Non-isolation type low price high-precision
AIO card for CardBus

ADA16-8/2(CB)L

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

This card is a multi-function PC card containing high-precision analog inputs/outputs, digital inputs, digital outputs, and counters. The card is a Type II size PC Card Standard CardBus card.

This card provides all you need to build a high-performance PC-based measurement and control system.

You can use the driver library (API-PAC(W32)) supplied with the PC card to write Windows application programs in any programming language (such as Visual Basic, Visual C++, etc.) that supports the calling of Win32 API functions.

It can also collect data easily without a program when the data logger software [C-LOGGER] stored on the attached CD-ROM is used. With plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.

* If your PC has two TYPE II size PC card slots one on top of the other, you cannot use the ADA16-8/2(CB)L cards in both slots at the same time. However, you can use the ADA16-8/2(CB)L together with another PC card that does not require an external connector such as a memory card.

Features

Rich set of basic functions
Compact system providing high-precision analog inputs/outputs.

This product contains analog inputs (16-bit, 8ch), analog outputs (16-bit, 2ch), analog I/O control signals (6ch), digital inputs (4ch), digital outputs (4ch), and counters (32-bit binary, 1ch).

Substantial control functions
Capable of analog input/output in either time-based mode or external-signal synchronous mode.

Filter function for easy connection of external signals
The digital input signals, counter input signals, and the external control signals for analog I/O incorporate a digital filter to prevent problems such as chattering.

Containing the Buffer memory
The analog inputs and outputs each have their own buffer.

You can also perform analog input and output in the background, independent of software and the current status of the PC.

Software-based calibration function
Calibration of analog input/output can be all performed by software. Apart from the adjustment information prepared before shipment, additional adjustment information can be stored according to the use environment.

The same systems can be implemented on either desktop or notebook PCs
The "Analog L Series" PC cards (ADA16-8/2(LPCI)L and ADA16-8/2(CB)L) have equivalent functionality.

Systems developed on a desktop PC can be ported directly to a notebook PC with minimal changes

Supported to the data logger software [C-LOGGER]
Supporting the data logger software [C-LOGGER] that enables the graph display of recorded signal data, file saving, and dynamic transfer to the spreadsheet software program "Excel"

Plug-ins for the dedicated libraries, the board also supports MATLAB and LabVIEW.
We offer a dedicated library [ML-DAQ], which allows you to use this product on MATLAB by The MathWorks as well as another dedicated library [VI-DAQ], which allows you to use the product on LabVIEW.

These dedicated libraries are available, free of charge (downloadable), on our web site.

Specification

Encoder Input Section

Item	Specification
Analog input	
Isolated specification	Unisolated
Input type	Single-Ended Input
Number of input channels	8ch (Single-Ended Input)
Input range	Bipolar ±10V
Absolute max. input voltage	±20V
Input impedance	1MΩ or more
Resolution	16bit
Non-Linearity error *1*2	±5LSB
Conversion speed	10μsec/ch
Buffer memory	1k Word
Conversion start trigger	Software / external trigger
Conversion stop trigger	Number of sampling times / external trigger/software
External start signal	LVTTL level (Rising or falling edge can be selected by software)
External stop signal	LVTTL level (Rising or falling edge can be selected by software)
External clock input signal	LVTTL level (Rising or falling edge can be selected by software)
External status output signal	2 LVTTL level Sampling clock output
Analog output	
Isolated specification	Unisolated
Number of output channels	2ch
Output range	Bipolar ±10V
Absolute max. output currency	±5mA
Output impedance	1Ω or less
Resolution	16bit
Non-Linearity error *1	±3LSB
Conversion speed	10μsec (Max.)
Buffer memory	1k Word
Conversion start trigger	Software / external trigger
Conversion stop trigger	Number of sampling times / external trigger/software
External start signal	LVTTL level (Rising or falling edge can be selected by software)
External stop signal	LVTTL level (Rising or falling edge can be selected by software)
External clock input signal	LVTTL level (Rising or falling edge can be selected by software)
External status output signal	2 LVTTL level Sampling clock output
Digital I/O	
Number of input channels	Unisolated input 4ch (LVTTL level positive logic)
Number of output channels	Unisolated output 4ch (LVTTL level positive logic)
Counter	
Number of channels	1ch
Counting system	Up count
Max. count	FFFFFFFFh (Binary data, 32bit)
Number of external inputs	2 LVTTL level (Gate/Up) Gate (High level), Up (Rising edge)
Number of external outputs	1 LVTTL level Count match output (positive logic, pulse output)
Response speed *3	10MHz (Max.)
Common section	
I/O address	64 ports
Interruption level	1 interruption level
Power consumption	3.3VDC 500mA (Max.)
Operating condition	0 - 50°C, 10 - 90%RH (No condensation)
Supported PC Card slot	PC Card Standard Compliant CardBus
Dimension (mm)	85.6 (W) x 54.0 (D) x 5.0 (H) TYPE II
Weight	70g

*1 The non-linearity error means an error of approximately 0.1% occurs over the maximum range at 0°C and 50°C ambient temperature.
The error can be reduced by calibrating under the actual temperature conditions.
*2 At the time of the source use of a signal which built in the high-speed operational amplifier.
*3 Assuming that no digital filter is used.

Support Software

Windows version of analog I/O driver API-AIO(WDM)
[Stored on the bundled CD-ROM driver library API-PAC(W32)]

The API-AIO(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.
< Operating environment >
OS   Windows Vista, XP, Server 2003, 2000
Adaptation language   Visual Basic, Visual C++, Visual C#, Delphi, C++ Builder

You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/). For more details on the supported OS, applicable language and new information, please visit the CONTEC's Web site.

Linux version of analog I/O driver   API-AIO(LNX)
[Stored on the bundled CD-ROM driver library API-PAC(W32)]

The API-AIO(LNX) is the Linux version driver software which provides device drivers (modules) by shared library and kernel version. Various sample programs of gcc are provided.
< Operating environment >
OS   RedHatLinux, TurboLinux
                            (For details on supported distributions, refer to Help available after installation.)
Adaptation language   gcc

You can download the updated version from the CONTEC's Web site (http://www.contec.com/apipac/). For more details on the supported OS, applicable language and new information, please visit the CONTEC's Web site.

Data Logger Software C-LOGGER
[Stored on the bundled CD-ROM driver library API-PAC(W32)]

C-LOGGER is a data logger software program compatible with our analog I/O products. This program enables the graph display of recorded signal data, zoom observation, file saving, and dynamic transfer to the spreadsheet software "Excel". No troublesome programming is required.
CONTEC provides download services (at http://www.contec.com/clogger) to supply the updated drivers. For details, refer to the C-LOGGER Users Guide or our website.
< Operating environment >
OS   Windows Vista, XP, Server 2003, 2000

Data Acquisition library for MATLAB ML-DAQ
(Available for downloading (free of charge) from the CONTEC web site.)

This is the library software which allows you to use our analog I/O device products on MATLAB by the MathWorks. Each function is offered in accordance with the interface which is integrated in MATLAB's Data Acquisition Toolbox.
See http://www.contec.com/mldaq/ for details and download of ML-DAQ.

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 http://www.contec.com/vidaq/ for details and download of VI-DAQ.

Cable & Connector

Cable (Option)

Shielded cables with single-ended connector
for 68-pin half-pitch connector   : PCA68PS-0.5   (0.5m)
                                        : PCA68PS-1.5   (1.5m)

Shielded cables with two-ended connector
for 68-pin half-pitch connector   : PCB68PS-0.5P (0.5m)
                                        : PCB68PS-1.5P (1.5m)

68/50-pin conversion shielded cable
for analog input/output   : ADC-68M/50M   (0.5m)

Accessories

Accessories (Option)

Screw Terminal Unit (M3 x 50P)   : EPD-50A *1 *5
Screw Terminal Unit (M3 x 68P)   : EPD-68A *2 *5
Buffer Amplifier Box for Analog Input Boards
(8ch type)   : ATBA-8L *1 *4
Buffer Amplifier Box for Analog Input Boards
(16ch type)   : ATBA-16L *1 *3 *4
BNC Terminal Unit (for analog input 8ch)
                                     : ATP-8L *1

*1   ADC-68M/50M optional cable is required separately.
*2   PCB68PS-0.5P optional cable is required separately.
*3   The analog input could have 8 channels to be used.
*4   An external power supply is necessary (optional AC adaptor POA200-20 prepared.)
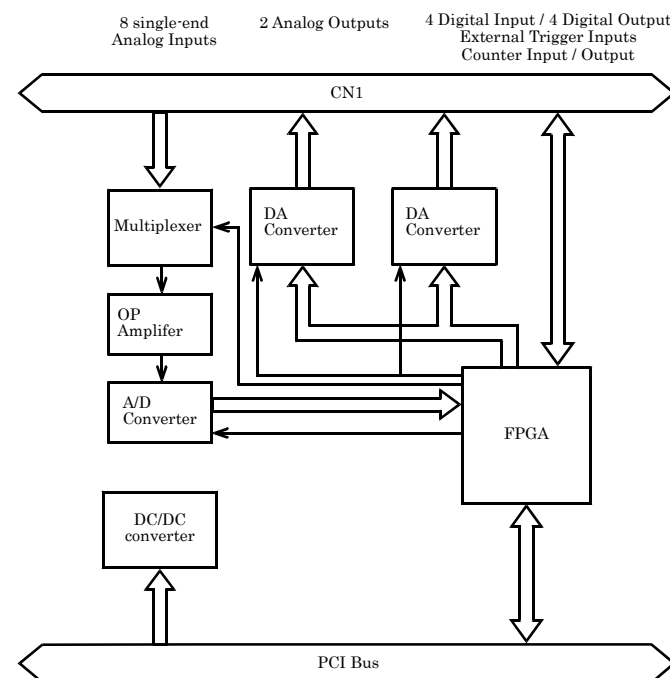*5   "Spring-up" type terminal is used to prevent terminal screws from falling off.

*   Check the CONTEC's Web site for more information on these options.

Packing List

PC Card [ADA16-8/2(CB)L] …1
First step guide …1
CD-ROM *1 [API-PAC(W32)] …1

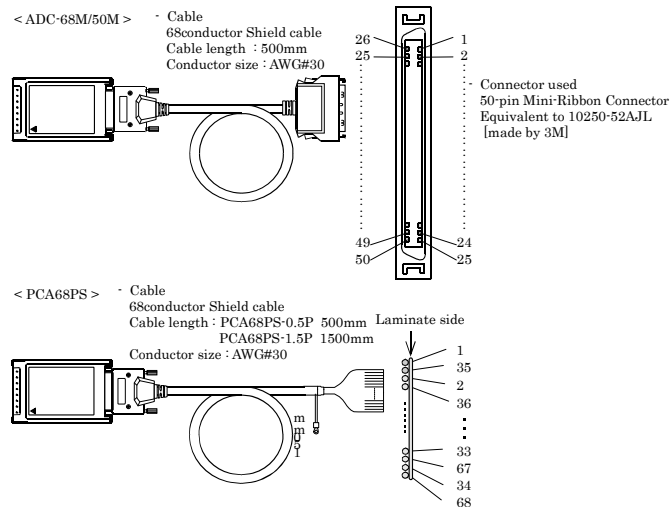*1   The CD-ROM contains the driver software and User's Guide.

Block Diagram

How to connect the connectors

Connector shape

An optional cable (ADC-68M/50M) is used to connect the PC card to external devices.   Use this cable in conjunction with a terminal block to connect external devices.

< ADC-68M/50M >
Cable
68conductor Shield cable
Cable length ：500mm
Conductor size ：AWG#30

26 — — 1
25 — — 2

Connector used
50-pin Mini-Ribbon Connector
Equivalent to 10250-52AJL
[made by 3M]

49 — — 24
50 — — 25

< PCA68PS >
Cable
68conductor Shield cable
Cable length：PCA68PS-0.5P 500mm   Laminate side
PCA68PS-1.5P 1500mm
Conductor size：AWG#30

1
35
2
36
m
33
67
34
68

*   Please refer to page 2 for more information on the supported cable and accessories.

Connector Pin Assignment

Pin Assignment of ADA16-8/2(CB)L interface connector

Analog Output 00	AO 00	1	35	AGND	Analog Ground (for AO)
Analog Output 01	AO 01	2	36	AGND	Analog Ground (for AO)
Analog Ground (for AO)	AGND	3	37	AGND	Analog Ground (for AO)
Analog Input 00	AI 00	4	38	N.C.	Non Connect
Analog Input 01	AI 01	5	39	N.C.	Non Connect
Analog Input 02	AI 02	6	40	N.C.	Non Connect
Analog Input 03	AI 03	7	41	N.C.	Non Connect
Analog Ground (for AI)	AGND	8	42	AGND	Analog Ground (for AI)
Analog Input 04	AI 04	9	43	N.C.	Non Connect
Analog Input 05	AI 05	10	44	N.C.	Non Connect
Analog Input 06	AI 06	11	45	N.C.	Non Connect
Analog Input 07	AI 07	12	46	N.C.	Non Connect
Analog Ground (for AI)	AGND	13	47	AGND	Analog Ground (for AI)
Non Connect	N.C.	14	48	N.C.	Non Connect
Non Connect	N.C.	15	49	N.C.	Non Connect
Non Connect	N.C.	16	50	N.C.	Non Connect
Non Connect	N.C.	17	51	N.C.	Non Connect
Analog Ground (for AI)	AGND	18	52	AGND	Analog Ground (for AI)
Non Connect	N.C.	19	53	N.C.	Non Connect
Non Connect	N.C.	20	54	N.C.	Non Connect
Non Connect	N.C.	21	55	N.C.	Non Connect
Non Connect	N.C.	22	56	N.C.	Non Connect
AI External Start Trigger Input	AI START	23	57	AI STOP	AI External Stop Trigger Input
AI External Sampling Clock Input	AI EXCLK	24	58	DGND	Digital Ground
Non Connect	N.C.	25	59	N.C.	Non Connect
AO External Start Trigger Input	AO START	26	60	AO STOP	AO External Stop Trigger Input
AO External Sampling Clock Input	AO EXCLK	27	61	DGND	Digital Ground
Non Connect	N.C.	28	62	N.C.	Non Connect
Digital Intput 00	DI 00	29	63	DI 01	Digital Input 01
Digital Intput 02	DI 02	30	64	DI 03	Digital Input 03
Digital Output 00	DO 00	31	65	DO 01	Digital Output 01
Digital Output 02	DO 02	32	66	DO 03	Digital Output 03
Counter Gate Control Input	CNT GATE	33	67	CNT OUT	Counter Output
Counter UP Clock Input	CNT UPCLK	34	68	Reserved	Reserved

Analog Input00 - Analog Input07	Analog input signal. The numbers correspond to channel numbers.
Analog Output00 - Analog Output01	Analog output signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger input signal for starting analog input sampling.
AI External Stop Trigger Input	External trigger input signal for stopping analog input sampling.
AI External Sampling Clock Input	External sampling clock input signal for analog input.
AO External Start Trigger Input	External trigger input signal for starting analog output sampling.
AO External Stop Trigger Input	External trigger input signal for stopping analog output sampling.
AO External Sampling Clock Input	External sampling clock input signal for analog output.
Digital Input00 - Digital Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Output	Counter output signal.
Digital Ground	Common digital ground for digital I/O signal, external trigger input, external sampling clock input signal, and counter I/O signal.
Reserved	Reserved pin
N.C.	No connection to this pin.

Signal assignment with the ADC-68M/50M used

Analog Output 00	AO 00	25	50	N.C.	Non Connect
Analog Ground (for AO)	AGND	24	49	AGND	Analog Ground (for AO)
Analog Output 01	AO 01	23	48	N.C.	Non Connect
Analog Ground (for AO)	AGND	22	47	AGND	Analog Ground (for AO)
Analog Input 00	AI 00	21	46	AI 04	Analog Input 04
Non Connect	N.C.	20	45	AI 05	Analog Input 05
Analog Input 01	AI 01	19	44	AI 05	Analog Input 05
Non Connect	N.C.	18	43	N.C.	Non Connect
Analog Ground (for AI)	AGND	17	42	AGND	Analog Ground (for AI)
Analog Ground (for AI)	AGND	16	41	AGND	Analog Ground (for AI)
Analog Input 02	AI 02	15	40	AI 06	Analog Input 06
Non Connect	N.C.	14	39	N.C.	Non Connect
Analog Input 03	AI 03	13	38	AI 07	Analog Input 07
Non Connect	N.C.	12	37	N.C.	Non Connect
AI External Start Trigger Input	AI START	11	36	AO START	AO External Start Trigger Input
AI External Stop Trigger Input	AI STOP	10	35	AO STOP	AO External Stop Trigger Input
AI External Sampling Clock Input	AI EXCLK	9	34	AO EXCLK	AO External Sampling Clock Inpu
Digital Ground	DGND	8	33	DGND	Digital Ground
Digital Input 00	DI 00	7	32	DO 00	Digital Output 00
Digital Input 01	DI 01	6	31	DO 01	Digital Output 01
Digital Input 02	DI 02	5	30	DO 02	Digital Output 02
Digital Input 03	DI 03	4	29	DO 03	Digital Output 03
Digital Ground	DGND	3	28	DGND	Digital Ground
Counter Gate Control Input	CNT GATE	2	27	CNT UPCLK	Counter UP Clock Input
Counter Output	CNT OUT	1	26	Reseved	Reserved

Analog Input00 - Analog Input07	Analog input signal. The numbers correspond to channel numbers.
Analog Output00 - Analog Output01	Analog output signal. The numbers correspond to channel numbers.
Analog Ground	Common analog ground for analog I/O signals.
AI External Start Trigger Input	External trigger input signal for starting analog input sampling.
AI External Stop Trigger Input	External trigger input signal for stopping analog input sampling.
AI External Sampling Clock Input	External sampling clock input signal for analog input.
AO External Start Trigger Input	External trigger input signal for starting analog output sampling.
AO External Stop Trigger Input	External trigger input signal for stopping analog output sampling.
AO External Sampling Clock Input	External sampling clock input signal for analog output.
Digital Input00 - Digital Input03	Digital input signal.
Digital Output00 - Digital Output03	Digital output signal.
Counter Gate Control Input	Gate control input signal for counter.
Counter Up Clock Input	Count-up clock input signal for counter.
Counter Output	Counter output signal.
Digital Ground	Common digital ground for digital I/O signal, external trigger input signal, external sampling clock input signal, and counter I/O signal.
Reserved	Reserved pin
N.C.	No connection to this pin.

⚠ CAUTION

Do not connect any of the outputs and power outputs to the analog or digital ground.

Neither connect outputs to each other.   Doing either can result in a fault.

If analog and digital ground are shorted together, noise on the digital signals may affect the analog signals. Accordingly, analog and digital ground should be separated.

Leave "Reserved" pins unconnected.   Connecting these pins may cause a fault in the PC card.
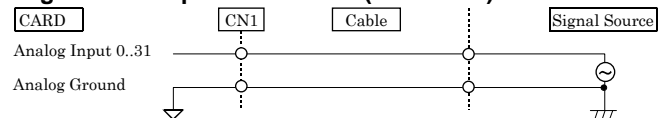
Analog Input Signal Connection

Analog signal input types are divided into single-ended input and differential input.   This card uses single-ended input fixed. The sections below describe how to connect the signals using flat cable and shielded cable.

Single-ended Input

The following figure shows an example of flat cable connection. Connect separate signal and ground wires for each analog input channel on CN1.

Single-ended Input Connection (Flat Cable)

CARD   CN1   Cable   Signal Source
Analog Input 0..31
Analog Ground

The following figure shows an example of shield cable connection. Use shielded cable if the distance between the signal source and PC card is long or if you want to provide better protection from noise. For each analog input channel on CN1, connect the core wire to the signal line and connect the shielding to ground.

Single-ended Input Connection (Shield Cable)
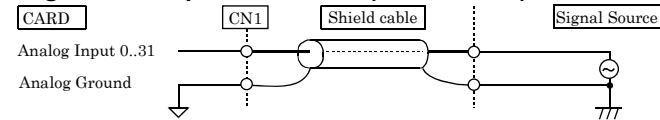
⚠ CAUTION

If the signal source contains over 1MHz signals, the signal may effect the cross-talk noise between channels.

If the PC card and the signal source receive noise or the distance between the PC card and the signal source is too long, data may not be input properly.

An input analog signal should not exceed the maximum input voltage (relate to the PC card analog ground).   If it exceeds the maximum voltage, the PC card may be damaged.

Connect all the unused analog input channels to analog ground. Failure to do so may affect input data to other channels.

The signal connected to an input pin may fluctuate after switching of the multiplexer. If this occurs, shorten the cable between the signal source and the analog input pin or insert a high-speed amplifier as a buffer between the two to reduce the fluctuation.

An input pin may fail to obtain input data normally when the signal source connected to the pin has high impedance.   If this is the case, change the signal source to one with lower output impedance or insert a high-speed amplifier buffer between the signal source and the analog input pin to reduce the effect.

Analog Output Signal Connection

This section shows how to connect the analog output signal by using a flat cable or a shielded cable.
The following figure shows an example of flat cable connection. Connect the signal source and ground to the CN1 analog output.

Analog Output Connection (Flat Cable)
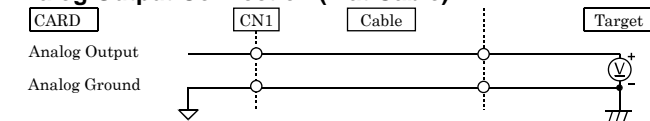
The following figure shows an example of shielded cable connection. Use shielded cable if the distance between the signal source and PC card is long or if you want to provide better protection from noise. For the CN1 analog output, connect the core wire to the signal line and connect the shielding to ground.

Analog Output Connection (Shield Cable)
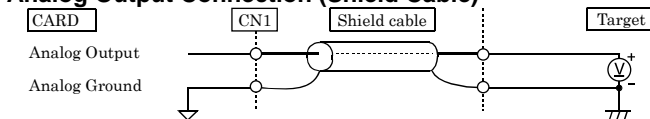
⚠ CAUTION

If the PC card or the target receives noise, or the distance between the PC card and the target is long, data may not be outputted properly.

For analog output signal, the current capacity is ±5mA (Max.). Check the specification of the connected device before connecting the PC card.

Do not short the analog output signal to analog ground, digital ground.   Doing so may cause a fault on the PC card.

Do not connect an analog output signal to any other analog output, either on the PC card or on an external device, as this may cause a fault on the PC card.

The voltage output when the PC is turned on is indeterminate.

## Digital I/O signals, Counter signals and Control signals Connection

The following sections show examples of how to connect digital I/O signals, counter I/O signals, and other control I/O signals (external trigger input signals, sampling clock input signals, etc.).
All the digital I/O signals and control signals are LVTTL level signals.

Digital Input Connection
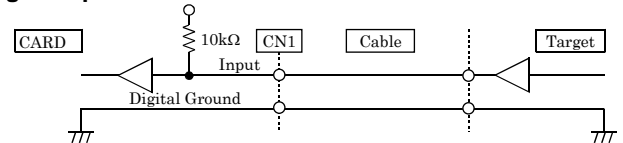
Digital Output Connection
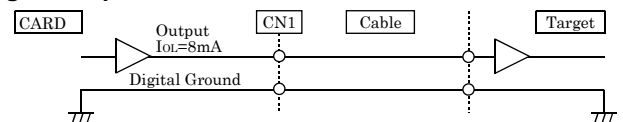
About the counter input control signal

Counter Gate Control Input (refer to the page 3 Connector Pin Assignment) acts as an input that validate or invalidate the input of an external clock for the counter. This function enables the control of an external clock input for the counter. The external clock for the counter is effective when input is "High" and invalid when input is "Low".   If unconnected, it is a pull-up in the board (card) and remains "High". Therefore the external clock for the counter is effective when the counter gate control input is not connected.

⚠ CAUTION

Do not short the output signals to analog ground, digital ground, and/or power line.   Doing so may cause a fault on the PC card.

If connected to each output, a pull-up resistor must be about 10 kΩ to pull up with a 3.3V power source.

Each input accepts 5V TTL level signals.