AD12-16U(PCI)EV

High-Speed Analog Input Board for PCI

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

**Features**

**Resolution : 12-bit, combination speed : 1μsec/ch**

This product is the high-speed type that performs A-D conversion at a conversion speed of 1μsec/ch and a resolution of 12-bit.

The product has analog input 16ch, analog output 1ch, digital input/output (TTL level: four each), and a counter (32-bit, TTL level 1ch). In addition, the analog input can be set to single-end input 16ch or differential input 8ch, while the counter is commonly used as the digital input/output.

**Equipped with high-capacity buffer memory for 16M data and a variety of sampling control functions**

FIFO or RING buffer memory for 16M data, allowing sampling to be performed as a background task independent of the processing power of the PC. Capable of starting and stopping sampling not only by software commands but depending on the strength of an analog signal (via conversion data comparison) or by detection of a TTL level signal (external trigger).

**Sixteen single-ended channels or eight differential channels (Analog input function)**

These boards allow either single-ended or differential input mode that is selected with on-board jumpers. The order of channels subject to signal conversion can be preset in the dedicated register. Using an optional unit, a board can increase the maximum number of input channels (up to 32 channels) and perform simultaneous sampling.

**Mixed on-board channels for analog output and digital I/O**

One channel for analog output, four channels for TTL level digital input, and four channels for TTL level digital output mixed on the board.

**Compact PCI short-size board with a wealth of advanced functions Abundant optional units**

Providing a variety of options available for extending the functions, including buffer amplifier, simultaneous sampling, insulation & current/thermocouple input, low pass filter, and cables.

**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.

This product is partly improved from the past analog E series; it is an upward-compatible product. Basically, this product can therefore be used in the same way as the analog E series. This product is different in specification from the E series. The difference point is shown in “Differences between past analog E and this product”.

This product is PCI-compliant interface boards that convert analog input signals to digital data (performing analog-to-digital conversion). This product carries high-capacity buffer memory for 16M data for analog input, allowing background sampling to be performed in a variety of trigger conditions. This product also has one analog output channel, four channels for TTL level digital input, and four channels for TTL level digital output.

This product is the high-speed type that performs A-D conversion at a conversion speed of 1μsec/ch and a resolution of 12-bit.

Using the bundled API function library package [API-PAC(W32)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C++.

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

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input</td>
<td></td>
</tr>
<tr>
<td>Isolated specification</td>
<td>Unisolated</td>
</tr>
<tr>
<td>Type</td>
<td>Single-Ended Input or Differential Input (Jumper setup)</td>
</tr>
<tr>
<td>Number of input channels</td>
<td>8ch (Single-Ended Input)</td>
</tr>
<tr>
<td>Input range</td>
<td>Bipolar ±10V, ±5V, ±2.5V</td>
</tr>
<tr>
<td></td>
<td>or Unipolar 0, ±5V, 0, ±10V (Jumper setup)</td>
</tr>
<tr>
<td>Absolute max. input voltage</td>
<td>±15V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>1MΩ or more</td>
</tr>
<tr>
<td>Resolution</td>
<td>12-bit</td>
</tr>
<tr>
<td>Non-Linearity error</td>
<td>±0.02LSB</td>
</tr>
<tr>
<td>Conversion speed</td>
<td>1μsec/ch (Max.)</td>
</tr>
<tr>
<td>Buffer memory</td>
<td>16M byte FIFO or 16M data RING (Software setup)</td>
</tr>
<tr>
<td>Conversion start trigger</td>
<td>Software/Input data comparison/TTL level external signal</td>
</tr>
<tr>
<td>Conversion stop trigger</td>
<td>Specified sampling data stored/Input data comparison/TTL level external signal/Software</td>
</tr>
<tr>
<td>Analog output</td>
<td></td>
</tr>
<tr>
<td>Isolated specification</td>
<td>Unisolated</td>
</tr>
<tr>
<td>Number of output channels</td>
<td>1ch</td>
</tr>
<tr>
<td>Output range</td>
<td>Bipolar ±10V / Bipolar ±5V / Unipolar 0, ±10V (Jumper setup)</td>
</tr>
<tr>
<td>Output current ability</td>
<td>±5mA</td>
</tr>
<tr>
<td>Output impedance</td>
<td>1Ω or less</td>
</tr>
<tr>
<td>Resolution</td>
<td>12-bit</td>
</tr>
<tr>
<td>Non-Linearity error</td>
<td>±0.02LSB</td>
</tr>
<tr>
<td>Conversion speed</td>
<td>1μsec/ch (Max.)</td>
</tr>
</tbody>
</table>

**Digital I/O**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of input channels</td>
<td>Unisolated input 4ch (TTL level, Selection of a counter output is possible at a jumper.)</td>
</tr>
<tr>
<td>Number of output channels</td>
<td>Unisolated input 4ch (TTL level, A counter control input and common use are possible at a jumper.)</td>
</tr>
<tr>
<td>Counter</td>
<td>8254 equivalent</td>
</tr>
<tr>
<td>Counter clock</td>
<td>Internal (4MHz) or External signal</td>
</tr>
<tr>
<td>I/O address</td>
<td>Any 32-byte boundary</td>
</tr>
<tr>
<td>Interrupt</td>
<td>1-channel use</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1W</td>
</tr>
<tr>
<td>Operating condition</td>
<td>0 - 50°C, 10% - 90% RH (No condensation)</td>
</tr>
<tr>
<td>PCI bus specification</td>
<td>32-bit, 33MHz, Universal key shapes supported</td>
</tr>
<tr>
<td>Physical dimensions (mm)</td>
<td>176.41(L) x 105.06(W)</td>
</tr>
<tr>
<td>Interface connectors</td>
<td>CN1: D-SUB 37-pin female connector, CN2: 16-pin plug</td>
</tr>
<tr>
<td>Weight</td>
<td>150g</td>
</tr>
</tbody>
</table>

**Certification**

*1 When the environment temperature is near 0°C or 50°C, the non-linearity error may become larger.
*2 At the time of the source use of a signal which built in the high-speed operational amplifier.
*3 If an external device requires this AD12-16U(PCI)EV board to supply +5VDC from the CN1 or CN2 connectors, the power consumption of this board will be larger than what this specification has defined.
*4 This board requires +5V power supply from expansion slots (it does not operate in the environment of only +3.3V power supply).

**Support Software**

**Windows version of analog I/O driver API-AIO(WDM) / API-AIO(98/PC)**

[Stored on the bundled Disk driver library API-PAC(W32)]

The API-AIO(WDM) / API-AIO(98/PC) 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. You can download the updated version from the CONTEC’s Web site. 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 Disk 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. You can download the updated version from the CONTEC’s Web site. 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 Disk driver library API-PAC(W32)]

The 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 to supply the updated drivers. For details, refer to the C-LOGGER Users Guide or our website.

**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.
Cable & Connector

**Cable (Option)**

Flat Cable with 37-Pin D-SUB Connector at One End
- PCA37P-1.5 (1.5m)
- PCA37P-0.5P (0.5m)
- PCA37P-1.5P (1.5m)

Shield Cable with 37-Pin D-SUB Connector at One End
- PCA37PS-0.5P (0.5m)
- PCA37PS-1.5P (1.5m)

Shielded Cable with 37-pin D-SUB connectors at either ends
- PCB37PS-0.5P (0.5m)
- PCB37PS-1.5P (1.5m)

Flat Cable with 15-Pin D-SUB Connector at One End
- PCA15P-1.5 (1.5m)
- PCA15P-0.5P (0.5m)

Coaxial Cable for Single-ended Inputs (16 channels)
- PCC16PS-1.5 (1.5m)
- PCC16PS-3 (3m)

2 Wires Shielded Cable for Differential Inputs (8 channels)
- PCD8PS-1.5 (1.5m)
- PCD8PS-3 (3m)

Flat Cable with 1 Sided 16-Pin Header Connector (1.5m)
- DT/E1

Conversion Cable (16-Pin to 15-Pin) with Bracket (100mm)
- DT/E2

Conversion Cable (16-Pin to 15-Pin) with Bracket (150mm)
- DT-E3

**Connector (Option)**

37-pin D-SUB (Male) Connector Set (5 Pieces)
- CN5-D37M

*1* For FTP-15 only

Accessories (Option)

- BNC Terminal Unit (for analog input 16ch) : ATP-16E *1
- Buffer Amplifier Box for Analog Input Boards (16ch type) : ATBA-16E *1
- General Purpose Terminal (M3 x 15P) : FTP-15 *2
- Screw Terminal Unit (M3 x 37P) : EPD-37A *1 *3
- Screw Terminal Unit (M3.5 x 37P) : EPD-37 *1
- General Purpose Terminal (M3 x 37P) : DTP-3A *1
- Screw Terminal (M2.6 x 37P) : DTP-4A *1
- Sample & Hold Board : ATSS-16 *1
- 8/16 channel Simultaneous
- Sample & Hold Board : ATII-16A *1
- 8/16 channel Simultaneous
- Sample & Hold Board : ATII-8C *1
- Low Pass Filter Accessory for Analog Input : ATLF-8A *1
- 16CH Multiplexer Sub-Board for AD12-16U(PCI)EV and AD16-16U(PCI)EV : ATUH-16A(PCI)

*1* A PCB37PS-*P optional cable is required separately. (0.5m is recommended.)
*2* A DT/E2 and PCB15P-1.5 optional cable is required separately.
*3* Check the CONTEC’s Web site for more information on these options.

---

Packing List

- Board [AD12-16U(PCI)EV] ...1
- First step guide ... 1
- Disk *1 [API-PAC(W32)]...1
- Serial number label...1
- Product Registration Card & Warranty Certificate...1

*1* The Disk contains the driver software and User’s Guide.

Block Diagram

- A/D converter
- Sample & Hold amplifier
- Instrument amplifier
- D/A converter
- Counter 8254
- 16-bit counter 0
- 16-bit counter 1
- 16-bit counter II

How to connect the connectors

**Connector shape**

To connect an external device to this board, plug the cable from the device into the interface connector (CN1, CN2) shown below.

The board has two interface connectors: the analog I/O connector (CN1: 37-pin female D-SUB connector) and the control signal connector (CN2: 16-pin pin-header) for digital input/output and counter control.

---

Please refer to this page for more information on the supported cable and accessories.
Examples of Connecting Options

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.

Analog Input Signal Connection

There are two analog input modes: the Single-ended input and the Differential input. Here we give some examples of analog input connections by using flat cable or shield cable.

Single-ended Input
The following figure shows an example of flat cable connection. Each signal source is connected to one analog input channel and the signal common to analog ground pin of CN1.

Single-ended Input Connection (Flat Cable)

The following figure shows an example of shield cable connection. When the distance between the signal source and the board is long or you want to increase the noise tolerance, a shield cable is suggested. Connect the signal by the core wire and common signal by the shield braids.

Single-ended Input Connection (Shield Cable)

AD12-16U(PCI)EV
Ver.1.03
Differential Input
The following figure shows an example of flat cable connection. Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by a third wire.

Differential Input Connection (Flat Cable)

The following figure shows an example of 2-wire shielded cable connection. When the distance between the signal source and the board is long or you want to increase the noise tolerance, a shield cable connection is preferred. Each signal source is connected to a [+] pin of analog input channel and the signal common of this source to the [-] pin of this input channel of CN1. In addition, the signal common must be connected to the pin of the analog ground of CN1 by the shielded braids.

Differential Input Connection (Shield Cable)

CAUTION
If the signal source contains over 1MHz signals, the signal may affect the cross-talk noise between channels. The input data would be uncertain if the analog ground is not connected.

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

The input voltage from the [+] input or [-] input should not exceed the maximum input voltage (based on the board analog ground). If it exceeds the maximum voltage, the board may be damaged.

Because the input data will be uncertain if the [+] pin or the [-] pin of CN1 is not connected, all the unused input pins of CN1 should be connected to the analog ground, AGND.

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)

If the distance between the signal source and the board is long or if you want to increase the noise tolerance, a shield cable connection is strongly recommended.

Analog Output Connection (Shield Cable)

Digital I/O signals and Control signals Connection
The digital I/O signals and the control signals are interfaced through the connector CN2. User can use an optional cable DT/E1 or DT/E2 or DT-E3 (with bracket and a 15-pin D type female connector) to connect these signals to your external devices. All the digital I/O signals and control signals are TTL level signals.

Digital Input Connection

Digital Output Connection

CAUTION
Do not short the output signals to analog ground, digital ground, and/or power line. Doing so may damage the board.

Differences between past analog E and this product
This product is a product that partially improves a past analog E series, and the upper compatibility goods of the analog E series. Therefore, the same usage as the E series can be basically done. There are some differences in specifications as shown below.

Past E Series : AD12-16U(PCI)EH
This product : AD12-16U(PCI)EV

<table>
<thead>
<tr>
<th></th>
<th>AD12-16U(PCI)EH</th>
<th>AD12-16U(PCI)EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption</td>
<td>+5V 1200mA (Max.)</td>
<td>+5V 1000mA (Max.)</td>
</tr>
<tr>
<td>Physical Dimension (mm)</td>
<td>176.41(L) x 106.68(H)</td>
<td>176.41(L) x 105.68(H)</td>
</tr>
</tbody>
</table>