is configured as following.

- When setting multiple Speed Tables at once  
Speed TB Setting Command\_<Data>:•••:Speed TB Setting Command\_<Data>

##### 4 . 2 . 4 . 1 Lspeed□\_\_<Data>

Command to set Start -up Velocity (L).

□ is a choice of 0 ~ 9 (Speed Table No. 0 ~ 9).

<Data> is 1 ~ 9999. UNIT is pps.

##### 4 . 2 . 4 . 2 Fspeed□\_\_<Data>

Command to set Driving Speed (F).

□ is a choice of 0 ~ 9 (Speed Table No. 0 ~ 9).

<Data> is 1 ~ 999999. UNIT is pps.

##### 4 . 2 . 4 . 3 Rate□\_\_<Data>

Command to set Rate of Acceleration and Deceleration (R).

□ is a choice of 0 ~ 9 (Speed Table No. 0 ~ 9).

<Data> is 1 ~ 9999. UNIT is msec.

#### 4.2.6. Driving Command

This commands conducts various driving of a stage: Constant Step Pulse driving to CW / CCW directions, Origin Return driving, driving to Home Position, and Absolute Position Driving.

- Connecting Axis Selection command, Parameter Setting command and Driving command is available.
- Use: (colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command→ Driving Command
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.

Parameter Setting Command is configured as following.

- When selecting axis and driving  
Axis Selection Command<Data>: Driving Command\_\_<Data>
- When selecting axis, setting parameter and having it driven  
Axis Selection Command<Data>: Parameter Setting Command\_<Data>: Driving Command\_\_<Data>

##### 4.2.5.1 GO\_\_<Data>

Driving commands for each axis.

<Data>	Content
0 or CW	Drive Parameter's Constant Step Pulse distance in the CW direction
1 or CCW	Drive Parameter's Constant Step Pulse distance in the CCW direction
2 or ORiGin	Conduct Origin Return by following a type of Origin Return set by Memory SW
3 or HOME	Move to Home Position of Parameter

##### 4.2.5.2 GOABSolute\_\_<Data>

Motion command for Absolute Position for each axis.

Setting Data is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)
- When data is not a multiplied number of travel distance per pulse, adjust the data with the following steps.
  - 1) Multiple = Data ÷ Travel distance per pulse

2) Delete a decimal number of multiple

3) Data = Travel distance per pulse x Multiple

\*\* Travel distance per pulse = Standard resolution of motorized stage ÷ Dividing number of driver

#### 4.2.7. Stop Command : STOP\_<Data>

This command conducts immediate-stop or gradual-stop on a driving stage.

- Connecting with Axis Selection command is available.
- Use: (colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command → Stop Command.
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When there is not Axis Selection Command, it conducts immediate-stop on a driving axis.

Parameter Setting Command is configured as following.

- When selecting axis and making it stop  
Axis Selection Command<Data>: Stop Command\_\_<Data>
- When stopping a driving axis  
Stop Command\_\_<Data>

<Data>	Content
0 or Emergency	Stop Immediately
1 or Reduction	Gradually slow down to stop

- When <Data> is omitted, it automatically selects "0"(Immediate stop).

#### 4.2.8. Parameter Setting Request Command

This command requests settings of CW & CCW side's Soft Limit, Dividing Number of driver, Home Position, Current Position, Travel Distance of Constant Step Pulse, Travel Distance per pulse, Speed Table, Travel Distance per pulse at full-step, and Display Unit.

- Connecting with Axis Selection command is available.
- Use: (colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command → Parameter Setting Request Command.
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.

Parameter Setting Command is configured as following.

- When selecting axis and requesting parameter setting data  
Axis Selection Command<Data>: Parameter Setting Command?

##### 4.2.7.1 CWSoftLimitEnable\_?

Command to request for setting: enable / disable CW side Soft Limit of each axis.

<Response Data>	Content
0	In process to disable CW Software Limit
1	In process to enable CW Software Limit

##### 4.2.7.2 CWSoftLimitPoint\_?

Command to request for setting of CW side Software Limit of each axis.

<Response Data> is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)

##### 4.2.7.3 CCWSoftLimitEnable\_?

Command to request for setting: enable / disable CCW side Software Limit of each axis.

<Response Data>	Content
0	In process to disable CCW Software Limit
1	In process to enable CCW Software Limit

#### 4.2.7.4 CCWSoftLimitPoint\_?

Command to request for setting of CCW side Software Limit of each axis.

<Response Data> is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)

#### 4.2.7.5 DRiverDIVision?

Command to request for setting of a dividing number of drivers for each axis.

<Response Data>	(Number of Division/Steps)
0	In process of setting 1 / 1
1	In process of setting 1 / 2
2	In process of setting 1 / 2 . 5
3	In process of setting 1 / 4
4	In process of setting 1 / 5
5	In process of setting 1 / 8
6	In process of setting 1 / 1 0
7	In process of setting 1 / 2 0
8	In process of setting 1 / 2 5
9	In process of setting 1 / 4 0
1 0	In process of setting 1 / 5 0
1 1	In process of setting 1 / 8 0
1 2	In process of setting 1 / 1 0 0
1 3	In process of setting 1 / 1 2 5
1 4	In process of setting 1 / 2 0 0
1 5	In process of setting 1 / 2 5 0

#### 4.2.7.6 HOMEPosition\_?

Command to request for setting of Home Position of each axis.

<Response Data> is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.  
(Ex: 1.2300000 = 1.23)

#### 4.2.7.7 POSition\_?

Command to request for setting of Current position of each axis.

<Response Data> is -99999999 ~ 99999999, -9.9999999 ~ 9.9999999.

- When there is continuous decimal number of 0, they can be omitted.

(Ex: 1.2300000 = 1.23)

#### 4.2.7.8 PULSe\_?

Command to request for setting of Constant Step Pulse of each axis.

<Response Data> is 0.0000001 ~ 99999999.

- When there is continuous decimal number of 0, they can be omitted.

(Ex: 1.2300000 = 1.23)

#### 4.2.7.9 RESOLUTION?

Command to request for setting of travel distance per pulse of each axis (= resolution of motorized stage / dividing number of driver).

<Response Data> is 0.0000001 ~ 99999999.

- When there is continuous decimal number of 0, they can be omitted.

(Ex: 1.2300000 = 1.23)

#### 4.2.7.10 SElectSPeed\_?

Command to request for setting of Speed Table of each axis.

<Response Data>	Content
0 ~ 9	Number of Speed Table in selection process

#### 4.2.7.11 STANDARdresolution\_?

Command to request for standard resolution of motorized stage (travel distance per pulse at full step) for each axis.

<Response Data> is 0.0000001 ~ 99999999

- When there is continuous decimal number of 0, they can be omitted.

(Ex: 1.2300000 = 1.23)

#### 4.2.7.12 UNIT\_?

Command to request for setting of Display Unit of each axis.

<Response Data>	Content
0	Setting a unit of pulse
1	Setting a unit of $\mu\text{m}$
2	Setting a unit of mm
3	Setting a unit of deg
4	Setting a unit of mrad

#### 4.2.9. Memory SW Setting Request Command

This command requests for settings of Memory SW 0 (Origin Return type), 1 (Mechanical Limit Sensor Input Logic), 2 (Origin Sensor Input Logic), 3(Near Origin Sensor Input Logic), and 5 (Motion Direction Switching).

- Connecting Axis Selection command is available.
- Use: (colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command: Parameter Setting Request Command.
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.

Parameter Setting Command is configured as following.

- When selecting axis and requesting parameter setting  
Axis Selection Command<Data>: Memory SW Setting Request Command?

##### 4 . 2 . 8 . 1 MEMorySWitch0?

Command to request for setting of Memory SW 0 (Origin Return Type) for each axis

<Response Data>	Content	<Response Data>	Content
0	Selecting Origin Return Type 0	7	Selecting Type 7
1	Selecting Type 1	8	Selecting Type 8
2	Selecting Type 2	9	Selecting Type 9
3	Selecting Type 3	10	Selecting Type 10
4	Selecting Type 4	11	Selecting Type 11
5	Selecting Type 5	12	Selecting Type 12
6	Selecting Type 6		

- Regarding types of origin returns, refer to Table of Origin Return Type. (See 3.2.4.1 )

#### 4.2.8.2 MEMorySWitch1?

Command to request for setting of Memory SW 1 (Mechanical Limit Sensor Input Logic)

<Response Data>	Content
0	Selecting Point B of Mechanical Limit Sensor Input Logic (Normal Close)
1	Selecting Point A of Mechanical Limit Sensor Input Logic (Normal Open)

#### 4.2.8.3 MEMorySWitch2?

Command to request for setting of Memory SW 2 (Origin Sensor Input Logic) for each axis

<Response Data>	Content
0	Selecting Point B of Origin Sensor Input Logic (Normal Close)
1	Selecting Point A of Origin Sensor Input Logic (Normal Open)

#### 4.2.8.4 MEMorySWitch3?

Command to request for setting of Memory SW3 (Near Origin Sensor Input Logic) for each axis

<Response Data>	Content
0	Selecting Point B of Near Origin Sensor Input Logic (Normal Close)
1	Selecting Point A of Near Origin Sensor Input Logic (Normal Open)

#### 4.2.8.5 MEMorySWitch5?

Command to request for setting of Memory SW 5 (Driving Direction Switching) for each axis

<Response Data>	Content
0	Normal Direction (POSITIVE)
1	Reversed Direction (NEGATIVE)

- See 3.2.4.5 for directions of motion.

#### 4.2.10. Speed Table Setting Request Command

This command requests for settings of Speed Table.

On receipt of request command, controller sends response back to the requester.

##### 4.2.9.1 Lspeed□?

Command to request for setting of Start -up Velocity (L).

□ is a choice of 0 ~ 9 (the number of requested Speed Table will be in □.)

<Response Data> is 1 ~ 9999. UNIT is pps.

##### 4.2.9.2 Fspeed□?

Command to set Driving Speed (F).

□ is a choice of 0 ~ 9 (the number of requested Speed Table will be in □.)

<Data> is 1 ~ 999999. UNIT is pps.

##### 4.2.9.3 Rate□?

Command to set Rate of Acceleration and Deceleration (R).

□ is a choice of 0 ~ 9 (the number of requested Speed Table will be in □.)

<Data> is 1 ~ 9999. UNIT is msec.

#### 4.2.11. Status Request Command

This command request for status on motion direction of each axis, CW & CCW side's Soft Limit (Effective/ Non-effective), Discontinuation, type of driver, detection of Home Position, detection of Mechanical Limit Sensor, In-motion, availability of Axis Selection, detection of Origin, detection of Soft Limit, Status 1 / 2 / 3, the number of controlling axis, and motion status of all axes.

- Connecting Axis Selection Command and Status Request Command is available. (However, CONTrolAxis? and MOTIONAll? command cannot be connected with Axis Selection Command.)
- Use: ( colon) to connect commands.
- Orders of connection have to begin with Axis Selection Command: Parameter Setting Request Command.
- When there is no Axis Selection Command, a previously sent Axis Selection Command becomes effective for use.
- When the power is turned on, X-axis is automatically selected.

Parameter Setting Command is configured as following.

- When requesting status without selecting axis  
Status Request Command?
- When selecting axis and requesting status  
Axis Selection Command<Data>: Status Request Command?

#### 4.2.10.1 COURSE?

Status Request Command for One byte Binary Code for each axis.

<Response Data>	Content
0	In motion in the CW direction or at halt after driving
1	In motion in the CCW direction or at halt after driving

This is the same as Bit 1 of StatusBinary1? (See 4.2.10.12).

#### 4.2.10.2 CWSoftLimitSET?

Status Request Command for Software Limit Effective / Non-effective in the CW direction.

<Response Data>	Content
0	Setting of Software Limit in the CW direction is Non-effective
1	Setting of Software Limit in the CW direction is Effective

This is the same as Bit 5 of StatusBinary2? (See 4.2.10.13).

#### 4.2.10.3 CCWSoftLimitSET?

Status Request Command for Software Limit Effective / Non-effective in the CCW direction.

<Response Data>	Content
0	Setting of Software Limit in the CCW direction is Non-effective
1	Setting of Software Limit in the CCW direction is Effective

This is the same as Bit 6 of StatusBinary2?(See 4.2.10.13).

#### 4.2.10.4 DISCONTinue?

Status Request Command for Discontinuation for each axis.

<Response Data>	Content
0	Complete a motion without discontinuing motion
1	Discontinued without completing motion due to Stop Command or <span style="border: 1px solid black; padding: 2px;">STOP</span> button of D200 Handy Terminal

This is the same as Bit 4 of Status Binary1? (See 4.2.10.12).

#### 4.2.10.5 DRIVERTYPE?

Status Request Command for Driver Type.

<Response Data>	Content
0	Loaded with Normal Type Driver
1	Loaded with Micro-Step Driver

This is the same as Bit 2 of Status Binary3? (See 4.2.10.14).

#### 4.2.10.6 HOME?

Status Request Command for Home Position Detection for each axis.

<Response Data>	Content
0	Home Position is not detected
1	Detecting Home Position

This is the same as Bit 6 of Status Binary1? (See 4.2.10.12).

#### 4.2.10.7 LIMIT?

Status Request Command for Mechanical Limit for each axis.

<Response Data>	Content
0	Mechanical Limit is not detected
1	Detecting Mechanical Limit in the CW direction
2	Detecting Mechanical Limit in the CCW direction
3	Detecting Mechanical Limit in the CW & CCW direction

#### 4.2.10.8 MOTION?

Status Request Command for axis in motion

<Response Data>	Content
0	At Halt
1	In Motion

This is the same as Bit 7 of Status Binary1? (See 4.2.10.12).

#### 4.2.10.9 ORIGIN?

Status Request Command for Origin Detection of each axis.

<Response Data>	Content
0	Origin Return is not in process
1	Origin Return has been completed and Mechanical Origin has been detected. At halt.

This is the same as Bit 5 of Status Binary1? (See 4.2.10.12).

#### 4.2.10.10 **READY?**

Status Request Command for availability of Axis Selection

<Response Data>	Content
0	Axis NOT loaded with driver.
1	Axis loaded with driver.

This is the same as Bit 1 of Status Binary3? (See 4.2.10.14).

#### 4.2.10.11 **SoftLIMIT?**

Status Request Command for Software Limit of each axis

<Response Data>	Content
0	Software Limit is not detected.
1	Detecting Software Limit in the CW direction.
2	Detecting Software Limit in the CCW direction
3	Detecting Software Limit in the CW & CCW direction

#### 4.2.10.12 StatusBinary1?

Status Request Command for One byte Binary Code for each axis.

(This binary code is output as ASCII code which is converted from the numbers between 0 ~ 255.)

<Response Data>

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
1		In Motion	Home Position Detected	Origin Detected	Dis-continuation	Soft Limit Detected	Mechanical Limit Detected	CW
0	0	At Halt						CCW

Bit 1	CW/CCW	1	<b>In motion in the CW direction or at halt after driving</b>
		0	In motion in the CCW direction or at halt after driving
Bit 2	Mechanical Limit Detection	1	<b>Detecting Mechanical Limit in the CW or CCW direction</b>
		0	Not-yet detecting Mechanical Limit in the CW or CCW direction
Bit 3	Soft Limit Detection	1	<b>Detecting Soft Limit in the CW or CCW direction</b>
		0	Not-yet detecting Soft Limit in the CW or CCW direction
Bit 4	Dis-continuation	1	<b>When motion is discontinued without completing a motion due to Stop command or STOP button of D200 Handy Terminal</b>
		0	When motion is completed by the following motion without discontinuation
Bit 5	Origin Detection	1	<b>Origin Return is completed and Mechanical Origin is detected: At halt.</b>
		0	Cleared to 0 with driving thereafter
Bit 6	Home Position Detection	1	<b>Detecting Home Position</b>
		0	Not-yet detecting Home Position
Bit 7	In Motion/At Halt	1	<b>In Motion</b>
		0	At Halt

#### 4.2.10.13 StatusBinary2?

Status Request Command for One byte Binary code for each axis.

(This binary code is output as ASCII code which is converted from the numbers between 0 ~ 255. )

<Response Data>

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
1			CCW Soft Limit Effective	CW Soft Limit Effective	CCW Soft Limit Detected	CW Soft Limit Detected	CCW Mechanical Limit Detected	CW Mechanical Limit Detected
0	0	0	Non-effective	Non-effective				

Bit 1	CW Mechanical Limit Detected	1 0	<b>Detecting CW Mechanical Limit</b> Not-yet detecting CW Mechanical Limit
Bit 2	CCW Mechanical Limit Detected	1 0	<b>Detecting CCW Mechanical Limit</b> Not-yet detecting CCW Mechanical Limit
Bit 3	CW Soft Limit Detected	1 0	<b>Detecting CW Soft Limit</b> Not-yet detecting CW Soft Limit
Bit 4	CCW Soft Limit Detected	1 0	<b>Detecting CCW Soft Limit</b> Not-yet detecting CCW Soft Limit
Bit 5	CW Soft Limit Effective /Non-effective	1 0	<b>In process of Enabling CW Soft Limit</b> In process of disabling CW Soft Limit
Bit 6	CCW Soft Limit Effective /Non-effective	1 0	<b>In process of Enabling CCW Soft Limit</b> In process of disabling CCW Soft Limit

#### 4.2.10.14 StatusBinary3?

Status Request Command for One byte Binary Code for each axis.

(This binary code is output as ASCII code which is converted from the numbers between 0 ~ 255. )

<Response Data>

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
1							Driver Type	Axis Selection Available
0	0	0	0	0	0	0		

Bit 1	Axis Selection Available	1 0	<b>Axis loaded with driver</b> Axis without driver
Bit 2	Driver Type	1 0	<b>Micro-step driver</b> Normal type driver

#### 4.2.10.15 CONTroIAxis?

Request Command for the number of controlling Axis

<Response Data> is 1 ~ 6.

#### 4.2.10.16 MOTIONAI?

Status Request Command for all axes in motion.

<Response Data> is 0~ 63.

<Response Data>

	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
1			W-axis in motion	V-axis in motion	U-axis in motion	Z-axis in motion	Y-axis in motion	X-axis in motion
0	0	0	W-axis at halt	V-axis at halt	U-axis at halt	Z-axis at halt	Y-axis at halt	X-axis at halt

Bit 1	X-axis	1 0	<b>In Motion</b> At Halt
Bit 2	Y-axis	1 0	<b>In Motion</b> At Halt
Bit 3	Z-axis	1 0	<b>In Motion</b> At Halt
Bit 4	U-axis	1 0	<b>In Motion</b> At Halt
Bit 5	V-axis	1 0	<b>In Motion</b> At Halt
Bit 6	W-axis	1 0	<b>In Motion</b> At Halt

### 4.3. Service Request

GP-IB is subject to IEEE488.2 standard.

With the ground above, it will support the following status structures and 488.2 common commands.

- Abbreviations of the following words are used hereafter.

**SBR: Status Byte Register** (See 4.3.2.1)

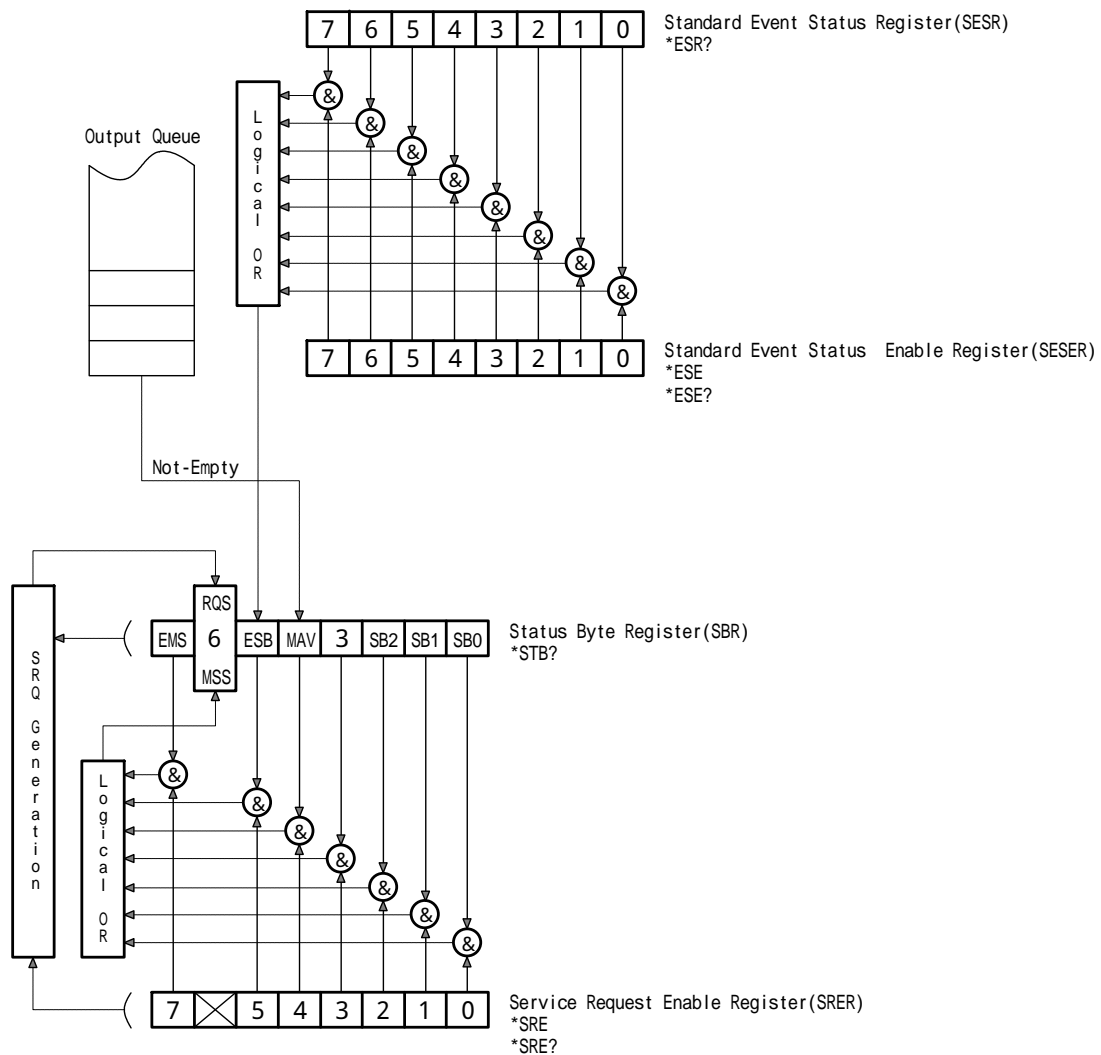
**SRER: Service Request Enable Register** (See 4.3.2.2)

**SESR: Standard Event Status Register** (See 4.3.2.3)

**SESER: Standard Event Status Enable Register** (See 4.3.2.4)

#### 4.3.1. Status Byte Register Structure

Structure of Service Request Summary Message for Status Byte Register is indicated below.



#### 4.3.2. IEEE488.2 Common Command

Among the 39 types of Common Commands which are defined in the IEEE488.2 standard, the following commands are supported.

Mnemonic Code	Command Full Specification Name	IEEE488.2 Standard	D250 Support Command
*ADD	Accept Address Command	Option	
*CAL	Calibration Query	Option	
*CLS	Clear Status Command	Required	
*DDT	Define Device Trigger Command	Option	
*DDT?	Define Device Trigger Query	Option	
*DLF	Disable Listener Function Command	Option	
*DMC	Define Macro Command	Option	
*EMC	Enable Macro Command	Option	
*EMC?	Enable Macro Query	Option	
*ESE	Standard Event Status Enable Command	Required	
*ESE?	Standard Event Status Enable Query	Required	
*ESR?	Standard Event Status Register Query	Required	
*GMC?	Get Macro contents Query	Option	
*IDN?	Identification Query	Required	
*IST?	Individual Status Query	Option	
*LMC?	Learn Macro Query	Option	
*LRN?	Learn Device Step Query	Option	
*OPC	Operation Complete Command	Required	
*OPC?	Operation Complete Query	Required	
*OPT?	Option Identification Query	Option	
*PCB	Pass Control Back Command	Required except C0	
*PMC	Purge Macro Command	Option	
*PRE	Parallel Poll Register Enable Command	Option	
*PRE?	Parallel Poll Register Enable Query	Option	
*PSC	Power On Status Clear Command	Option	
*PSC?	Power On Status Clear Query	Option	
*PUD	Protected User Data Command	Option	

*PUD?	Protected User Data Query	Option	
*RCL	Recall Command	Option	
*RDT	Resource Description Transfer Command	Option	
*RDT?	Resource Description Transfer Query	Option	
*RST	Reset Command	Required	
*SAV	Save Command	Option	
*SRE	Service Request Enable Command	Required	
*SRE?	Service Request Enable Query	Required	
*STB?	Read Status Byte Query	Required	
*TRG	Trigger Command	Required if it's DT1	
*TST?	Self Test Query	Required	
*WAI	Wait to Continue Command	Required	

IEEE488.2 Common commands always begin with \*.

Commands that D250 controller supports are as following.

Command	Content of Command / Data
*CLS	Clears both SBR and SESR, and clears output buffer related to Status
*ESE_□	By setting SESER, it selects which Bit to be enabled or disabled against ESB (SBR's Bit 5) of SESR <Data> 0 ~ 255
*ESE?	Command to request for setting of SESER <Response Data> 0 ~ 255
*ESR?	Command to request for current setting of SESR <Response Data> 0 ~ 255
*IDN?	Command to request for controller's ID <Response Data> <Field 1>, <Field 2>, <Field 3>, <Field 4> Field 1...Manufacturer's name (SURUGA) Field 2...Part number (D250) Field 3...Serial Number (0) Field 4...Software version (ROM version)
*OPC	This command does not exist in the D250 controller
*OPC?	<Response Data> 1

*RST	Command to initialize all the setting data of Parameter, Memory SW, Speed Table and Current Position (recover factory setting).
*SRE_□	By setting SRER, it selects which Bit to be enabled or disabled against SBR's Bit. <Data> 0 ~ 255
*SRE?	Command to request for setting of SRER <Response Data> 0 ~ 255
*STB?	Command to request for the sum of SBR setting and MSS summary message setting. Response Data> 0 ~ 255
*TST	D250 controller does not operate self-testing
*WAI	This command does not exist in D250 controller

#### 4.3.2.1 Status Byte Register (SBR)

Status Byte Register is configured as following.

Bit	Name	Content
0	SBO	Stop Summary Bit Set at the time when any of motor motion is stopped.
1	—	Not in Use
2	—	Not in Use
3	-	Not in Use
4	MAV	Message Available Summary Bit Set at the time when output data is set at output buffer. When output data is read, it will be reset.
5	ESB	Event Summary Bit When any of SESER bit is set to Enable, it will be set when a primary factor of SESR corresponding bit comes out.
6	RQS(MSS)	RQS Bit (Master Summary Status) When any of SESER bit is set to Enable and a primary factor of SBR corresponding bit comes out, turn on the SRQ (RQS Bit).
7	EMS	EMS Summary Bit Set at the time when an axis stopped with completing a motion.

- Content of SBR can be cleared by \*CLS Command.
- When Serial poll is done during GP-IB Interface bass is in use, device transmits Status Byte of 7 bits and RQS message.

However, due to specification of this controller, you need to conduct serial poll twice and refer to the second result.

- SBR cannot be cleared by serial poll.
- When \*STB common inquiry is done, device transmits Status Byte of 7 bits and MSS Summary message.

#### 4.3.2.2 Service Request Enable Register (SRER)

With Service Request Enable Register, you can select to either enabling or disabling which summary message of SBR against service request.

- The content of SRER can be read by using \*SRE? Common inquiry.
- The content of SRER can be written by using \*SRE Common command.
- SRER can be cleared by operating \*SRE Common Command or restarting the power supply. Consequently, there will be no service request to occur.

#### 4.3.2.3 Standard Event Status Register (SESR)

Bit	Name	Content
0	OPC Operation Complete	<b>Operation Completed</b> Device has completed a motion on pending, and ready to receive a new order. This bit responds to * OPC command only and creates Operation Completion Bit.
1	RQC Request Control	<b>Bass Control Authorization Request</b> Requesting to become active controller. Not Available with D250 Controller. 0 at all time.
2	QYE Query Error	<b>Inquiry Error</b> Set at the time when there is a try to read non-existing output data or when output buffer is overflowed.
3	DDE Device-dependent Error	<b>Device Dependent Error</b> Set at when there is an error according to a reason other than QYE / EXE / CME. For example: there is no axis to operate.
4	EXE Execution Error	<b>Execution Error</b> When there received a grammatically correct but non-executable command. For example: Data is out of Setting Range.
5	CME Command Error	<b>Command Error</b> When there received a grammatically incorrect command. spelling mistake etc.

6	URQ User Request	<p><b>User Request</b></p> <p>Requesting Local Control (rtl). This bit comes out regardless of the condition of Device remote / local.</p> <p>Not Available with D250 Controller: 0 at all time.</p>
7	PON Power On	<p><b>Power-ON</b></p> <p>Set when the power is turned on.</p>

- The content of SESR can be destructively read through \*ESR? Common inquiry, which means it will be cleared after reading.
- The content of SESR can be cleared by \*CLS command.
- The content of SESR can be cleared by turning the power on.  
Device during a sequence of turning on the power clears SESR at first, but it will record events which occur during the sequence.

#### 4 . 3 . 2 . 4 **Standard Event Status Enable Register (SESER)**

With Standard Event Status Enable Register, you can select either enabling or disabling which summary message of SESR against ESB summary message service bit.

- The content of SESER can be read by using \*ESE? Common inquiry.
- The content of SESER can be written by using \*ESE Common command.
- SESER can be cleared by operating \*ESE Common Command or restarting the power supply.

## 5. Others & Trouble Shooting

### 5.1. Trouble Shooting

Please check the following before considering the product is defective.

Trouble	Possible Cause	Solution	See	
Power is not turned on	Power cable is not plugged	Plug power cable in the socket tightly	1.4.2 1.4.4 1.6.2	
	Out of fuse	Replace with new fuse	1.4.3 1.6.2	
	Incorrect wiring	Check proper wiring instruction	2.1	
	Emergency Stop button is pressed	Release Emergency stop button	1.6.1 1.6.3	
Motorized Stage does not drive	Inproper connection of standard stage cable	Check connector part of standard stage cable	1.6.2 2.1	
	Software Limit has been set	Check Software Limit setting	3.2.3.3. 4.2.2.1~ 4.2.2.4	
	External Control	Inproper connection connection cable	Check cable connections	1.6.2 2.1.2 2.1.3 2.1.4
		Dip SW setting is not properly set	Check setting of Dip SW setting	2.2
	LED of Power lamp / D200 Handy Terminal does not light on	Broken lamp	Ask for repair	Contact Suruga
Power cable is not plugged		Plug power cable in the socket tightly	1.4.2 1.4.4 1.6.2	
Fuse burns out often	Damaged or defective power cable	Ask for repair	Contact Suruga	

## 5.2. Controller Specification

### 5.2.1. Basic Specification

<b>Product Name</b>	D251	D252	D253	D254	D255	D256
<b>Controlling Axis</b>	1	2	3	4	5	6
<b>Weight</b>	9kg	9.5kg	10.0kg	10.5kg	11kg	11.5kg
<b>Dimension</b>	430 (W) * 100 (H) * 350 (D) mm <Handle, stand and other projections not included>					
<b>Operating Environment</b>	0 ~ 40 °C 20 ~ 80% RH (Non-condensation)					
<b>Storage Environment</b>	-20 ~ 60 °C 20 ~ 80% RH (Non-condensation)					
<b>Power Source</b>	AC100 ~ 240V +/-10% 50/60Hz (Wide-range Input)					
<b>Max. Consuming Electric Power</b>	60W	100W	140W	180W	220W	260W

### 5.2.2. Controller Specification

**Controlling Axes:** 6 axes at maximum (Single Axis motion)

**Number of Output Pulse (P):** 0 ~ 99999999

**Driving Speed (F):** 1 ~ 999999 pps

**Start-Up Velocity (L):** 1 ~ 9999 pps

**Rate of Acceleration & Deceleration (R):** 1 ~ 9999 msec

**Software Limit Setting:** 2 points ( CW and CCW ) per each axis

**Mechanical Limit Detection:** 2 points (CW and CCW) per each axis (Input Logic Switching system)

**Origin Detection:** Mechanical origin detecting function 12 systems (Input Logic Switching system)

**External Interface:** GP-IB (subject to IEEE - 488.2)

RS-232C (19200/9600BPS: Dip SW switching system)

**Emergency Stop:** Loaded

- D250 controller will save and back up registered parameter and content of Memory SW by EEPROM. However, a current position (POSITION) will be cleared when the power is turned off.

### 5.2.3. Driver Specification

**Driving System:** Bipolar constant current chopper pentagon drive system

**Excitation System:** 4 Phase Excitation (Max. 250 Micro-Steps, 16 Channels for MS step type)

**Driving Capacity:** 0.75A/Phase /1.4A/Phase (with Current Down function)

\*1.4A/Phase is custom-made.

### 5.3. Warranty & Customer Service

#### 5.3.1. Warranty

At time of contacting Suruga Seiki or our distributor in your area, please refer to the serial number (8 digits) of product that is indicated on the side of product or enclosed warranty or quality assurance certificate. Suruga Seiki will refer to the date of purchase and registration according to the serial number. The warranty period is one year from the time of purchase.

The following conditions are not covered by the warranty.

- \* Failure to use the product properly as explained in the instruction manual, damage or injury caused by repair or modification made by a person other than a qualified personnel of Suruga Seiki.
- \* Damage caused by breakage during shipping or transportation or faulty handling.
- \* Damage due to fire, gas, sea and sea wind, wrong electrical or battery voltage, earthquake, thunder, flood and wind, and any other acts of nature.
- \* Damage or injury due to not following the proper procedures as indicated in the instruction manuals, not adhering to the caution warnings as indicated in the instruction manuals.

<Suruga Seiki will not be responsible for any direct or indirect damage or loss caused by our broken product or its use.>

#### 5.3.2. Repair Service

Please review the section on Trouble Shooting (See 5.1) prior to requesting repair service. If the problem still persists, please contact your local Suruga Seiki distributor for service.

<During Warranty Period>

Suruga Seiki will repair breakage caused under proper use following operation manuals for free of charge. Those repairs except mentioned above will be charged.

<After Warranty Period>

When repairing may maintain functions of a product, we can repair the product as charged service.

### 5.3.3. Repairable Period

#### Repairable Period and Repair Parts

Replacement and repair parts of controller are guaranteed for one year after closing of production. This period is the repairable period. However, please contact your local Suruga Seiki distributor for repairs and replacement parts even after the repairable period in case that repair may be still available.

<Regarding controller's breakage, Suruga Seiki will not be responsible for anything but free repair service based on this warranty.>

## 5.4. CE Certificate / CE Marking

### 5.4.1. CE Certificate

CE certificate (CE Marking) is a required certification on an instrument which distributes within the region of European Union. Manufacturer of the instrument has an obligation to approve with CE instructions related to the instrument. In general, manufacturer executes a self-declaration of approval on the CE certificate after confirming the compliance of the instrument with the EN standard, which has been issued to operate self-examination of instrument with CE instruction.

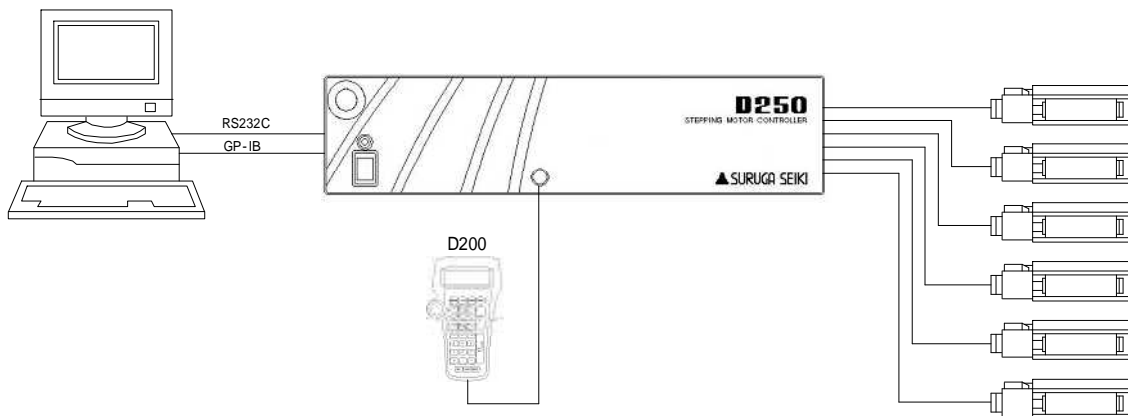
Product with self-declaration is mentioned with the following mark on package label or inscribed on a product.



### 5.4.2. Suruga Seiki's CE Certificate

Suruga Seiki has self-declaration of CE certificate regarding the connection of the figure below.

- PC is not necessary if you don't need to use PC.
- D200 Handy Terminal is not necessary when the controller is connected to PC.



Use **ONLY Suruga Seiki's motorized stages shown below** for connecting to D250 series controller.

<b>Series</b>	<b>Product Name</b>			
<b>KS101-15</b>	KS101-15	KS201-15	KS301-15	KS701-15
<b>KS101-20</b>	KS101-20	KS201-20	KS301-20N	KS701-20L
<b>KS101-20MS</b>	KS101-20MS	KS201-20MS	KS301-20NMS	KS701-20LMS
<b>TKS101-20MS</b>	TKS101-20MS	TKS201-20MS	TKS301-20NMS	TKS701-20LMS
	TKS701-20RMS			
<b>KS101-30</b>	KS101-30L	KS201-30L	KS301-30L	KS701-30L
	KS101-30R	KS201-30R	KS301-30R	KS701-30R
<b>KS101-30MS</b>	KS101-30LMS	KS201-30LMS	KS301-30LMS	KS701-30LMS
	KS101-30RMS	KS201-30RMS	KS301-30RMS	KS701-30RMS
<b>KS101-20HD</b>	KS101-20HD	KS201-20HD	KS301-20NHD	KS701-20LHD
	KS701-20RHD			
<b>KS101-30HD</b>	KS101-30LHD	KS201-30LHD	KS301-30LHD	KS701-30LHD
	KS101-30RHD	KS201-30RHD	KS301-30RHD	KS701-30RHD
<b>KS161-35</b>	KS161-35	KS261-35	KS361-35	
<b>KS161-85</b>	KS161-85	KS261-85	KS361-85	
<b>KS162-50</b>	KS162-50	KS262-50	KS362-50	
<b>KS162-100</b>	KS162-100	KS262-100	KS362-100	
<b>KS162-200</b>	KS162-200	KS262-200	KS362-200	
<b>KS102-30</b>	KS102-30	KS202-30	KS302-30	
<b>KS102-70</b>	KS102-70	KS202-70	KS302-70	
<b>KS102-100</b>	KS102-100	KS202-100	KS302-100	
<b>KS103-70</b>	KS103-70	KS203-70	KS303-70	
<b>KS103-100</b>	KS103-100	KS203-100	KS303-100	
<b>KS121-30</b>	KS121-30	KS221-30	KS321-30	
<b>KS121-60</b>	KS121-60	KS221-60	KS321-60	
<b>KS122-100</b>	KS122-100	KS222-100	KS332-100	
<b>KS122-200</b>	KS122-200	KS222-200	KS332-200	
<b>KS122-300</b>	KS122-300	KS222-300	KS332-300	
<b>KS111-100</b>	KS111-100	KS211-100	KS311-100	
<b>KS111-150</b>	KS111-150	KS211-150	KS311-150	
<b>KS111-200</b>	KS111-200	KS211-200	KS311-200	
<b>KS113-50A</b>	KS113-50A	KS213-50A	KS313-50A	

<b>KS113-100A</b>	KS113-100A	KS213-100A	KS313-100A	
<b>KS113-150A</b>	KS113-150A	KS213-150A	KS313-150A	
<b>KS113-50F</b>	KS113-50F	KS213-50F	KS313-50F	
<b>KS113-100F</b>	KS113-100F	KS213-100F	KS313-100F	
<b>KS113-150F</b>	KS113-150F	KS213-150F	KS313-150F	
<b>KS112-100</b>	KS112-100	KS212-100	KS312-100	
<b>KS112-200</b>	KS112-200	KS212-200	KS312-200	
<b>KS112-300</b>	KS112-300	KS212-300	KS312-300	
<b>KS112-400</b>	KS112-400	KS112-600		
<b>KS332/KS333</b>	KS332-4	KS332-8N	KS332-12	KS332-20
	KS332-50	KS333-5		
<b>KS401</b>	KS401-40	KS401-60		
<b>KS402</b>	KS402-60	KS402-75	KS402-100	KS402-160
	KS402-180			
<b>KS431/KS432</b>	KS431-60	KS432-60	KS432-75	KS432-100
<b>KS421</b>	KS421-60			
<b>KS451</b>	KS451-40	KS451-60	KS451-130	
<b>KS501-40</b>	KS501-40U	KS501-40L		
<b>KS501-60</b>	KS501-60U	KS501-60L	KS501-60WL	KS501-60TL
<b>KS521</b>	KS521-40	KS521-60	KS521-60W	KS521-60T
<b>TKS102</b>	TKS102-30	TKS202-30		
	TKS102-30F	TKS202-30F		

**Caution:**

- In case of connecting SURUGA motorized stages which are not listed above and/or other company's motorized stages to D250 controller, compliance check with EN standard needs to be done by customer.
- In case of connecting the stages listed above to a stepping motor controller other than D250 series controller, compliance check with EN standard needs to be done by customer.
- Check if a cable which is connected to a motorized stage has Fair light Core. If there is no Fair Light Core, please contact Suruga Seiki's OST Overseas Sales Office. (No compliance with EN standard.)
- Controller and Handy Terminal are certified with CE marking. However, self-declaration of Suruga Seiki only applies to applications of 5.4.2. Instrument itself is not covered by

the self-declaration.

- DO NOT disassemble or remodel Suruga Seiki products. Suruga Seiki is not responsible for any disassembled, remodeled products.

**PLEASE CONTACT US WHEN SURUGA STAGES ARE TO BE EXPORTED TO THE REGION OF EU (EUROPEAN UNION). SURUGA IS NOT RESPONSIBLE FOR ANY PRODUCT EXPORTED WITHOUT SURUGA'S CONSENT.**

<CONTACT INFORMATION>

**SURUGA SEIKI CO., LTD.**  
**OST DIVISION**

**OVERSEAS SALES OFFICE**

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