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# **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 Driver Pack 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 instruction 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 Driver Pack'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 Driver Pack requirement.
- Operate Driver Pack in the required operating environment.
- Do not put any vase or container of chemicals on or close to Driver Pack.
- Do not place or drop any flammable item or metal at vent holes.
- Avoid dropping by using belts when Driver Pack is on a carrier.
- Turn off power switch when connecting with external equipment.
- Place Driver Pack on a flat ground.
- DO NOT disassemble or alternate or make any improper repairing of Driver Pack.

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## 1. INTRODUCTION

### 1.1. Features

The D234/D236 Micro-Stepping Motor Driver pack (Hereafter: Driver Pack) are with built-in 5 phase stepping motor driver (0.75A/phase, 1.4A/phase) and a capability of driving 4 axes or 6 axes.

( 1.4A/phase Driver is a custom-made model)

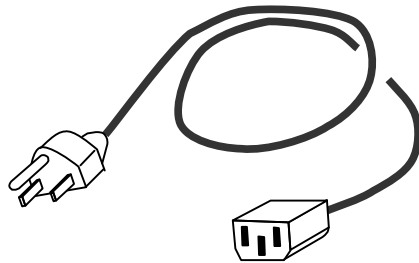
Maximum 250 Micro-steps, 16 channels for Micro-step type.

By the connection with Motion Control Board “D244PCI, D244ISA, D246PCI and D246ISA”, they can drive 4 axes or 6 axes stages.

Size : 430(W) × 100(H) × 350(D) (without raised portion like handle, rubber legs etc.)

### 1.2. Accessory

D230 series contains the following item. Please check at the time of unpacking.



Power source cable : 1 (L=3m)

## 1.3. Operating Environment

### 1.3.1. Operating Conditions

Install Driver Pack 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 Driver Pack at 10 cm (3 inches) away from wall or whatever might block the back panel of Driver Pack.

Avoid using Driver Pack under the following conditions.

- Directly under sunlight
  - Areas that have much dust or metallic particles
  - Near fire
  - Much electrically noise, Much Vibration
- In case of using Driver Pack in the electrically noisy conditions, please use noise-removal

filter.

### 1.3.2. Power Source Conditions

Power Source Specification

- Input Voltage : AC100 ~ 240V
- Frequency : 50/60Hz
- Consuming Electrical Power : D234 : Max.180W  
D236 : Max 260W

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

### 1.3.3. Power Source Fuse

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

- Size : 6.35 × 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

Turn off Power Switch

Unplug Power Cable from AC inlet or power source outlet

Open a fuse holder at the rear panel

Check and replace a fuse, and put it back.

**1.3.4. Power Cable**

Driver pack 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 driver pack 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.

## 1.4. Cleaning and Storage

### 1.4.1. Cleaning

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

Caution : 1. Turn the power off, and unplug power cable from AC inlet or power outlet.

2. Do not let water come inside Driver Pack.

3. Do not use organic solvent such as Benzene or Toluene

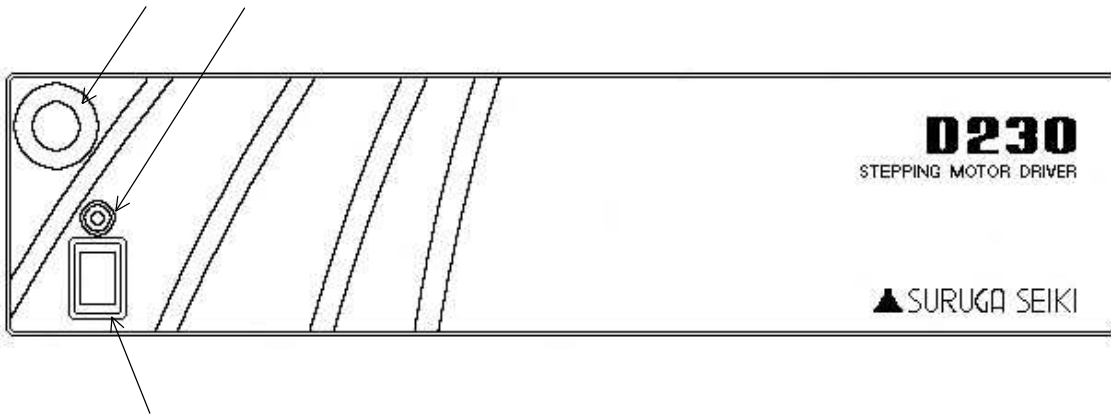
4. Do not use cleanser

### 1.4.2. Storage

Store Driver Pack at the temperature of  $-20 \sim +60$  . When not in use for long time, leave the power off and disconnect the power cable and store Driver Pack in a cool and not under direct sunlight.

## 1.5. Explanation of Parts & Functions

### 1.5.1. D234/D236 Front Panel



#### POWER SWITCH

Power Supply Switch

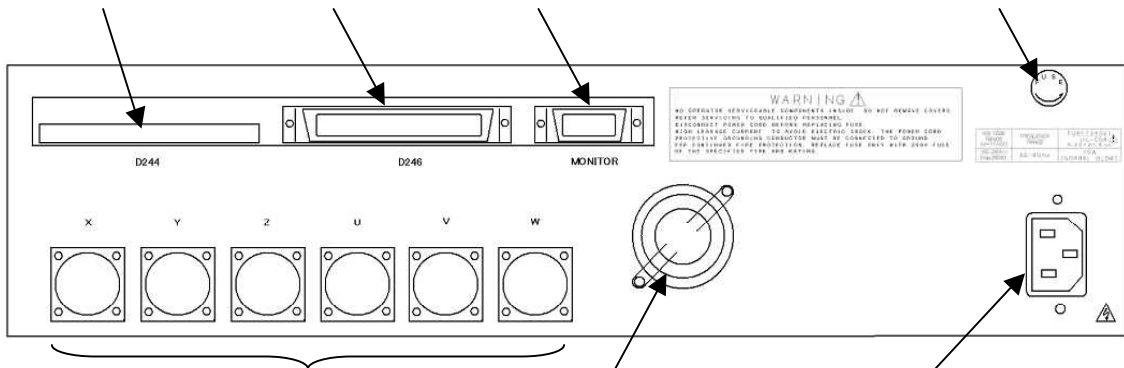
#### POWER LIGHT

Light on when power is on

#### EMERGENCY STOP

Push to turn off the power of the D230 Driver Pack 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.

## 1.5.2. D234/D236 Rear Panel



### D244 Connector

Connector for Motion Control Board “D244PCI or D244 ISA”

### D246 Connector

Connector for Motion Control Board “ D246PCI or D246ISA”.

### Monitor Connection

Output driving pulse, axis select signal and motion signal.

### Fuse Holder

250V 10A Glass fuse is used. (See 1.3.3)

### Stage Connection

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

Use X, Y, Z and U for D244PCI/D246ISA

Use X, Y, Z, U, V and W for D246PCI/D246ISA

### Fan

Fan motor for internal cooling

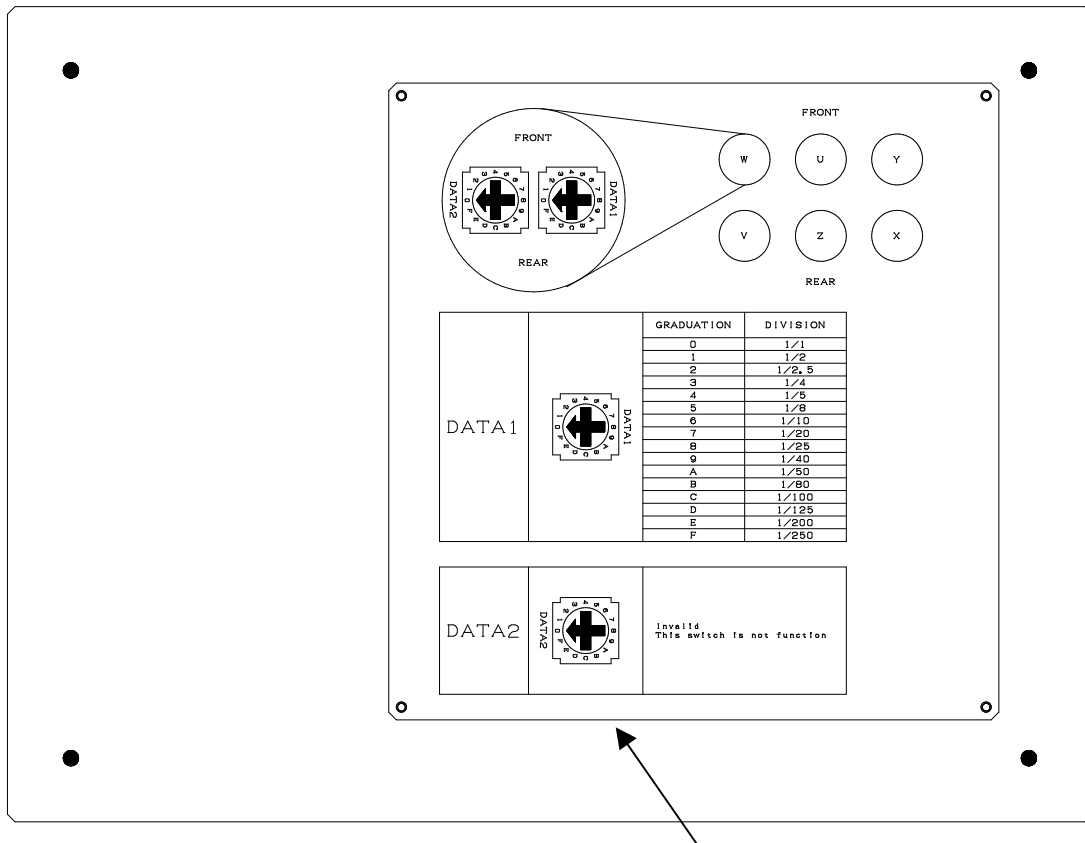
### AC Inlet

Input AC100 ~ 240V 50/60Hz (See 1.3.2)

Connect an accessory power cable (1.3.4)

### 1.5.3. D234/D236 Bottom Panel

~ Front Panel ~



~ Rear Panel ~

#### Stepping Number Control Cover

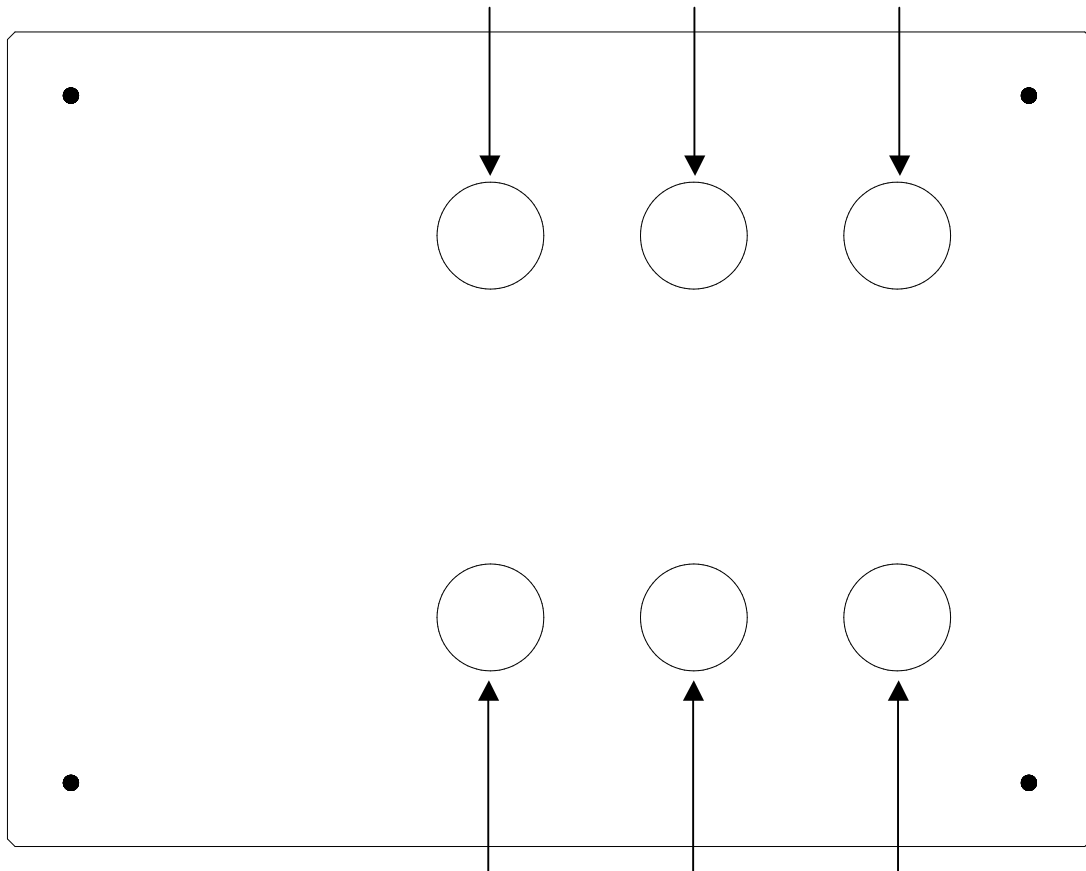
Set the number of Micro-steps of the MS driver with Rotary Switch of Micro-step driver.

Refer to the setting instruction displayed on the Stepping Number Control Cover.

**Caution** : After unplugging AC code, take off Stepping Number Control Cover and adjust the division number of Micro-step driver.

During operation, be sure to keep the Step Number Control Cover on.

1.5.4. D234/D236 Bottom Board Panel (When Stepping Number Control Cover is open)  
~ Front Panel ~



~ Rear Panel ~

**X-axis Micro-Step Driver Adjustment (for D234/D236)** : to adjust the number of Micro-Steps for X-Axis by using an adjustment driver.

**Y-axis Micro-Step Driver Adjustment (for D234/D236)** : to adjust the number of Micro-Steps for Y-Axis by using an adjustment driver.

**Z-axis Micro-Step Driver Adjustment (for D234/D236)** : to adjust the number of Micro-Steps for Z-Axis by using an adjustment driver.

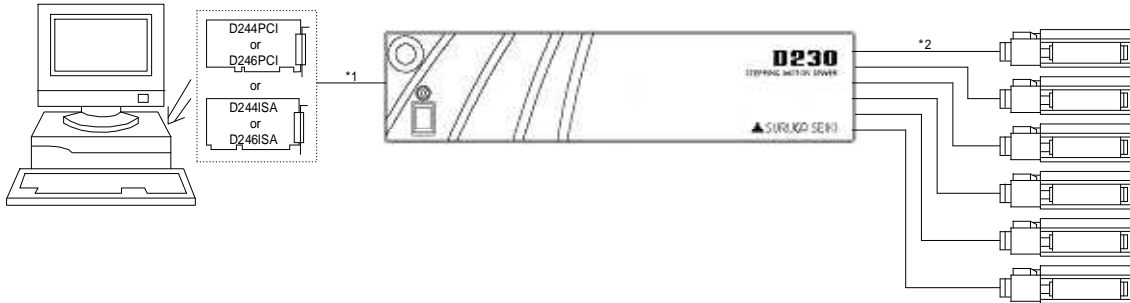
**U-axis Micro-Step Driver Adjustment (for D234/D236)** : to adjust the number of Micro-Steps for U-Axis by using an adjustment driver.

**V-axis Micro-Step Driver Adjustment (for D236)** : to adjust the number of Micro-Steps for V-Axis by using an adjustment driver.

**W-axis Micro-Step Driver Adjustment (for D236)** : to adjust the number of Micro-Steps for W-Axis by using an adjustment driver.

## 2. Connection

### 2.1. D234/D236 System Configuration(Connection with External Equipment)



\* 1 : I/O Cable (sell separately)

Please purchase the cables below separately.

**AB80413** : for connection with D244PCI /D244ISA

**CE-26-100A20** : for connection with S246PCI /D246ISA

\* 2 : Standard Cable

• Use the following connection cables:

**D214-1-2 / D214-1-4 / D214-2-2 / D214-2-4**

( \*Suruga Seiki's motorized stage is equipped with D214-1-2(2m) or D214-2-2(2m) connection cable.)

• Robot cables are also available. Please contact us for detail.

• For custom-made product employing 1.4A driver type, type of cable is D216-1-2 / D216-1-4. (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 Driver Pack 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 to stage (See 2.1) to stage connector at Driver Pack's rear panel.

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

[Stage Connector]

Connector Model Number : 09 - 0054 - 00 - 14 (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 (DC 5 V + )
R	Sensor Power Source (DC 5 V - )
S	Electromagnetic Brake Source (DC 2.4 V + )
T	Electromagnetic Brake Source (DC 2.4 V - )
U	Frame Ground

## 2.1.2. Connection for D244

Connect I/O Cable to the Connector for D244 on the Rear Panel of D234 Driver Pack.

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

[Stage Connector]

Connector Model Number : FX2B - 100P - 1.27DS (Manufactured by HRS)

Matching Contact : FX2B - 100SA - 1.27R (Manufactured by HRS)

Pin Number	Name of signal	Terminal Function	Pin Number	Name of signal	Terminal Function
A 1	VEX	External Power (DC12 ~ 24V)	B 1		
A 2	EMG	Emergency Stop (All axes to be stopped)	B 2		
A 3	XLMT +	X Axis, + Direction Limit	B 3	ZLMT +	Z Axis, + Direction Limit
A 4	XLMT -	X Axis, - Direction Limit	B 4	ZLMT -	Z Axis, - Direction Limit
A 5	XIN1	X Axis Near Origin Sensor	B 5	ZIN1	Z Axis Near Origin Sensor
A 6	XIN2	X Axis Origin Sensor	B 6	ZIN2	Z Axis Origin Sensor
A 7	XIN3	X Axis Excitation Timing	B 7	ZIN3	Z Axis Excitation Timing
A 8	YLMT +	Y Axis, + Direction Limit	B 8	ULMT +	U Axis, + Direction Limit
A 9	YLMT -	Y Axis, - Direction Limit	B 9	ULMT -	U Axis, - Direction Limit
A 10	YIN1	Y Axis Near Origin Sensor	B 10	UIN1	U Axis Near Origin Sensor
A 11	YIN2	Y Axis Origin Sensor	B 11	UIN2	U Axis Origin Sensor
A 12	YIN3	Y Axis Excitation Timing	B 12	UIN3	U Axis Excitation Timing
A 13 ~ A 32		Not used	B 13 ~ B 32		Not used
A 33	GND	Internal Circuit GND	B 33	GND	Internal Circuit GND
A 34 ~ A 38		Not used	B 34 ~ B 38		Not used
A 39	XP + N	X Axis, + Direction Pulse	B 39	ZP + N	Z Axis, + Direction Pulse
A 40		Not used	B 40		Not used
A 41	XP - N	X Axis, - Direction Pulse	B 41	ZP - N	Z Axis, - Direction Pulse
A 42	GND	Internal Circuit GND	B 42	GND	Internal Circuit GND
A 43 ~ A 47		Not used	B 43 ~ B 47		Not used
A 48	YP + N	Y Axis, + Direction Pulse	B 48	UP + N	U Axis, + Direction Pulse
A 49		Not used	B 49		Not used
A 50	YP - N	Y Axis, - Direction Pulse	B 50	UP - N	U Axis, - Direction Pulse

### 2.1.3. Connection for D246

Connect I/O Cable to the Connector for D246 on the Rear Panel of D236 Driver Pack.

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

[Stage Connector]

Connector Model Number : DX10A - 100S (Manufactured byHRS)

Matching Plug : DX30A - 100P (Manufactured byHRS)

Matching Cover Case : DX - 100 - CV1 (Manufactured byHRS)

Pin Number	Name of signal	Terminal Function	Pin Number	Name of signal	Terminal Function
1	XCWLM	X Axis, + (CW) Direction Limit	51	ZCWLM	Z Axis, + (CW) Direction Limit
2	XCCWLM	X Axis, - (CCW) Direction Limit	52	ZCCWLM	Z Axis, - (CCW) Direction Limit
3	XNORG	X Axis Near Origin Sensor	53	ZNORG	Z Axis Near Origin Sensor
4	XORG	X Axis Origin Sensor	54	ZORG	Z Axis Origin Sensor
5	YCWLM	Y Axis, + (CW) Direction Limit	55	ACWLM	U Axis, + (CW) Direction Limit
6	YCCWLM	Y Axis, - (CCW) Direction Limit	56	ACCWLM	U Axis, - (CCW) Direction Limit
7	YNORG	Y Axis Near Origin Sensor	57	ANORG	U Axis Near Origin Sensor
8	YORG	Y Axis Origin Sensor	58	AORG	U Axis Origin Sensor
9	BCWLM	V Axis, + (CW) Direction Limit	59	CCWLM	W Axis, + (CW) Direction Limit
10	BCCWLM	V Axis, - (CCW) Direction Limit	60	CCCWLM	W Axis, - (CCW) Direction Limit
11	BNORG	V Axis Near Origin Sensor	61	CNORG	W Axis Near Origin Sensor
12	BORG	V Axis Origin Sensor	62	CORG	W Axis Origin sensor
13		Not used	63		Not used
14	EXTV	External Power (+ 24V)	64	EXTVGND	External Power GND
15	EXTV	External Power (+ 24V)	65	EXTVGND	External Power GND
16		Not used	66		Not used
17	+COM	XCWP, XCCWP Common (+ 5V)	67	+COM	ZCWP, ZCCWP Common (+ 5V)
18		Not used	68		Not used
19	XCWP	X Axis, + (CW) Direction Negative Logic Pulse	69	ZCWP	Z Axis, + (CW) Direction Negative Logic Pulse
20		Not used	70		Not used
21	XCCWP	X Axis, - (CCW) Direction Negative Logic Pulse	71	ZCCWP	Z Axis, - (CCW) Direction Negative Logic Pulse
22		Not used	72		Not used
23		Not used	73		Not used
24	XPO	X Axis Excitation Timing	74	ZPO	Z Axis Excitation Timing
25		Not used	75		No used
26		Not used	76		Not used
27	+COM	YCWP, YCCWP Common (+ 5V)	77	+COM	UCWP, UCCWP Common (+ 5V)

## Continued from previous page

Pin Number	Name of signal	Terminal Function	Pin Number	Name of signal	Terminal Function
28		Not used	78		Not used
29	YCWP	Y Axis, + (CW) Direction Negative Logic Pulse	79	ACWP	U Axis, + (CW) Direction Negative Logic Pulse
30		Not used	80		Not used
31	YCCWP	Y Axis, - (CCW) Direction Negative Logic Pulse	81	ACCWP	U Axis, - (CCW) Direction Negative Logic Pulse
32		Not used	82		Not used
33	YDRST	Y Axis Output Current OFF ( + 2.4 V )	83	ADRST	U Axis Output Current OFF ( + 2.4 V )
34	YPO	Y Axis Excitation Timing	84	APO	U Axis Excitation Timing
35		Not used	85		Not used
36		Not used	86		Not used
37	+COM	VCWP, VCCWP Common ( + 5V )	87	+COM	WCWP, WCCWP Common ( + 5 V )
38		Not used	88		Not used
39	BCWP	V Axis + (CW) Direction Negative Logic Pulse	89	CCWP	W Axis + (CW) Direction Negative Logic Pulse
40		Not used	90		Not used
41	BCCWP	V Axis - (CCW) Direction Negative Logic Pulse	91	CCCWP	W Axis - (CCW) Direction Negative Logic Pulse
42		Not used	92		Not used
43	BDRST	Not used	93	CDRST	Not used
44	BPO	V Axis Excitation Timing Input	94	CPO	W Axis Excitation Timing Input
45		Not used	95		Not used
46		Not used	96		Not used
47	FSSTOP	All Axes- Immediate Stop Input ( + 2.4 V )	97		Not used
48		Not used	98		Not used
49		Not used	99		Not used
50		Not used	100		Not used

## 2.1.4. Monitor Output

Connect a Monitor Cable to the Monitor Connection on the Rear Panel of D234, or D236 Driver Pack.

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

### 【Connector】

Connector Model Number : DX10 - 28S (Manufactured by HRS)

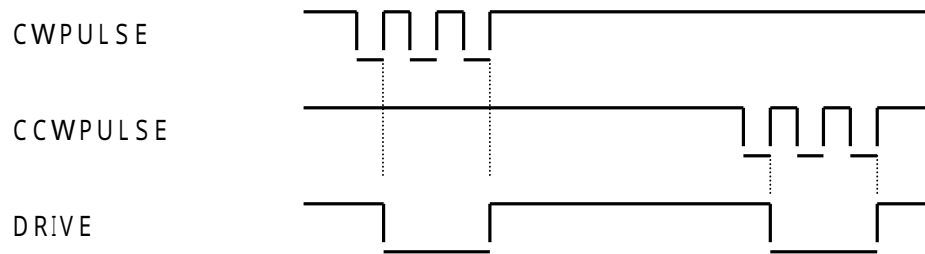
Matching Plug : DX30A - 28P (Manufactured by HRS)

Matching Cover Case : DX - 28 - CV (Manufactured by HRS)

Pin Number	Name	Terminal Function	Type of Output
1	PULSE	3 ~ 19 pin, AND Output of Pulse Output	A
2	DRIVE	5 ~ 20 pin, AND Output of Active Signal Output	A
3	XCWPULSE	X Axis, CW Direction Driving Pulse Output	B
4	XCCWPULSE	X Axis, CCW Direction Driving Pulse Output	B
5	XDRIVE	X Axis Active Signal Output	B
6	YCWPULSE	Y Axis, CW Direction Driving Pulse Output	B
7	YCCWPULSE	Y Axis, CCW Direction Driving Pulse Output	B
8	YDRIVE	Y Axis Active Signal Output	B
9	ZCWPULSE	Z Axis, CW Direction Driving Pulse Output	B
10	ZCCWPULSE	Z Axis, CCW Direction Driving Pulse Output	B
11	ZDRIVE	Z Axis Active Signal Output	B
12	UCWPULSE	U Axis, CW Direction Driving Pulse Output	B
13	UCCWPULSE	U Axis, CCW Direction Driving Pulse Output	B
14	UDRIVE	U Axis Active Signal Output	B
15	VCWPULSE	V Axis, CW Direction Driving Pulse Output	B
16	VCCWPULSE	V Axis, CCW Direction Driving Pulse Output	B
17	VDRIVE	V Axis Active Signal Output	B
18	WCWPULSE	W Axis, CW Direction Driving Pulse Output	B
19	WCCWPULSE	W Axis, CCW Direction Driving Pulse Output	B
20	WDRIVE	W Axis Active Signal Output	B
21 ~ 24	Not connected	-	
25	+5V	Vcc	
26	+5V	Vcc	
27	GND	GND	
28	GND	GND	

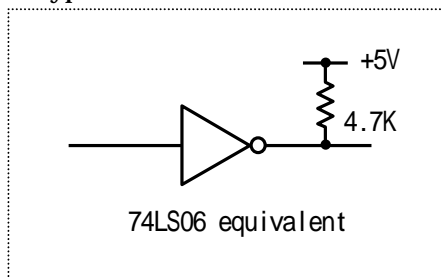
PULSE (1 pin) outputs the AND of the Pulse Outputs of CW,CCW of 6 Axes.  
 And DRIVE (2 pin) outputs the AND of the Active Signal Outputs of 6 Axes.

[Output Signal (Negative Logic Pulse)]

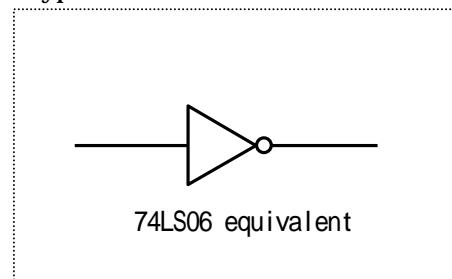


[Type of Output]

< Type A >



< Type B >



### 3. Others and Truble Shooting

#### 3.1. 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	1.3.2 1.3.4 1.5.2
	Out of fuse	Replace with new fuse	1.3.3 1.5.2
	Incorrect wiring	Check proper wiring instruction	2.1
	Emergency Stop button is pressed	Release Emergency stop button	1.5.1
Motorized Stage does not drive	Inproper connection of standard stage cable	Check connector part of Standard stage cabel	1.5.2 2.1.1
Power lamp does not turn on	Broken lamp	Ask for repair	Contact Suruga
	Power cable is not plugged	Plug power cable in the socket tightly	1.3.2 1.3.4 1.5.2
Fuse burns out often	Damaged or defective power cable	Ask for repair	Contact Suruga

#### 3.2. Driver Specification

Emergency Stop : Loaded

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)

#### 3.3. Options

D244PCI Controller Board

D244ISA Controller Board

D246PCI Controller Board

D246ISA Controller Board

## 3.4. Warranty & Customer Service

### 3.4.1. 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.

#### **Warranty Period**

· 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.

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

### 3.4.2. Repair Service

Please review the section on Trouble Shooting (See 3.1) 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.

### 3.4.3. **Repairable Period**

#### Repairable Period and Repair Parts.

Replacement and repair parts of Driver Pack 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 Driver Pack's breakout, Suruga Seiki will not be responsible for anytime but free repair service based on this warranty.>

<CONTACT INFORMATION>

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

**OVERSEAS SALES OFFICE**

4F UCJ Ueno  
Bldg.,2-18-4 ,Kitaueno,Taitou-ku,Tokyo  
110-0014,Japan

**INT'L TEL : +81-3-5806-1634**

**INT'L FAX : +81-3-5806-1696**

E-mail : [ost@suruga-g.co.jp](mailto:ost@suruga-g.co.jp)

URL <http://www.suruga-g.co.jp/jp/suruga/ost/>

**Headquarter & Factory**

160-1, Hanzaemon-shinden, Shimizu,  
Shizuoka-city, Shizuoka 424-8566, JAPAN

Ver. 1.0 (May 6th, 2003/Apr 1st, 2008)