



I/O start type drive controller  
**ICD200 series**

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**【User's manual】**

## Attention on safety

Please read this operation manual thoroughly before starting any operation. This manual will guide the customers for proper use and avoid any mis-operation. This manual if properly read, will protect the users as well as other people from possibilities physical injuries, property damage and other serious accidents.



### DANGER

This danger shows the possibility that the user may die or get serious injures by fire or electrical shock and the contents which are high emergency of caution when danger is occurred if this warning is neglected and operated.



### WARNING

This warning shows the possibility that the user may die or get serious injures, fire or electrical shock if this warning is neglected and operated.



### CAUTION

This caution shows the possibility that the user may be injured by electrical shock or the contents which expect to issue physical damage if this caution is neglected and operated.



## DANGER

- Do not operate this product if it is damaged or disassembled. Otherwise, it may cause fire or electrical shock.
- In any case, do not attempt to repair or modify this product as it may cause fire, electrical shock or serious injuries.
- Do not use this product, in a place where the air includes a corrosive gas, inflammable gas, or any type of explosive gas, or the water or oil splashes, or it is near a flammable material. Otherwise, it may cause fire or electrical shock.
- Leave works such as installation, wiring, operation, checking and maintenance to experts who have enough knowledge on this product. Operation without knowledge may cause electrical shock and other serious physical or property damages.
- Keep the power supply within the rated voltage range. Otherwise, it may cause fire or other damages.
- Make sure all the connections correctly done referring to the wiring diagram shown in this user's manual. Otherwise, it may cause fire or other damages.
- Do not, in any circumstances, touch the terminal block while the power is on as there are some terminals which high voltage appeared. Otherwise, it may cause electrical shock. (Only apparatus with a terminal block)
- Do not touch or place objects such as metals or foreign substance on the board. Otherwise, it may cause fire or electrical shock.
- Do not bend, pull or place the power or motor lines by the extreme force. Otherwise, it may cause fire or electrical shock.
- Do not make a mistake connecting the motor output terminals to protective earth or power supply. Otherwise, it may cause fire.
- Do not do the driver's installation preventing ventilation. Otherwise, it may cause fire.
- Please stop operation soon in case that more than 70 heat generates or HEAT(over heat) function, if the device has HEAT function, acts on during operation. This is cause of fire or accident.

 **WARNING**

- Do not operate to move, wire, maintain and test etc. during power on. After power-off and ten seconds pass, please start to operate. It may cause electric shock.
- Do not touch the unit with wet hand by no means during power on. There is a reason of electric shock.
- Connect the protective earth (PE) with the protective earth terminal by no means. It may cause electric shock.
- Do not use driver outside of control box. It may cause electric shock and injure.
- Fix the driver tightly when installing. It may cause injury. (Only apparatus with a terminal block)
- Do not touch the driver during operation and for the time being after stop. Because the surface of driver is hot depending of operating condition, it may cause injury.
- Use power isolated from dangerous voltage. It may cause electric shock

 **CAUTION**

- Avoid using or storing the unit where air is dusty. It may cause malfunctions.
- Do not give a large shock. It may cause malfunctions.
- Do not use or store this unit in a place of high or low temperature, extreme high or low humidity. It may cause a short circuit or malfunctions.
- Avoid dews to form. It may cause a short circuit or malfunctions.
- We do not have the responsibility about user's repair and modification because it is out of our guarantee.
- When abandoning the driver, treat it as industrial wastes.
- Do not leave the name plate.

If necessary, we would ask the trading company or distributor to translate this manual into the importer's mother language.

## Index

1. FOREWORD.....	1
2. MODEL NUMBER .....	1
2-1. DRIVE-CONTROLLER MODEL .....	1
2-2. DRIVE-CONTROLLER NAME PLATE.....	1
3. SPECIFICATION .....	2
4. PART NAME AND FUNCTION .....	4
4-1. NAME OF EACH PART .....	4
4-2. FUNCTION.....	5
4-2-1. DIP Switch.....	5
4-2-2. LED .....	6
4-2-3. Connector .....	7
4-2-4. Driving current adjusting volume ( C.ADJ) .....	8
4-2-5. JP for terminator ( JP1) .....	9
4-2-6. NanoDrive resolution.....	9
4-2-7. Current-off function .....	9
4-2-8. I/O logic setting .....	10
4-2-9. Setting of driving parameter.....	10
5. DRIVING .....	11
5-1. SENSOR MODE.....	12
5-1-1 Sensor input terminal and direction.....	12
5-1-2 Home search .....	13
5-1-3. Driving between sensors .....	14
5-1-4. Position compensation .....	15
5-1-5. Stopping position .....	16
5-2. ABSOLUTE POSITION MOVEMENT MODE.....	17
5-2-1. Absolute position driving mode, Home search .....	17
5-2-1. Absolute position driving mode, Home search .....	18
5-2-2. Absolute position driving mode, PTP driving.....	19
5-3 RELATIVE POSITION DRIVING MODE.....	20
5-3-1. Relative positioning driving mode, Home searching .....	21
5-3-2. Relative positioning driving mode.....	22
5-4. PC DRIVING.....	23
6. EXAMPLE OF WIRING.....	24
7. HOW TO ADJUST DRIVING CURRENT.....	25
8. WIRING AND INSTALLATION CONDITION.....	26
8-1. WIRING POWER INPUT AND MOTOR OUTPUT .....	26
8-2. WIRING OF SENSOR SIGNAL .....	26
8-3. APPLICABLE TOOL FOR CONTACT PIN .....	26
8-4. INSTALLATION CONDITION .....	26
8-5. HOW TO INSTALL .....	26
9. NOISE MEASURES .....	27
10. DIMENSION .....	28
11. FACTORY DEFAULT SETTING.....	29
12. PRODUCT GUARANTEE PERIOD.....	31
12-1. GUARANTEE PERIOD .....	31
12-2. OUT OF GUARANTEE .....	31

<b>13. ACCESSORIES</b> .....	<b>31</b>
<b>14. OPTIONAL ACCESSORIES</b> .....	<b>32</b>

## 1. Foreword

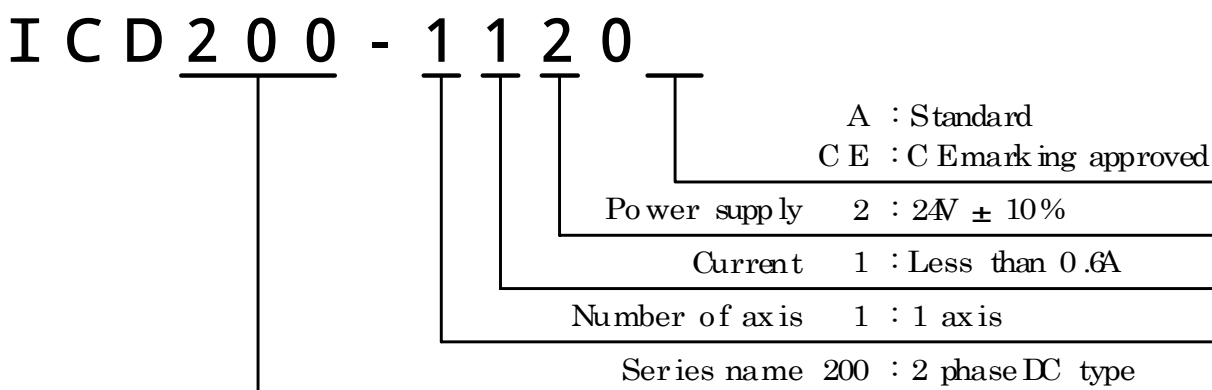
Thank you for using our ICD200 series, I/O start type controller, this time.

If the usage is wrong or operation is not correct, the feature of device cannot be displayed fully and there are possibility of wrong operation, cause of unexpected trouble or shortage of life of device.

Please read this manual thoroughly in prior to using this unit then operate this unit correctly.

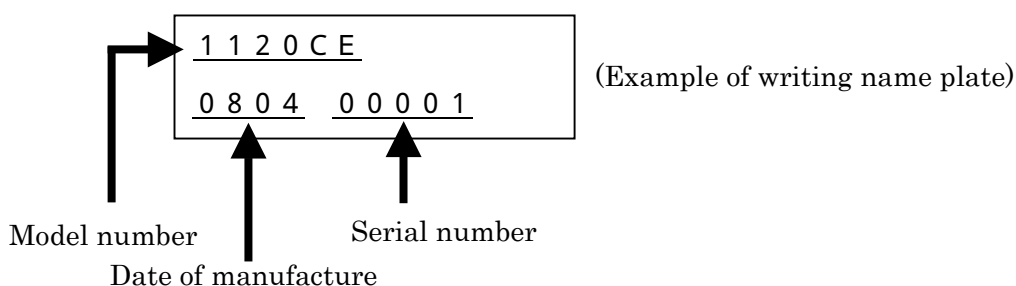
## 2. Model number

### 2-1. Drive-controller model



### 2-2. Drive-controller name plate

Do not remove the name plate(model number, data of manufacture and serial number) which is attached at the drive-controller.



The above plate shows “Model number:ICD200-1120CE, manufacturing year: Spring, 2008 and Serial number:00001”

Marking item	Characters	Explanation of item
Model number	5 – 6 characters	ICD200 - 1120A (marking: 1120A) ICD200 - 1120CE (marking: 1120CE)
Date of manufacture	4 characters	The Christian era (2 digits) month (2 digits)
Serial number	5 characters	Sequential number for each product model (00001 ~)

### 3. Specification

Common specification for ICD200-1120A, ICD200-1120CE drive-controller

Items	Description	
Number of Applicable axis	1 axis	
Use of ASIC	1 pc. MCD1201	
Dimensions	60(D) x 90(W) x 36(H)	
Control type	I/O start type	
Input power	DC24V plus or minus 10%	
Consumption power	Less than 24W	
Numbers of setting point	Sensor mode : 3 points Absolute position driving mode setting : 3 points( 1/3 is home) Relative position driving mode setting : 4 points	
Operation	<ol style="list-style-type: none"> <li>1. Sensor positioning by "sensor 1, 2, 3".</li> <li>2. Absolute positioning by "point 1, 2, 3"</li> <li>3. Relative positioning by code and direction input.</li> <li>4. Home search</li> <li>5. Stop by FOR/REV sensor(When absolute/relative setting)</li> <li>6. Instant stop by heat of driver.</li> <li>7. Movement completion signal outputs of point 1, 2, 3.</li> <li>8. Alarm output</li> <li>9. Reading out the numbers of output pulses(position status). Stopping only.</li> <li>10. Reading out status of stopping, normal finish, error. Stopping only.</li> </ol>	
Start I/F	Input	Photo coupler input 3 point starts, Home search start, Instant stop Rotating direction(Setting of pulse numbers appoint mode), Current off
	Output	Photo coupler open collector output 3 Completion signals, Alarm output
Sensor I/F	Input	Photo coupler input 3 sensor inputs
Communication I/F	RS485 (Data download and start command etc. from PC)	
Numbers of rewriting serial ROM	1 million times	
LED	Power ON, Pulse monitor output, Error output	
Standard	EU RoHS compliant	
Environmental temperature	Operating	0 to +40 (No freezing)
	Storing	0 to +60 (No freezing)
Operating humidity	Less than 80% (No condensation)	
Storing humidity	Less than 80% (No condensation)	
Operating height	Blow than 1,000 from sea level	
Weight	130g	

## Specification of controller part

Setting range of moving distance	1 to 4,294,967,295 (without code 32 bit) -2,147,483,648 to 2,147,483,647(with code 32 bit)
Range of position management	-2,147,483,648 to 2,147,483,647 (with code 32 bit)
Range of start speed and maximum output Hz.	114.44/N to 7499825.4/N [Hz] (Multiple ratio N = 1 to 256) In case N=1, 114.44[Hz] to 7.4998254[MHz] (114.44[Hz] unit) In case N=256, 0.447[Hz] to 29.294[kHz] (0.447[Hz] unit)
Shape of acceleration/deceleration	Trapezoidal/S curve shape(memory data) acceleration/deceleration driving. Deceleration is same slope.
Slope of acceleration/deceleration	26.193/N [kHz/sec] to 1.717/N [GHz/sec] (Division ratio N = 1 to 256) When N = 1, 26.193 [kHz/sec] to 1.717 [GHz/sec] When N = 256, 102.3 [Hz/sec] to 6.7 [MHz]

## Specification of driver part

Driving type	Bi-polar constant current type
Driving current	Max. 1.2A (Total output current)
Correspondence motor current	Bi-polar : Max. 0.6A/phase Uni-polar : Max. 1.2A/phase
Resolution	1, 2, 2.5, 4, 5, 10, 20, 25, 50 or 100 division(10 kinds) of standard step.
Auto-current down	About 50% of driving current
Driving current adjustment	By volume on the board
Over heat detection	Alarm output at higher than about 70

#### 4. Part name and function

##### 4-1. Name of each part

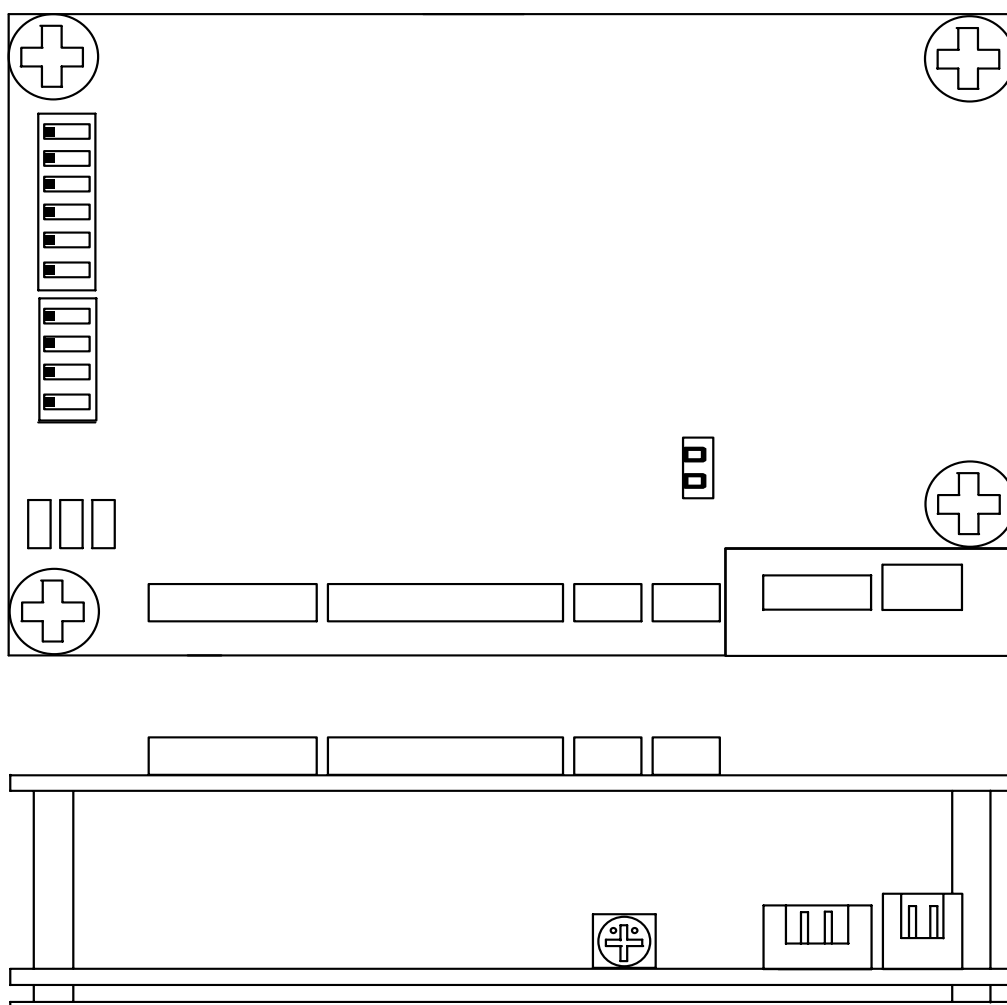


Fig. 4-1. Connector configuration of ICD200

Table 4-1. Part name

No.	Symbol	Name
	SW1	Selection of function
	SW2	Selection of axis number
	LED1	Power display LED
	LED2	Pulse monitor LED
	LED3	Error LED
	C-CN-1	Sensor I/F connector
	C-CN-2	Start signal I/F connector
	C-CN-4	RS485 I/F connector (IN)
	C-CN-5	RS485 I/F connector (OUT)
	D-CN-1	Power connector
	D-CN-2	Motor connection connector
	C.ADJ	Volume for driving current adjustment
	JP1	JP for end terminal resistor

## 4-2. Function

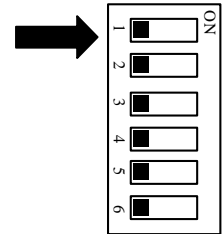
### 4-2-1. DIP Switch

Home search direction ( SW1 1 pole IORGDIR)

This sets the direction of home search. Table 4-2 shows the relation of driving mode and home search.

Table 4-2 Direction of home search

	ON	OFF
Sensor mode	Sensor 1	Sensor 3
Absolute positioning driving mode	Forward	Reverse
Relative positioning driving mode	Forward	Reverse



SW1

Maintenance setting ( SW1 2-3 pole SPEED[1:0])

Maintenance setting compels to set start speed and maximum speed 1/2 and 1/4 respectively.

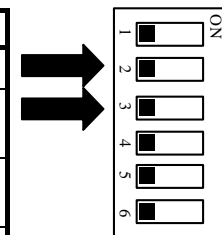
Maintenance setting is useful when user wants to drive slowly with setting parameter.

Because maintenance setting compels to change speed setting only, S curve a

cceleration/deceleration may not be reflected depending on setting or mis-operation may occur if the setting value is zero.

Table 4-3 Maintenance setting

SPEED0(2 poles)	SPEED1(3 poles)	Speed setting
ON	ON	Normal
OFF	ON	Start speed and Maximum speed 1/2
ON	OFF	Start speed and Maximum speed 1/4
OFF	OFF	Normal



SW1

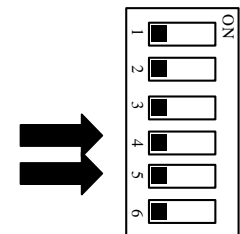
Selection of Driving mode ( SW1 4-5 pole MOVEMODE[1:0])

SW1(4·5 pole) sets driving mode. Table 4-4 shows the relation of the

Setting of SW1(4, 5 pole) and driving mode. Please refer chapter 5 for each driving mode.

Table 4-4. Driving mode

MOVE MODE0(4th pole)	MOVE MODE1(5th pole)	Driving mode
ON	ON	Sensor mode
OFF	ON	Absolute positioning driving mode
ON	OFF	Relative positioning driving mode
OFF	OFF	prohibition

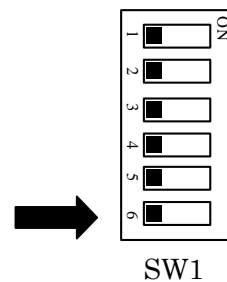


SW1

Auto current down function ( SW1 6<sup>th</sup> pole ICDOFF)

This reduces the motor driving current to 50% of normal current and temperature rising of motor after the motor stops. Current down setting(SW1, 6<sup>th</sup> pole) can set valid or invalid of auto current down.

- ON : Auto current down invalid
- OFF : Auto current down valid



It is available to set the period from motor stops to auto current down becomes valid.



This setting downloads from our special application software or user's application software to serial ROM through RS484 communication. The downloaded data is stored therefore the set data is kept even if power off. Data is not set by only

Axis number setting ( SW2 1-4<sup>th</sup> pole AXIS[3:0])

This selects axis number. The maximum connectable axes are 15 axes. In case of daisy chain connection, do not duplicate axis number.



Table 4-5 Axis number

1 <sup>st</sup> pole	2 <sup>nd</sup> pole	3 <sup>rd</sup> pole	4 <sup>th</sup> pole	Axis #	1 <sup>st</sup> pole	2 <sup>nd</sup> pole	3 <sup>rd</sup> pole	4 <sup>th</sup> pole	Axis #
ON	ON	ON	ON	prohibition	ON	ON	ON	OFF	8
OFF	ON	ON	ON	1	OFF	ON	ON	OFF	9
ON	OFF	ON	ON	2	ON	OFF	ON	OFF	10
OFF	OFF	ON	ON	3	OFF	OFF	ON	OFF	11
ON	ON	OFF	ON	4	ON	ON	OFF	OFF	12
OFF	ON	OFF	ON	5	OFF	ON	OFF	OFF	13
ON	OFF	OFF	ON	6	ON	OFF	OFF	OFF	14
OFF	OFF	OFF	ON	7	OFF	OFF	OFF	OFF	15

4-2-2. LED

ICD200 has three LED for display. Table 4-6 describes each LED.

Table 4-6. Description of LED

Symbol	Name	Function
LED1	Power LED	This lights during power on
LED2	Pulse monitor LED	This monitors outputting pulse during driving.
LED3	Error LED	This LED lights when motor stops by error factor like heat alarm or instant stop interrupt. Then signal also outputs to error terminal of start signal I/F(C-CN-2).

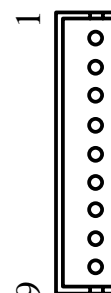
### 4-2-3. Connector

Sensor I/F connector( C-CN-1)

Connect with sensor signal. Power connected with start signal I/F is supplied to the sensor.

Table 4-7. Pin assignment of sensor I/F connector.

Connector pin assignment					
No.	I/O	Terminal name	No.	I/O	Terminal name
1	O	+COM ( 1)	6	O	- COM( 2)
2	I	Sensor 1 (SEN1)	7	O	+ COM( 1)
3	O	- COM ( 2)	8	I	Sensor 3 (SEN3)
4	O	+COM ( 1)	9	O	- COM( 2)
5	I	Sensor 2 (SEN2)			



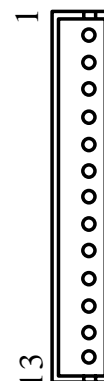
1:24V output      2:0V output

Start signal I/F connector ( C-CN-2)

Connect with start signal of each driving mode, rotating direction signal, home search start signal, current-off signal, instant stop signal, driving completion signal, error signal. Please use another power supply for +COM and –COM than power supply connecting with power connector( D-CN-1).

Table 4-8. Pin assignment of start signal I/F.

Connector pin assignment					
No.	I/O	Terminal name	No.	I/O	Terminal name
1	I	+ COM ( 1)	8	I	Instant stop (STOP)
2	I	Start signal 1 (ST1)	9	O	Completion signal 1 (FIN1)
3	I	Start signal 2 (ST2)	10	O	Completion signal 2 (FIN2)
4	I	Start signal 3 (ST3)	11	O	Completion signal 3 (FIN3)
5	I	Rotating direction (DIR)	12	O	Error signal (ERR)
6	I	Home search (ORG)	13	I	COM ( 2)
7	I	Current-off (CO)			



1:24V Sensor supply      2:0V Sensor supply

RS485 I/F connector( C-CN-4 C-CN-5)

ICD200 has 2 channels connectors on which RS484 serial communication is available and maximum 15 axes daisy chain is available. Connect C-CN-4 of two connectors with input(Host daisy chain input), then connect C-CN-5 with output(daisy chain output). The example connection of daisy chain shows Fig. 4-2.

Table 4-9. RS485 I/F connector pin assignment

Connector pin assignment	
No.	Terminal name
1	TRX-
2	TRX+
3	GND



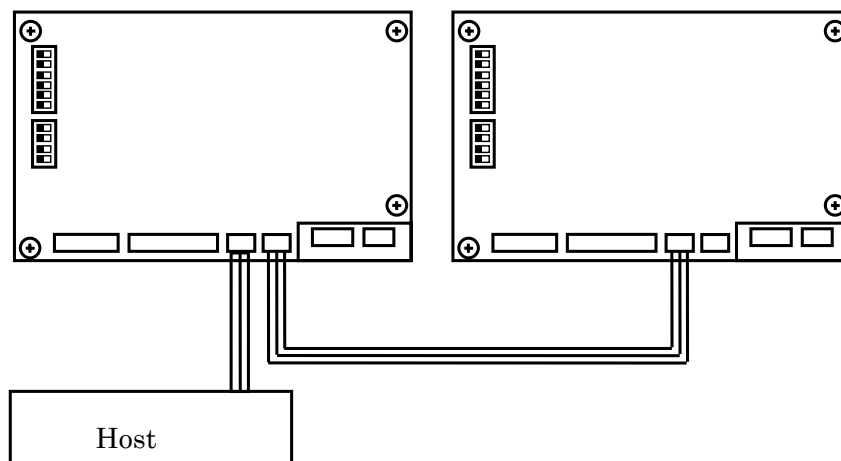


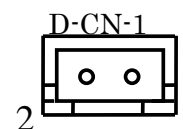
Fig. 4-2, Daisy chain

Power connector( D-CN-1)

Connect with DC+24V, 0V. This power is power supply for motor control and logic parts.

Table 4-10. Power connector pin assignment.

Connector pin assignment	
No.	Terminal name
1	+24V
2	0V

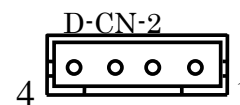


Motor connector ( D-CN-2)

Connect with motor leads.

Table 4-11. Motor connecting pin assignment.

Connector pin assignment	
No.	Terminal name
1	/B
2	B
3	/A
4	A



#### 4-2-4. Driving current adjusting volume ( C.ADJ)

This adjusts driving current. Please refer chapter 7 how to adjust driving current.

#### 4-2-5. JP for terminator ( JP1)

Inserting JP1 becomes terminator. Please insert JP1 of farthest ICD200 from host when daisy chain configuration. Do not insert JP1 of other ICD200.

In case of wrong setting such as JP1 of all axes are inserted, there will be the possibility of break down of communication IC or wrong communication. Please pay attention.

In case that only one axis is used, insert JP1.

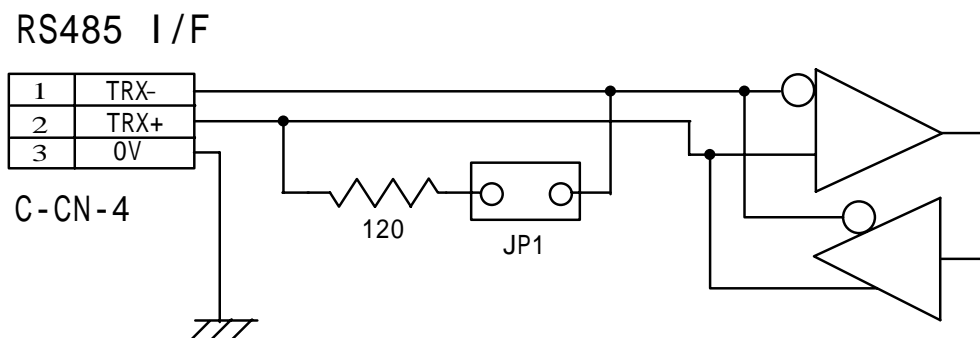


Fig. 4-3. JP1 peripheral circuit

#### 4-2-6. NanoDrive resolution

10 kinds NanoDrive resolution are available to set as shown Table 4-12.

Please set all driving mode(sensor/absolute/relative/PC) same resolution.

Table 4-12 NanoDrive resolution

1/1	1/2	1/2.5	1/4	1/5
1/10	1/20	1/25	1/50	1/100



This setting downloads from our special application software or user's application software to serial ROM through RS484 communication. The downloaded data is stored therefore the set data is kept even if power off. ICD200 does not have setting switch.

#### 4-2-7. Current-off function

Current-off function controls excitation or un-excitation of motor.

7<sup>th</sup> pin of start signal I/F( C-CN-1) sets current-off.

Photo coupler OFF : excitation ON(default setting, positive logic)

Photo coupler ON : OFF(default setting, positive logic)

Remark : Changing of logic setting of current-off control terminal is available.

#### 4-2-8. I/O logic setting

It is available to change I/O logic. When you change default setting, once power off ICD200 then power on again. When power on, the changed logic setting becomes effective. Even if logic setting is changed only, ICD200 does not reflect the changing. Please pay attention. Table 4-13 shows terminals which can change logic setting.



This setting downloads from our special application software or user's application software to serial ROM through RS484 communication. The downloaded data is stored therefore the set data is kept even if power off. ICD200 does not have setting switch.

Table 4-13. List of logic changeable I/O terminal

Connector	Name
Sensor I/F 2/5/8 <sup>th</sup> pins	Sensor input
Start signal I/F 6 <sup>th</sup> pin	Rotating direction input
Start signal I/F 7 <sup>th</sup> pin	Current-off input
Start signal I/F 8 <sup>th</sup> pin	Instant stop input
Start signal I/F 9/10/11 <sup>th</sup> pin	Operation completion signal output
Start signal I/F 12 <sup>th</sup> pin	Error signal output

#### 4-2-9. Setting of driving parameter

Each driving mode requires individual parameters. (Please refer chapter 5 for detail.) The below (Table 4-14) shows required parameter for each driving mode.

Table 4-14. Driving mode and driving parameter

Driving mode	Driving parameter setting			
	Sensor mode	Acceleration/deceleration setting	Moving distance 1(P1)	Moving distance 2(P2)
Start speed 1(S1)		Start speed 2(S2)	Maximum speed(V1)	-
Absolute positioning driving mode	Acceleration/deceleration setting	Moving distance 1(P1)	Start speed 1(S1)	Maximum speed(V1)
Relative positioning driving mode	Acceleration/deceleration setting	Moving distance 1(P1)	Start speed 1(S1)	Maximum speed(V1)
Home search (Common in all driving mode)	Acceleration/deceleration setting	Moving distance 3(P3)	Start speed 1(S1)	Maximum speed(V1)



This setting downloads from our special application software or user's application software to serial ROM through RS484 communication. The downloaded data is stored therefore the set data is kept even if power off. ICD200 does not have setting switch.

## 5. Driving

There are two methods to start ICD200. One method is I/O driving which external I/O makes start signal and another method is PC driving which starts from PC through RS485 I/F.

I/O driving makes start, specify moving point and so on by input signal from start signal I/F connector and sensor I/F connector. All I/O signals are positive logic in default setting. Terminals except start signal(ST1/ST2/ST3/ORG) is available to change logic. Please refer column 4-2-8 for logic change. Start signal(ST1/ST2/ST3/ORG) is fixed to positive logic.

Each driving mode like sensor mode can set driving mode as table 5-1 by changing 2-3<sup>rd</sup> pole(MOVEMODE[1:0]) of DIP switch SW1. Do not set 2-3<sup>rd</sup> pole of SW1 [OFF:OFF]. Each driving mode is explained from column 5-1.

The explanation of start signal or sensor becoming active in default setting(positive logic) means that photo coupler becomes ON. If the logic setting is changed into negative logic, the active means that photo coupler is OFF. Please pay attention.

Table 5-1 Driving mode

MOVE MODE0 (SW1-22 <sup>nd</sup> pole)	MOVE MODE1 (SW1-2 <sup>nd</sup> pole)	Driving mode
ON	ON	Sensor mode
OFF	ON	Absolute positioning driving mode
ON	OFF	Relative positioning driving mode
OFF	OFF	Prohibition

Start signal I/F connector terminal changes function depending on driving mode. Please pay attention.

Table 5-2 Terminal function of start I/F and sensor I/F

I/O	Terminal name	Sensor mode	Absolute positioning driving mode	Relative positioning driving mode
Input	SEN1	Sensor input 1	Forward limit signal	
	SEN2	Sensor input 2	Home signal	
	SEN3	Sensor input 3	Reverse limit signal	
	ST1	Moving to sensor 1	Moving to point 1	Start signal
	ST2	Moving to sensor 2	Moving to point 2	Code selection 0
	ST3	Moving to sensor 3	Moving to point 3	Code selection 1
	ORG	Home search start		
	STOP	Instant stop input		
	DIR			Rotation direction
Output	FIN1	Sensor 1 movement completion	Point 1 movement completion	Home search completion
	FIN2	Sensor 2 movement completion	Point 2 movement completion	Driving completion
	FIN3	Sensor 3 movement completion	Point 3 movement completion	
	ERR	Error output		

Remark : When you make start signal (ST1/ST2/ST3/ORG) of each driving mode active(photo coupler ON), please return to non-active(photo coupler OFF) until driving completion. If it keeps active, there is a possibility of mis-operation when re-start. Please pay attention.

## 5-1. Sensor mode

In sensor mode, when start signals 1 to 3 (ST1 to 3) become active(photo coupler ON), it drives to sensor position corresponding start signal according to preset driving parameter

For example when start signal 1(ST1) starts driving, the target position is sensor 1(SEN1). If the input of sensor 1 becomes active, driving stops then movement completion signal 1(FIN1) outputs. Please execute home search when power on, error issues or driving mode changes. Driving does not start even if start signal is inputted without home search.

Table 5-3 Flow of sensor mode

Start signal		Target position sensor		Completion signal
ST1		SEN1		FIN1
ST2		SEN2		FIN2
ST3		SEN3		FIN3

The condition that each movement completion signal is cleared is below cases.

- . When position is off stopping sensor position after driving by following start signal
- . When error issues (Please refer chapter 5-1-3, Driving among sensors for the factor of error
- . When driving mode is changed.

Please use Sensor 1 and Sensor 2 by all means when sensor mode driving.

### 5-1-1 Sensor input terminal and direction

The arrangement of three sensors input terminals premise the blow.

Sensor input 2(SEN2) is between Sensor input1(SEN1) and Sensor input 3(SEN3)

The forward direction is from Sensor 2 to Sensor 1

The reverse direction is form Sensor 2 to Sensor 3.

If this connection is wrong, incorrect action issues. Please pay attention.

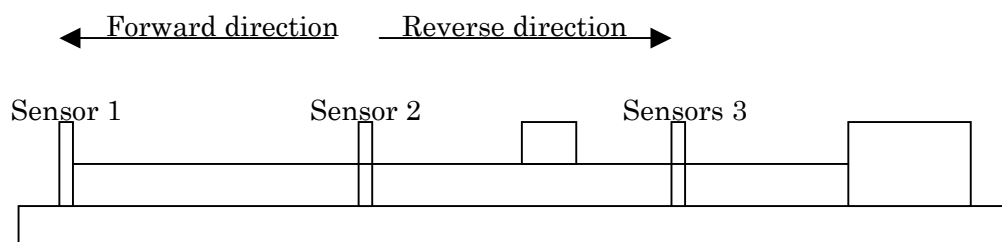


Fig. 5-1. Each sensor position and direction

## 5-1-2 Home search

Home search starts by making Home search start signal(ORG) of Start signal I/F active.  
 If Sensor 1 or Sensor 3 is edge(limit) of mechanism, please execute home search by start speed.  
 In only case that there is enough space outside of Sensor 1 or Sensor 3 to stop with deceleration, you can execute home search with acceleration/deceleration stop.

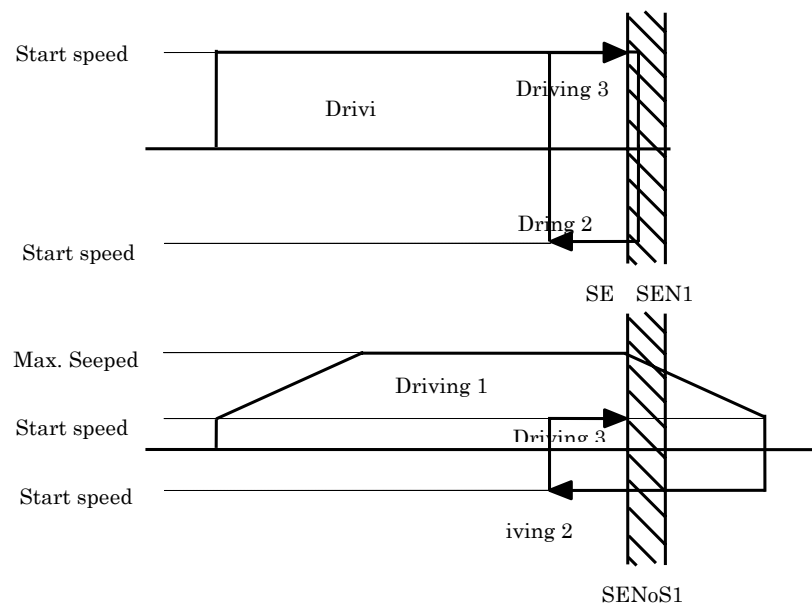


Fig. 5-2. Home search of sensor mode

The home in sensor mode is sensor input 1(SEN1) or sensor input 3(SEN3). The setting of DIP switch(SW1 1<sup>st</sup> pole IORGDIR) selects home of sensor input 1 or sensor input 3.

Table 5-4. Home position

IORGDIR	Home position
ON	Sensor 1
OFF	Sensor 3

Home search executes as procedure of Table 5-2 shows driving order -

Driving 1 : Executing starts to the direction set by home search direction then decelerates and stops when SEN1(3) is active. (\*Remark)

Driving 2 : Movement starts with start speed to the reverse direction against Driving 1, then stops instantly at the fall time of SEN1(3)

Driving 3 : Movement starts to the same direction of Driving 1 with start speed again and stops instantly when SEN1(3) is active.

\* Remark : In case that the parameter is set to execute acceleration / deceleration, Driving 1 stops with deceleration when SEN1(3) is active. Therefore movement may exceed SEN1(3). Please accelerate /decelerate in case that there are enough space outside of SEN1(3).

\* If it stops outside of home sensor, please execute home search to the opposite direction against current home searching direction.

When home searching, the sensor of target position is active, Driving 1 is omitted then Driving 2 starts.

After Driving 3, unless the target sensor is active, position compensation is executed. Please refer 5-1-4 Position compensation about position compensation.

### 5-1-3. Driving between sensors

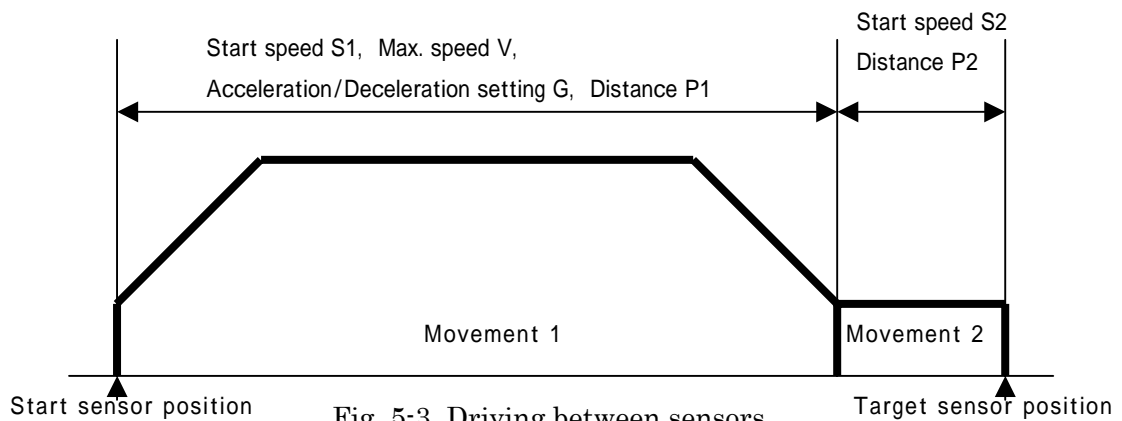


Fig. 5-3, Driving between sensors

Driving between sensors separates Movement 1 and Movement 2 in sensor mode and executes Movement 1 and Movement 2 continuously.

**Movement 1** : Movement starts from Start sensor position with Start speed S1, Maximum speed V, Distance P1 and Acceleration /deceleration setting G. The shape of Acceleration /deceleration is a trapezoidal or S-curve. Movement 1 finishes after output of Setting pulse numbers P1.

**Movement 2** : After Movement 1 finishes, Movement 2 execute start speed driving with Start speed S2 and Distance P2. The condition of movement completion is finish of setting pulse number P2 output or activating target sensor. However activating of target sensor is prior to finish of setting pulse number output.

After Driving 2, unless the target sensor is active, position compensation is executed. Please refer "5-1-4 Position compensation" about position compensation.

The condition that error occurs at Driving between sensors is listed as below.

- . The sensor of target position goes active at the step of Movement 1.
- . Start signal is inputted when any movement completion signal (FIN1-3) are not active(When power inputs, etc for example)
- . After normal movement completion, position is off current position sensors in the condition that completion signal is active.
- . Even if position compensation finishes, the sensor of target position does not become active.
- . Instant stop interrupt is inputted.

If error occurs, error signal outputs. The error signal is released by home searching.

### 5-1-4. Position compensation

Position compensation is function to stop motor surely in case that sensor is active condition when home searching in any mode and moving between sensors in sensor mode.

Position compensation is executed in case that sensor does not become active even if setting pulse numbers finished to output at movement between sensors or in case that movement stops keeping non-active status of the sensor because position is off target position sensor such as stopping reaction. Setting movement is executed until sensor becomes active.

Fig. 5-4 shows flow chart of Position compensation execution.

Below setting is available with regard to Position compensation.

Time from movement stop to judgment of sensor status(WAIT).

The number of Position compensation to output at once(P3)

The maximum loop times(LOOP)



This setting downloads from our special application software or user's application software to serial ROM through RS484 communication. The downloaded data is stored therefore the set data is kept even if power off. ICD200 does not have setting switch.

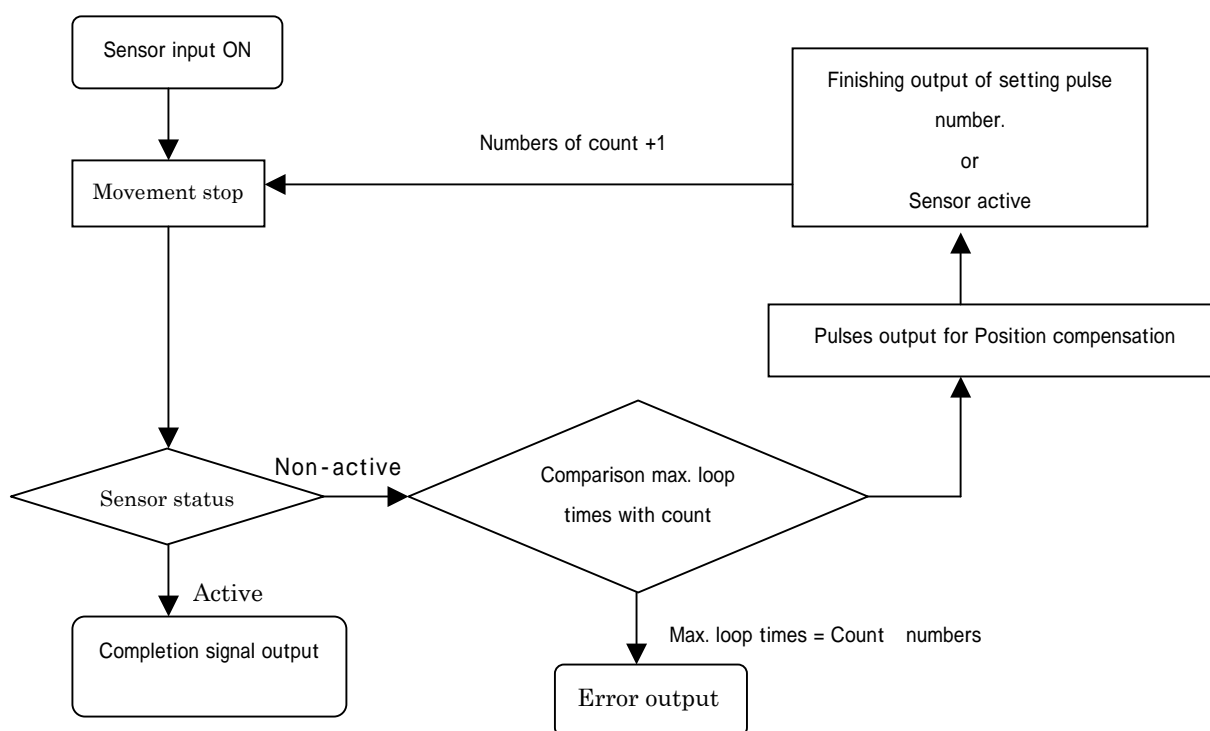


Fig. 5-4. Flow chart of Position compensation

5-1-5. Stopping position

Motor stops at the position of edge where each sensor becomes active. Both ends of forward / reverse have edges to become active. Sensor 1 and Sensor 3 at the ends use edges which become only one way active toward either forward or reverse direction. Sensor 2 at the center uses edges which become active toward both Sensor 1 and Sensor 3.

Stopping position of each sensor is as below.

Table 5-5. Stopping position of sensor

Sensor #	Stopping position
1	Edge of Sensor 2 side
2	Movement from 1 to 2 : Edge of Sensor 1 side. Movement of below Fig. 5-5 solid arrow line. Movement from 3 to 2 : Edge of Sensor 3. Movement of below Fig. 5-5 dotted arrow line
3	Edge of Sensor 2 side

The stopping position at Sensor 2 is depending on Sensor 3 to 2 or Sensor 1 to 2. (Please refer Fig. 5-5)

For example the moving distance from Sensor 2 to 1 is depending on whether Sensor 1 to 2 or Sensor 3 to 2 is just before movement. Please pay attention such things and set moving parameters.

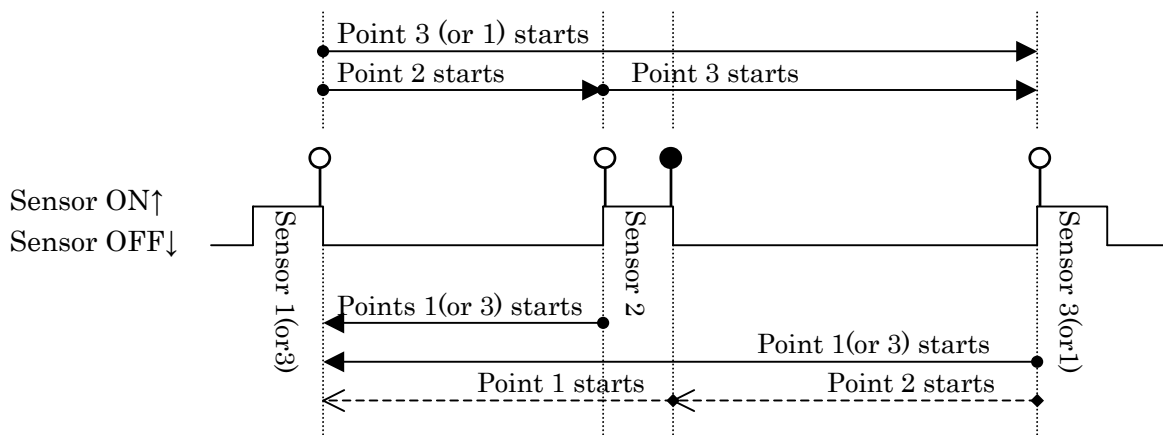


Fig. 5-5. Sensor stopping position (Stop with sensor ON)

## 5-2. Absolute position movement mode

Absolute position movement mode is to move among any three points(Home is one point) by start signal(ST1 to ST3). For example, when Start signal 1(ST1) becomes active, movement reaches to target position of Point 1, then Movement completion signal 1(FIN 1) is outputted. Continuing start signal 1, if Start signal 2(ST2) becomes active, movement reaches to target position of Point 2 then Movement completion signal 2(FIN 2) is outputted.

Please execute home searching just after power on, when error occurs or when mode exchanging. Even if start signal is inputted without home searching, movement does not start.

Position mark means that the position from home to forward direction(SEN1) is plus and the position from home to reverse direction(SEN3) is minus.

Table 5-6. Flow of Absolute position movement mode

Start signal		Target position		Movement completion signal
ST1		Point 1		FIN1
ST2		Point 2		FIN2
ST3		Point 3		FIN3

The movement completion signal is cleared in below condition.

At the time when start signal is inputted.

At the time when error occurs. (Please refer 5-2-2. PTP movement for the error factor).

At the time when driving mode is switched.

Table 5-7 shows the function of sensor input terminal in absolute position driving mode, which is different from sensor mode.

Table 5-7. Sensor in absolute position driving

Sensor #	Function
SEN1	Forward limit
SEN2	Home sensor
SEN3	Reverse limit

Fig. 5-6 is image of specified position mode. As shown in Table 5-7, SEN1 and SEN3 are limit signals. It is available to specify any three points but Point 1 of three points is fixed to Home.

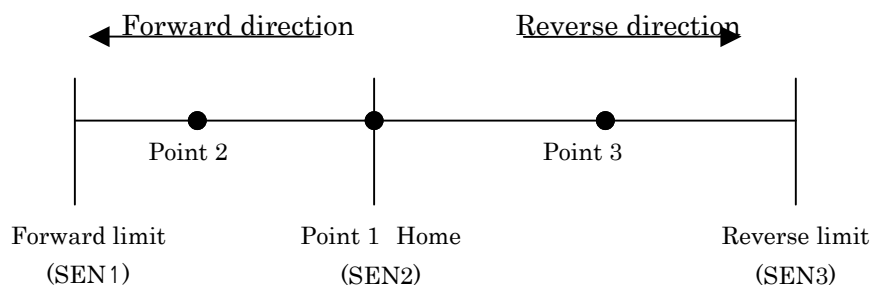


Fig. 5-6. Absolute position driving mode

### 5-2-1. Absolute position driving mode, Home search

When home search start signal(ORG) becomes active from start signal I/F, home searching starts. DIP switch(SW1 1<sup>st</sup> pole, ORGDIR) sets the direction of home search.

Table 5-8. Direction of home search

Start signal		Direction of home search		Target sensor		Completion signal
ORG		ORGDIR ON To forward direction		SEN2		FIN1
		ORGDIR OFF To reverse direction				

The target position of home search is Point 1(SEN2) and the direction of home searching depends on which direction is Point 1(SEN2) from current position to forward or reverse direction. For example, when 3 points are appointed such as Fig. 5-6, if current position is the direction of Point 2 from Point 1, home searching is executed to the reverse direction. If current position is the direction of Position 3 from Point 1, home searching is executed to the forward direction.

In case of absolute position driving mode, home position is Sensor 2(SEN2), then Sensor 1(SEN1) and Sensor 3(SEN3) are limit sensors. Therefore home searching is available by limit sensors.

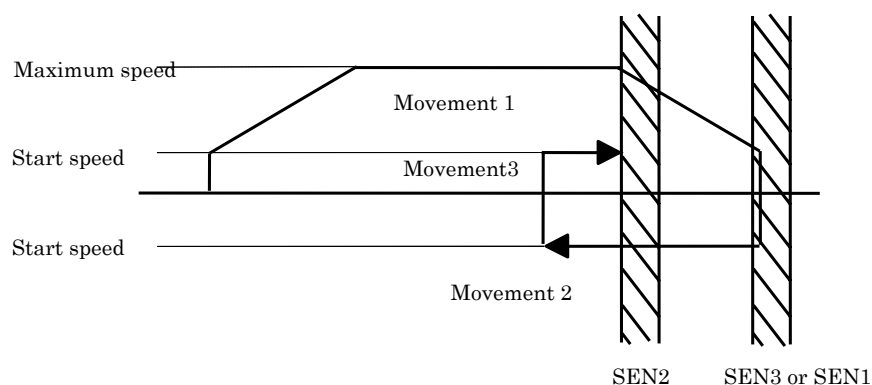


Fig. 5-7. Example of home searching

- Movement 1 : Movement starts to the direction specified by home searching direction. When SEN2 is active, deceleration stop is executed. If movement reaches limit sensor before deceleration stop, movement stops instantly.
- Movement 2 : Movement executes to the opposite direction from Movement 1 with start speed. It stops instantly at the rising edge of SEN2.
- Movement 3 : Movement executes to the same direction with Movement 1 by start speed again. It stops instantly when SEN2 is active.

When home searching, if home sensor (SEN2) is active, Movement 1 is omitted and movement starts from Movement 2. After Movement 3, if home sensor is not active, position compensation is executed. Please refer chapter 5-1-4 Position compensation for position compensation.

## 5-2-2. Absolute position driving mode, PTP driving

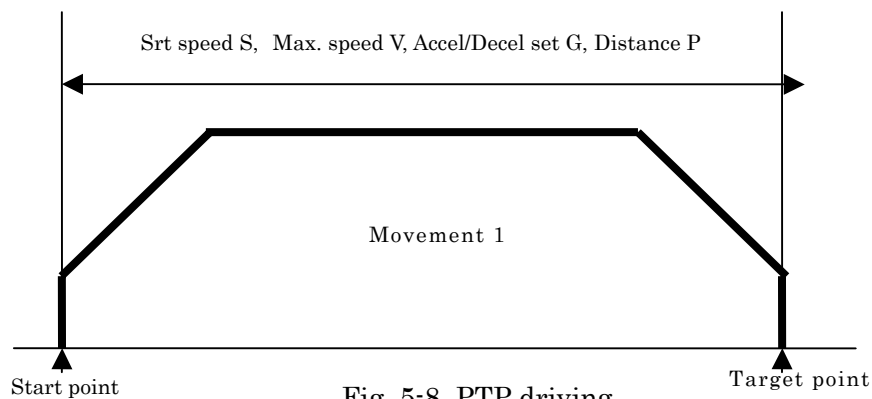


Fig. 5-8. PTP driving

Movement 1 : If start signal is inputted, Movement starts from start point with specified Start speed S, Maximum speed V, Distance P(difference between Start point and Target point), Acceleration/Deceleration setting G. The Acceleration/Deceleration is trapezoidal or S curve. When movement reaches target point, it is completion and movement completion signal outputs.

The below is the condition which causes error when PTP driving in absolute position driving mode.

Starting without home searching immediately after power on or changing of driving mode.

Starting when position is Point 1(Home position) and Sensor 2(home sensor) is not non-active status.

Inputting interrupt of instant stop.

Becoming limit sensor active.

In case of error, error signal issues. The error signal is released by home searching execution.

### 5-3 Relative position driving mode

In relative position driving mode, selected one of preset 4 driving patterns drives. It is necessary to set the direction of rotation by input terminal(C-CN-2, 5 pin DIR) of start signal I/F.

DIR: Photo coupler ON      Forward \*Remark (default setting, positive logic)

DIR: Photo coupler OFF      Reverse \*Remark (default setting, positive logic)

\*Remark : Please pay attention. If logic setting is changed, the direction of forward and reverse is inverted.

When relative position driving mode, Start signal 1(ST1) is start signal and Start signal 2/3 are code bit of parameter selection. After code bit selects parameter to drive, movement starts by making Start signal(ST1) active. Movement completion is Movement completion signal 2(FIN2) independent of parameter selection.

Table 5-9. Flow of absolute position driving mode

Parameter selection			Start signal	Completion signal
ST3	ST2		ST1	FIN2
Photo coupler OFF	Photo coupler OFF	Parameter 1		
Photo coupler OFF	Photo coupler ON	Parameter 2		
Photo coupler ON	Photo coupler OFF	Parameter 3		
Photo coupler ON	Photo coupler ON	Parameter 4		

The below is condition that movement completion signal is cleared.

At the time when start signal is inputted.

At the time when error is issued.(Please refer chapter 5-3-2, PTP driving for the error factor)

At the time when driving mode changes.

In the relative position driving mode, the function of sensor input terminal is same with absolute position driving mode as Table 5-10 but different from sensor mode.

Table 5-10. Sensor in relative position driving mode

Sensor signal	Function
SEN1	Forward limit
SEN2	Home sensor
SEN3	Reverse limit

It is available to drive without sensor input signal in absolute position driving mode. It is necessary to release error signal such as instant stop or immediately after power on reset for example in both sensor mode and absolute position driving mode. However in relative position driving mode, the error signal is released by home searching or re-start.

### 5-3-1. Relative positioning driving mode, Home searching

Home searching starts when home searching start signal(ORG) becomes active by start signal I/F. DIP switch(SW1, 1 pole ORGDIR) sets the direction of home searching

Table 5-11. Direction of home searching

Start signal		Direction of home searching		Target sensor		Completion signal
ORG		ORGDIR ON To forward		SEN2		FIN1
		ORGDIR OFF To reverse				

In absolute positioning driving mode, the home is SEN2. SEN1 and SEN3 are limit sensor. Home searching is available by using limit sensors.(Refer Fig. 5-9)

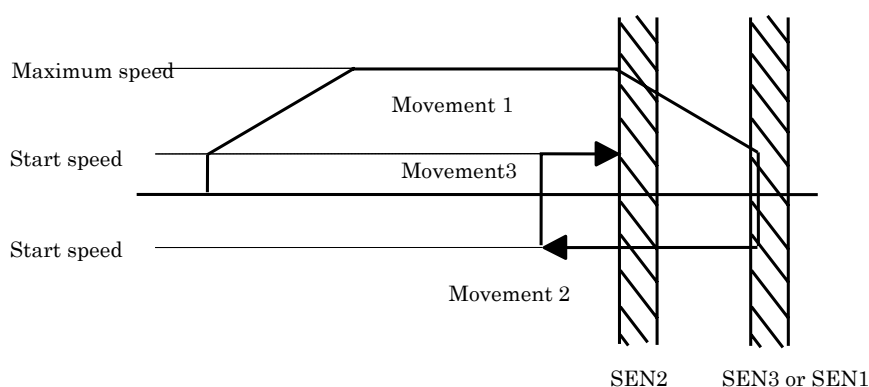


Fig. 5-9. Example of home searching

- Movement1 : Movement starts to the direction specified by home searching direction. When SEN2 is active, deceleration stop is executed. If movement reaches limit sensor before deceleration stop, movement stops instantly.
- Movement2 : Movement executes to the opposite direction from Movement 1 with start speed. It stops instantly at the falling edge of ISEN2.
- Movement3 : Movement executes to the same direction with Movement 1 by start speed again. It stops instantly when ISEN2 is active.

When home searching, if home sensor (SEN2) is active, Movement 1 is omitted and movement starts from Movement 2. After Movement 3, if home sensor is not active, position compensation is executed. Please refer chapter 5-1-4 Position compensation for position compensation.

### 5-3-2. Relative positioning driving mode

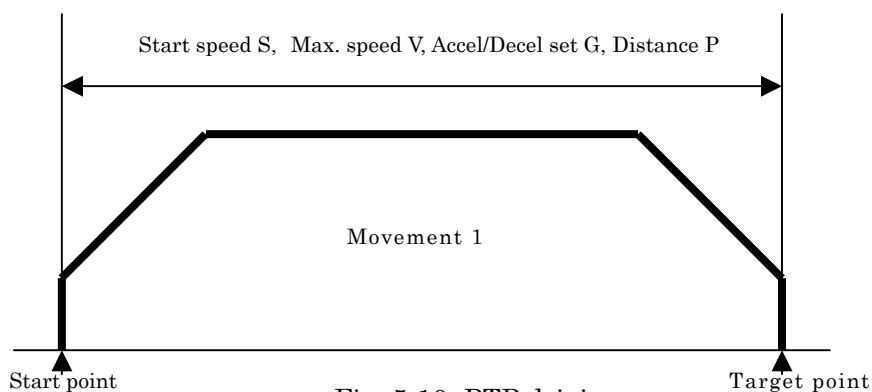


Fig. 5-10. PTP driving

Movement 1 : If start signal is inputted, movement starts with specified Start speed S, Maximum speed V, Distance P(difference between Start point and Target point), Acceleration/Deceleration setting G. The Acceleration/Deceleration is trapezoidal or S curve. When set pulse numbers output, movement completes and movement completion signal outputs.

The below is the condition which causes error in relative positioning driving mode.

- Inputting interrupt of instant stop.
- Becoming limit sensor active.

In case of error, error signal issues. The error signal is released by home searching execution or inputting start signal again.

## 5-4. PC driving

PC driving can start, specify movement point, write parameter into serial ROM, read out status and so on through RS485 I/F. While PC starts and specifies movement point, input terminal excepting sensor input terminal specified at Table 5-2 are masked.



PC driving is executed by RS485 interface. ICD200 cannot execute PC driving alone

Home searching movement of PC driving is same with home searching of driving mode set at that moment. However DIP switch (SW1, 1 pole, Refer chapter 4-2-1) setting is ignored for direction of home searching but the direction of rotation is set by PC command.

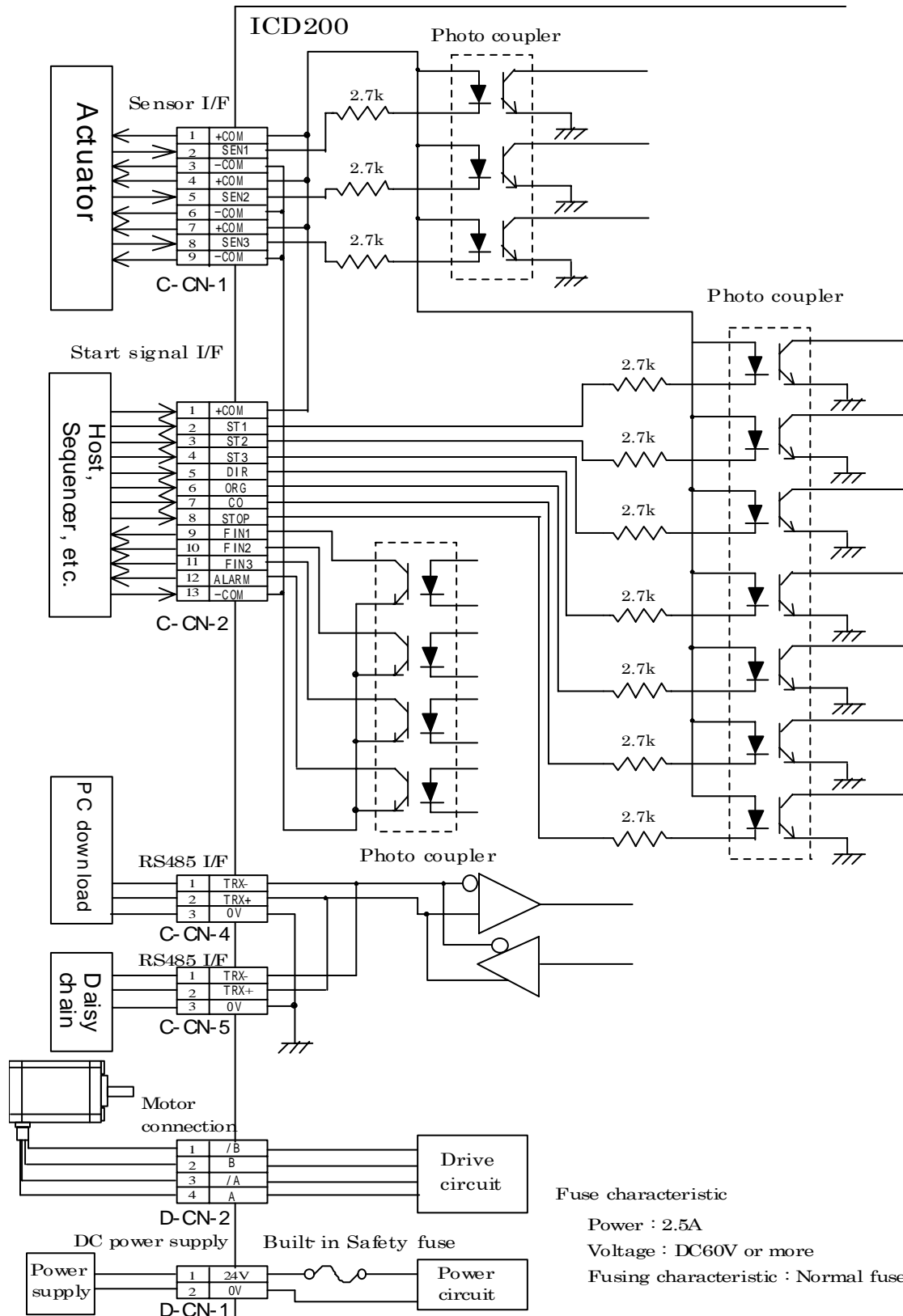
PTP driving sets moving distance by relative position same as Sensor/Relative positioning movement mode and the direction of rotation is set by PC command. Absolute positioning mode sets moving distance by absolute position and the direction of rotation depends on the relationship with current position and target position. (Please refer Chapter 5-2, Absolute positioning movement mode). The direction of rotation by PC setting is ignored.

Sensor 1(Forward) and Sensor 3(Reverse) are limit sensors in relative/absolute positioning movement mode.

Table 5-12. PC driving and driving mode

	Home searching		PTP driving	
	Target sensor	Setting of rotating direction	Setting of moving distance	Setting of rotating direction
Sensor mode	Sensor 1 or 3	Command from PC	Relative position	Command from PC
Absolute positioning mode	Sensor 2	Command from PC	Absolute position	Depending on target position
Relative positioning mode	Sensor 2	Command from PC	Relative position	Command from PC

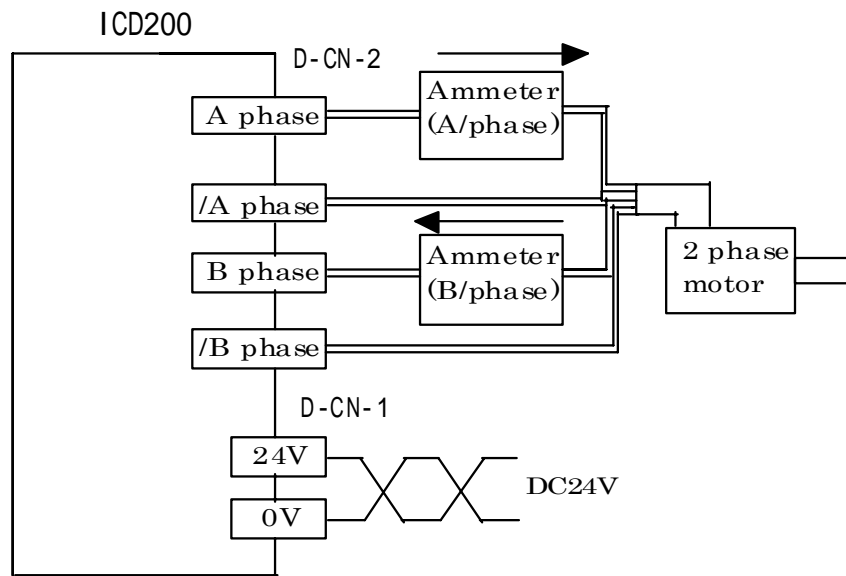
### 6. Example of wiring



Please separate A-COM from B-Com and use in non-connection condition when uni-polar motor is used.

## 7. How to adjust driving current

Please connect A phase and B phase of ICD200 with ammeters as show below. \*Remark



(An arrow above ammeter shows the direction of current immediate after power on.)

Fig. 7-1. Wiring diagram at current adjustment

\*Remark : Fig. 7-1 shows wiring diagram of bi-polar motor. Please separate A-COM from B-Com and use in non-connection condition when uni-polar motor is used

Set Auto-current down invalid.(Make SW1-6 pole ON)

Confirm that C.ADJ volume is turned to the counter clock wise end position(MIN) then power driver ON.

Adjust rated motor driving current with C.ADJ volume.

Set each phase 1/2 current of rated motor current if uni-polar type motor is used.

Example

Motor type	Rated motor current	Indication of each phase current of ammeter
Bi-polar	0.6A/phase	0.6A
Uni-polar	1.2A/phae	0.6A

Make auto-current down setting effective(Set SW1-6 pole OFF)



Warning

- Confirm effective dial of ammeter then connect.  
Set not to exceed the rated current. If the volume is rotated to the clock wise end(MAX), more than rated current flows.
- Use with smaller current(rotate counter clock wise) than rated current if the load is very small or vibration occurs while driving.

## 8. Wiring and installation condition

### 8-1. Wiring power input and motor output

- The radiation noise can be depressed by using sealed cable in case that motor cable is longer.
- Please insert noise filter at power input in case that there are noise source near.
- It is very dangerous because over current flows if power input and motor output are connected wrongly.

### 8-2. Wiring of sensor signal

- Mis-operation caused by noise can be depressed by using sealed cable in case that input signal wiring is longer.

### 8-3. Applicable tool for contact pin

There are three types contact pins for ICD200. Please use special tool to clamp each contact pin.

Connector No.	Model of contact pin	Applicable tool
D-CN-1	BXH-001T-0.6	YC-110R
D-CN-2	BPH-002T-P0.5S	YRM-240
C-CN-1, C-CN-2 C-CN-4, C-CN-5	SZH-002T-P0.5	YRS-491

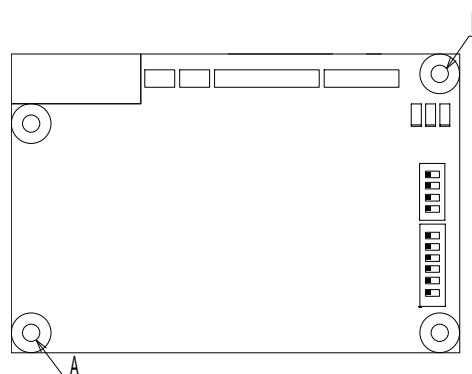
Made by JST Mfg. Co., Ltd.(JST)

### 8-4. Installation condition

- Please do not outside of controller box. This unit is designed subject to below condition.
  - Voltage category : Category 1, Material group 3
  - Pollution grade : Class 2
  - Protection structure : IP00
  - Protection against electric shock : Class 3 device
- It is also limited to use at the place where is no mechanical stress.
- Put 3cm or more space between each driver and fix the drivers when multiple drivers are arranged.
- It is suggested to use sealed twisted pair wires for signal cable of this device
- There is a possibility that heat sink temperature exceeds 60 depending on load or other environmental condition. If it is used in hard condition, please cool the heat sink by cooling fan
- Cover this device by material which does not intercept ventilation and take the safety measures by no means so that 4mm diameter pole does not enter inside.
- This product should fix the part indicated to the 8-5.How to install in a control board, and should take a ground firmly.

### 8-5. How to install

Please fix 2 points of A and B by screw as right figure.



## 9. Noise measures

The target for EMC directive of CE marking is whole components including our products. This device is designed to depress unnecessary radiant noise and not to be affected easily by external noise but noise measures may be required depending on the condition of usage (installation and wiring). In such case please take noise measures referring below method.

### 1. Prevent drive controller mis-operation

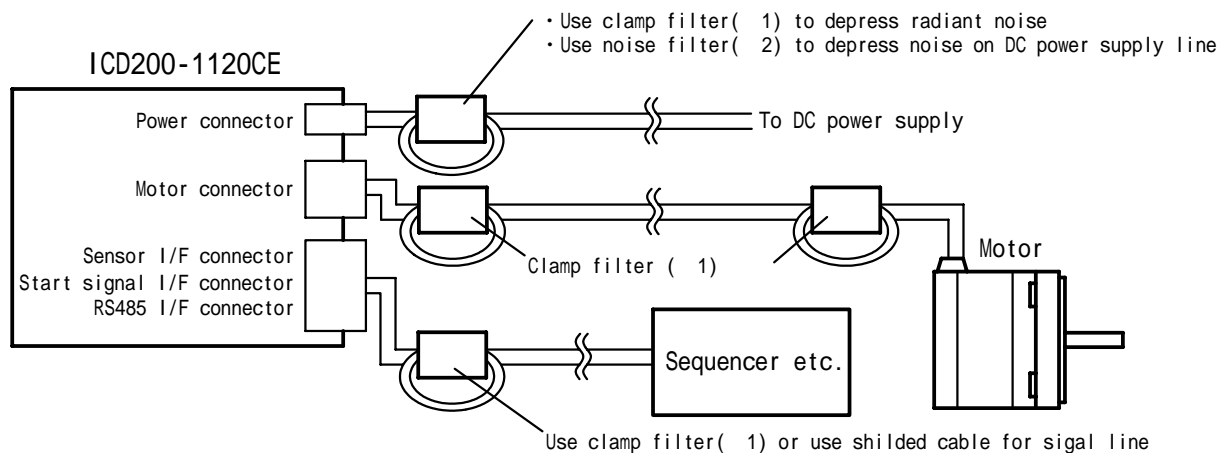
- Please insert clamp filter or toroidal core for drive controller's signal line if the position become off during operation by external noise, or please use shielded cable for drive controller's signal line. These measures are also effective to decrease radiant noise.

### 2. Decrease radiant noise

- Insert clamp filter or toroidal core among motor wirings(drive controller side and motor side).
- Insert clamp filter or toroidal core on power line.

### 3. Decrease conductive noise

- Insert noise filter on power line.



1 ZCAT2032-0930[TDK] or equivalent. (One rolling is more effective)

2 ZAG2206-11S[TDK] or equivalent.



## 11. Factory default setting

Table 11-1 shows factory default setting stored in serial ROM of ICD200.

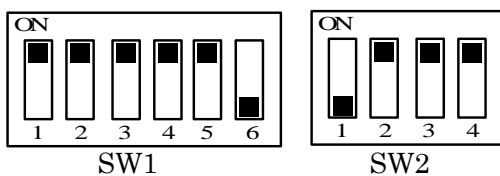
Table 11-1 Factory default setting

	Register	Default setting
Sensor mode	Acceleration /deceleration slope setting(x16)	0001h
	Moving distance 1(P1)	00000001h
	Moving distance 2(P2)	00000001h
	Moving distance 3(P3)	00000001h
	Start speed 1(S1)	0001h
	Start speed 2(S2)	0001h
	Maximum speed (V1)	0001h
Absolute positioning drive mode	Acceleration /deceleration slope setting(x16)	0001h
	Start speed 1(P1)	00000001h
	Start speed 1(S1)	0001h
	Maximum speed (V1)	0001h
Relative positioning drive mode	Acceleration /deceleration slope setting(x16)	0001h
	Moving distance 1(P1)	00000001h
	Start speed 1(S1)	0001h
	Maximum speed (V1)	0001h
Home searching (common in any mode)	Acceleration /deceleration slope setting(x16)	0001h
	Start speed 3(P3)	00000001h
	Start speed 1(S1)	0001h
	Maximum speed (V1)	0001h
Others	Numbers of loop	001h
	Waiting time	001h
	Period of count down	FFFFFFh
	Movement setting	03h
Logic setting	Sensor input	Positive logic
	Rotating direction input	Positive logic
	Current-off input	Positive logic
	Instant stop input	Negative logic
	Movement completion output	Positive logic
	Error output	Positive logic

The below is DIP switch setting.

Table 11-2. Default setting of DIP switch

DIP switch		Default setting	Function	Setting
SW1	1 <sup>st</sup> pole	ON	Direction of home searching	Sensor 1
	2 <sup>nd</sup> pole	ON	Maintenance setting	Normal driving
	3 <sup>rd</sup> pole	ON		
	4 <sup>th</sup> pole	ON	Driving mode selection	Sensor mode
	5 <sup>th</sup> pole	ON		
	6 <sup>th</sup> pole	OFF	Auto-current down	Valid
SW2	1 <sup>st</sup> pole	OFF	Axis number selection	Axis number 1
	2 <sup>nd</sup> pole	ON		
	3 <sup>rd</sup> pole	ON		
	4 <sup>th</sup> pole	ON		



## 12. Product guarantee period

### 12-1. Guarantee period

#### One year after delivery

We will repair or replace ICD200 on our responsibility if ICD200 goes wrong with our cause within the warranty period. However the caused damage from the products if out of warranty.

### 12-2. Out of guarantee

In below case, they are out of guarantee even if within guarantee period.

- Wrong usage, malfunction or damage by modification or unwarrantable repair.
- Damage or malfunction by remove, transpiration or fall after delivery.
- Damage or malfunction by unsuitable maintenance, store or keeping.
- Damage or malfunction by abnormal voltage or using of unspecified power supply(voltage or frequency)
- Damage or malfunction by fire, earthquake, flood, lightning, other natural disaster, circumstance pollution, smoke pollution, gas pollution( sulfated gas etc.)
- Other damage or malfunction by unconsidered our responsibility.

## 13. Accessories

Table 13-1 is list of accessory.

Table 13-1. List of accessory

Items	Qty	Connector				Applicable cable diameter (AWG)
		Connector #	Housing model #	Contact pin model #	Qty	
Power connector	1	D-CN-1	XHP-2	BXH-001T-0.6	2	28 ~ 22
Motor connecting connector	1	D-CN-2	PHR-4	BPH-002T-0.5S	4	30 ~ 24
Sensor I/F connector	1	C-CN-1	ZHR-9	SZH-002T-P0.5	9	28 ~ 26
Start signal I/F connector	1	C-CN-2	ZHR-13	SZH-002T-P0.5	13	28 ~ 26
RS485 I/F connector	1	C-CN-4	ZHR-3	SZH-002T-P0.5	3	28 ~ 26
RS485 I/F connector	1	C-CN-5	ZHR-3	SZH-002T-P0.5	3	28 ~ 26

Model name		Qty
ICD200 series User's manual	This book	1unit

Brand of J.S.T. Mfg. Co., Ltd.(JST)

## 14. Optional accessories

There is the following option in ICD200 series.

Parts name	Model number	Specifications	Note
Communication software	ICDRS_GUI_EN	Parameter setting software	Gratis offer
Power Cable	ICD-P-15	1.5m Twisted pair wire	
Motor Cable	ICD-M-15		
Sensor I/F Cable	ICD-S-15	1.5m Flat cable	
Start signal I/F Cable	ICD-A-15		
RS485 I/F Cable	ICD-R-15		
RS485 I/F Cable For daisy chain	ICD-K-5	0.5m Flat cable	
Clamp Filter	ZCAT2032-0930 (TDK)		
Noise Filter	ZAG2206-11S (TDK)		

Please understand that we may make modifications to our products without notification in order to improve the capabilities and external appearance of our products.

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## **MYCOM**

### MYCOM, INC. (Head office)

12, S. Shimobano, Saga hirosawa, Ukyo, Kyoto, Japan 616-8303

TEL: 81-75-882-3601 FAX : 81-75-882-6531

support@mycom-japan.co.jp

<http://www.mycom-japan.co.jp/>

### NYDEN CORP.

2610-B North First St. San Jose, Ca. 95134 U.S.A.

TEL.(010)+1-408-232-7700 FAX.(010)+1-408-232-7701

info@Nyden.com

<http://www.nyden.com/>

### MYCOM TECHNOLOGY, INC.

2FL., No.333, Fuhsing N. Road Taipei Taiwan, R.O.C.

TEL.(010)+886-2-2719-0525 FAX.(010)+886-2-2719-0509

support@mycom-taiwan.com

<http://www.mycom-taiwan.com/>

### MYCOM KOREA, INC.

RM. C-605, Woolim Lions Valley, Geum Cheon-Gu, Gasan-dong, Seoul, Korea.

TEL.(010)+82-2-2635-6703 FAX.(010)+82-2-2265-6705

mycom@mycom-korea.co.kr

<http://www.mycom-korea.co.kr/>

### MYCOM THCHNOLOGY (SINGAPORE) PTE. LTD.

No.1 Sims Lane #05-05 One Sims Lane Singapore 387355

TEL.(010)+65-6743-4476 FAX.(010)65-6743-4576

sales@mycom.com.sg

<http://www.mycom.com.sg/>