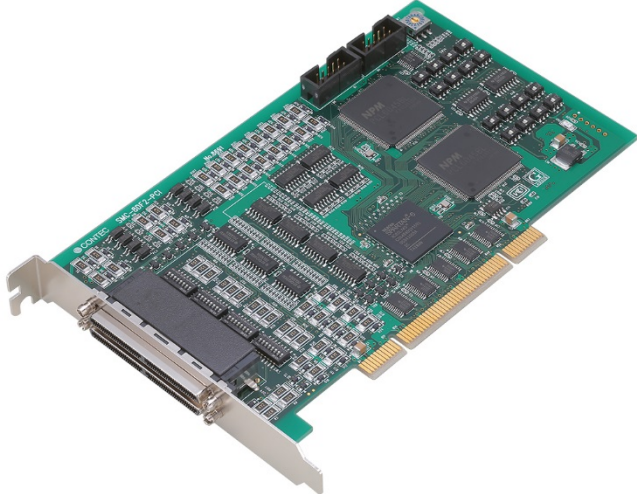# High-Speed Motion Control Board for PCI
# SMC-4DF2-PCI, SMC-8DF2-PCI

\* Specifications, color and design of the products are subject to change without notice.

This product is a PCI board that supports stepping motors and ("pulse string input" types of) servomotors.

SMC-4DF2-PCI can perform motor control for up to 4 axes.
SMC-8DF2-PCI can perform motor control for up to 8 axes.

Multi-axis independent control and linear/circular interpolation control are performed via a motor driver unit.   It can store positioning information for up to 1024 frames per axis and control multiple axes simultaneously. In addition, it can override speed/target positions during operation. Windows driver is bundled with this product.
These various functions make it possible to build complex positioning control systems for variety of uses such as manufacturing devices and test devices.
These various functions make it possible to build complex positioning control systems for variety of uses such as manufacturing devices and test devices.

\* The contents in this document are subject to change without notice.
\* Visit the CONTEC website to check the latest details in the document.
\* The information in the data sheets is as of April 2021.

## Features

**- Capable of multi-axis independent control and pulse output up to 6.5Mpps.**
SMC-4DF2-PCI : Control for up to 4 axes and motor control pulse output up to 6.5Mpps are available.

SMC-8DF2-PCI : Control for up to 8 axes and motor control pulse output up to 6.5Mpps are available.

Command pulse for motor control supports common pulse, independent pulse and 90°C phase difference pulse.
Limit input 3channels/axis, general-purpose input 7channels/axis, and general-purpose output 3channels/axis are equipped.   Also, depending on the software setting, 6 general-purpose inputs can be used as alarm inputs, and general-purpose outputs as deviation counter clear outputs.

**- Capable of various control operations such as positioning, linear/circular interpolation, frame continuous operations, synchronization control, and so on.**
Various control operations such as positioning, origin returning, linear/circular interpolation, S-curve acceleration/deceleration, frame continuous motion, synchronization control, and so on are available.
Changing speed/target position during operation is available.

" PCL6045 series" from Nippon Pulse Motor CO., LTD. is used as the motor control IC.

**- Provided with various output formats enabling connection to an encoder input circuit.**
Encoder input circuits can be connected with differential output, TTL level output and open-collector output.

**- Provided with various input formats enabling connection to pulse output format switching function.**
Pulse output circuit can be switched differential line driver output and open-collector output by the switch. As a result, pulse output circuit can be connected to the differential input, the TTL level input, and the opto-coupler input that requires a lot of output current.

**- Capable of storing positioning information up to 1024 frames for each axis and control without extra CPU load.**
The parameters which are necessary for motor operations such as travel distance, travel speed, acceleration/deceleration rate, and so on as 1 frame can be stored up to 1024 frames for each axis.   In addition, the control from the ending of 1 frame to the beginning of the next frame is mainly performed by hardware, complex continuous positioning can operate at a high speed.   It is possible to repeatedly execute the frame after executing a frame once (loop operation).

**- With the multi-boards and axis synchronization control function, capable of aligning the timing for operation start and end.**
Synchronization control of multi-axis simultaneous start/stop control, linear interpolation operation is available.   Synchronization control of up to 16 boards (128 axes) is possible, when dedicated synchronization control cables are connected.

**- Windows compatible driver libraries are attached.**
Using the attached driver library API-PAC(W32) makes it possible to create applications of Windows.   In addition, a diagnostic program by which the operations of hardware can be checked is provided.

**- Connector shape and pin assignments are compatible with SMC-8DL-PCI.**
Since this product is compatible with SMC-8DL-PCI in the connector shape and signal allocation, it can be replaced with them.

**- Provided with a terminal strip CCB-SMC2 (option) to which driver units up to 4 pieces can be connected.**
A dedicated terminal strip CCB-SMC2 (option) which assigns signals for each axis is provided.   Driver units and limit sensors for stepping motors and servo motors can be connected up to 4 pieces.

## Cable & Connector

Cable (Option)
Shielded cable with Two 100pin Connector
 : PCB100PS-0.5 (0.5m), PCB100PS-1.5 (1.5m), PCB100PS-3 (3m), PCB100PS-5 (5m)

## Accessories

Accessories (Option)
Connection Conversion Board for SMC        : CCB-SMC2 *1*2*3

Screw Terminal Unit (M3 x 100P)        : EPD-100A *2*3*4

*1   Distributes 100-pin 0.8-mm pitch connector x 1 to: D-SUB 37 connector x 4, D-SUB-9 connector x 4.
*2   A PCB100PS optional cable is required separately.
*3   Cables and accessories are required each connector.
*4   "Spring-up" type terminal is used to prevent terminal screws from falling off.
*    Check the CONTEC's Web site for more information on these options.

## Specifications

### Common Section

| Item | Specification | |
| --- | --- | --- |
| | SMC-4DF2-PCI | SMC-8DF2-PCI |
| Control target | Stepping motor or servo motor driver unit (pulse train input type) | |
| Number of axes to control | 4 axes | 8 axes |
| Device used | PCL6045B (Nippon Pulse Motor CO., LTD.) or equivalence to it | |
| Interrupt | 1 ch | |
| Interrupt factor | When stopping by positive-direction end limit input ON<br>When stopping by negative-direction end limit input ON<br>At the time of stop by alarm input on<br>When stopping by simultaneous stop operation<br>When stopping by deceleration (decelerated stop) input on<br>When occurring the encoder input error<br>The other event (setting by the software) | |
| The number of sheets that can be used simultaneously | 16 sheets | |
| I/O address | Any 128 ports boundary | |
| Current consumption (Max.) | 5VDC 1000mA | 5VDC 2000mA |
| Operating condition | 0 - 50°C, 10 - 90% (No condensation) | |
| PCI bus specification | 32-bit, 33MHz, Universal key shapes supported *1 | |
| Dimension (mm) | 176.41(L) x 106.68(H) | |
| Connector used | HDRA-EC1000LFDT+ [mfd by HONDA TSUSHIN KOGYO CO., LTD.] or equivalence to it | HDRA-E100W1LFDT1EC-SL+ [mfd by HONDA TSUSHIN KOGYO CO., LTD.] or equivalence to it |
| Weight | 120g | 150g |
| Certification | RoHS,CE,VCCI | |

*1  This board requires power supply at +5V from an expansion slot (it does not work on a machine with a +3.3V power supply alone).

### Encoder Input Section

| Item | Specification |
| --- | --- |
| Encode type | Incremental |
| Maximum counter value | 8000000h - 7FFFFFFh(-134,217,728 - 134,217,727), 28 bit |
| Input signal type | Single-phase input (UP/DOWN/Z) / Phase input (A/B/Z) |
| Supported output type | Differential output, TTL level output, open-collector output |
| Device used | AM26LS32A(T.I) or equivalence to it |
| Terminal resister | 150Ω (Separable with SW) |
| Receiver input sensitivity | ±200mV |
| In-phase input voltage range | ±7V |
| Distance in which signal can be extended | 10m (Depending on the time of connecting the differential output, wiring environment and input frequency)<br>3m (Depending on the time of connecting the open-collector output, wiring environment and input frequency)<br>1.5m (Depending on the time of connecting the TTL level output, wiring environment and input frequency) |
| Response frequency (Max.) | 5MHz duty (When connecting the differential output, 2-phase Input, Multiply by 4, duty 50%)<br>3MHz duty (When connecting the TTL level output, 2-phase Input, Multiply by 4, duty 50%)<br>1MHz duty (When connecting the open-collector output, 2-phase Input, Multiply by 4, duty 50%) |

### Limit Input Section

| Item | Specification |
| --- | --- |
| Signal channel | 3channels/axis (original point, Forward limit, reserve limit) |
| Input signal name | ORG : origin input<br>+LIM : positive direction end limit input<br>-LIM : negative direction end limit input |
| Input logic | Enables selecting the positive/negative logic by using the Software |
| Input type | Opto-coupler input (corresponding to current sink output) |
| Response time (Max.) | 200 μsec |
| Input resister | 4.7kΩ |
| Input ON current | 2.0mA or more |
| Input OFF current | 0.16mA or less |
| External circuit power supply | 12V - 24VDC(±10%) |

### General-purpose Input Section

| Item | Specification |
| --- | --- |
| Signal channel | 7channels/axis |
| Input signal name | IN1/ALM : alarm input, general-purpose input<br>IN2/INP : positioning completion input, general-purpose input<br>IN3/SD : deceleration (decelerated stop) input, general-purpose input<br>IN4/LTC : counter latch input, general-purpose input<br>IN5/PCS : positioning control start input, general-purpose input<br>IN6/CLR : counter clear input, general-purpose input<br>IN7 : general-purpose input |
| Input logic | Enables selecting the positive/negative logic by using the Software |
| Input type | Opto-coupler input (corresponding to current sink output) |
| Response time (Max.) | 200 μsec |
| Input resister | 4.7kΩ |
| Input ON current | 2.0mA or more |
| Input OFF current | 0.16mA or less |
| External circuit power supply | 12V - 24VDC(±10%) |

### Pulse Output Section

| Item | Specification |
| --- | --- |
| Pulse rate | 0.1pps - 6.5 Mpps (differential line driver output)<br>0.1pps - 1 Mpps (open-collector output) |
| Output signal name | CW : pulse / CW output<br>CCW : direction / CCW output |
| Output signal system | 2 Pulse types (pulse for positive/negative direction) or the common pulse type (pulse signal/directional signal)<br>90°C phase difference pulse (lead/lag pulse) |
| Output form | Un-isolated differential line driver output ,open-collector output (selected by the switch) |
| Device used | AM26LS31(T.I) or equivalence to it |
| Device used (open-collector output) | 2SC3325 (TOSHIBA) or equivalence to it |
| H level output voltage | 2.5V - 5.25V |
| L level output voltage | 0V - 0.5V |
| Rated output withstanding voltage (Max.) (open-collector output) | 50VDC |
| Rated output current (Max.) | 20mA(differential line driver output)<br>100mA (open-collector output) |

### General-purpose Output Section

| Item | Specification |
| --- | --- |
| Number of signal channel | 3channels/axis |
| Output signal name | OUT1 : general-purpose output<br>OUT2 : general-purpose output<br>OUT3 : general-purpose output<br>(Each output pin can be switched with the following functions)<br>ALMCLR : alarm clear output<br>ERC : driver differential clear output<br>CP1 : comparator1 output<br>CP2 : comparator2 output |
| Signal specification | Un-isolated open collector output (current sink type)<br>(Enables selecting the positive/negative logic by using the Software) |
| Response time (Max.) | 10μsec (when using the loading on the input side 510Ω, +24VDC) |
| Rated output current (Max.) | 100mA per 1ch, 300mA per 1axis |
| Rated output withstanding voltage (Max.) | 50VDC |

### Physical Dimensions

176.41(L)

106.68(H)
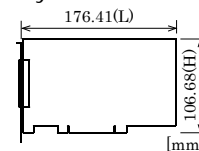
The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

[mm]

## Block Diagram
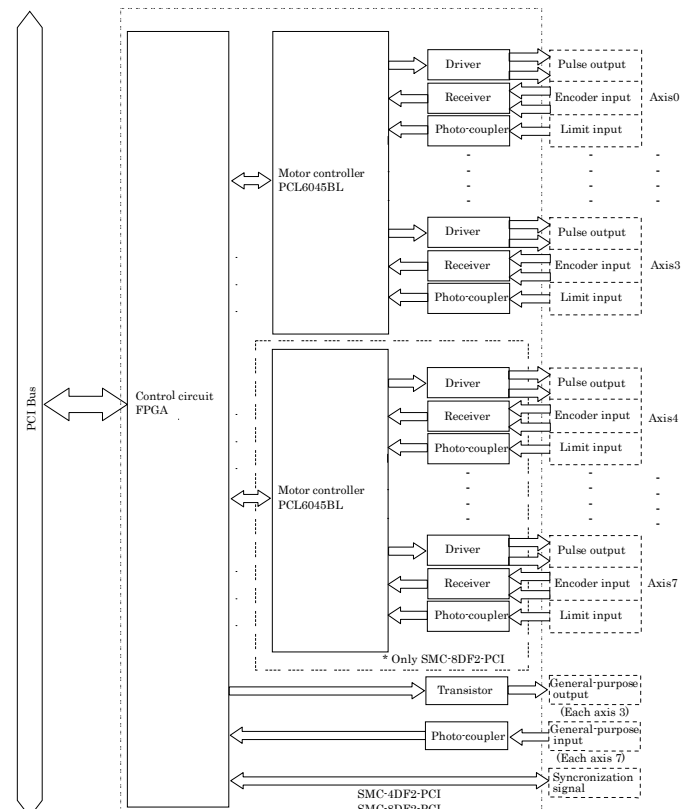
## Packing List

Board [SMC-4DF2-PCI or SMC-8DF2-PCI] ...1
First step guide ... 1
Disk *1 [API-PAC (W32)] ...1
Synchronization control cable (10cm) ...1
Serial number label...1
Warranty Certificate ...1

*1   Driver software (API-PAC (W32)), User's Guide.

## Support Software

**- Windows version of motion control driver API-SMC(WDM) [Stored on the bundled media driver library API-PAC(W32)]**
The API-SMC(WDM) is the Windows version driver library software that provides products in the form of Win32 API functions (DLL). Various sample programs such as Visual Basic and Visual C++, etc and diagnostic program useful for checking operation is provided.

For more details on the supported OS, applicable language and how to download the updated version, please visit the CONTEC's Web site.

**- Data acquisition VI library for LabVIEW VI-DAQ (Available for downloading (free of charge) from the CONTEC web site.)**
This is a VI library to use in National Instruments LabVIEW. VI-DAQ is created with a function form similar to that of LabVIEW's Data Acquisition VI, allowing you to use various devices without complicated settings. See the CONTEC's Web site for details and download of VI-DAQ.

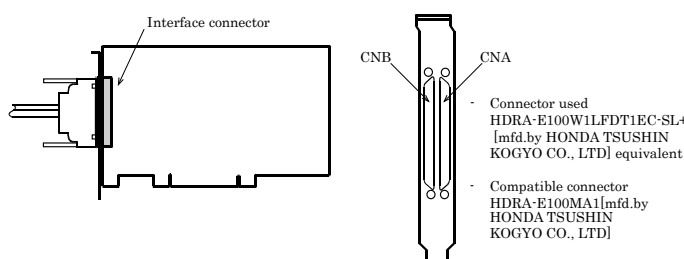## Difference between SMC-4DF2-PCI, SMC-8DF2-PCI and SMC-4DF-PCI, SMC-8DF-PCI

SMC-4DF2-PCI, SMC-8DF2-PCI is a product that added the pulse output format switching function from SMC-4DF-PCI, SMC-8DF-PCI. There is compatibility in terms of connector, signal arrangement, and software, it is easy to migrate from the existing system.

|  | SMC-4DF2-PCI, SMC-8DF2-PCI | SMC-4DF-PCI, SMC-8DF-PCI |
|---|---|---|
| Device used | PCL6045BL (Nippon Pulse Motor CO., LTD.) or equivalence to it | PCL6045B (Nippon Pulse Motor CO., LTD.) or equivalence to it |
| Pulse rate | 0.1pps - 6.5 Mpps (differential line driver output) 0.1pps - 1 Mpps (open-collector output) | 0.1pps - 6.5Mpps |
| Output form | Un-isolated differential line driver output, open-collector output (selected by the switch) | Un-isolated differential line driver output |
| Rated output withstanding voltage (Max.) (open-collector output) | 50VDC | - |
| Rated output current (Max.) | 20mA (differential line driver output) 100mA (open-collector output) | 20mA |
| Current consumption (Max.) | SMC-4DF2-PCI : 5VDC 1,000mA SMC-8DF2-PCI : 5VDC 2,000mA | SMC-4DF-PCI : 5VDC 800mA SMC-8DF-PCI : 5VDC 1600mA |

## How to connect the connectors

Connector shape
< SMC-8DF2-PCI >

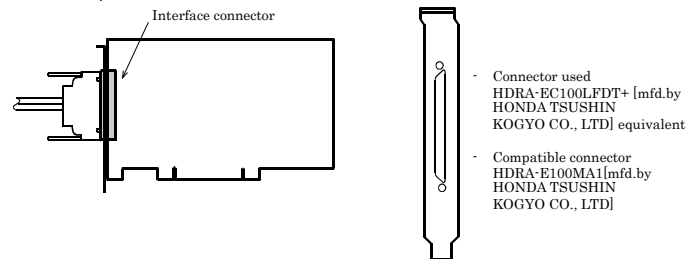The on-board interface connector (CNA, CNB) is used when connecting this product and the external devices.



Interface connector
CNB        CNA

- Connector used HDRA-E100W1LFDT1EC-SL+ [mfd.by HONDA TSUSHIN KOGYO CO., LTD] equivalent
- Compatible connector HDRA-E100MA1[mfd.by HONDA TSUSHIN KOGYO CO., LTD]

*    Please refer to chapter 1 for more information on the supported cable and accessories.

---

Cables and accessories are required each connector.
< SMC-4DF2-PCI >
The on-board interface connector is used when connecting this product and the external devices.Physical dimensions of attached AC adapter (POA200-20-2)



Interface connector

- Connector used HDRA-EC100LFDT+ [mfd.by HONDA TSUSHIN KOGYO CO., LTD] equivalent
- Compatible connector HDRA-E100MA1[mfd.by HONDA TSUSHIN KOGYO CO., LTD]

* Please refer to chapter 1 for more information on the supported cable and accessories.

## Connector Pin Assignment

Pin Assignments of Interface Connector (CNA, CNB) <SMC-8DF2-PCI>
Pin Assignments of Interface Connector (CNB)

CNB

| | | | | |
|---|---|---|---|---|
| axis0 : P-COM | 100 | 50 | axis2 : P-COM |
| axis0 : IN1/ALM | 99 | 49 | axis2 : IN1/ALM |
| axis0 : IN2/INP | 98 | 48 | axis2 : IN2/INP |
| axis0 : IN3/SD | 97 | 47 | axis2 : IN3/SD |
| axis0 : IN4/LTC | 96 | 46 | axis2 : IN4/LTC |
| axis0 : IN5/PCS | 95 | 45 | axis2 : IN5/PCS |
| axis0 : IN6/CLR | 94 | 44 | axis2 : IN6/CLR |
| axis0 : IN7 | 93 | 43 | axis2 : IN7 |
| axis0 : ORG | 92 | 42 | axis2 : ORG |
| axis0 : +LIM | 91 | 41 | axis2 : +LIM |
| axis0 : -LIM | 90 | 40 | axis2 : -LIM |
| axis1 : P-COM | 89 | 39 | axis3 : P-COM |
| axis1 : IN1/ALM | 88 | 38 | axis3 : IN1/ALM |
| axis1 : IN2/INP | 87 | 37 | axis3 : IN2/INP |
| axis1 : IN3/SD | 86 | 36 | axis3 : IN3/SD |
| axis1 : IN4/LTC | 85 | 35 | axis3 : IN4/LTC |
| axis1 : IN5/PCS | 84 | 34 | axis3 : IN5/PCS |
| axis1 : IN6/CLR | 83 | 33 | axis3 : IN6/CLR |
| axis1 : IN7 | 82 | 32 | axis3 : IN7 |
| axis1 : ORG | 81 | 31 | axis3 : ORG |
| axis1 : +LIM | 80 | 30 | axis3 : +LIM |
| axis1 : -LIM | 79 | 29 | axis3 : -LIM |
| axis0 : A+ | 78 | 28 | axis2 : A+ |
| axis0 : A- | 77 | 27 | axis2 : A- |
| axis0 : B+ | 76 | 26 | axis2 : B+ |
| axis0 : B- | 75 | 25 | axis2 : B- |
| axis0 : Z+ | 74 | 24 | axis2 : Z+ |
| axis0 : Z- | 73 | 23 | axis2 : Z- |
| axis1 : A+ | 72 | 22 | axis3 : A+ |
| axis1 : A- | 71 | 21 | axis3 : A- |
| axis1 : B+ | 70 | 20 | axis3 : B+ |
| axis1 : B- | 69 | 19 | axis3 : B- |
| axis1 : Z+ | 68 | 18 | axis3 : Z+ |
| axis1 : Z- | 67 | 17 | axis3 : Z- |
| axis0 : OUT3 | 66 | 16 | axis2 : OUT3 |
| axis0 : OUT2 | 65 | 15 | axis2 : OUT2 |
| axis0 : OUT1 | 64 | 14 | axis2 : OUT1 |
| axis0 : DIR+/CCW+ | 63 | 13 | axis2 : DIR+/CCW+ |
| axis0 : DIR-/CCW- | 62 | 12 | axis2 : DIR-/CCW- |
| axis0 : OUT+/CW+ | 61 | 11 | axis2 : OUT+/CW+ |
| axis0 : OUT-/CW- | 60 | 10 | axis2 : OUT-/CW- |
| GND | 59 | 9 | GND |
| axis1 : OUT3 | 58 | 8 | axis3 : OUT3 |
| axis1 : OUT2 | 57 | 7 | axis3 : OUT2 |
| axis1 : OUT1 | 56 | 6 | axis3 : OUT1 |
| axis1 : DIR+/CCW+ | 55 | 5 | axis3 : DIR+/CCW+ |
| axis1 : DIR-/CCW- | 54 | 4 | axis3 : DIR-/CCW- |
| axis1 : OUT+/CW+ | 53 | 3 | axis3 : OUT+/CW+ |
| axis1 : OUT-/CW- | 52 | 2 | axis3 : OUT-/CW- |
| GND | 51 | 1 | GND |

*    Axis0 - Axis3 of this manual corresponds to Axis No.1 - Axis No.4 in API-SMC(WDM).
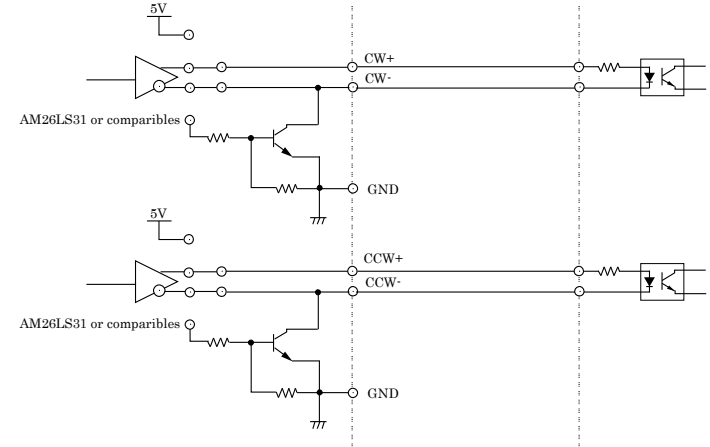
Pin Assignments of Interface Connector (CNA)

CNA

| | | | | |
|---|---|---|---|---|
| GND | 1 | 51 | GND |
| axis7 : OUT-/CW- | 2 | 52 | axis5 : OUT-/CW- |
| axis7 : OUT+/CW+ | 3 | 53 | axis5 : OUT+/CW+ |
| axis7 : DIR-/CCW- | 4 | 54 | axis5 : DIR-/CCW- |
| axis7 : DIR+/CCW+ | 5 | 55 | axis5 : DIR+/CCW+ |
| axis7 : OUT1 | 6 | 56 | axis5 : OUT1 |
| axis7 : OUT2 | 7 | 57 | axis5 : OUT2 |
| axis7 : OUT3 | 8 | 58 | axis5 : OUT3 |
| GND | 9 | 59 | GND |
| axis6 : OUT-/CW- | 10 | 60 | axis4 : OUT-/CW- |
| axis6 : OUT+/CW+ | 11 | 61 | axis4 : OUT+/CW+ |
| axis6 : DIR-/CCW- | 12 | 62 | axis4 : DIR-/CCW- |
| axis6 : DIR+/CCW+ | 13 | 63 | axis4 : DIR+/CCW+ |
| axis6 : OUT1 | 14 | 64 | axis4 : OUT1 |
| axis6 : OUT2 | 15 | 65 | axis4 : OUT2 |
| axis6 : OUT3 | 16 | 66 | axis4 : OUT3 |
| axis7 : Z- | 17 | 67 | axis5 : Z- |
| axis7 : Z+ | 18 | 68 | axis5 : Z+ |
| axis7 : B- | 19 | 69 | axis5 : B- |
| axis7 : B+ | 20 | 70 | axis5 : B+ |
| axis7 : A- | 21 | 71 | axis5 : A- |
| axis7 : A+ | 22 | 72 | axis5 : A+ |
| axis6 : Z- | 23 | 73 | axis4 : Z- |
| axis6 : Z+ | 24 | 74 | axis4 : Z+ |
| axis6 : B- | 25 | 75 | axis4 : B- |
| axis6 : B+ | 26 | 76 | axis4 : B+ |
| axis6 : A- | 27 | 77 | axis4 : A- |
| axis6 : A+ | 28 | 78 | axis4 : A+ |
| axis7 : -LIM | 29 | 79 | axis5 : -LIM |
| axis7 : +LIM | 30 | 80 | axis5 : +LIM |
| axis7 : ORG | 31 | 81 | axis5 : ORG |
| axis7 : IN7 | 32 | 82 | axis5 : IN7 |
| axis7 : IN6/CLR | 33 | 83 | axis5 : IN6/CLR |
| axis7 : IN5/PCS | 34 | 84 | axis5 : IN5/PCS |
| axis7 : IN4/LTC | 35 | 85 | axis5 : IN4/LTC |
| axis7 : IN3/SD | 36 | 86 | axis5 : IN3/SD |
| axis7 : IN2/INP | 37 | 87 | axis5 : IN2/INP |
| axis7 : IN1/ALM | 38 | 88 | axis5 : IN1/ALM |
| axis7 : P-COM | 39 | 89 | axis5 : P-COM |
| axis6 : -LIM | 40 | 90 | axis4 : -LIM |
| axis6 : +LIM | 41 | 91 | axis4 : +LIM |
| axis6 : ORG | 42 | 92 | axis4 : ORG |
| axis6 : IN7 | 43 | 93 | axis4 : IN7 |
| axis6 : IN6/CLR | 44 | 94 | axis4 : IN6/CLR |
| axis6 : IN5/PCS | 45 | 95 | axis4 : IN5/PCS |
| axis6 : IN4/LTC | 46 | 96 | axis4 : IN4/LTC |
| axis6 : IN3/SD | 47 | 97 | axis4 : IN3/SD |
| axis6 : IN2/INP | 48 | 98 | axis4 : IN2/INP |
| axis6 : IN1/ALM | 49 | 99 | axis4 : IN1/ALM |
| axis6 : P-COM | 50 | 100 | axis4 : P-COM |

*    Axis4 - Axis7 of this manual corresponds to Axis No.5 - Axis No.8 in API-SMC(WDM).

## Pin Assignments of Interface Connector  < SMC-4DF2-PCI >

```
axis0 : P-COM      100  50   axis2 : P-COM
axis0 : IN1/ALM     99  49   axis2 : IN1/ALM
axis0 : I N2/INP    98  48   axis2 : IN2/INP
axis0 : IN3/SD      97  47   axis2 : IN3/SD
axis0 : IN4/LTC     96  46   axis2 : IN4/LTC
axis0 : IN5/PCS     95  45   axis2 : IN5/PCS
axis0 : IN6/CLR     94  44   axis2 : IN6/CLR
axis0 : IN7         93  43   axis2 : IN7
axis0 : ORG         92  42   axis2 : ORG
axis0 : +LIM        91  41   axis2 : +LIM
axis0 : -LIM        90  40   axis2 : -LIM
axis1 : P-COM       89  39   axis3 : P-COM
axis1 : IN1/ALM     88  38   axis3 : IN1/ALM
axis1 : IN2/INP     87  37   axis3 : IN2/INP
axis1 : IN3/SD      86  36   axis3 : IN3/SD
axis1 : IN4/LTC     85  35   axis3 : IN4/LTC
axis1 : IN5/PCS     84  34   axis3 : IN5/PCS
axis1 : IN6/CLR     83  33   axis3 : IN6/CLR
axis1 : IN7         82  32   axis3 : IN7
axis1 : ORG         81  31   axis3 : ORG
axis1 : +LIM        80  30   axis3 : +LIM
axis1 : -LIM        79  29   axis3 : -LIM
axis0 : A+          78  28   axis2 : A+
axis0 : A-          77  27   axis2 : A-
axis0 : B+          76  26   axis2 : B+
axis0 : B-          75  25   axis2 : B-
axis0 : Z+          74  24   axis2 : Z+
axis0 : Z-          73  23   axis2 : Z-
axis1 : A+          72  22   axis3 : A+
axis1 : A-          71  21   axis3 : A-
axis1 : B+          70  20   axis3 : B+
axis1 : B-          69  19   axis3 : B-
axis1 : Z+          68  18   axis3 : Z+
axis1 : Z-          67  17   axis3 : Z-
axis0 : OUT3        66  16   axis2 : OUT3
axis0 : OUT2        65  15   axis2 : OUT2
axis0 : OUT1        64  14   axis2 : OUT1
axis0 : DIR+/CCW+   63  13   axis2 : DIR+/CCW+
axis0 : DIR-/CCW-   62  12   axis2 : DIR-/CCW-
axis0 : OUT+/CW+    61  11   axis2 : OUT+/CW+
axis0 : OUT-/CW-    60  10   axis2 : OUT-/CW-
GND                 59   9   GND
axis1 : OUT3        58   8   axis3 : OUT3
axis1 : OUT2        57   7   axis3 : OUT2
axis1 : OUT1        56   6   axis3 : OUT1
axis1 : DIR+/CCW+   55   5   axis3 : DIR+/CCW+
axis1 : DIR-/CCW-   54   4   axis3 : DIR-/CCW-
axis1 : OUT+/CW+    53   3   axis3 : OUT+/CW+
axis1 : OUT-/CW-    52   2   axis3 : OUT-/CW-
GND                 51   1   GND
```

## Connecting Output Signals

Pulse output circuit (CW, CCW)

The pulse output circuit on this product is equipped with the differential line driver output format and open-collector output as shown in the following figure, can be connected with differential input, opto-coupler, and TTL level input.
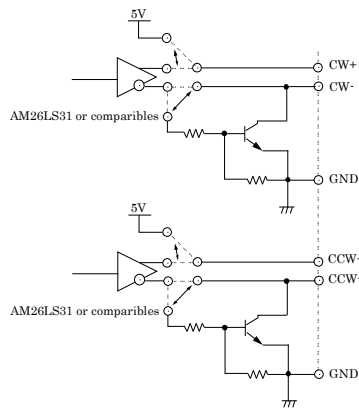


Connection with the differential input



⚠ CAUTION
- Please use the twisted-pair cable that does the shield processing as a noise measures when connecting it with the differential input.

Connection with the opto-coupler input (When the driver unit guarantees the connection with the differential output)



⚠ CAUTION
- The pulse output part of this product outputs the voltage by 2.5V or more at the High level output, and outputs the voltage of 0.5V or less at the Low level output. When connecting with the opto-coupler input, please check the driver unit's specification can be connected to the differential output. Also, if the driver unit can not connect the differential output, please consider a connection with open-collector output as bellow.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.
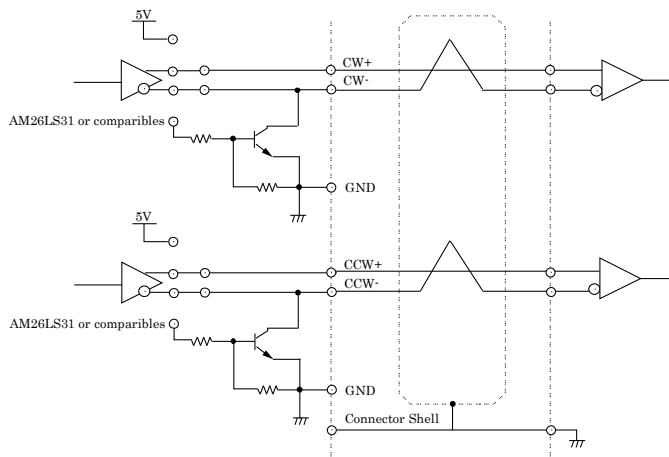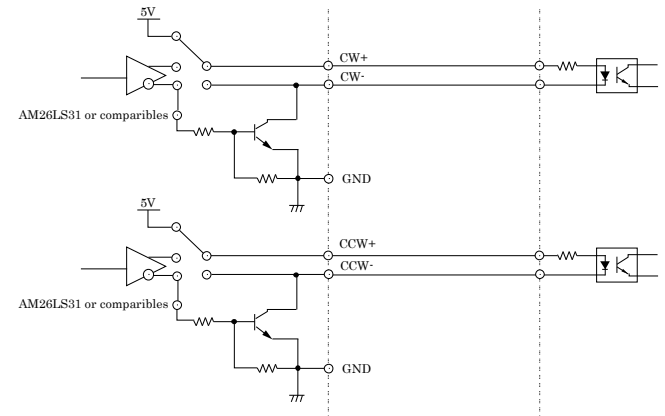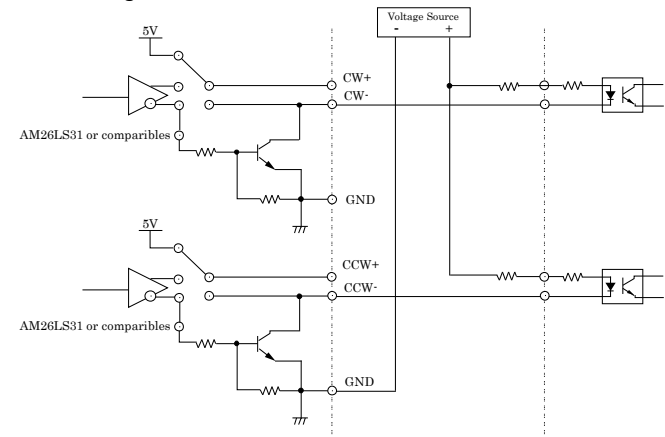
Connection with the opto-coupler input (connected to the open-collector output is required)



Connection with the opto-coupler input (when it is necessary to drive at a voltage other than 5V)



⚠ CAUTION
- If the power supply for the opto-coupler of the driver unit is other than 5V, please connect an external power supply. In addition, the allowable current of the input circuit to be connected, please insert a current-limiting resistor in response to the drive current.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.
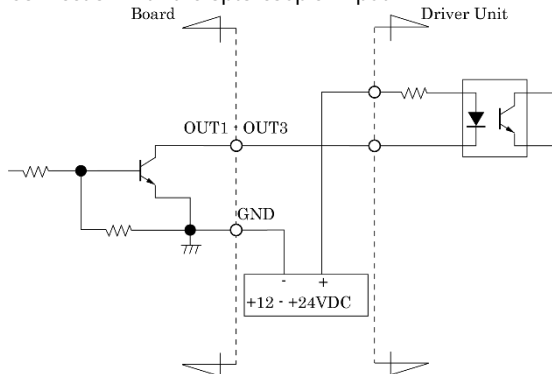
## Connection with TTL level input
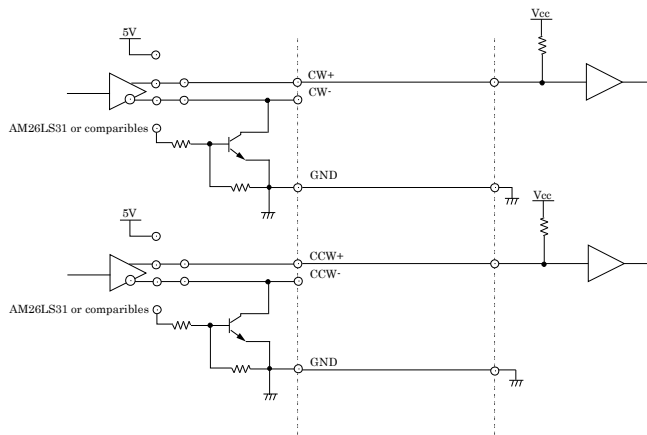


⚠ CAUTION
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.
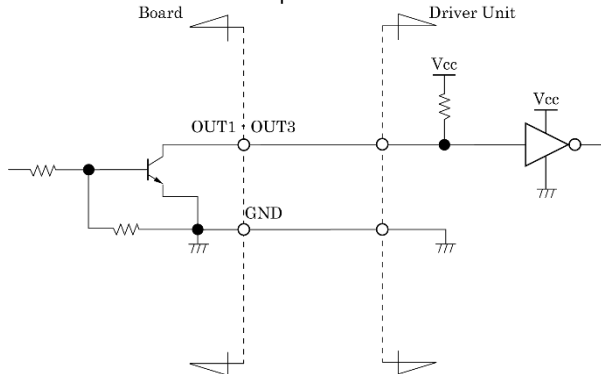
## Control signal/general-purpose signal output circuit(OUT1 - OUT3, ERC, CP1, CP2)

Output circuit of each output signal on this product is illustrated below.　The signal output is an open-collector output. A ground wire must therefore be connected for driving.
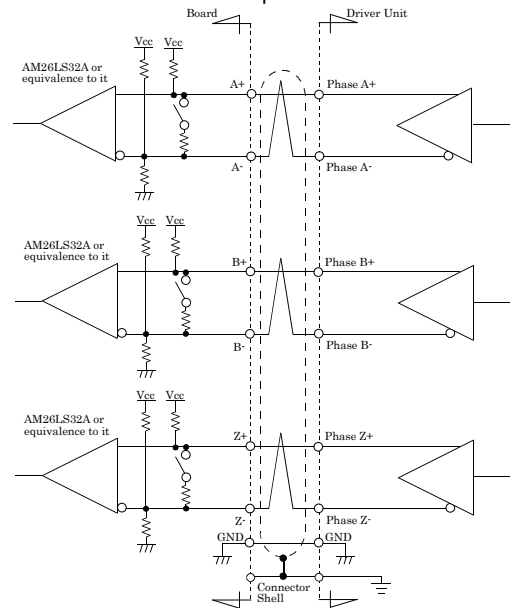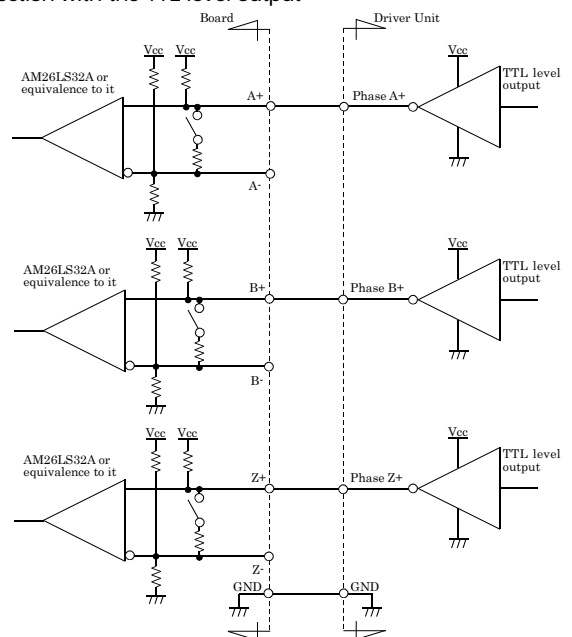
### Connection with the opto-coupler input



### Connection with TTL level input



## Connecting Input/Output Signals

### Encoder input circuit

Encoder input circuit on this product is illustrated below.　The signal input is a differential input capable of connecting a line driver output, TTL level output and open-collector output.

## Connection with the differential output



⚠ CAUTION
- Please use the twisted-pair cable that does the shield processing as a noise measures when connecting it with the differential output.
- Restrict the use of cables to 10m for the line driver output.

## Connection with the TTL level output



⚠ CAUTION
- When connecting TTL level output signals, please do not insert a terminating resistor with reference to "Setting the Terminating Resistor in chapter 2".　When inserted with a terminating resistor (factory setting), this product may malfunction, overheat, or causes a failure.
- Restrict the use of cables to 1.5m for the TTL level output.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.

## Connection with the open-collector output
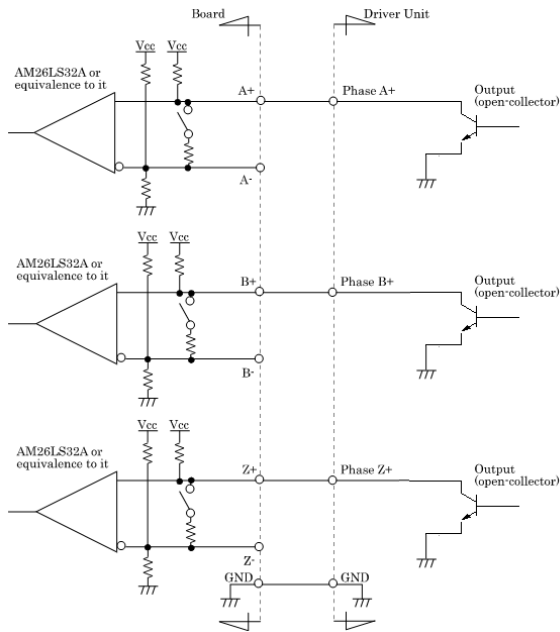


### ⚠ CAUTION

- When connecting open-collector output signals, please do not insert a terminating resistor with reference to "Setting the Terminating Resistor in chapter 2". When inserted with a terminating resistor (factory setting), this product may malfunction, overheat, or causes a failure.
- Restrict the use of cables to 3m for the open-collector output.
- To prevent the circuit from malfunctioning due to noise, wire it as far away from other signal lines and noise sources as possible.

## Limit input/general-purpose input/control input circuit(IN1 - IN7, +LIM, -LIM, ORG)

The limit input/general-purpose input/control input circuit on this board is illustrated below. The signal input is an current drive input by opto-coupler (Corresponding to the current sink output). To drive the limit input/general-purpose input/control input block, therefore, an external power supply is required at +12 - +24 V.
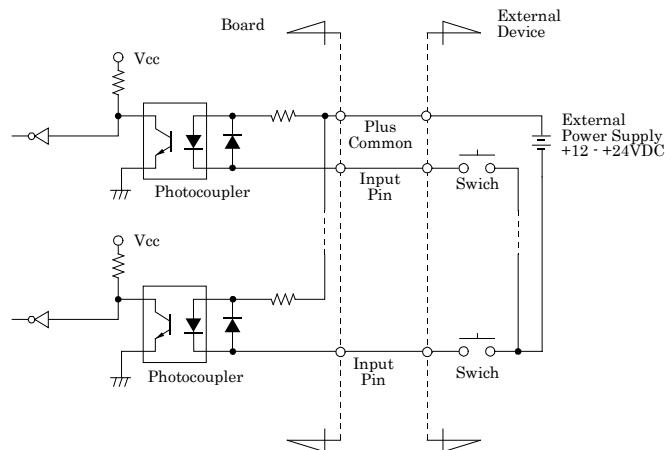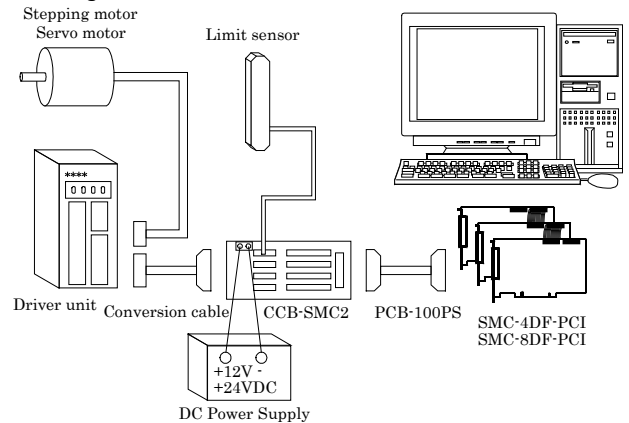


## Connection Examples

Given below are practical examples of connection of this product that outputs pulses by the independent pulsing method to motor drivers. These examples show the connections through axis0 (Axis No.1 in API-SMC(WDM)).

## Example of Connection to driver unit (ΣII Series) for Servo motor
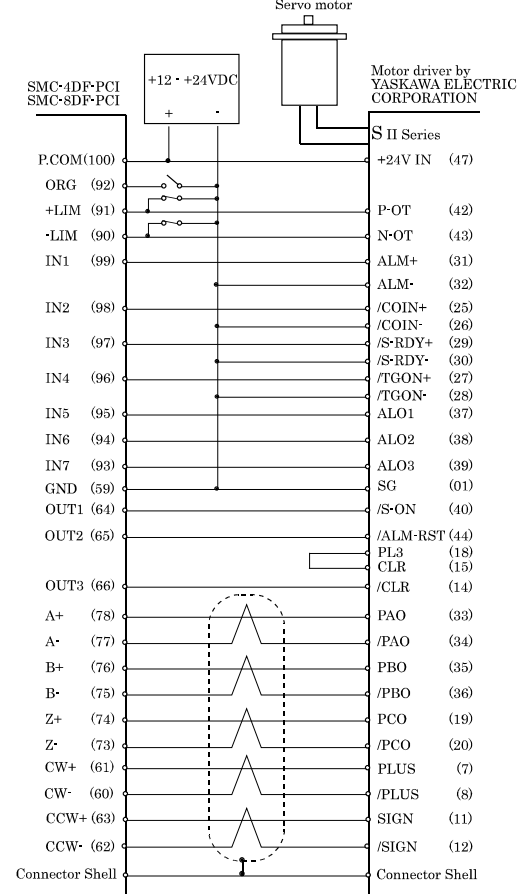


## Motion control system

### System configuration



### Component features

| Item | Description |
|---|---|
| SMC-4DF2-PCI SMC-8DF2-PCI (Main board) | When installed on the PC, this board generates pulses required for position control. |
| PCB-100PS (Option) | This cable connects the board to the CCB-SMC2. |
| CCB-SMC2 (Option) | This screw terminal is used to efficiently connect the devices (the board, driver unit, DC power supply, limit sensor) required for position control. The screw terminal can connect a four-axis motion control system alone. |
| Conversion cable (User) | The shape of the control connector of each driver unit is largely different depending on the manufacturer and type. A conversion cable must be prepared to connect each driver unit to the CCB-SMC2. |
| Driver unit (Motor maker) | Motor and driver unit to be subject to motion control. |
| Stepping motor Servo motor (Motor maker) | Available in various types by motor capacity, power-supply voltage, and motor shape. Select the ones that best fit your needs. |
| Limit sensor (Switch maker) | This sensor is installed at the forward/backward limit and origin detection positions. When a table is used in the system, the sensor is bundled with the table. For a self-made system, use commercially available switches. |
| DC Power supply (Power supply maker) | Power supply to the CCB-SMC2. Use a 12 - 24-VDC power supply. |