Plug-In DA&C Cards

Data Acquisition and Control Tutorial & Software
Data Acquisition and Control Card Selection Guide

PCI / Universal PCI Multifunction Cards
PCI-1711/1711L/1711HG/1711HGL
- 100 kS/s, 12-bit, (High-gain), PCI-bus Multifunction Card

PCI-1712/1712L
- 1 M/S/s, 12-bit, 16-ch High-speed Multifunction Card

PCI-1716/1716L
- 250 kS/s, 16-bit, 16-ch High-resolution Multifunction Card

PCI-1718HDU/PCI-1718HGU (New)
- 16-bit, 200kS/s High-Resolution Multifunction Card

 PCI-1713
- 100 kS/s, 12-bit, 32-channel Isolated Analog Input Card

 PCI-1714/1714UL (New)
- 30 MS/s Simultaneous 4-ch Analog Input Card

 PCI-1715
- 12-bit, 4-ch Advanced Analog Output Card

 PCI-1716
- 12-bit, 8-ch Isolated Analog Output Card

 PCI-1717
- 14-bit, 32-ch Analog Output Card

 PCI-1718
- 12-ch D/A Output Card

 PCI-1719
- 48-bit Digital I/O and Counter Card

 PCI-1721
- 4-bit Digital I/O Card

 PCI-1722
- 4-bit Isolated Digital I/O Card

 PCI-1723
- 4-bit Isolated Digital I/O Card

 PCI-1724
- 4-bit Isolated Digital I/O Card

 PCI-1725
- 4-bit Isolated Digital I/O Card

 PCI-1726
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 PCI-1727
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 PCI-1728
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- 4-bit Isolated Digital I/O Card

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- 4-bit Isolated Digital I/O Card

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 PCI-1737
- 4-bit Isolated Digital I/O Card

 PCI-1738
- 4-bit Isolated Digital I/O Card

 PCI-1739
- 4-bit Isolated Digital I/O Card

 PCI-1740
- 4-bit Isolated Digital I/O Card

 PCI-1741U (New)
- 16-bit, 200kS/s High-Resolution Multifunction Card

 PCI-1742
- 16-bit, 200kS/s High-Resolution Multifunction Card

 PCI-1743
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 PCI-1744
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 PCI-1745
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 PCI-1746
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 PCI-1750
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 PCI-1751
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 PCI-1752
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 PCI-1778
- 16-bit, 200kS/s High-Resolution Multifunction Card

 PCI-1779
- 16-bit, 200kS/s High-Resolution Multifunction Card

 PCI-1780
- 16-bit, 200kS/s High-Resolution Multifunction Card

 ISA / Universal PCI Analog Input Cards

 ISA / Universal PCI Analog Output Cards

 ISA / Universal PCI Non-Isolated Digital I/O Cards

 ISA / Universal PCI Isolated Digital I/O Cards

 Counter Cards

 ISA-Bus Data Acquisition and Control Cards

 Multifunction Cards

 Analog Input Cards

 Analog Output Cards

 Non-Isolated Digital I/O Cards

 Isolated Digital I/O Cards

 Relay Actuator and Isolated D/I Card

 Counter/Timer Card

 Digital I/O and Counter Card

 144-bit Digital I/O Card

 48-bit Digital I/O Card

 32-bit Digital I/O Card

 12-bit Digital I/O Card

 12-bit Analog Output Module

 12-bit Multifunction Module

 12-bit Digital I/O Module

 8-bit Digital I/O Module

 6-channel Digital Input Module

 4-channel Digital Input Module

 2-channel Digital Input Module

 1-channel Digital Input Module

 16-channel Digital Output Module

 8-channel Digital Output Module

 4-channel Digital Output Module

 ISA-Compatible PCI Cards

 GB interface series

 GPIB interface PCI card

 High-Performance IEEE-488.2 Interface for PCI-Bus Computers

 Portable Data Acquisition Modules

 USB-4711 (New)
 USB-4716 (New)
 USB-4718 (New)

 PC/104 I/O Modules

 PCM-3712
 PCM-3718/18HG/PCM-3718HGU (New)
 PCM-3724
 PCM-3732
 PCM-3730
 PCM-3738 (New)

 GPB interface series

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Data Acquisition and Control Tutorial

PC-based Data Acquisition System Overview

In the last few years, industrial PC I/O interface products have become increasingly reliable, accurate and affordable. Because of this, PC-based data acquisition and control systems are now widely used in industrial and laboratory applications such as: monitoring, control, data acquisition and automated testing.

Selecting and building a DA&C (Data Acquisition and Control) system that actually does what you want it to do requires some knowledge of electrical and computer engineering. This tutorial gives a brief introduction to what DA&C systems do and how to configure them. It covers:

- Transducers and actuators
- Signal conditioning
- Data acquisition and control hardware
- Getting Started
- Computer systems software

Transducers and Actuators

A transducer converts temperature, pressure, level, length, position, etc. into voltage, current, frequency, pulses or other signals.

Thermocouples, thermistors and resistance temperature detectors (RTDs) are common transducers for temperature measurements. Other types of transducers include flow sensors, pressure sensors, strain gauges, load cells and LVDTs, which measure flow rate, pressure variances, force or displacement.

An actuator is a device that activates process control equipment by using pneumatic, hydraulic or electrical power. For example, a valve actuator can open and close a valve to control fluid rates.

Signal Conditioning

Signal conditioning circuits improve the quality of signals generated by transducers before they are converted into digital signals by the PC’s data-acquisition hardware. Examples of signal conditioning are signal scaling, amplification, linearization, cold-junction compensation, filtering, attenuation, excitation, common-mode rejection, and so on.

One of the most common signal conditioning functions is amplification. For maximum resolution, the voltage range of the input signals should be approximately equal to the maximum input range of the A/D converter. Amplification expands the range of the transducer signals so that they match the input range of the A/D converter. For example, a x10 amplifier maps transducer signals that range from 0 to 1 V into the range 0 to 10 V before they go into the A/D converter.

The layout of a typical PC-based data acquisition system

Using digital I/O and SSRs to open and close a valve
Data Acquisition & Control Hardware

Data acquisition and control hardware generally performs one or more of the following functions: analog input, analog output, digital input, digital output and counter/timer functions. This section will discuss each function and list some considerations that are important when you select a data acquisition and control system.

Analogue Inputs (A/D)

Analogue-to-digital (A/D) conversion changes analog voltage or current levels into digital information. The conversion is necessary to enable a computer to process or store the signals.

The most significant criteria when selecting A/D hardware are:
1. Number of input channels
2. Single-ended or differential input signals
3. Sampling rate (in samples per second)
4. Resolution (usually measured in bits of resolution)
5. Input range (specified in full-scale volts)
6. Noise and nonlinearity

Analogue Outputs (D/A)

The opposite of analogue-to-digital conversion is digital-to-analogue (D/A) conversion. This operation converts digital information into analogue voltage or current. D/A devices allow a computer to control real-world events.

Digital Inputs and Outputs

Digital input/output functions are useful in applications such as contact closure and switch status monitoring, industrial On/Off control and digital communications.

Counter/timer

A counter/timer can be used for event counting, flowmeter monitoring, frequency counting, pulse width measurement, time period measurement, and so on.

Getting Started

Advantech: The source for what you need

Advantech manufactures data acquisition hardware and software for measurement, monitoring and applications control. The following guide is provided to help you choose components for your data acquisition system.

Step 1: Know your fundamental goal

Decide whether your DA&C system will be used primarily for measurement, monitoring, control, or analysis. Know the data requirements of your process, and know the number of data collection points in your system. Know the required data collection speed, the sampling rate, the type of measurement, the voltage or current being produced, the desired accuracy and the output resolution at each data collection point. Finally, know the timing of events in your system, and any special environmental conditions that exist.

Step 2: Hardware selection

Select the hardware required to achieve your fundamental goal. Advantech provides plug-in boards for Analog-to-Digital, Digital-to-Analog, Digital I/O, RS-232 or RS-485 needs. Both ISA and PCI bus products are available. Your hardware selection should be based on five major criteria:
1. Number and types of channels
2. Differential or single-ended inputs
3. Resolution
4. Speed
5. Software compatibility with hardware

Step 3: Accessory selection

Most applications require additional accessories which are available as separate items. These include:
1. Expansion peripherals to add channels to your system
2. Cables, signal conditioners and external boxes such as screw terminals or BNC accessories

Step 4: Software selection

More than any other single factor, software will determine your system start-up time, as well as its effectiveness, suitability for your application, and ease of modification. Three major criteria should determine the choice of software:
1. Operating system used
2. User programming expertise
3. Software compatibility with hardware
<table>
<thead>
<tr>
<th>Model</th>
<th>Category</th>
<th>Connector</th>
<th>Dimensions (mm)</th>
<th>Onboard FIFO</th>
<th>Per-Channel Output Range (V)</th>
<th>Mainsourcing</th>
<th>Auto-trigger</th>
<th>Analog Slope</th>
<th>About-trigger</th>
<th>DMA channel, Single A/D channel scan</th>
<th>SM = Single DMA channel, Multiple A/D channel scan</th>
<th>DM = Dual DMA channel, Multiple A/D channel scan</th>
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### Selection Guide

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<th><strong>ISA</strong></th>
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**Note:** System-dependent

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<th><strong>Unipolar Inputs</strong></th>
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<td>±5, 2.5, 1.05, 0.625</td>
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**Selection Guide**

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<th>FPM</th>
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**Last updated:** January 2005

All product specifications are subject to change without notice.
## Data Acquisition and Control Cards

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<td>On-board FIFO</td>
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<td>Output Range (V)</td>
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<td>Throughput</td>
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<td>Resolution</td>
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<td>Time Base</td>
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</tbody>
</table>

* Note: SS = Single DMA channel, Single A/D channel scan  
SM = Single DMA channel, Multiple A/D channel scan  
DM = Dual DMA channel, Multiple A/D channel scan
## Selection Guide

<table>
<thead>
<tr>
<th>Bus Category</th>
<th>Non-Isolated DI/O</th>
<th>PCI</th>
<th>Isolated DI/O</th>
</tr>
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<tbody>
<tr>
<td><strong>Model</strong></td>
<td><strong>PCI-1751/1751U</strong></td>
<td><strong>PCI-1753/1753E</strong></td>
<td><strong>PCI-1755</strong></td>
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<td>96</td>
<td>32</td>
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<tr>
<td><strong>Output Channels</strong></td>
<td>16</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### TTL DI/O

#### Input Channels
- **Sink Current**: 24 mA @ 0.4 V, 24 mA @ 0.44 V, 48 mA @ 0.5 V, 8 mA @ 0.5 V
- **Source Current**: 15 mA @ 2.4 V, 15 mA @ 3.76 V, 0.4 mA @ 2.4 V

#### Output Channels
- **Number of Channels (Input type)**: -
- **Isolation Voltage**: -
- **Input Range**: -
- **Source Current**: 15 mA @ 2.4 V, 24 mA @ 3.76 V, 15 mA @ 2.4 V

### Isolated DI/O

#### Input Channels
- **Number of Channels**: 16 (Sink), 32 (Sink)
- **Isolation Voltage**: 2,500 V DC
- **Input Range**: 5 ~ 30 V DC

#### Output Channels
- **Number of Channels**: 16 (Sink)
- **Isolation Voltage**: 2,500 V DC
- **Output Range**: 5 ~ 40 V DC
- **Max. Sink Current**: 200 mA, 200 mA, 200 mA

### Timer/Counter
- **Number of Channels**: 3
- **Resolution**: 16-bit
- **Time Base**: 5 MHz, 10 MHz

### Advanced Functions
- **Pattern Match**: -
- **Change of State**: -
- **BoardID™ Switch**: -
- **Channel-Freeze Function**: -
- **Output Status Read Back**: ✓
- **Dry/Wet Contact**: ✓

### Dimensions (mm)
- 175 x 100, 175 x 100, 175 x 100, 175 x 100, 175 x 100, 175 x 100

### Connectors
- 68-pin SCSI-II, 100-pin SCSI-II, 100-pin SCSI-II, 1 x DB9, 4 x 20-pin, 1 x DB9, 1 x DB9, 100-pin SCSI-II

### Software
- Windows® 95/98/ME/2000/XP DLL Driver
- Windows® 95/98/ME/2000/XP Test Utility
- VC++, VB & Delphi Examples
- Advantech ActiveDAQ
- LabView® I/O Drivers (Ver.6i and 7.0)
- MathWorks MATLAB & Simulink Data Acquisition Tool Box 2.5.1

* Dry/wet contact can be mixed at the same time within one group.
<table>
<thead>
<tr>
<th>Bus Category</th>
<th>Model</th>
<th>PCI-1754</th>
<th>PCI-1758</th>
<th>PCI-1758UDI</th>
<th>PCI-1758DD</th>
<th>PCI-1760D</th>
<th>PCI-1761</th>
<th>PCI-1762</th>
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<td>Isolated DI/O</td>
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<td>500 Hz for Up CTR</td>
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* Dry/wet contact can be mixed at the same time within one group.
### Selection Guide

<table>
<thead>
<tr>
<th>Non-Isolated D/O</th>
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<th>Isolated D/O</th>
<th>PCI</th>
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<td>PCL-836</td>
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</table>

| 24 mA @ 0.5 V  | 24 mA @ 0.5 V | 24 mA @ 0.4 V | 24 mA @ 0.4 V | - | 8 mA @ 0.5 V | - |
| 3 mA @ 2.4 V   | 15 mA @ 2.4 V | 15 mA @ 2.4 V | 15 mA @ 2.4 V | - | 0.4 mA @ 2.4 V | - |

| - | - | - | - | 8 (Sink) | 16 (Sink) | 32 (Sink) |
| - | - | - | - | 1,500 V<sub>DC</sub> | 2,500 V<sub>DC</sub> | 2,500 V<sub>DC</sub> |
| - | - | - | - | 5 – 24 V<sub>DC</sub> | 5 – 24 V<sub>DC</sub> | 5 – 24 V<sub>DC</sub> |
| - | - | - | - | 4 X Form A | 4 X Form C | 16 (Sink) | 32 (Sink) | 12 X Form C |
| - | - | - | - | 1,000 V<sub>DC</sub> | 1,000 V<sub>DC</sub> | 1,000 V<sub>DC</sub> | 1,000 V<sub>DC</sub> |
| - | - | - | - | 120 V<sub>DC</sub> @ 0.5 A | 30 V<sub>DC</sub> @ 1 A | 200 mA | 200 mA |

| 3 | - | - | - | - | - | - | 8 X CTR | 6 X CTR |
| 16-bit | - | - | - | - | - | - | 16-bit | 16-bit |

| 1 MHz | - | - | - | - | - | - | 20 MHz | 10 MHz |

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</table>

| 185 x 100 | 334 x 100 | 125 x 100 | 185 x 100 | 147 x 95 | 185 x 100 | 185 x 100 | 185 x 100 | 155 x 100 | 175 x 100 | 185 x 100 | 185 x 100 |
| 5 X 20-pin | 6 x 50-pin | 1 x 50-pin | 2 x 20-pin | 2 x 50-pin | 1 x DB37 | 1 x DB37 | 4 x 20-pin | 1 x DB37 | 1 x DB37 | 68-pin | 1 DB37 | 2 x 20-pin |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| 6-55 | 6-56 | 6-56 | 6-56 | 6-59 | 6-57 | 6-57 | 6-57 | 6-59 | 6-47 | 6-60 |
Introduction
The PCI-1710 Series are multifunction cards for the PCI bus. Their advanced circuit design provides higher quality and more functions, including the five most desired measurement and control functions: 12-bit A/D conversion, D/A conversion, digital input, digital output, and counter/timer.

Specifications

Analog Input
- Channels: 16 single-ended or 8 differential (software programmable)
- Resolution: 12-bit
- On-board FIFO: 4 K samples
- Maximum Input: ±30 V
- Overvoltage: (V, software programmable)

Model | PCL-1710/1710L | PCL-1710HG/1710HGL
Bipolar | 0 – 10, 0 – 5, 0 – 2.5, 0 – 1.25 | 0 – 10, 0 – 5, 0 – 2.5, 0 – 1.25
Unipolar | 0 – 10, 0 – 5, 0 – 2.5, 0 – 1.25 | 0 – 10, 0 – 5, 0 – 2.5, 0 – 1.25

- Common Mode Rejection Ratio (CMRR)

Model | PCL-1710/1710L | PCL-1710HG/1710HGL
Gain | CMRR | Gain | CMRR
0.5, 1 | 75 dB | 0.5, 1 | 75 dB
2 | 80 dB | 10 | 90 dB
4 | 84 dB | 100 | 106 dB
8 | 84 dB | 1000 | 106 dB

- Maximum Sampling Rate (S/s, depending on PGIA settling time)

Model | PCL-1710/1710L | PCL-1710HG/1710HGL
Gain | Max. Sampling Rate | Gain | Max. Sampling Rate
0.5, 1, 2, 4, 8 | 100 kS/s | 0.5, 1, 2, 4, 8 | 100 kS/s
5, 10 | 35 kS/s | 5, 10 | 35 kS/s
20, 100 | 7 kS/s | 500, 1000 | 770 kS/s

- Analog Output
  - Channels: 2
  - Resolution: 12-bit
  - Relative Accuracy: ±1/2 LSB
  - Gain Error: ±1 LSB
  - Throughput: PC dependent, Software update (direct AO)
  - Slow Rate: 10 V/ms
  - Output Range: Internal reference: 0 – +5 V @ -5 V, (software programmable) 0 – +10 V @ -10 V
  - External reference: 0 – +x V @ -x V (-10 ≤ x ≤ 10)
  - Driving Capability: 10 mA

- Digital Input
  - Channels: 16
  - Input Voltage: Low: 0.4 V max., High: 2.4 V min.
  - Input Load: Low: -0.2 mA @ 0.4 V, High: 20 mA @ 2.7 V

Note: The sampling rate depends on the computer hardware architecture and software environment. The rates may vary due to programming language, code efficiency, CPU utilization and so on.
Specifications Cont.

Digital Output
- Channels: 16
- Output Voltage:
  - Low: 0.4 V max. @ 8.0 mA (sink)
  - High: 2.4 V min. @ -0.4 mA (source)

Programmable Timer/Counter
- Counter Chip: 82C54 or equivalent
- Counters: 3 channels, 16 bits, 2 channels are permanently configured as a 32-bit programmable pacer; 1 channel is free for user applications
- Input, gate: TTL/CMOS compatible
- Time Base:
  - Channel 1: 10 MHz
  - Channel 2: Takes input from output of channel 1
  - Channel 0: Internal 1 MHz or external clock (10 MHz max.) selected by software.

General
- CE Certified to CISPR 22 class B
- I/O Connector: 68-pin SCSI-II female connector
- Power Consumption:
  - +5 V @ 850 mA (Typical),
  - +5 V @ 1.0 A (Max.)
- Operating Temperature: 0 – 60° C (32 – 140° F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 – 70° C (-4 – 158° F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- Dimensions (L x H): 175 x 100 mm (6.9" x 3.9")
- MTBF: Over 64,770 hrs @ 25° C, grounded-fix environment

Ordering Information
- PCI-1710: 100 kS/s, 12-bit Multifunction Card, user's manual and driver CD-ROM. (cable not included)
- PCI-1710L: 100 kS/s, 12-bit Multifunction Card w/o AO, user's manual and driver CD-ROM. (cable not included)
- PCI-1710HG: 100 kS/s, 12-bit High-Gain Multifunction Card, user's manual and driver CD-ROM. (cable not included)
- PCI-1710HGL: 100 kS/s, 12-bit High-Gain Multifunction Card w/o AO, user's manual and driver CD-ROM. (cable not included)
- PCLD-8710: Industrial Wiring Terminal Board with CJC circuit for DIN-rail mounting (cable not included)
- PCL-10168: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 m.
- PCL-10168-2: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 2 m.
- ADAM-3968: 68-pin SCSI-II Wiring Terminal Board for DIN-rail Mounting

Feature Details
PCI-1710 series provide specific functions for different user requirements:
- PCI-1710: 100 kS/s, 12-bit Multifunction Card
- PCI-1710L: 100 kS/s, 12-bit Multifunction Card w/o AO
- PCI-1710HG: 100 kS/s, 12-bit High-Gain Multifunction Card
- PCI-1710HGL: 100 kS/s, 12-bit High-Gain Multifunction Card w/o AO

Mixed Single-ended or Differential Analog Inputs
PCI-1710 and PCI-1710HG feature an automatic channel/gain scanning circuit. The circuit, rather than your software, controls multiplexer switching during sampling. The on-board SRAM stores different gain values and configurations for each channel. This design lets you perform multi-channel high-speed sampling (up to 100 KHz) with different gains for each channel and allows free combination of single-ended and differential inputs.

On-board FIFO (First In First Out) Memory
PCI-1710, PCI-1710L, PCI-1710HG and PCI-1710HGL have an on-board FIFO buffer that can store up to 4 K A/D samples. PCI-1710 and PCI-1710HG generate an interrupt when the FIFO is half full. This feature provides continuous high-speed data transfer and more predictable performance on Windows systems.

On-board Programmable Counter
The PCI-1710/1710/1710HG/1710HGL provides a programmable counter to generate a pacer trigger for the A/D conversion. The counter chip is an 82C54 or equivalent, which includes three 16-bit counters on a 10 MHz clock. One counter is used as an event counter for counting events coming from the input channels. The other two are cascaded together to make a 32-bit timer for a pacer trigger.

Special Shielded Cable for Noise Reduction
The PCL-10168 shielded cable is specially designed for the PCI-1710/1710HG to reduce noise in the analog signal lines. Its wires are all twisted pairs, and the analog lines and digital lines are separately shielded, providing minimal cross talk between signals and great protection against EMI/EMC problems.

Pin Assignments
- A5: 68
  - A11
- A2: 67
  - A13
- A3: 66
  - A15
- A4: 65
  - A17
- A5: 64
  - A19
- A6: 63
  - A21
- A7: 62
  - A23
- A8: 61
  - A25
- A9: 60
  - A27
- A10: 59
  - A29
- A11: 58
  - A31
- A12: 57
  - A33
- A13: 56
  - A35
- A14: 55
  - A37
- A15: 54
  - A39
- A16: 53
  - A41
- D8: 52
  - D9
- D9: 51
  - D10
- D10: 50
  - D11
- D11: 49
  - D12
- D12: 48
  - D13
- D13: 47
  - D14
- D14: 46
  - D15
- D15: 45
  - D16
- D16: 44
  - D17
- D17: 43
  - D18
- D18: 42
  - D19
- D19: 41
  - D20
- D20: 40
  - D21
- D21: 39
  - D22
- D22: 38
  - D23
- D23: 37
  - D24
- D24: 36
  - D25
- D25: 35
  - D26
- D26: +5V

* Pins 23–25 and pins 57–59 are not defined for PCI-1710L/1710HGL
Introduction

PCI-1711 and PCI-1711L are powerful, but low-cost multifunction cards for the PCI bus. PCI-1711 comes with 2 analog output channels, while the PCI-1711L doesn’t. Thus, PCI-1711L represents a cost saver for those that do not need analog output.

Specifications

Analog Input
- **Channels**: 16 Single-Ended
- **Resolution**: 12-bit
- **FIFO Size**: 1K samples
- **Sampling Rate**: 100 kS/s max.

<table>
<thead>
<tr>
<th>Input and Gain Range</th>
<th>Gain List</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>± 10 V, ± 5 V, ± 2.5 V, ± 1.25 V, ± 0.625 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drift (ppm/°C)</th>
<th>Gain</th>
<th>Zero</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Zero</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Gain</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

| Small Signal Bandwidth for PGA |
| Bandwidth | 4.0 MHz, 2.0 MHz, 1.5 MHz, 0.65 MHz, 0.35 MHz |

- **Max. Input Overvoltage**: 20 V
- **Input Protect**: 30 Vp-p
- **Input Impedance**: 2 MΩ/5 pF
- **Trigger Mode**: Software, On-board Programmable Pacer or external

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>DC</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RLIE: ±0.5 LSB</td>
<td>SNR: 68 dB</td>
</tr>
<tr>
<td></td>
<td>Monotonicity: 12 bits</td>
<td>ENOB: 11 bits</td>
</tr>
<tr>
<td></td>
<td>Offset error: Adjustable to zero</td>
<td>Gain error: 0.005% FSR (Gain=1)</td>
</tr>
</tbody>
</table>

Analog Output (only for PCI-1711)
- **Channels**: 2
- **Resolution**: 12-bit

<table>
<thead>
<tr>
<th>Output Range (Internal &amp; External Reference)</th>
<th>Internal Reference</th>
<th>External Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>0 – ±5 V, 0 – +10 V</td>
<td>0 – ±x V @ -x V (-10 ≤ x ≤ 10)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Relative</th>
<th>Differential Non-linearity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±1/2 LSB</td>
<td>±1/2 LSB</td>
</tr>
</tbody>
</table>

- **Gain Error**: Adjustable to zero
- **Slew Rate**: 11 V/µs
- **Drift**: 40 ppm/°C
- **Driving Capability**: 3 mA
- **Thruput**: PC dependent, Software update (direct AO)
- **Output Impedance**: 0.81 Ω
- **Settling Time**: 26 µs (to ±1/2 LSB of FSR)
- **Reference Voltage**: Internal -5 or -10 V, External -10 or +10 V

Digital Input / Output
- **Channels**: 16
- **Input Voltage**: Low: 0.8 V max., High: 2.0 V max.
- **Output Channels**: 16
- **Output Voltage**: Low: 0.8 V max @ 8.0 mA (sink), High: 2.0 V min @ -0.4 mA (source)

Programmable Counter / Timer
- **Channels**: 1
- **Resolution**: 16-bit
- **Compatibility**: TTL level
- **Base Clock**: 10 MHz
- **Max. Input Frequency**: 10 MHz

Accuracy
- **DC**: RLIE: ±0.5 LSB
- **AC**: SNR: 68 dB

Note:
The sampling rate and throughput depends on the computer hardware architecture and software environment. The rates may vary due to programming language, code efficiency, CPU utilization and so on.

Programmable Counter / Timer
- **Channels**: 1
- **Resolution**: 16-bit
- **Compatibility**: TTL level
- **Base Clock**: 10 MHz
- **Max. Input Frequency**: 10 MHz

Note:
The sampling rate and throughput depends on the computer hardware architecture and software environment. The rates may vary due to programming language, code efficiency, CPU utilization and so on.

General
- **I/O Connector Type**: 68-pin SCSI-II female
- **Dimensions**: 175 x 100 mm (6.9" x 3.9"")
- **Power Consumption**: Typical PCI-1711: +5 V @ 850 mA, PCI-1711L: +5 V @ 700 mA
- **Max.**: +5 V @ 1.0 A
- **Temperature**: Operation: 0 – 60° C (32 – 140° F) (refer to IEC 68-2-1, 2)
- **Storage**: -20 – 70° C (-4 – 158° F) (refer to IEC 68-2-3)
- **Relative Humidity**: 5% – 95% RH non-condensing (refer to IEC 68-2-3)
Ordering Information

- **PCI-1711**
  100 kS/s, 12-bit, 16-ch S.E. inputs Low-cost Multifunction Card, user’s manual and driver CD-ROM.
  (cable not included)

- **PCI-1711L**
  100 kS/s, 12-bit, 16-ch S.E. inputs Low-cost Multifunction Card w/o analog output, user’s manual and driver CD-ROM.
  (cable not included)

- **PCLD-8710**
  Industrial Wiring Terminal Board with CJC circuit for DIN-rail mounting (cable not included)

- **PCL-10168**
  68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2 m

- **ADAM-3968**
  68-pin SCSI-II Wiring Terminal Board for DIN-rail Mounting

Feature Details

**Plug & Play Function**
PCI-1711 and PCI-1711L fully comply with the PCI Specification Rev. 2.1. and thus are Plug & Play devices. During card installation, it is virtually unnecessary to set any jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupts are conveniently taken care of by the Plug & Play function.

**Flexible Input Types and Range Settings**
PCI-1711 and PCI-1711L feature an automatic channel/gain scanning circuit. This circuit design controls multiplexer switching during sampling. You can set different gain values for each channel according to your needs for the corresponding range of input voltages. The gain values thus selected are stored in the SRAM. This flexible design enables multi-channel and high-speed sampling for high-performance data acquisition (up to 100 kS/s).

**On-board FIFO Memory**
PCI-1711 and PCI-1711L provide an onboard FIFO (First In First Out) memory buffer, storing up to 1 K A/D samplings. You can either enable or disable the interrupt request feature of the FIFO buffer. While the interrupt request for FIFO is enabled, you can further specify whether the interrupt request will be sent whenever one sampling takes place or when the FIFO buffer is half saturated. This feature enables a continuous high-speed data transfer with more predictable performance on Windows systems.

**Onboard Programmable Counter**
PCI-1711 and PCI-1711L are equipped with a programmable counter, which can serve as a pacer trigger for A/D conversions. The counter chip is an 82C54 or equivalent, which incorporates three 16-bit counters on a 10 MHz clock. One of the three counters is used as an event counter for input channels. The other two are cascaded into a 32-bit timer for pacer triggering.

Applications

- Process monitoring and control
- Transducer and sensor measurement
- Multi-channel DC voltage measurement

Pin Assignments

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>68-34 A1</td>
</tr>
<tr>
<td>A2</td>
<td>67-33 A3</td>
</tr>
<tr>
<td>A4</td>
<td>66-32 A5</td>
</tr>
<tr>
<td>A6</td>
<td>65-31 A7</td>
</tr>
<tr>
<td>A9</td>
<td>64-30 A9</td>
</tr>
<tr>
<td>A10</td>
<td>63-29 A11</td>
</tr>
<tr>
<td>A12</td>
<td>62-28 A13</td>
</tr>
<tr>
<td>A14</td>
<td>61-27 A15</td>
</tr>
<tr>
<td>A/AGND</td>
<td>60-26 A/AGND</td>
</tr>
<tr>
<td>*AO0_RBF</td>
<td>59-25 A01_RBF*</td>
</tr>
<tr>
<td>*AO0_OUT</td>
<td>58-24 A01_OUT*</td>
</tr>
<tr>
<td>*A0GND</td>
<td>57-23 A0GND*</td>
</tr>
<tr>
<td>D10</td>
<td>55-22 D1</td>
</tr>
<tr>
<td>D12</td>
<td>55-21 D3</td>
</tr>
<tr>
<td>D14</td>
<td>54-20 D5</td>
</tr>
<tr>
<td>D16</td>
<td>53-19 D7</td>
</tr>
<tr>
<td>D18</td>
<td>52-18 D9</td>
</tr>
<tr>
<td>D10</td>
<td>51-17 D11</td>
</tr>
<tr>
<td>D12</td>
<td>50-16 D13</td>
</tr>
<tr>
<td>D14</td>
<td>49-15 D15</td>
</tr>
<tr>
<td>D/GND</td>
<td>48-14 D/GND</td>
</tr>
<tr>
<td>D00</td>
<td>47-13 D01</td>
</tr>
<tr>
<td>D02</td>
<td>46-12 D03</td>
</tr>
<tr>
<td>D04</td>
<td>45-11 D05</td>
</tr>
<tr>
<td>D06</td>
<td>44-10 D07</td>
</tr>
<tr>
<td>D08</td>
<td>43-9 D09</td>
</tr>
<tr>
<td>D010</td>
<td>42-8 D11</td>
</tr>
<tr>
<td>D012</td>
<td>41-7 D13</td>
</tr>
<tr>
<td>D014</td>
<td>40-6 D15</td>
</tr>
<tr>
<td>D/GND</td>
<td>39-5 D/GND</td>
</tr>
<tr>
<td>CNTCLK</td>
<td>38-4 PACER OUT</td>
</tr>
<tr>
<td>CNTOUT</td>
<td>37-3 TRG GATE</td>
</tr>
<tr>
<td>CNT9_GATE</td>
<td>36-2 EXT TRG</td>
</tr>
<tr>
<td>+12V</td>
<td>35-1 +5V</td>
</tr>
</tbody>
</table>

* Pins 23–25 and pins 57–59 are not defined for PCI-1711L.
PCI-1712
PCI-1712L

1MS/s, 12-bit High-speed Multifunction Card
1MS/s, 12-bit High-speed Multifunction Card w/o AO function

Introduction
The PCI-1712/1712L is a powerful high-speed multifunction card for the PCI bus. It features a 1 MHz 12-bit A/D converter, an onboard FIFO buffer (storing up to 1K samples for A/D, and up to 32K samples for D/A conversion). The PCI-1712 provides a total of up to 16 single-ended or 8 differential A/D input channels or a mixed combination, two 12-bit D/A output channels, 16 digital input/output channels, and three 10MHz 16-bit multifunction counter channels. PCI-1712/1712L provides specific functions for different user requirements:

Specifications

Analog Input

| Channels | 16 Single-Ended or 8 Differential or Combination |
| Resolution | 12-bit |
| FIFO Size | 1 K samples |
| Max. Sampling Rate | Multi-channel, single gain: 1 MS/s |
| | Multi-channel, multi gain: 600 kS/s |
| | Multi-channel, multi gain, unipolar/bipolar: 400 kS/s |
| Common Mode Voltage | ±11 V max. (operational) |
| Input Range and Gain List | Unipolar: N/A, 0 ~ 10, 0 ~ 5, 0 ~ 2.5, 0 ~ 1.25 |
| | Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625 |
| Drift | Gain: 0.5, 1, 2, 4, 8 |
| | Gain (µV/°C): ±80, ±30, ±10, ±3, ±0 |
| | Gain (ppm/°C): ±30, ±30, ±10, ±3, ±0 |
| Small Signal Bandwidth for PGA | Gain: 0.5, 1, 2, 4, 8 |
| | Bandwidth: 4.0 MHz, 4.0 MHz, 2.0 MHz, 1.5 MHz, 0.65 MHz |
| Max. Input Voltage | ±20 V |
| Input Protect | 30 Vp-p |
| Input Impedance | 100Ω (Off); 100Ω (On) |
| Trigger Mode | Software, On-board Programmable Pacer or External, Pre-trigger, Post-trigger, Delay-trigger, Abort-trigger |
| Accuracy | DC: ±1LSB, INL: ±1LSB, Offset error < 1LSB |
| | Gain Error (% FSR): 0.15, 0.03, 0.03, 0.05, 0.1 |

Digital Input/Output

| Channels | 16 |
| Number of Ports | 2 (8-ch/port) |
| Input Channels | Low |
| Input Voltage | 0.8 V max. |
| | 0.5 V max. @ +24 mA (sink) |
| Input Load | High |
| Power Consumption | Typical: +5 V @ 850 mA; +12 V @ 600 mA |
| | Max.: +5 V @ 1 A; +12 V @ 700 mA |
| Temperature | Operating: 0 ~ 60°C (32 ~ 140°F) (refer to IEC 68-2-1, 2) |
| | Storage: -20 ~ 85°C (-4 ~ 185°F) |
| Relative Humidity | 0 ~ 95% RH non-condensing (refer to IEC 68-2-3) |
| Certification | CE certified |

Analog Output

| Channels | 2 |
| Resolution | 12-bit |
| FIFO Size | 32 K samples |
| Operation Mode | Single output, continuous output, waveform output |
| Output Range (Internal & External Reference) | Using Internal Reference: 0 ~ +5 V, 0 ~ +10 V, -5 ~ +5 V, -10 ~ +10 V |
| | Using External Reference: -x ~ +x V @ ±x V (-10 ≤ x ≤ 10) |
| Accuracy | Relative ±1 LSB |
| Differential Non-linearity | ±1 LSB (monotonic) |
| Offset | <1 LSB |
| Slew Rate | 20 V/µs |
| Driving Capability | 10 ppm/°C |
| Max. Transfer Rate | Single Channel: 1 MS/s for FSR |
| | Dual Channel: 500 kS/s for FSR |
| Output Impedance | 0.1 Ω max. |
| Max. Digital Update Rate | 5 MHz |
| Settling Time | 2 µs (to ±1/2 LSB of FSB) |

Counter/Timer

| Channels | 3 |
| Resolution | 16-bit |
| Compatibility | TTL level |
| | Max. Input Frequency: 10 MHz |
| BASE Clock | 10 MHz, 1 MHz, 100 kHz, 10 KHz |
| Clock Input | Low: 0.8 V max. |
| Gate Input | Low: 0.8 V max. |
| Counter | Low: 0.5 V max. @ +24 mA |
| | High: 2.0 V min. |
| | High: 2.0 V min. @ -15 mA |

General

| I/O Connector Type | 68-pin SCSI-II female |
| Dimensions | 175 x 100 mm (6.9" x 3.9") |
| Power Consumption | Typical: +5 V @ 850 mA; +12 V @ 600 mA |
| | Max.: +5 V @ 1 A; +12 V @ 700 mA |
| Operating | -20 ~ 85°C (-4 ~ 185°F) |
| Storage | -20 ~ 85°C (-4 ~ 185°F) |
| Relative Humidity | 0 ~ 95% RH non-condensing (refer to IEC 68-2-3) |
| Certification | CE certified |
Feature Details

PCI-bus Mastering Data Transfer
PCI-1712 and PCI-1712L support PCI-Bus mastering DMA for high-speed data transfer and gap-free analog input and analog output. By setting aside a block of memory in the PC, the PCI-1712 and PCI-1712L perform bus-mastering data transfers without CPU intervention, setting the CPU free to perform other more urgent tasks such as data analysis and graphic manipulation. The function allows users to run all I/O functions simultaneously at full speed without losing data.

Plug & Play Function
PCI-1712 and PCI-1712L are Plug & Play devices, which fully complies with the PCI Specification Rev 2.2. During card installation, there is no need to set any jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug & Play function.

On-board FIFO Memory
PCI-1712 provides an on-board FIFO (First In First Out) memory buffer, storing up to 1K samples for A/D and 32K for D/A conversion.

Automatic Channel/Gain/SD*/BU* Scanning
PCI-1712 and PCI-1712L feature an automatic channel/Gain/SD/BU scanning circuit. This circuit controls multiplexer switching during sampling in a way that is much more efficient than software implementation. Onboard SRAM stores different gain, SD and BU values for each channel. This combination lets users perform multi-channel high-speed sampling with different gain, SD and BU values for each channel.

SD: Single-Ended/Differential; BU: Bipolar/Unipolar

Flexible Triggering and Clocking Capabilities
PCI-1712 and PCI-1712L provide flexibility in triggering action, both in the available trigger modes and trigger events for analog input. You can acquire data using post-trigger, pre-trigger, delay-trigger and about-trigger modes. The trigger source could be either an analog or digital signal. The analog trigger could originate from a dedicated input pin. In fact, you can designate any of the analog input channels as the analog trigger input. You can set the analog trigger level within a voltage range from zero to A/D FSR. With the trigger signal being digital, you can pace A/D and D/A conversion using software interrupt, internal or external clock.

Continuous Analog Output (PCI-1712 only)
PCI-1712 provides two analog output channels. Both can perform continuous waveform output. The analog output can be up to 500 kS/s for each analog output channel. Or you can load a cyclic waveform into an on-board FIFO, which will continuously output the cyclic waveform. The on-board FIFO of the PCI-1712 can store 2 to 32K samples of the waveform.

On-board Programmable Multifunction Counter/Timer
PCI-1712 and PCI-1712L are equipped with 3 programmable multifunction counter/counters, which can serve as a pace trigger for A/D conversion. The counter chip is an 82C54 or equivalent, which incorporates three 16-bit channels on a 10 MHz clock. And then we enhance the gate and clock input function for more applications, of event counting, pulse generation, duty cycle frequency generation, one shot, frequency measurement and pulse width measurement.

Ordering Information
- PCI-1712: 1MS/s, 12-bit High-speed Multifunction Card, user’s manual and driver CD-ROM. (cable not included)
- PCI-1712L: 1MS/s, 12-bit High-speed Multifunction Card w/o AO, user’s manual and driver CD-ROM. (cable not included)
- PCLD-8712: Industrial Wiring Terminal Board for DIN-rail mounting. (cable not included)
- PCL-10168: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2 m
- ADAM-3968: 68-pin SCSI-II Wiring Terminal Board for DIN-rail Mounting

Pin Assignments

A9  34  A11
A2  33  A2
A4  32  A4
A6  31  A6
A8  30  A8
A10 29  A10
A12 28  A12
A14 27  A14
A16 26  A16
A18 25  A18
A20 24  A20
A22 23  A22
A24 22  A24
A26 21  A26
A28 20  A28
A30 19  A30
A32 18  A32
A34 17  A34
A36 16  A36
A38 15  A38
A40 14  A40
A42 13  A42
A44 12  A44
A46 11  A46
A48 10  A48
A50 9  A50
A52 8  A52
A54 7  A54
A56 6  A56
A58 5  A58
A60 4  A60
A62 3  A62
A64 2  A64
A66 1  A66
A68 +12V
A70
A72 15  A72
A74 14  A74
A76 13  A76
A78 12  A78
A80 11  A80
A82 10  A82
A84 9  A84
A86 8  A86
A88 7  A88
A90 6  A90
A92 5  A92
A94 4  A94
A96 3  A96
A98 2  A98
A100 1  A100

*: Pin 20, 22–25, 54, 56–59 are not defined on PCI-1712L

Block Diagram

[Diagram showing the block diagram of the PCI-1712 and PCI-1712L, including various components and connections such as PCI-bus interface, trigger and control logic, analog trigger, FIFO, and counter/timer.]
Introduction

PCI-1716 and PCI-1716L are powerful high-resolution multifunction cards for the PCI bus. They feature a 250 kS/s 16-bit A/D converter, and an on-board 1K sample FIFO buffer for A/D. The cards can also have up to sixteen single-ended or eight differential A/D input channels or a combination of these, two 16-bit D/A output channels, 16 digital input/output channels, and one 10 MHz 16-bit counter channel. PCI-1716 and PCI-1716L provide specific functions for different user requirements.

Specifications

| Analog Input | Channels | 16 Single-Ended, 8 differential or combination |
| Resolution | 16-bit |
| FIFO Size | 1K samples |
| Sampling Rate* | 250 kS/s max. |

<table>
<thead>
<tr>
<th>Input range and Gain List</th>
<th>Gain</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unipolar</td>
<td>N/A</td>
<td>0–10</td>
<td>0–5</td>
<td>0–2.5</td>
<td>0–1.25</td>
<td></td>
</tr>
<tr>
<td>Bipolar</td>
<td>+10</td>
<td>+5</td>
<td>+2.5</td>
<td>+1.25</td>
<td>+0.625</td>
<td></td>
</tr>
</tbody>
</table>

| Small Signal Bandwidth for PGA Gain | Bandwidth | 4.0 MHz | 4.0 MHz | 2.0 MHz | 1.5 MHz | 0.65 MHz |

- Common Mode Voltage ±11 V max. (operational)
- Max. Input Overvoltage ±20 V
- Input Protection 30 Vp-p
- Input Impedance 100 MΩ/10 pF (Off); 100 MΩ/100 pF (On)
- Trigger Mode Software, Onboard Programmable Pacer or external

<table>
<thead>
<tr>
<th>Digital Input /Output</th>
<th>Input Channels</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>Low</td>
<td>0.4 V max.</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>High</td>
<td>2.4 V max.</td>
</tr>
<tr>
<td>Input Load</td>
<td>Low</td>
<td>0.4 V max. @ -0.2 mA</td>
</tr>
<tr>
<td>Input Load</td>
<td>High</td>
<td>2.7 V max. @ 2.0 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Channels</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage</td>
<td>Low</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>High</td>
</tr>
</tbody>
</table>

| Counter/Timer | 3 channels, 2 channels are permanently configured as programmable pacers; 1 channel is free for user application |
| Resolution | 16-bit |
| Compatibility | TTL level |
| Base Clock | Channel 2: Takes input from output of channel 1 |
| Channel 1: 10 MHz |
| Channel 0: Internal 1 MHz or external clock (10 MHz) max Selected by software |
| Max. Input Frequency | 1 MHz |

| Clock Input | Low | 0.8 V max. |
| Gate Input | High | 2.0 V min. |
| Counter Output | Low | 0.5 V max. @ +24 mA |
| Counter Output | High | 2.4 V min. @ -15 mA |

| General | 68-pin SCSI-II female |
| I/O Connector Type | 175 x 100 mm (6.9" x 3.9") |
| Dimensions | Typical +5 V @ 850 mA, +12 V @ 600 mA |
| Power Consumption | Max. +5 V @ 1 A, +12 V @ 700 mA |
| Operating Temperature | 0 ~ 60° C (32 ~ 158° F) refer to IEC 68-2-1, 2 |
| Storage Temperature | -20 ~ 85° C (-4 ~ 158° F) |
| Operating Humidity | 5 ~ 85% RH non-condensing |
| Storage Humidity | 5 ~ 95% RH non-condensing |
| Certifications | CE |
**Analog Output (PCI-1716 only)**

- **Channels**: 2
- **Resolution**: 16-bit
- **Operation Mode**: Single output
- **Throughput****: PC dependent, Software update (direct AO)

<table>
<thead>
<tr>
<th>Output Range (Internal &amp; External Reference)</th>
<th>Using Internal Reference</th>
<th>Using External Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>±1 LSB (monotonic)</td>
<td>±1 LSB</td>
</tr>
<tr>
<td>INLE</td>
<td>±1 LSB</td>
<td>±1 LSB</td>
</tr>
<tr>
<td>DNLE</td>
<td>±1 LSB (monotonic)</td>
<td>±1 LSB</td>
</tr>
<tr>
<td>Zero (Offset) error: Adjustable ±1 LSB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain (Full-scale) error: Adjustable ±1 LSB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Accuracy**

- **Settling Time**: 5 µs (to 4 LSB of FSB)
- **Slew Rate**: 20 V/µs
- **Drift**: 10 ppm/° C
- **Driving Capability**: ±20 mA
- **Output Impedance**: 0.1 Ω max.

**Dynamic Performance**

- **Drift**: 10 ppm/° C
- **Driving Capability**: ±20 mA
- **Output Impedance**: 0.1 Ω max.

**Plug & Play Function**

PCI-1716 and PCI-1716L are Plug & Play devices, which fully complies with PCI Specification Rev 2.2. During card installation, there is no need to set jumpers or DIP switches (Unless you are using several identical cards (See BoardID switch)). Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug & Play function.

**Automatic Channel/Gain/SD*/BU* Scanning**

PCI-1716 and PCI-1716L feature an automatic channel/gain/SD/BU scanning circuit. This circuit controls multiplexer switching during sampling in a way that is more efficient than software implementation. On-board SRAM stores different gain, SD and BU values for each channel. This combination lets users perform multi-channel high-speed sampling with different gain, SD and BU values for each channel.

**On-board FIFO Memory**

PCI-1716 and PCI-1716L provide 1K sample on-board FIFO (First In First Out) memory buffer for AD. This is an important feature for faster data transfer and more predictable performance under the Windows system.

**On-board Programmable Timer/Counter**

PCI-1716 and PCI-1716L provide a programmable timer counter for generating a pacer trigger for the A/D conversion. The timer/counter chip is 82C54, which includes three 16-bit counter 10 MHz clocks. One counter is used as an event counter for counting events coming from the input channel. The other two are cascaded together to make a 32-bit timer for a pacer trigger time base.

**Ordering Information**

- **PCI-1716**: 250 kS/s, 16-bit, 16-ch High-resolution Multifunction Card, user’s manual and driver CD-ROM. (cable not included)
- **PCI-1716L**: 250 kS/s, 16-bit, 16-ch High-resolution Multifunction Card w/o analog output, user’s manual and driver CD-ROM. (cable not included)
- **PCLD-8710**: Industrial Wiring Terminal Board with CJC circuit for DIN-rail Mounting. (cable not included)
- **PCL-1016**: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2 m
- **ADAM-3968**: 68-pin SCSI-II Wiring Terminal Board for DIN-rail Mounting

**Feature Details**

**PCI-Bus Mastering Data Transfer**

PCI-1716 and PCI-1716L support PCI-Bus mastering DMA for high-speed data transfer and gap-free analog input and analog output. By setting aside a block of memory in the PC, PCI-1716 and PCI-1716L performs bus-mastering data transfers without CPU intervention, setting the CPU free to perform other more urgent tasks such as data analysis and graphic manipulation. The function allows users to run all I/O functions simultaneously at full speed without losing data.

**Automatic Calibration Function**

PCI-1716 and PCI-1716L provide an automatic calibration function by using a calibration utility. The built-in calibration circuitry of the PCI-1716 and PCI-1716L corrects gain and offset errors in analog input and analog output channels thereby eliminating the need for external equipment and user adjustments.

**BoardID™ Switch**

PCI-1716 and PCI-1716L have a built-in BoardID™ DIP switch that helps define each card’s unique identity when multiple identical PCI cards have been installed in the same computer. The BoardID switch is very useful when you build your system with multiple identical PCI cards. With the correct BoardID switch settings, you can easily identify and access each card during hardware configuration and software programming.

**Pin Assignments**

*: Pins 23–25 and pins 57–59 are not defined for the PCI-1716L.
### Introduction

PCI-1718HDU/HGU is a multifunction data acquisition card based on the PCI bus. It offers the five most desired measurement and control functions: 12-bit A/D conversion, 12-bit D/A conversion, digital input, digital output, and counter/timer.

### PCI-Bus Plug & Play

The PCI-1718HDU/HGU uses a PCI controller to interface the card to the PCI bus. The controller fully implements the PCI bus specification Rev 2.2. All bus relative configurations, such as base address and interrupt assignment, are automatically controlled by software. No jumper or DIP switch is required for user configuration.

### Automatic Channel/Gain/SD Scanning

PCI-1718HDU/HGU features an automatic channel/Gain/SD scanning circuit. This circuit, instead of your software, controls multiplexer switching during sampling. On-board SRAM stores different gain and SD values for each channel. This combination lets user perform multi-channel high-speed sampling (up to 100kHz) with different gains and SD for each channel.

### On-board FIFO

There are 4k samples FIFO for A/D (AI) on PCI-1718HDU/1718HGU. This is an important feature for faster data transfer and more predictable performance under Windows system.

### On Board Programmable Timer/Counter

PCI-1718HDU/1718HGU provides a programmable timer counter for generating pacer trigger for the A/D conversion. The timer/counter chip is 82C54, which includes three 16-bit counters of 10 MHz clock. One counter is used as an event counter for counting events coming from the input channel. The other two are cascaded together to make a 32-bit timer for pacer trigger time base.

### Specifications

#### Analog Input
- Channels: 16 single-ended or 8 differential analog inputs
- Resolution: 12-bit
- FIFO Size: 4 K samples
- Max. Sampling Rate: 100 kS/s

#### PCI-1718HDU/PCI-1718HGU PGA
- Bandwidth: 1.0 MHz: ±10, 100 kHz: ±5, 10 kHz: ±1 kHz
- Gain (ppm/°): ±40
- Drift (µV/°): ±15

#### Input and Gain List for PCI-1718HDU/PCI-1718HGU
- Gain: 0.5, 1, 2, 4, 8
  - Unipolar: N/A, 0-0.1, 0-1, 0-2.5, 0-1.25
  - Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625

#### Input and Gain List for PCI-1718HDU/PCI-1718HGU PGA
- Gain: 0.5, 1, 2, 4, 8
  - Unipolar: N/A, 0-0.1, 0-1, 0-2.5, 0-1.25
  - Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625

#### PCI-1718HDU/PCI-1718HGU Accuracy
- DC
  - Offset error: Adjustable to 0
  - Gain: 0.5, 1, 2, 4, 8
    - Gain error (% FSR): 0.01, 0.01, 0.02, 0.02, 0.04
- AC
  - THD: -80 dB
  - ENOB: 11 bits
<table>
<thead>
<tr>
<th>Analog Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Channels</td>
<td>1</td>
</tr>
<tr>
<td>• Resolution</td>
<td>12-bit</td>
</tr>
<tr>
<td>• Max. Transfer Rate</td>
<td>100 kS/s</td>
</tr>
<tr>
<td>Output Range (Internal &amp; External Reference)</td>
<td></td>
</tr>
<tr>
<td>Using Internal Reference</td>
<td>0 - +5 V, 0 - +10 V</td>
</tr>
<tr>
<td>Using External Reference</td>
<td>0 - +5 V, 0 - +10 V</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>INL: ±1 LSB (monotonic)</td>
<td></td>
</tr>
<tr>
<td>Offset error: Adjustable to ±1 LSB</td>
<td></td>
</tr>
<tr>
<td>Gain error: Adjustable to ±1 LSB</td>
<td></td>
</tr>
<tr>
<td>Dynamic Performance</td>
<td></td>
</tr>
<tr>
<td>Slew Rate</td>
<td>20 V/µs</td>
</tr>
<tr>
<td>Setting Time</td>
<td>2µs to 0.01% of FSR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Channels</td>
<td>16</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>Low: 0.4 V max.</td>
</tr>
<tr>
<td>Input Load</td>
<td>Low: 0.4 V max @ 0.2 mA</td>
</tr>
<tr>
<td>High: 2.7 V min @ 20 µA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Channels</td>
<td>16</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>Low: 0.4 V max @ 0.0 mA (sink)</td>
</tr>
<tr>
<td>High: 2.4 V min @ 0.4 mA (source)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Counter/Timer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Counter Chip</td>
<td>82C54 or equivalent</td>
</tr>
<tr>
<td>• Channels</td>
<td>3 channels, 2 channels are permanently configured as programmable pacers; 1 channel is free for user application</td>
</tr>
<tr>
<td>• Resolution</td>
<td>16-bit</td>
</tr>
<tr>
<td>• Compatibility</td>
<td>TTL level</td>
</tr>
<tr>
<td>• Base Clock</td>
<td>Channel 1: 10 MHz</td>
</tr>
<tr>
<td></td>
<td>Channel 2: Takes input from output of channel 1</td>
</tr>
<tr>
<td></td>
<td>Channel 0: Internal 100 kHz or external clock (10 MHz max.) selected by software</td>
</tr>
<tr>
<td>• Max. Input Frequency</td>
<td>10 MHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clock Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low: 0.8 V max.</td>
<td></td>
</tr>
<tr>
<td>High: 2.0 V min.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gate Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low: 0.8 V max.</td>
<td></td>
</tr>
<tr>
<td>High: 2.0 V min.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Counter Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low: 0.5 V max @ 24 mA</td>
<td></td>
</tr>
<tr>
<td>High: 2.4 V min @ 15 mA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• I/O Connector Type</td>
<td>37-pin DSUB female for Analog One 20-pin Box</td>
</tr>
<tr>
<td></td>
<td>Header for DI One 20-pin Box Header for DO</td>
</tr>
<tr>
<td>• Dimensions</td>
<td>175 x 100 mm (6.9” x 3.9”)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td>+5 V @ 850 mA</td>
</tr>
<tr>
<td>Max.</td>
<td>+5 V @ 1 A</td>
</tr>
</tbody>
</table>

| Temperature | 0 - 60 °C (32 - 158 °F) |
| Storage | -20 - 70 °C (-4 - 158 °F) |

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>5~85%RH non-condensing (refer to IEC 68-1, 2, 3)</td>
</tr>
<tr>
<td>Storage</td>
<td>5~85%RH non-condensing (refer to IEC 68-1, 2, 3)</td>
</tr>
</tbody>
</table>

| Certification | CE certified |

**Ordering Information**

- PCI-1718HDU: 12-bit multi-function card with PCI bus
- PCI-1718HG: 12-bit high-gain multi-function card with PCI bus
- PCL-10120-1: 20-pin flat cable, 1m
- PCL-10120-2: 20-pin flat cable, 2m
- PCL-10137-1: DB37 cable assembly, 1m
- PCL-10137-2: DB37 cable assembly, 2m
- PCLD-8115: 12-bit high-gain multi-function card with PCI bus
- PCI-1718HGU: 12-bit multi-function card with PCI bus
- PCI-1718HDU: 12-bit high-gain multi-function card with PCI bus

<table>
<thead>
<tr>
<th>Pin Assignments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D S0</td>
<td>1</td>
</tr>
<tr>
<td>A/D S1</td>
<td>2</td>
</tr>
<tr>
<td>A/D S2</td>
<td>3</td>
</tr>
<tr>
<td>A/D S3</td>
<td>4</td>
</tr>
<tr>
<td>A/D S4</td>
<td>5</td>
</tr>
<tr>
<td>A/D S5</td>
<td>6</td>
</tr>
<tr>
<td>A/D S6</td>
<td>7</td>
</tr>
<tr>
<td>A/D S7</td>
<td>8</td>
</tr>
<tr>
<td>A/GND</td>
<td>9</td>
</tr>
<tr>
<td>A/GND</td>
<td>10</td>
</tr>
<tr>
<td>V.REF</td>
<td>11</td>
</tr>
<tr>
<td>S0</td>
<td>12</td>
</tr>
<tr>
<td>S1</td>
<td>13</td>
</tr>
<tr>
<td>S2</td>
<td>14</td>
</tr>
<tr>
<td>D.GND</td>
<td>15</td>
</tr>
<tr>
<td>D.GND</td>
<td>16</td>
</tr>
<tr>
<td>Counter 0 CLK</td>
<td>17</td>
</tr>
<tr>
<td>Counter 0 OUT</td>
<td>18</td>
</tr>
<tr>
<td>+5V</td>
<td>19</td>
</tr>
</tbody>
</table>
PCI-1741U

Features
- 16-bit high resolution
- 200 kS/s sampling rate
- Auto calibration function
- 16 S.E. or 8 Diff. AI
- Unipolar/Bipolar input range
- 1 K samples FIFO for AI
- Universal PCI bus (support 3.3 V or 5 V PCI bus signal)
- BoardID™ switch

Introduction
PCI-1741U is a powerful high-resolution multifunction DAS card for the PCI bus. Its sampling rate is up to 200 kS/s and the 16-bit resolution makes it suitable for most data acquisition applications. PCI-1741U provides 16 single-ended or 8 differential analog input channels, one 16-bit D/A output channel, 16 digital input/output channels, and one 10 MHz 16-bit counter channel.

Auto-calibration Function
PCI-1741U provides an auto-calibration function by using a calibration utility. The built-in calibration circuitry of the PCI-1741U corrects gain and offset errors in analog input and analog output channels thereby eliminating the need for external equipment and user adjustments.

BoardID™ Switch
PCI-1741U has a built-in BoardID™ DIP switch that helps define each card's unique identity when multiple identical PCI cards have been installed in the same computer. The BoardID switch is very useful when you build your system with multiple identical PCI cards. With the correct BoardID switch settings, you can easily identify and access each card during hardware configuration and software programming.

Plug & Play Function
The PCI-1741U is a Plug & Play device, which fully complies with PCI Specification Rev 2.2. During card installation, there is no need to set jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug & Play function.

On-board FIFO Memory
The PCI-1741U provides 1K samples on-board FIFO (First In First Out) memory buffer for AD. This is an important feature for faster data transfer and more predictable performance under the Windows system.

On Board Programmable Timer/Counter
The PCI-1741U provides a programmable timer counter for generating a pacer trigger for the A/D conversion. The timer/counter chip is 82C54, which includes three 16-bit counter 10 MHz clocks. One counter is used as an event counter for counting events coming from the input channel. The other two are cascaded together to make a 32-bit timer for pacer trigger time base.

Specifications

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>Channels</th>
<th>16 single-ended or 8 differential or combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>16-bit</td>
<td></td>
</tr>
<tr>
<td>FIFO Size</td>
<td>1 K samples</td>
<td></td>
</tr>
<tr>
<td>Max. Sampling Rate</td>
<td>200 kS/s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input range and Gain List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
</tr>
<tr>
<td>Unipolar</td>
</tr>
<tr>
<td>Bipolar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bandwidth for PGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
</tr>
</tbody>
</table>

- Common mode voltage ±11 V max. (operational)
- Max. Input voltage ±20 V (protection)
- Input Protect 30Vp-p
- Input Impedance 100 MΩ/10pF(Off); 100 MΩ/700pF(On)

Accuracy

<table>
<thead>
<tr>
<th>DC</th>
<th>DNLE: ±1 LSB</th>
<th>INL±: ±1 LSB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Zero (Offset) error: Adjustable to ±1 LSB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain error (% FSR)</td>
<td>0.03</td>
<td>0.02</td>
</tr>
</tbody>
</table>

| AC | THD: -90 dB |
|    | ENOB: 13.5 bits |

Clocking and Trigger Inputs

<table>
<thead>
<tr>
<th>Trigger Mode</th>
<th>Software, on-board programmable pacer or external</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D pacer clock</td>
<td>200 kHz (max.), 2.328MHz (min.)</td>
</tr>
</tbody>
</table>

Analog Output

- Channels | 1 |
- Resolution | 16-bit |
- Operation mode | Single output |
- Throughput | PC dependent, Software update (Direct AO) |
## Pin Assignments

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A10</td>
<td>68</td>
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<tr>
<td>A11</td>
<td>67</td>
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<tr>
<td>A12</td>
<td>66</td>
</tr>
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<td>A13</td>
<td>65</td>
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<td>A14</td>
<td>64</td>
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<td>A15</td>
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<td>A42</td>
<td>36</td>
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<td>A43</td>
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</tbody>
</table>

## Ordering Information

- **PCI-1741U**
  - 200 ks/s, 16-bit, 16-ch High-Resolution Multifunction Card, user's manual and driver CD-ROM. (cable not included)

- **PCL-10168**
  - 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1m.

- **PCL-10168-2**
  - 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 2m.

- **ADAM-3968**
  - Industrial Wiring Terminal Board for DIN-rail Mounting

- **PCLD-8710**
  - Wiring Terminal Board with CJC circuit for DIN-rail Mounting. (cable not included)

- **PCI-1741S**
  - PCI-1741U with PCLD-8710 and PCL-10168 cable
PCI-1747U

250 kS/s, 16-bit, 64-ch Analog Input Card

Features
- 16-bit high resolution
- 250 kS/s sampling rate
- 64 S.E. or 32 Diff. AI, or a combination
- Auto calibration function
- Unipolar/Bipolar input range
- 1k samples FIFO for AI
- Bus master DMA data transfer
- Universal PCI Bus
- BoardID™ switch

Introduction
PCI-1747U is a high-resolution high channel count analog input card for the PCI bus. Its sampling rate is up to 250 kS/s and 16-bit resolution provides the power needed for most data acquisition applications. PCI-1747U provides 64 single-ended, 32 differential analog input channels or a combination of these. It also has built in a 1k-sample FIFO buffer for analog input data.

Specifications

Analog Input
- Channels: 64 single-ended or 32 differential or combination
- Resolution: 16-bit
- FIFO Size: 1 K samples
- Max. Sampling Rate: 250 kS/s

Input range and Gain List

<table>
<thead>
<tr>
<th>Gain</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unipolar</td>
<td>N/A</td>
<td>0–10</td>
<td>0–5</td>
<td>0–2.5</td>
<td>0–1.25</td>
</tr>
<tr>
<td>Bipolar</td>
<td>±10</td>
<td>±5</td>
<td>±2.5</td>
<td>±1.25</td>
<td>±0.625</td>
</tr>
</tbody>
</table>

Bandwidth for PGA

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>4.0 MHz</th>
<th>2.0 MHz</th>
<th>1.5 MHz</th>
<th>0.65 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

- Common mode voltage: ±11 V max. (operational)
- Max. Input voltage: ±20 V
- Input Protect: 30 Vp-p
- Input Impedance: 100 MΩ/10pf(Off); 100 MΩ/100pf(On)

Accuracy

<table>
<thead>
<tr>
<th>DC</th>
<th>Gain</th>
<th>Zero (Offset) error: Adjustable to ±1 LSB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AC</th>
<th>Gain error (% FSR)</th>
<th>THD: -90 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±0.03</td>
<td>±0.02</td>
</tr>
<tr>
<td></td>
<td>±0.03</td>
<td>±0.04</td>
</tr>
</tbody>
</table>

Clocking and Trigger Inputs

<table>
<thead>
<tr>
<th>Trigger Mode</th>
<th>Software, on-board programmable pacers or external</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/D pacer clock</td>
<td>250 kHz (max.); 2.328 MHz (min.)</td>
</tr>
</tbody>
</table>

Counter/Timer

- Counter chip: 82C54 or equivalent
- Channels: 3 channels, 2 channels are permanently configured as programmable pacers; 1 channel is for internal use only

Introduction

- Resolution: 16-bit
- Base Clock: Channel 1: 10 MHz
- Channel 2: Takes input from output of channel 1
- Channel 0: Internal 100 kHz

Counter 0
- 16-bit timer

Counter 1, 2
- Cascade as a 32-bit clock divider for pacer clock for A/D conversion

General
- I/O Connector Type: 68-pin SCSI-II female
- Dimensions: 175 x 100 mm (6.9” x 3.9”)

Power Consumption

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>Typical</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 V @ 850 mA</td>
<td>+5 V @ 1 A</td>
<td></td>
</tr>
<tr>
<td>+12 V @ 600 mA</td>
<td>+12 V @ 700 mA</td>
<td></td>
</tr>
</tbody>
</table>

Temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Operating</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 – 60 °C (32 – 158 °F)</td>
<td>-20 – 70 °C (-4 – 185 °F)</td>
</tr>
</tbody>
</table>

| Relative Humidity  | ≤ 5%RH non-condensing (refer to IEC 68-2-3) |

Certifications
- CE certified

Ordering Information:
- PCI-1747U: 250 kS/s, 16-bit, 64-ch, analog input universal PCI bus card
- ADAM-3968: 68-pin SCSI cable wiring terminal for DIN-rail mounting
- PCL-10168: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1m.
- PCL-10168-2: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 2m.
Feature Details

Auto-Calibration Function
The PCI-1747U provides an auto-calibration function with an calibration utility. The built-in calibration circuitry of the PCI-1747U corrects gain and offset errors in analog input, thereby eliminating the need for external equipment and user adjustments.

On-Board Programmable Timer/Counter
PCI-1747U provides a programmable timer counter for generating a pacer trigger for the A/D conversion. The timer/counter chip is 82C54, which includes three 16-bit counter 10 MHz clocks. One counter is used as an event counter for counting events coming from the input channel. The other two are cascaded together to make a 32-bit timer for pacer trigger time base.

Plug & Play Function
The PCI-1747U is a Plug & Play device, which fully complies with PCI Specification Rev 2.2. During card installation, there is no need to set jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug & Play function.

Automatic Channel/Gain/SD/BU Scanning
The PCI-1747U features an automatic channel/gain/SD/BU scanning circuit. This circuit controls multiplexer switching during sampling in a way that is more efficient than software implementation. An on-board SRAM stores different gain, SD (Single-Ended/Differential) and BU (Bipolar/Unipolar) values for each channel. This combination lets users perform multi-channel high-speed sampling with different gain, SD and BU values for each channel.

PCI-Bus Mastering Data Transfer
PCI-1747U supports PCI-Bus mastering DMA for high-speed data transfer and gap-free analog input and analog output. By setting aside a block of memory in the PC, the PCI-1747U performs bus-mastering data transfers without CPU intervention, setting the CPU free to perform more urgent tasks such as data analysis and graphics manipulation. The function makes it possible to run all I/O functions simultaneously at full speed without losing data.

On-board FIFO Memory
PCI-1747U provides 1K samples on-board FIFO (First In First Out) memory buffer for AD. This is an important feature for faster data transfer and more predictable performance under the Windows system.

Pin Assignments

<table>
<thead>
<tr>
<th>Pin</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI0</td>
<td>68</td>
</tr>
<tr>
<td>AI2</td>
<td>67</td>
</tr>
<tr>
<td>AI4</td>
<td>66</td>
</tr>
<tr>
<td>AI6</td>
<td>65</td>
</tr>
<tr>
<td>AI8</td>
<td>64</td>
</tr>
<tr>
<td>AI10</td>
<td>63</td>
</tr>
<tr>
<td>AI12</td>
<td>62</td>
</tr>
<tr>
<td>AI14</td>
<td>61</td>
</tr>
<tr>
<td>AGND</td>
<td>60</td>
</tr>
<tr>
<td>AI16</td>
<td>59</td>
</tr>
<tr>
<td>AI18</td>
<td>58</td>
</tr>
<tr>
<td>AI20</td>
<td>57</td>
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<tr>
<td>AI22</td>
<td>56</td>
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<td>AI24</td>
<td>55</td>
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<tr>
<td>AI26</td>
<td>54</td>
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<td>AI28</td>
<td>53</td>
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<td>AI30</td>
<td>52</td>
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<tr>
<td>AI32</td>
<td>51</td>
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<td>AI34</td>
<td>50</td>
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<td>AI36</td>
<td>49</td>
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<td>AI38</td>
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<td>AI42</td>
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<td>AI44</td>
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<td>AI46</td>
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<td>AGND</td>
<td>43</td>
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<td>AI48</td>
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<td>AI50</td>
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<td>AI52</td>
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<td>AI3</td>
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<td>AI45</td>
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<td>AGND</td>
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<td>AI59</td>
<td>3</td>
</tr>
<tr>
<td>AI61</td>
<td>2</td>
</tr>
<tr>
<td>AI63</td>
<td>1</td>
</tr>
</tbody>
</table>
**Introduction**

The PCI-1713 is an isolated high-speed analog input card for the PCI bus. It provides 32 analog input channels with a sampling rate up to 100 kS/s, 12-bit resolution and isolation protection of 2500 V_{DC}.

**Specifications**

**Analog Input**
- Channels: 32 single-ended or 16 differential (software programmable)
- Resolution: 12-bit
- Onboard FIFO: 4K samples
- Input Range:
  - Bipolar: ±10 V, ±5 V, ±2.5 V, ±1.25 V, ±0.625 V (software programmable)
  - Unipolar: 0 ~10 V, 0 ~ 5 V, 0 ~ 2.5 V, 0 ~ 1.25 V
- Maximum Input: ±30 V
- Common Mode Rejection Ratio (CMRR): 0.5, 1, 75dB, 2, 80dB, 4, 84dB, 8, 84dB
- Maximum Sampling Rate: 100 kS/s
- Accuracy (depends on gain):
  - 0.5, 1: 0.01% of FSR±1LSB
  - 2: 0.02% of FSR±1LSB
  - 4: 0.02% of FSR±1LSB
  - 8: 0.04% of FSR±1LSB
- Linearity Error: ±1 LSB
- Input Impedance: 1 GΩ
- Trigger Mode: Software, on-board programmable pacer or external (TTL level)

**Programmable Pacer**
- Timer: 32-bit programmable timer
- Time Base: 10 MHz

**Features**
- 2500 V_{DC} isolation protection
- 32 single-ended or 16 differential analog inputs, or a combination
- 12-bit resolution for A/D conversion
- Up to 100 kS/s sampling rate for A/D conversion
- Programmable gain for each input channel
- On-board 4 K samples FIFO buffer
- S/W, internal or external pacer triggering supported

**General**
- I/O Connector: 37-pin D-type female connector
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)
- Power Consumption: +5 V @ 850 mA (Typical), +5 V @ 1.0 A (Max.)
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 ~ 70° C (-4 ~ 158° F)
- Operating Humidity: 5 ~ 95% RH non-condensing (refer to IEC 68-2-3)

**Ordering Information**
- PCI-1713: 100 kS/s, 12-bit, 32-channel Isolated Analog Input Card, user's manual and driver CD-ROM. (cable not included)
- PCLD-881B: Industrial Wiring Terminal Board (cable not included)
- ADAM-3937: Wiring Terminal Board
- PCL-10137-1: DB37 cable assembly, 1m
- PCL-10137-2: DB37 cable assembly, 2m
- PCL-10137-3: DB37 cable assembly, 3m

**Applications**
- Signal isolation
- Process monitoring and control
- Transducer/sensor interfacing
- Multi-channel DC voltage measurement
### Introduction

The PCI-1714 is an advanced-performance data acquisition card based on 32-bit PCI bus architecture. The maximum sampling rate of PCI-1714 is up to 30 MS/s, with an emphasis on continuous, non-stop, high-speed, streaming data of A/D samples to host memory.

### Specifications

#### Analog Input
- **Channels**: 4 single-ended analog input channels
- **Resolution**: 12 bits
- **FIFO Size**: 32 K samples/ch for PCI-1714
  - 8 K samples/ch for PCI-1714UL
- **Max. Sampling Rate**: 30 MS/s for PCI-1714
  - 10 MS/s for PCI-1714UL

#### General
- **I/O Connector Type**: 4 BNC connector (for AI)
- **Dimensions**: 137 x 107 mm (5.4" x 4.2")
- **Power Consumption**:
  - Typical +5 V @ 850 mA ; +12 V @ 600 mA
  - Max. +5 V @ 1 A ; +12 V @ 700 mA
- **Operating Temperature**: 0 ~ 70° C (32~158° F)
- **Storage Temperature**: -20 ~ 85° C (-4~185° F)
- **Relative Humidity**: 5 ~ 95%RH non-condensing (refer to IEC 68-2-3)
- **Certifications**: CE, CE, CE

### Analog Input

<table>
<thead>
<tr>
<th>Channels</th>
<th>4 single-ended analog input channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>12 bits</td>
</tr>
<tr>
<td>FIFO Size</td>
<td>32 K locations (8K for PCI-1714UL)</td>
</tr>
</tbody>
</table>
| Max. Sampling Rate | 30 MHz for PCI-1714
10 MHz for PCI-1714UL |

<table>
<thead>
<tr>
<th>Input range and Gain List</th>
<th>Drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>±5 V, ±2.5 V, ±1 V, ±0.5 V</td>
</tr>
<tr>
<td>Gain (µV/° C)</td>
<td>±30, ±30, ±30, ±30</td>
</tr>
<tr>
<td>Gain (ppm/° C)</td>
<td>±30, ±30, ±30, ±30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small Signal Bandwidth for PGA Bandwidth (-3dB)</th>
<th>±3 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth (-3dB)</td>
<td>7 MHz</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>±15 V</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>50Ω</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trigger Mode</th>
<th>Software, pulse, post-trigger, pre-trigger, delay-trigger, about-trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>DC</td>
</tr>
<tr>
<td>Gain Error</td>
<td>Adjustable to ±LSB</td>
</tr>
<tr>
<td>Offset Error</td>
<td>Adjustable to ±LSB</td>
</tr>
<tr>
<td>ENOB</td>
<td>11 bits</td>
</tr>
</tbody>
</table>

### Pin Assignments

- **EXT TRIG0**: NC
- **EXT CLK1**: NC
- **EXT TRIG0+**: NC
- **EXT CLK1+**: NC
- **EXT CLK0**: NC
- **EXT CLK0+**: NC
- **EXT CLK0-**: NC
- **EXT CLK1**: NC

**On board PS-2 connector**: Pa2 To DB-9 Cable Connector

### Ordering Information

- **PCI-1714**: 30 MHz Simultaneous 4-ch Analog Input Card, user’s manual and driver CD-ROM (PCL-10901-1 cable included)
- **PCI-1714UL**: 10 MHz Simultaneous 4-ch Analog Input Card
- **ADAM-3909**: DB-9 Wiring Terminal for DIN-rail Mounting
- **PCL-10901-1**: PS2 to DB9 Wiring Cable, 1m
- **PCL-10901-3**: PS2 to DB9 Wiring Cable, 3m
- **PCL-1010B-1**: BNC to BNC Wiring Cable, 1m
Introduction
The PCI-1720 provides four 12-bit isolated digital-to-analog outputs for the PCI bus. With isolation protection of 2500 VDC between the outputs and the PCI bus, the PCI-1720 is ideal for industrial applications where high-voltage protection is required.

Keeping the Output Settings and Values after System Reset
Users can independently set the four outputs to different ranges: 0 to +5 V, 0 to +10 V, ±5 V, ±10 V, 0 to 20 mA (sink) or 4 to 20 mA (sink). When the system is hot reset, (power is not shut off), the PCI-1720 can either retain the last analog output settings and values, or return to its default configuration, depending on jumper setting. This practical function eliminates danger caused by misoperation during an unexpected system reset.

PCI-Bus Plug & Play
The PCI-1720 uses a PCI controller to interface the card to the PCI bus. The controller fully implements the PCI bus specification Rev 2.1. All bus relative configurations, such as base address and interrupt assignment, are automatically controlled by software.

Specifications
- Channels: 4 isolated D/A channels
- Resolution: 12 bits
- Output Range:
  - Unipolar: 0 to +5 V, 0 to +10 V
  - Bipolar: ±5 V, ±10 V
  - Current loop (sink): 0 to 20 mA, 4 to 20 mA
- Throughput: 15 kHz min. @ full-scale output range
- Accuracy: ±0.024%
- Isolation Voltage: 2,500 VDC between the outputs and the PCI bus
- Temperature Drift:
  - Typical: 10 PPM/°C (0 to 60°C) (32 to 140°F)
  - Maximum: 20 PPM/°C (0 to 60°C) (32 to 140°F)
- Output Drive: ±5 mA max.
- Current Loop Excitation: 50 V (max.)
- On-board 12 VDC Excitation Voltage: 80 mA (max.)
- Power Consumption:
  - +5 V @ 350 mA (typical), 500 mA (max.)
  - +12 V @ 200 mA (typical), 350 mA (max.)
- Operating Temperature: 0 to 60°C (32 to 140°F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 to +70°C (-4 to 158°F)
- Connector:
  - DB-37 connector
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)

Ordering Information
- PCI-1720: 4-channel isolated output Card, user’s manual and driver CD-ROM. (cable not included)
- PCI-1720U: 4-channel isolated output Card, user’s manual and driver CD-ROM. (cable not included)
- ADAM-3937: DB37 wiring terminal for DIN-rail mounting
- PCLD-880: Screw terminal board

Applications
- Process control
- Programmable voltage source
- Programmable current sink
- Servo control

Pin Assignments

```
<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+12 Vout</td>
<td>+12 V output</td>
</tr>
<tr>
<td>AGND</td>
<td>AGND (ground)</td>
</tr>
<tr>
<td>Vref</td>
<td>Reference voltage</td>
</tr>
<tr>
<td>Vout</td>
<td>Output voltage</td>
</tr>
<tr>
<td>in</td>
<td>Input pin</td>
</tr>
<tr>
<td>DB-37</td>
<td>DB-37 connector</td>
</tr>
<tr>
<td>20</td>
<td>Top connector pin</td>
</tr>
<tr>
<td>19</td>
<td>Second to last connector pin</td>
</tr>
<tr>
<td>NC</td>
<td>No connection</td>
</tr>
</tbody>
</table>
```

Features
- Four 12-bit D/A output channels
- Multiple output ranges
- 2,500 VDC isolation between the outputs and the PCI bus
- Keeps the output settings and values after system reset
- One DB37 connector for easy wiring
- Universal PCI and BoardID switch (PCI-1720U only)
Introduction

The PCI-1721 is an advanced high-speed analog output card for PCI bus, and each of analog output channels are equipped with a 12-bit, double-buffered DAC. It features many powerful and unique functions, like a waveform output function with 10 MHz maximum update rate, auto-calibration and a BoardID switch. The PCI-1721 is an ideal solution for industrial applications where high-speed continuous analog output or real-time waveform output functions are required.

Specifications

### Analog Output
- **Channels**: 4
- **Resolution**: 12-bit
- **FIFO Size**: 1 K Samples
- **Operation Mode**: Single/ Continuous/ Waveform /Synchronized output

### Output Range (Internal & External Reference)
- **Using Internal Reference**: 0 ~ +5 V, 0 ~ +10 V, -5 ~ +5 V, 0 ~ 20 mA, 4 ~ 20 mA
- **Using External Reference**: 0 ~ x V @ +x V (10 ≤ x ≤ 10)

### Accuracy
- **Relative**: ±1 LSB
- **Differential Non-linearity**: ±1 LSB (monotonic)

- **Offset**: <1 LSB
- **Slew Rate**: 10 V/μs
- **Driving Capability**: ±10 mA
- **Output Impedance**: 0.1 Ω max.
- **Max. Update Rate**: 10 MHz (max. for one channel)
- **Settling Time**: 5 μs (to ±1/1 LSB of FSR)

### Clock Input
- **Low**: 0.8 V max.
- **High**: 2.0 V min.

### Gate Input
- **Low**: 0.8 V max.
- **High**: 2.0 V min.

### Counter Output
- **Low**: 0.4 V max. @ +2.5 mA
- **High**: 3.0 V min. @ -2.5 mA

### General
- **I/O Connector Type**: 68-pin SCSI-II female
- **Dimensions**: 175 x 100 mm (6.9” x 3.9”)
- **Power Consumption**
  - Typical: +5 V @ 850 mA, +12 V @ 600 mA
  - Max.: +5 V @ 1 A, +12 V @ 700 mA
- **Temperature**
  - Operation: 0 ~ 60° C (32 ~ 140° F) (refer to IEC 68-2-1, 2)
  - Storage: -20 ~ 85° C (-4 ~ 185° F)
- **Relative Humidity**: 5 ~ 95% RH non-condensing (refer to IEC 68-2-3)
- **Certifications**: CE certified

### Digital Input /Output
- **Input Channels**: 16 (bi-directional)
- **Input Voltage**
  - **Low**: 0.8 V max.
  - **High**: 2.0 V min.
- **Input Load**
  - **Low**: 0.5 V max. @ +24 mA (sink)
  - **High**: 2.0 V min. @ -15 mA (source)

### Ordering Information
- **PCI-1721**: 12-bit, 4-ch Advanced Analog Output Card, user’s manual and driver CD-ROM. (cable not included)
- **PCL-10168**: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2 m
- **ADAM-3968**: 68-pin SCSI-II Wiring Terminal Board for DIN-rail Mounting

---

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Clock Input</td>
<td>0.8 V max.</td>
<td>2.0 V min.</td>
</tr>
<tr>
<td>Gate Input</td>
<td>0.8 V max.</td>
<td>2.0 V min.</td>
</tr>
<tr>
<td>Counter Output</td>
<td>0.4 V max. @ +2.5 mA</td>
<td>3.0 V min. @ -2.5 mA</td>
</tr>
</tbody>
</table>

---

**Table 2**

<table>
<thead>
<tr>
<th></th>
<th>16 (bi-directional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Ports</td>
<td>2</td>
</tr>
</tbody>
</table>
PCI-1723

16-bit, 8-ch Non-isolated Analog Output Card

Introduction
The PCI-1723 is a non-isolated multiple channel analog output card for the PCI bus, and each analog output channel is equipped with a 16-bit, double-buffered DAC. It also features an auto-calibration function and a BoardID™ switch. The PCI-1723 is an ideal solution for industrial applications where multiple analog output channels are required.

Specifications

Analog Output
- Output Channels: 8
- Resolution: 16-bit
- Operation Mode: Single output, Synchronized output
- Output Range: -10 ~ +10 V, 0 ~ 20 mA, 4 ~ 20 mA (Internal Reference only)
- Accuracy: Relative ±6 LSB
- Differential Non-linearity: ±6 LSB (monotonic)
- Offset: < 6 LSB
- Output Impedance: 0.1 Ω max.
- Throughput: PC dependent, Software update (direct AO)
- Settling Time: 50 μs (to ±6 LSB of FSR)

Digital Input/Output
- Channels: 16 (bi-directional)
- Number of Ports: 2
- Input Voltage: Low 0.8 V max., High 2.0 V min.
- Output Voltage: Low 0.5 V max., @ 24 mA (sink), High 2.4 V min., @ -15 mA (source)

General
- I/O Connector Type: 68-pin SCSI-II female
- Dimensions: 175 x 100 mm (6.9” x 3.9”)
- Power Consumption: Typical +5 V @ 850 mA, +12 V @ 600 mA, Max. +5 V @ 1 A, +12 V @ 700 mA
- Operating Temperature: 0 ~ 60°C (32 ~ 158°F) (IEC 68-2-1,2)
- Storage Temperature: -20 ~ 85°C (-4 ~ 185°F)
- Relative Humidity: 5 ~ 95 % RH non-condensing (IEC 68-2-3)
- Certifications: CE

Ordering Information
- PCI-1723: 16-bit, 8-ch Non-isolated Analog Output Card
- PCL-10168: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2m
- ADAM-3968: 68-pin SCSI-II Wiring Terminal Board for DIN-rail mounting

Applications
- Process control, Programmable voltage source, Programmable current sink, Servo control, Multiple loop PID control, V-command motion control

Pin Assignments

Features
- Auto calibration function
- A 16-bit DAC is equipped for each analog output channel
- Synchronized output function
- Output values retained after system hot reset
- 2-port (16-channel) user-defined digital input/output
- BoardID™ switch

All product specifications are subject to change without notice. Last updated: January 2005
PCI-1724U

14-bit, 32-ch Isolated Analog Output Card

Introduction
The PCI-1724U is an isolated high-density multiple channel analog output card for the PCI bus, where each analog output channel is equipped with a 14-bit DAC. It features optional voltages, current output and a BoardID™ switch. The PCI-1724U is an ideal solution for industrial applications where multiple analog output channels are required.

Specifications

Analog Output
- Channels: 32 ch isolation
- Resolution: 14-bit
- Operation Mode: Single output, synchronized output
- Output Range: -10 ~ +10 V, 0 ~ 20 mA, 4 ~ 20 mA (Internal Reference only)
- Accuracy: Relative +/- 4 LSB, Differential Non-linearity +/- 2 LSB (monotonic)
- Offset: < 2 LSB
- Output Impedance: 0.1 Ω max.
- Throughput: PC dependent, Software update (Direct AO)
- Settling Time: 60 µs
- Isolation: 1,500 Vdc, system isolation

General
- I/O Connector Type: One 62-pin D-type connector
- Dimensions (L x H): 175 x 100 mm (6.9" x 3.9")
- Operating Temperature: 0 ~ 60°C (32 ~ 140°F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 ~ 70°C (-4 ~ 158°F)
- Operating Humidity: 5 ~ 95 % RH non-condensing (refer to IEC 68-2-3)

Applications
- Process control
- Programmable voltage source
- Programmable current sink
- Servo control
- Multiple loop PID control
- V-command motion control

Pin Assignments

Ordering Information
- PCI-1724U: 14-bit, 32-ch Isolated Analog Output Card
- PCI-10162: DB62 Cable Assembly (1m, 3m)
- ADAM-3962: DB62 Cable Wiring Terminal for Din-Rail Mounting

Features
- High-density 32-channel analog output channels
- Flexible Output Range: +/-10 V, 0 ~ 20 mA and 4 ~ 20 mA
- Synchronized output function
- Keeps output values after system hot reset
- BoardID™ switch

Introduction
The PCI-1724U is an isolated high-density multiple channel analog output card for the PCI bus, where each analog output channel is equipped with a 14-bit DAC. It features optional voltages, current output and a BoardID™ switch. The PCI-1724U is an ideal solution for industrial applications where multiple analog output channels are required.

Specifications

Analog Output
- Channels: 32 ch isolation
- Resolution: 14-bit
- Operation Mode: Single output, synchronized output
- Output Range: -10 ~ +10 V, 0 ~ 20 mA, 4 ~ 20 mA (Internal Reference only)
- Accuracy: Relative +/- 4 LSB, Differential Non-linearity +/- 2 LSB (monotonic)
- Offset: < 2 LSB
- Output Impedance: 0.1 Ω max.
- Throughput: PC dependent, Software update (Direct AO)
- Settling Time: 60 µs
- Isolation: 1,500 Vdc, system isolation

General
- I/O Connector Type: One 62-pin D-type connector
- Dimensions (L x H): 175 x 100 mm (6.9" x 3.9")
- Operating Temperature: 0 ~ 60°C (32 ~ 140°F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 ~ 70°C (-4 ~ 158°F)
- Operating Humidity: 5 ~ 95 % RH non-condensing (refer to IEC 68-2-3)

Applications
- Process control
- Programmable voltage source
- Programmable current sink
- Servo control
- Multiple loop PID control
- V-command motion control

Pin Assignments

Ordering Information
- PCI-1724U: 14-bit, 32-ch Isolated Analog Output Card
- PCI-10162: DB62 Cable Assembly (1m, 3m)
- ADAM-3962: DB62 Cable Wiring Terminal for Din-Rail Mounting

Features
- High-density 32-channel analog output channels
- Flexible Output Range: +/-10 V, 0 ~ 20 mA and 4 ~ 20 mA
- Synchronized output function
- Keeps output values after system hot reset
- BoardID™ switch
Introduction

The PCI-1727U provides twelve 14-bit analog output channels, and is pin-compatible with the ISA PCL-727 card. It supports both +/-10V and 0–20mA current loop (sink). The card's on board DC-to-DC converter ensures the full 10V D/A output is always available.

Each analog output channel has a built-in fuse to protect the circuit, PC and the external devices. The PCI-1727U is an ideal, economical solution for the applications which require multiple PID control loops.

In addition to its analog outputs, the PCI-1727U provides 16 TTL DI and 16 TTL DO channels that are easily applied with industrial on/off control applications.

Specifications

Analog Output
- Chipset: ADI AD5390
- Channels: 12
- Resolution: 14 bits
- Output Range: ±10 V, 0 – 20 mA
- Current Loop: 8 V – 36 V
- Excitation Voltage: 8 V
- Output Current in Voltage Output:
  - 15 mA max.
- Throughput:
  - Software Static Update
- Setting Time: <= 70 µs
- Power on Default Value: All output ranges will output 0V or 0mA in power on
- Fuse on Each Channel: 0.1A
- Calibration Function

Power Supply
- +5V: 250 mA typical, 500 mA max
- +12V: 150 mA typical, 300 mA max
- -12V: 100 mA typical, 130 mA max

General
- Connector: 37-pin D-type female
- Dimensions: 175 x 100 mm (6.9” x 3.9”)
- Operating Temperature: 0 – 50 °C
- Storage Temperature: -20 – 65 °C
- Relative Humidity: 5 – 95%, non-condensing

Digital Input
- Channels: 16
- Level: TTL compatible
- Logic0: 0.8 V max
- Logic1: 2.0 V min
- Input loading:
  - 0.5 V @ 0.4 mA max (low)
  - 2.7 V @ 50 µA max (high)

Digital Output
- Channels: 16
- Level: TTL compatible
- Logic0: 0.5 V @ 8 mA (sink)
- Logic1: 2.4 V @ 0.4 mA (source)
PCI-1751
48-bit Digital I/O Card and Counter Card

PCI-1751U
48-bit Universal Digital I/O and Counter Card

Features
- 48 TTL digital I/O lines
- Emulates mode 0 of 8255 PPI
- Buffered circuits for higher driving capacity than 8255
- Interrupt handling
- Timer/Counter interrupt capability
- Supports both dry and wet contact
- Keeps the I/O port setting and DO state after system reset
- Universal PCI & BoardID switch (PCI-1751U only)

Introduction
PCI-1751 is a 48-bit digital I/O card for the PCI bus. Its 48 bits are divided into six 8-bit I/O ports and users can configure each port as input or output via software. The PCI-1751 also provides one event counter and two 16-bit timers, which can be cascaded to become a 32-bit timer.

Fulfilling the True Requirements of Industrial Applications
With two practical functions, the PCI-1751 fulfills the true requirements of industrial applications. When the system is hot reset, (power is not shut off), the PCI-1751 can either retain the last I/O port setting and output value, or reset to its default configuration, depending on jumper settings. This function protects the system from wrong operations during unexpected system resets. Additionally, the PCI-1751 supports both dry and wet contacts so that it can easily interface with other devices.

Interrupt Handling Capability
Two lines in each I/O port (C0 and C4) and two of the three counter outputs (Timer 1 and Counter 2) are connected to the interrupt circuitry. Two interrupt request signals can be generated at the same time and the software can service the two request signals by ISR. Moreover, a pin in the connector can output a digital signal simultaneously with the card generating an interrupt, and users can utilize this function to trigger external devices with the interrupt.

Specifications
- I/O Channels: 48 digital I/O lines
- Programming Mode: 8255 PPI mode 0

Digital Output
- Logic Level 0: 0.4 V max. @ 24 mA (sink)
- Logic Level 1: 2.4 V min. @ 15 mA (source)

Digital Input
- Logic Level 0: 0 – 0.8 V
- Logic Level 1: 2 – 5.25 V

Programmable timer/counter
- Frequency Range: 0 – 10 MHz
- Counters: Two 16-bit counters or one 32-bit counter

General
- Power Consumption: 5 V @ 850 mA (typical)
- Operating Temperature: 0 – 70° C (32 – 158° F)
- Storage Temperature: -20 – 80° C (-4 – 176° F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- Connectors: 68-pin SCSI-II female connector (Centronics type)
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)

Applications
- Industrial AC/DC I/O monitoring and controlling
- Relay and switch monitoring and controlling
- Parallel data transfer
- TTL, DTL and CMOS logic signal sensing
- Indicator LED driving

Ordering Information
- PCI-1751: 48-bit digital I/O card and Counter Card, user's manual and driver CD-ROM. (cable not included)
- PCI-1751U: 48-bit universal digital I/O card and Counter Card, user's manual and driver CD-ROM. (cable not included)
- PCL-10168: 68-pin SCSI cable wiring terminal for DIN-rail mounting
- ADAM-3968/20: 68-pin SCSI-II to three 20-pin box headers converter module
- ADAM-3968/50: 68-pin SCSI to 2 x 50-pin box headers converter module
- PCLD-8761: 48-ch Isolated DI Board
- PCLD-8761: 24-ch Replay and 24-IDI Board

Pin Assignments
PCI-1753
96-ch Digital I/O Card

PCI-1753E
96-ch Digital I/O Extension Card for PCI-1753

Features
- Up to 192 (96-96) TTL digital I/O lines
- Emulates mode 0 of 8255 PPI
- Buffered circuits for higher driving capacity than 8255
- Multiple-source interrupt handling
- Interrupt output pin for simultaneously triggering external devices with the interrupt
- Output status read-back
- "Pattern match" and "Change of state" interrupt functions for critical I/O monitoring
- Keeps I/O setting and digital output values when hot system reset
- Supports dry contact and wet contact
- High-density 100-pin SCSI connector

Introduction
PCI-1753 is a 96-bit digital I/O card for the PCI bus, which can be extended to 192 digital I/O channels by connecting with its extension board, PCI-1753E. The card emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255. The 96 I/O lines are divided into twelve 8-bit I/O ports: A0, B0, C0, A1, B1, C1, A2, B2, C2, A3, B3 and C3. You can configure each port as input or output via software.

Specifications
- I/O Channels
  - 96 digital I/O lines for PCI-1753
  - 192 digital I/O lines if extending with PCI-1753E
- Programming Mode
  - 8255 PPI mode 0
- Input Signal
  - logic level 0: 0.8 V max.
  - logic level 1: 2.0 V min.
- Output Signal
  - logic level 0: 0.44 V max. @ 24 mA (sink)
  - logic level 1: 3.76 V min. @ 24 mA (source)
- Power Consumption
  - +5 V @ 400 mA (typical)
  - +5 V @ 2.7 A (max.)
- Operating Temperature
  - 0 – 60° C (32 – 140° F) (refer to IEC 68-2-1, 2)
- Storage Temperature
  - -20 – 70° C (-4 – 158° F) (refer to IEC 68-2-3)
- Operating Humidity
  - 5 – 95% RH non-condensing
- Connector
  - One 100-pin SCSI female connector (Centronics™ type)
- Dimensions (L x H)
  - 175 x 100 mm (6.9" x 3.9")

Ordering Information
- PCI-1753
  - 96 ch. Digital I/O Card, user's manual and driver CD-ROM. (cable not included)
- PCI-1753E
  - Extension Board for PCI-1753
- PCL-10268
  - 100-pin to 2x68-pin SCSI cable, 1 and 2m (PCL-10268 100-pin SCSI-II male connector P/N: 16549A0000)
- ADAM-3968
  - 68-pin SCSI wiring terminal for DIN-rail mounting
- ADAM-3968/20
  - 68-pin SCSI-II to Three 20-pin Wiring Terminal Module for DIN-Rail Mounting
- ADAM-3968/50
  - 68-pin SCSI wiring terminal for DIN-rail mounting
- PCLD-8751
  - 48-ch Isolated DI Board
- PCLD-8761
  - 24-ch Replay and 24-IDI Board

Applications
- Industrial AC/DC I/O devices for monitoring and controlling
- Relay and switch monitoring and controlling
- Parallel data transfer
- TTL, DTL and CMOS logic signal sensing
- Indicator LED driving

Pin Assignments

Ordering Information
- PCI-1753
  - 96 ch. Digital I/O Card, user’s manual and driver CD-ROM. (cable not included)
- PCI-1753E
  - Extension Board for PCI-1753
- PCL-10268
  - 100-pin to 2x68-pin SCSI cable, 1 and 2m (PCL-10268 100-pin SCSI-II male connector P/N: 16549A0000)
- ADAM-3968
  - 68-pin SCSI wiring terminal for DIN-rail mounting
- ADAM-3968/20
  - 68-pin SCSI-II to Three 20-pin Wiring Terminal Module for DIN-Rail Mounting
- ADAM-3968/50
  - 68-pin SCSI wiring terminal for DIN-rail mounting
- PCLD-8751
  - 48-ch Isolated DI Board
- PCLD-8761
  - 24-ch Replay and 24-IDI Board

Applications
- Industrial AC/DC I/O devices for monitoring and controlling
- Relay and switch monitoring and controlling
- Parallel data transfer
- TTL, DTL and CMOS logic signal sensing
- Indicator LED driving
## PCI-1755

### Ultra-Speed 32-ch Digital I/O Card

#### Features
- Bus-mastering DMA data transfer with scatter gather technology
- 32/16/8-bit Pattern I/O with start and stop trigger function, 2 modes
- Handshaking I/O Interrupt handling capability
- On-board active terminators for high speed and long distance transfer
- Pattern match and Change state detection interrupt function
- General-purpose 8-ch DO

### Introduction
The PCI-1755 supports PCI-bus mastering DMA for high-speed data transfer. By setting aside a block of memory in the PC, the PCI-1755 performs bus-mastering data transfers without CPU intervention, setting the CPU free to perform other more urgent tasks such as data analysis and graphic manipulation. The function allows users to run all I/O functions simultaneously at full speed without losing data.

### Specifications

<table>
<thead>
<tr>
<th>Transfer Characteristics</th>
<th>Data Transfer Rate</th>
<th>Operation Mode</th>
<th>Handshaking Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Transfer Bus Width</td>
<td>6/16/32 bits (programmable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Transfer Rate</td>
<td>50 M bytes/sec, 32-bit @ 20 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 M bytes/sec, 32-bit @ 40 MHz</td>
<td>External: EXT_CLKIN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>400 M bytes/sec, 32-bit @ 20 MHz</td>
<td>External: EXT_CLKOUT</td>
<td></td>
</tr>
</tbody>
</table>

| Input Voltage             | 0 V min.; High     |                  |                  |
| DC Voltage                |                    |                  |                  |
|                            | 2.4 V min. @ -15 mA (source) |                  |                  |
|                            | 2.9 V               |                  |                  |
|                            | +2.7 V @ ±1 mA max. |                  |                  |
|                            | +0.5 V @ ±22.4 mA  |                  |                  |

| Output Voltage            | 0 V max.           |                  |                  |
| DC Voltage                |                    |                  |                  |
|                            | 2.5 V max.         |                  |                  |
|                            | 2.7 V @ ±1 mA max. |                  |                  |
|                            | 4.5 V min. @ ±4.4 mA (sink) |                  |                  |

| hysteresis                | 500 mV             |                  |                  |
|                          | Power Available at |                  |                  |
|                          | I/O connector      |                  |                  |
|                          | +4.65 ↔ ±2.5 VDC, 1A |                  |                  |

| Pacer                     | Channels           | Timer0, Timer1 and Timer2 |
|                          | Timer0            | Timer pacer for digital input |
|                          | Timer1            | Timer pacer for digital output |
|                          | Timer2            | Interrupt source |
|                          | Resolution        | 16-bit |
|                          | Base Clock        | 10 MHz |

| Power Available at        | I/O Connector Type | 100-pin SCSI-II female |
|                          |                  | 175 x 100 mm (6.9" x 3.9") |

| Power Consumption         | Typical           | Max.           |
|                          | Terminator OFF: -5 V @ 1 A | Terminator OFF: -5 V @ 1 A |
|                          | Terminator ON: +5 V @ 1 A   | Terminator ON: +5 V @ 1 A |

| Temperature and Humidity   | Operating         | Storage         |
|                          | 0 ~ 60° C (32 ~ 140° F) | -20 ~ 85° C (-4 ~ 185° F) |

| Relative Humidity         | 5 ~ 95% RH non-condensing | Cert. |                  |
|                          | (refer to IEC 68-2-2) | FCC, CE certified |                  |

## Ordering Information
- **PCI-1755**
  - Ultra-speed 32-ch Digital I/O Card
- **ADAM-39100**
  - PCI-1755 Wiring Terminal for DIN-rail Mounting
- **PCL-101100-1**
  - 100-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 m
### Specifications

#### Isolated Digital Input
- **Input Channels**: 16 (16-ch/group)
- **Interrupt Inputs**: 4 (IDIO, IDI1, IDIO1, DIO1)
- **Interrupt Levels**: 2 - 7
- **Input Voltage**: 5 ~ 30 V
- **Input Resistance**: 2.7 kΩ @ 1 W
- **Optical Isolation**: 2,500 V
- **Throughput**: 10 kHz max.

#### Isolated Digital Output
- **Output Channels**: 16 (16-ch/group)
- **Optical Isolation**: 2,500 V
- **Throughput**: 10 kHz
- **Supply Voltage**: 5 ~ 40 V
- **Sink Current**: 200 mA max./channel

#### General
- **I/O Connector Type**: 37-pin D-type female
- **Dimensions (L x H)**: 185 x 100 mm (7.3" x 3.9")
- **Power Consumption**:
  - Typical: +5 V @ 320 mA
  - Max: +5 V @ 500 mA
- **Operating Temperature**: 0 ~ 60°C
- **Storage Temperature**: -20~70°C
- **Relative Humidity**: 5 ~ 95% (IEC 68-2-3) non-condensing

### Features
- 32 isolated DIO ch. (16 inputs and 16 outputs)
- 32 TTL-level DIO ch. (16 inputs and 16 outputs)
- High output driving capacity
- Interrupt capability
- Two 20-pin connectors for isolated digital I/O channels
- D-type connector for isolated input and output ch.

#### Ordering Information
- **PCI-1730**: Card, manual and driver CD-ROM (cable not included.)
- **PCI-1733**: 32-channel isolated digital input card, manual and driver CD-ROM (cable not included)
- **PCI-1734**: 32-channel isolated digital output card, user's manual and driver CD-ROM (cable not included)
Introduction

The PCI-1730/1733/1734 cards offer isolated digital input channels as well as isolated digital output channels with isolation protection up to 2,500 VDC, which makes them ideal for industrial applications where high-voltage isolation is required. In addition, all output channels are provided with high-voltage protection.

Applications

- Industrial on/off control
- Contact closure monitoring
- Switch status sensing
- BCD interfacing
- Digital input control
- Industrial and lab automation

General Accessories

- PCLD-780 Universal screw terminal board
- PCLD-880 Universal screw terminal board
- ADAM-3937 DB97 wiring terminal for DIN-rail mounting
- PCL-10137-1 DB97 cable, 1m
- PCL-10137-2 DB97 cable, 2m
- PCL-10137-3 DB97 cable, 3m

Pin Assignments

<table>
<thead>
<tr>
<th>1730 Accessories</th>
<th>1733 Accessories</th>
<th>1734 Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-pin flat cable, 1m</td>
<td>20-pin flat cable, 1m</td>
<td>20-pin flat cable, 1m</td>
</tr>
<tr>
<td>PCLD-782 16-channel opto-isolated D/I board</td>
<td>PCLD-885 16-channel power relay (form A) output board</td>
<td>PCLD-786 8-channel SSR I/O module carrier board</td>
</tr>
</tbody>
</table>

Isolated Input Circuit Diagram

Isolated Output Circuit Diagram
PCI-1752
PCI-1754
PCI-1756

Features
- 64 isolated digital output channels
- High-voltage isolation on output channels (2500 Vdc)
- 2000 Vdc ESD protection
- Wide output range (5 – 40 Vdc)
- High-sink current on isolated output channels (200 mA max./channel)
- Output status read-back for output channels
- Keeps digital output values when hot system reset
- Channel-freeze function

Specifications

General
- I/O Connector Type: 100-pin SCSI-II female
- Dimensions (L x H): 175x100mm (6.9”x3.9”)
- Power Consumption: Typical: +5 V @ 285 mA
- Operating Temperature: -20~70° C (-4 ~ 158° F)
- Storage Temperature: -20~70° C (-4 ~ 158° F)
- Over-Voltage Protection: 2,500 V
- ESD: 2,000 V
- Input Voltage: VIH (max.) Vdc, VIH (min.) Vdc, VIL (max.) Vdc
- Input Current: 10 Vdc, 12 Vdc, 24 Vdc, 48 Vdc, 50 Vdc
- Over-Voltage Protection: 70 Vdc
- Opto-Isolator Resp. Time: 25 µs
- Supply Voltage: 5 ~ 40 Vdc
- Sink Current: 200 mA max./channel

Ordering Information
- PCI-1752: 64-channel Isolated Digital Output Card, user’s manual and driver CD-ROM (cable not included)
- PCI-1754: 64-channel Isolated Digital Input Card
- PCI-1756: 64-channel Isolated Digital I/O Card

PCI-1752
PCI-1754
PCI-1756

Features
- 64 isolated digital input channels
- Either +/- voltage input for DI by group
- High-voltage isolation on input channels (2500 Vdc)
- High-over-voltage protection (70 Vdc)
- Wide input range (10 ~ 50 Vdc)
- Interrupt handling capability
- High-density 100-pin SCSI connector

Specifications

General
- I/O Connector Type: 100-pin SCSI-II female
- Dimensions (L x H): 175x100mm (6.9”x3.9”)
- Power Consumption: Typical: +5 V @ 285 mA
- Operating Temperature: 0-60° C (32 ~ 140° F)
- Storage Temperature: -20~70° C (-4 ~ 158° F)
- Relative Humidity: 5~95 % (IEC 68-2-3, non-condensing)

Isolated Digital Input
- Input Channels: 64 (16-ch/group)
- Interrupt Inputs: 4
- Optical Isolation: 2,500 Vdc
- Opto-Isolator Resp. Time: 25 µs
- Over-Voltage Protection: 70 Vdc
- ESD: 2,000 Vdc
- Input Voltage: VIH (max.) Vdc, VIH (min.) Vdc, VIL (max.) Vdc
- Input Current: 10 Vdc, 12 Vdc, 24 Vdc, 48 Vdc, 50 Vdc

Ordering Information
- PCI-1754: 64-channel Isolated Digital Input Card

PCI-1754
PCI-1756

Features
- Either +/- voltage input for DI by group
- Output status read-back for output channels
- Keeps digital output values after hot system reset

Specifications

General
- I/O Connector Type: 100-pin SCSI-II female
- Power Consumption: Max.: +5 V @ 475 mA
- Opto-Isolator Resp. Time: 25 µs
- Supply Voltage: 5 ~ 40 Vdc
- Sink Current: 200 mA max./channel

Isolated Digital Output
- Output Channels: 32 (16-ch/group)
- Input Channels: 32 (16-ch/group)
- Interrupt Inputs: 2 (DI0, IDI16)
- Optical Isolation: 2,500 Vdc
- Opto-Isolator Resp. Time: 25 µs
- Over-Voltage Protection: 70 Vdc
- ESD: 2,000 Vdc
- Input Voltage: VIH (max.) Vdc, VIH (min.) Vdc
- Input Current: 10 Vdc, 12 Vdc, 24 Vdc, 48 Vdc, 50 Vdc

Ordering Information
- PCI-1756: 64-channel Isolated Digital I/O Card

PCI-1756

64-ch Isolated Digital Output Card
64-ch Isolated Digital Input Card
64-ch Isolated Digital I/O Card

All product specifications are subject to change without notice. Last updated: January 2005

- High-density 100-pin SCSI connector
- Output status read-back for output channels
- Keeps digital output values after hot system reset
- ESD protection
- Includes CD-ROM (cable not included)
- User’s manual and driver CD-ROM (cable not included)

- High-sink current on isolated output channels (200 mA max./channel)
- Output status read-back
- Keeps digital output values when hot system reset
- Channel-freeze function

- High-voltage isolation on input channels (2500 Vdc)
- High-over-voltage protection (70 Vdc)
- Wide input range (10 ~ 50 Vdc)
- Interrupt handling capability

- Either +/- voltage input for DI by group
- Output status read-back for output channels
- Keeps digital output values after hot system reset

- 64 isolated digital output channels
- 2000 Vdc ESD protection
- Wide output range (5 – 40 Vdc)
- High-sink current on isolated output channels (200 mA max./channel)
- Output status read-back

- 100-pin SCSI-II female
- 175x100mm (6.9”x3.9”)
- Typical: +5 V @ 230 mA
- 0-60° C (32 ~ 140° F)
- 5-95 % (IEC 68-2-3, non-condensing)
- +5 V @ 340 mA
- +5 V @ 450 mA
- +5 V @ 475 mA
- +5 V @ 285 mA
- +5 V @ 230 mA
- +5 V @ 340 mA
- +5 V @ 450 mA
- +5 V @ 475 mA
- +5 V @ 285 mA
- +5 V @ 230 mA
- +5 V @ 340 mA
- +5 V @ 450 mA
Feature Details

PCI-1752, PCI-1754 and PCI-1756 offer isolated digital input channels and isolated digital output channels with isolation protection up to 2,500 VDC. This makes them ideal for industrial applications where high-voltage isolation is required. In addition, all output channels are able to keep their last values after a hot system reset. Furthermore, the PCI-1752 and PCI-1756 provide a channel-freeze function that keeps the current output status unchanged for each channel during operation.

Robust Protection

PCI-1752, PCI-1754 and PCI-1756 feature robust isolation protection for applications in industrial, lab and machinery automation. It can durably withstand voltage up to 2,500 VDC, preventing your host system from any incidental harm. If connected to an external input source with surge-protection, PCI-1754 and 1756 can offer up to 2,000 V DC ESD (Electrostatic Discharge) protection for input channels. If the input voltage rises up to 70 V DC, the input channels of PCI-1754 and PCI-1756 can still manage to work properly for a short period of time.

Wide Input/Output Range

PCI-1754 and PCI-1756 have a wide range of input voltages from 10 to 50 V DC, and is therefore suitable for most industrial applications with 12 V DC, 24 V DC and 48 V DC input voltage. PCI-1752 and PCI-1756 feature a wide output voltage range from 5 to 40 V DC, suitable for most industrial applications with 12 V DC/24 V DC output voltages. In the meantime, you can also request specific input/output voltage ranges as products can be tailored to specifications.

BoardID™ Switch

PCI-1752, PCI-1754 and PCI-1756 have a built-in BoardID™ DIP switch that helps define each card’s unique identity when multiple identical PCI cards have been installed in the same computer. The BoardID switch is very useful when you build your system with multiple identical PCI cards. With the correct BoardID switch settings, you can easily identify and access each card during hardware configuration and software programming.

Channel-Freeze Function

PCI-1752 and PCI-1756 provide a Channel-Freeze function, which can be enabled either in dry contact or wet contact mode (selected by the on-board jumper). When the Channel-Freeze function is enabled, the last status of each digital output channel will be safely kept for emergency use. Moreover, you can enable this function through software as it is useful in software simulation and testing program.

Reset Protection Fulfills Requirement for Industrial Applications

If the system has undergone a hot reset (i.e. without turning off the system power), PCI-1752 and PCI-1756 can either retain the output values of each channel or return to its default configuration as open status, depending on its on-board jumper setting. This function protects the system from performing wrong operations during unexpected system resets.
PCI-1758U
128-ch Isolated Digital I/O Card

Features
PCI-1758UDO card
- 128 isolated digital output channels
- High-voltage isolation on output channels (2,500 V<sub>DC</sub>)
- Wide output range (5 ~ 40 V<sub>DC</sub>)
- High-sink current for isolated output channels (90 mA max./Channel)
- Current protection for each port
- BoardID™ switch
- Output status read-back
- Digital output value retained after hot system reset
- Programmable Power-Up States
- Watchdog timer

PCI-1758UDI card
- 128 isolated digital input channels
- Wide input range (5 ~ 25 V<sub>DC</sub>)
- High ESD protection (2,000 V<sub>DC</sub>)
- Digital Filter function
- BoardID™ switch
- Interrupt handling capability for each channel (128-ch)

Specifications
Isolated Digital Input

<table>
<thead>
<tr>
<th>Model Name</th>
<th>PCI-1758UDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Channels</td>
<td>128</td>
</tr>
<tr>
<td>Interrupt Input</td>
<td>128</td>
</tr>
<tr>
<td>Optical Isolation</td>
<td>2,500 V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>Opto-Isolator Response Time</td>
<td>50 µs</td>
</tr>
<tr>
<td>Input Voltage</td>
<td></td>
</tr>
<tr>
<td>VIH (max)</td>
<td>25V</td>
</tr>
<tr>
<td>VIH (min)</td>
<td>5V</td>
</tr>
<tr>
<td>VIL (max)</td>
<td>2.5V</td>
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<tr>
<td>Input Resistance</td>
<td>3 kΩ</td>
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</tbody>
</table>

Isolated Digital Output

<table>
<thead>
<tr>
<th>Model Name</th>
<th>PCI-1758UDO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Channels</td>
<td>128</td>
</tr>
<tr>
<td>Optical Isolation</td>
<td>2,500 V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>Opto-Isolator Response Time</td>
<td>50 µs</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td></td>
</tr>
<tr>
<td>5-40 V</td>
<td></td>
</tr>
<tr>
<td>Sink Current</td>
<td></td>
</tr>
<tr>
<td>90 mA max./Channel</td>
<td></td>
</tr>
</tbody>
</table>

General

<table>
<thead>
<tr>
<th>Model Name</th>
<th>PCI-1758UDI</th>
<th>PCI-1758UDO</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Connector Type</td>
<td>MINI-SCSI HDRA-E100 Female</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>175 x 100 mm (6.9” x 3.9”)</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td>+5 V @ 0.3 A</td>
<td>+5 V @ 1.1 A</td>
</tr>
<tr>
<td>Max.</td>
<td>+5 V @ 0.6 A</td>
<td>+5 V @ 2.2 A</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>0 ~ 60° C (32 ~ 140° F) (refer to IEC 68-2-1,2)</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-20 ~ 70° C (-4 ~ 158° F)</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 ~ 95% RH non-condensing (refer to IEC 68-2-3)</td>
<td></td>
</tr>
</tbody>
</table>

Feature Details
Interrupt Function (PCI-1758UDI)
PCI-1758UDI provides an interrupt function for every digital input channel. All the isolated digital input channels are connected to the interrupt circuitry. You can disable/enable the interrupt functions, select trigger type by setting the Rising Edge Interrupt Registers and Falling Edge Interrupt Registers of PCI-1758UDI. When the interrupt request signals occur, software will service these interrupt requests by ISR. The multiple interrupt sources provide the card with more capability and flexibility.

Digital Filter Function (PCI-1758UDI)
The digital filter function is used to eliminate glitches on input data and reduce the number of changes to examine and process. The filter blocks pulses that are shorter than the specified timing interval and passes pulses that are twice as long as the specified interval. Intermediate-length pulses that are longer than half of the interval, but less than the interval, may or may not pass the filter.

Watchdog Timer Function (PCI-1758UDO)
This feature is used to set critical outputs to safe states in the event of a software failure. When the watch-dog timer is enabled, the PCI-1758UDO has to receive a “watchdog clear” software command within the interval time specified for the watchdog timer. If it doesn’t, this is considered a loss of communication between the application and PCI-1758UDO, and the outputs go to a user-defined safe state and remain in that state until the watchdog timer is disabled and new values are written by the software. After the watchdog timer expires, the PCI-1758UDO will ignore any writes until the watchdog timer is disabled. You can set the watchdog timer timeout period through the WDT register to specify the amount of time that must elapse before the watchdog timer expires. The counter on the watchdog timer is configurable up to (2<sup>32</sup>-1) x 100 ns (approximately seven minutes) before it expires.

Programmable Power-up Status Function (PCI-1758UDO)
User-configurable power-up states are useful for ensuring that the PCI-1758UDO powers up in a known state. When the system is power-up, all output lines of PCI-1758UDO are user-configurable for logic high output or logic low output. So the output can be predefined by users. This function ensures the card’s output state can be defined at any time.

Applications
1. Industrial On/Off control
2. Relay and switch monitoring and controlling
3. Industrial and lab automation

Ordering Information
- PCI-1758UDI 128-channel Isolated Digital Input Card
- PCI-1758UDO 128-channel Isolated Digital Output Card
- PCL-101100S-1 100-pin SCSI Cable, 1m
- ADAM-39100 100-pin SCSI wiring terminal, DIN-rail mounting
### Specifications

#### Digital Input
- **Logic High Voltage**: 2.0 to 5.25 V
- **Logic Low Voltage**: 0.0 to 0.80 V
- **High Level Input Current**: 20 mA
- **Low Level Input Current**: -0.2 mA

#### Digital Output
- **Logic High Voltage**: 2.4 V minimum
- **Logic Low Voltage**: 0.4 V maximum (source)
- **High Level Input Current**: 15 mA maximum (sink)
- **Driving Capability**: 15 LS TTL

#### Interrupt Source
- **PC0, PC4**

#### General
- **Connector**: One D-SUB 25-pin female connector
- **Power Consumption**: 5 V @ 140 mA (Typical)
- **Operating Temperature**: 0 – 70°C (32 – 158°F)
- **Storage Temperature**: -20 – 80°C (-4 – 176°F)
- **Humidity**: 5 – 95% non-condensing
- **Dimensions**: 119.91 x 64.41 mm (4.721” x 2.536”) Low profile PCI MD1 card size

### Introduction

The PCI-1757UP is a 24-bit DI/O low profile PCI card that meets the PCI standard REV.2.2 (universal PCI expansion card). The card also works with 3.3 V and 5 V PCI slots, and provides you with 24 bits of parallel digital input/output, that emulates mode 0 of the 8255 PPI chip. However, the buffered circuits offer a higher driving capability than the 8255.

### Features
- Low profile PCI card
- Universal PCI card, fits 3.3 V and 5 V PCI slot
- 24 TTL level digital I/O lines
- Emulates mode 0 of 8255 PPI
- Buffered circuits provide higher driving capability
- Output status read-back
- I/O configurable by software or on board DIP switch
- Keeps port I/O settings and digital output states after hot reset
- BoardID™ switch
- High density D-SUB 25-pin connector

### Ordering Information
- **PCI-1757UP**: 24-channel Digital Input/Output Card
- **ADAM-3925**: DB25 wiring terminal for DIN-rail mounting

### Pin Assignments
**Introduction**

PCI-1736UP offer isolated digital input channels as well as isolated digital output channels with isolation protection up to 2,500 V<sub>oc</sub>, which makes it ideal for industrial applications where high-voltage isolation is required.

In addition, all output channels provide high-voltage protection. The low profile PCI form factor and universal PCI connector (V2.2 compliant) meet requirements for size and power consumption.

**Specifications**

- **Bus interface**
  - PCI bus spec. 2.2 compliant
  - PCI universal card (both 3.3V and 5V signalling)
- **IRQ**
  - All ports use the same IRQ assigned by PCI Plug-and-Play
- **I/O Channels**
  - 16 Isolated DI and 16 Isolated DO
- **Isolation Protection**
  - 2500 V<sub>oc</sub>
- **Input Voltage Range**
  - 5-50 V<sub>cc</sub>
- **Output Voltage Range**
  - Open collector 5-40 V<sub>cc</sub>
- **Connector**
  - DB-44 female connector
- **Dimensions**
  - Low profile PCI MD1 (119.91 x 64.41 mm)
- **Operating Temperature**
  - 0 – 60 °C (32 – 140° F)
- **Storage Temperature**
  - -25 – 85 °C (-4 – 185° F)
- **Operating Humidity**
  - 5 – 95% Relative Humidity, non-condensing

**Ordering Information**

- **PCI-1736UP**
  - 32-channel isolated digital input/output card
- **PCI-18144-1**
  - DB 44-pin cable, 1m
- **ADAM-3944**
  - DB-44 Wiring Terminal for DIN-rail mounting

**Applications**

- Industrial on/off control
- Contact closure monitoring
- Switch status sensing
- BCD interfacing
- Digital input control
- Industrial and lab automation

**Pin Assignments**

- **EI.WCOM1**
  - E1.WCOM2
  - 15
  - 20
  - 25
  - 30
- **DI0**
  - 0
  - 5
  - 10
  - 15
  - 20
- **DI1**
  - 1
  - 6
  - 11
  - 16
  - 21
- **DI2**
  - 2
  - 7
  - 12
  - 17
  - 22
- **DI3**
  - 3
  - 8
  - 13
  - 18
  - 23
- **DI4**
  - 4
  - 9
  - 14
  - 19
  - 24
- **DI5**
  - 5
  - 10
  - 15
  - 20
  - 25
- **DI6**
  - 6
  - 11
  - 16
  - 21
  - 26
- **DI7**
  - 7
  - 12
  - 17
  - 22
  - 27
- **DI8**
  - 8
  - 13
  - 18
  - 23
  - 28
- **DI9**
  - 9
  - 14
  - 19
  - 24
  - 29
- **DI10**
  - 10
  - 15
  - 20
  - 25
  - 30
- **EI.DCOM1**
  - E1.DCOM2
  - 9
  - 14
  - 19
  - 24
  - 29
- **EI.GND1**
  - E1.GND2
  - 23
  - 28
  - 33
  - 38
- **PCOM1**
  - P10
  - 1
  - 6
  - 11
  - 16
- **PCOM2**
  - 2
  - 7
  - 12
  - 17
  - 22
- **E.GND1**
  - E.GND2
  - 38
  - 33
  - 38
  - 33
  - 38

**Features**

- 32 isolated DI/O channels (16 inputs and 16 outputs)
- High output driving capacity
- High-voltage isolation on I/O channels (2500 VDC)
- Interrupt handling capability
- D-type connector for isolated input and output channels
- Keep digital output values when hot system reset
- Wide input range (5 – 50 V<sub>cc</sub>)
- Surge protection
- Universal PCI Bus
- Low profile card
- BoardID™ switch
Introduction
PCI-1763UP relay actuator and isolated DI card is an add-on card for the PCI bus. It provides 8 optically-isolated digital inputs with isolation protection of 2500 VDC for collecting digital inputs in noisy environments, and 8 relay actuators for serving as on/off control devices or small power switches. For easy monitoring, each relay is equipped with one red LED to show its on/off status. The PCI-1761’s eight optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials. The low profile PCI form factor and universal PCI connector (V2.2 compliant), meet requirements for size and reduced power consumption.

Specifications

Isolated Digital Input
- Channels: 8
- Optical Isolation: 3,750 V<sub>DC</sub>
- Opto-isolator: 25 µs
- Response Time
- Over-Voltage Protection: 70 V<sub>DC</sub>
- Input Voltage: 5 ~ 50 V<sub>DC</sub>
- Input Current: 3.16 mA @ 10 V<sub>DC</sub> 17.3 mA @ 50 V<sub>DC</sub>

Relay Output
- Channels: 8
- Relay Type: DPDT (8 Form C)
- Rating (resistive): 0.25 A @ 240 V<sub>AC</sub> or 1 A @ 30 V<sub>DC</sub>
- Max. Switching Power: 62.5 VA, 60 W
- Insulation Resistance: 1,000 MΩ min. (at 500 V<sub>DC</sub>)
- Operate Time: 5 ms max.
- Release Time: 4 ms max.
- I/O Connector Type: DB44 female
- Dimensions: 119.91 x 64.41 mm
- Power Consumption: +5V @ 107.5 mA (typical) +5V @ 301.3 mA (max.)

Environment
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F) (refer to IEC 68-2-1,2)
- Storage Temperature: -20 ~ 70° C (-4 ~158° F)
- Relative Humidity: 5 ~ 95 % RH non-condensing (refer to IEC 68-2-3)

Features
- 8 relay output channels and 8 isolated digital input channels
- LED indicators to show activated relays
- 8 Form C type relay output channels
- Output status read-back
- Retained relay output values when hot system reset
- High-voltage isolation on input channels (3,750 V<sub>DC</sub>)
- High ESD protection (2,000 V<sub>DC</sub>)
- High over-voltage protection (70 V<sub>DC</sub>)
- Wide input range (10 ~ 50 V<sub>DC</sub>)
- Interrupt handling capability
- Support Universal PCI Bus
- Low Profile PCI card
- BoardID™ switch

Pin Assignments

Ordering Information
- PCI-1763UP 8-ch Relay and 8-ch Isolated DI card
- PCL-10144-1 DB 44-pin cable, 1m
- ADAM-3944 DB-44 Wiring Terminal for DIN-rail mounting
Introduction

PCI-1750 offers 16 isolated digital input channels, 16 isolated digital output channels, and one isolated counter/timer for the PCI bus. With isolation protection of 2,500 V_{DC}, and dry contact support, PCI-1750 is ideal for industrial applications where high-voltage protection is required. Each I/O channel of the PCI-1750 corresponds to a bit in a PC I/O port. This makes PCI-1750 very easy to program. This card also offers a counter or timer interrupt and two digital input interrupt lines to a PC. So you can then easily do configurations by software.

Plug & Play

PCI-1750 uses a PCI controller to interface the card to the PCI bus. The controller fully implements PCI bus specification Rev 2.1. All bus relative configurations, such as base address and interrupt assignment, are automatically controlled by the software. No jumper or DIP switch is required for user configuration.

On-board Programmable Counter/Timer

PCI-1750 provides a programmable counter/timer for generating periodic interrupts to the host computer. The counter/timer chip is an 82C54, which includes three 16-bit counters based on a 10 MHz clock. One counter is used to count events coming from the isolated input channel. The other two are cascaded together to make a 32-bit timer.

Specifications

Digital Input
- 16 Optically-isolated Inputs
  - Input Range: 5 – 50 V_{DC} or dry contact
  - Isolation Voltage: 2,500 V_{DC}
  - Throughput: 10 kHz

Digital Output
- 16 Optically-isolated Outputs
  - Output Range: Open collector 5 – 40 V_{DC}
  - Sink Current: 200 mA max. per channel
  - Isolation Voltage: 2,500 V_{DC}
  - Throughput: 10 kHz

Programmable Counter/Timer
- One 32-bit timer
- One 16-bit optically-isolated Counter
  - Shares pin with isolated input 15
  - Throughput: 1 MHz max.
  - Isolation voltage: 2,500 V_{DC}

General
- Interrupt Source: Isolated input 0, 8, counter and timer
- Power Consumption: 5 V @ 850 mA (typical), 5 V @ 1.0 A (max.)
- Operating Temperature: 0 – 70° C (32 – 158° F)
- Storage Temperature: -20 – 80° C (-4 – 176° F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- Connectors: One 37-pin D-type female connector
  - One 2-pin terminal block for extended ground
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)

Features
- 16 isolated DI and 16 isolated DO channels
- High voltage isolation on all isolated channels (2,500 V_{DC})
- High sink current on isolated output channels (200 mA/channel)
- Supports dry contact or 5 – 50 V_{DC} isolated inputs
- Interrupt handling
- Timer/counter interrupt capability

Ordering Information
- PCI-1750 32-channel isolated DIO and Counter Card, user’s manual and driver CD-ROM. (cable not included)
- PCL-10137-1 DB37 cable assembly, 1m
- PCL-10137-2 DB37 cable assembly, 2m
- PCL-10137-3 DB37 cable assembly, 3m
- ADAM-3937 37-pin D-type cable wiring terminal for DIN-rail mounting

Applications
- Industrial on/off control
- Contact closure monitoring
- Switch status sensing
- BCD interfacing
- Digital I/O control
- Industrial and lab automation

Pin Assignments
Introduction
The PCI-1761 relay actuator and isolated D/I card is an add-on card for the PCI bus. It provides 8 optically-isolated digital inputs with isolation protection of 3,750 V<sub>dc</sub> for collecting digital inputs in noisy environments and 8 relay actuators for serving as on/off control devices or small power switches. For easy monitoring, each relay is equipped with one red LED to show its on/off status. The PCI-1761's eight optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials.

Rugged Protection
The PCI-1761 digital input channels feature a rugged isolation protection for industrial, lab and machinery automation applications. It durably withstands voltage up to 3,750 V<sub>dc</sub>, protecting your host system from any incidental harms. If connected to an external input source with surge-protection, the PCI-1761 can offer up to a maximum of 2,000 V<sub>dc</sub> ESD (Electrostatic Discharge) protection. Even with an input voltage rising up to 70 V<sub>dc</sub>, the PCI-1761 can still manage to work properly, albeit for only a short period of time.

Reset Protection Fulfills Requirement for Industrial Applications
When the system has undergone a hot reset (i.e. without turning off the system power), the PCI-1761 can either retain output values of each channel, or return to its default configuration as open status, depending on its onboard jumper setting. This function protects the system from unwanted operations during unexpected system resets.

Specifications

**Isolated Digital Input**
- Channels: 8
- Optical Isolation: 3,750 V<sub>dc</sub>
- Opto-isolator: 25 µs
- Response Time
  - Over-Voltage Protection: 70 V<sub>dc</sub>
  - Input Voltage: 10 – 50 V<sub>dc</sub>
  - Input Current: 1.6 mA @ 10 V<sub>dc</sub>
  - 8.9 mA @ 50 V<sub>dc</sub>

**Relay Output**
- Channels: 8
- Relay Type: SPDT (4 Form C and 4 Form A)
- Rating (resistive): 3 A @ 250 V<sub>ac</sub> or 3 A @ 24 V<sub>dc</sub>
- Max. Switching Power: 750 VA, 72 W
- Max. Switching Load: 10 mA @ 5 V<sub>dc</sub>
- Insulation Resistance: 1,000 MΩ min. (at 500 V<sub>dc</sub>)
- Operate Time: 15 ms max.
- Release Time: 5 ms max.

**General**
- Connector: One 37-pin D-type connector
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)
- Power Consumption
  - +5 V @ 220 mA (typical)
  - +5 V @ 750 mA (max.)
- Operating Temperature: 0 – 60° C (32 – 140° F) (refer to IEC 68-2-1, 2)
- Storage Temperature: -20 – 70° C (-4 – 158° F)
- Operating Humidity: 5 – 95 % RH non-condensing (refer to IEC 68-2-3)

**Ordering Information**
- PCI-1761: 8-ch Relay Actuator and 8-ch Isolated D/I Card
- PCL-10137-1: DB37 cable assembly, 1m
- PCL-10137-2: DB37 cable assembly, 2m
- PCL-10137-3: DB37 cable assembly, 3m
- ADAM-3937: DB37 Wiring Terminal for Din-rail Mounting
- PCLD-880: Universal screw terminal board
**PCI-1760 PCI-1760U**

**Introduction**

The PCI-1760U relay actuator and isolated D/I card is a PCI add-on card for the PCI bus. It meets the PCI standard Rev. 2.2 (Universal PCI expansion card), and works with both 3.3 \text{V} and 5 \text{V} PCI slots. It provides 8 opto-isolated digital inputs with isolation protection of 2,500 V\text{DC} for collecting digital inputs in noisy environments, 8 relay actuators that can be used as an on/off control devices or small power switches, and 2 isolated PWM (Pulse Width Modulation) outputs for custom applications.

For easy monitoring, each relay is equipped with one red LED to show its on/off status. Each isolated input supports both dry contact and wet contact so that it can easily interface with other devices when no voltage is present in the external circuit.

**Specifications**

**Isolated Digital Input**

- **Channels**: 8 (Sink)
- **Opto-isolator**: PC354
- **Input Voltage**: 5 – 12 \text{V}_{\text{DC}}
  - High: > 4.5 \text{V}
  - Low: < 1.0 \text{V}
  - Uncertain: 1.0 \text{V} \geq \text{Vin} \geq 4.5 \text{V}
- **Input Resistance**: 1 k\text{\Omega} \pm 1/4 \%W
- **Isolation Voltage**: 2,500 \text{V}_{\text{DC}}
- **Digital Filter**: Minimum effective high input period \geq [(2 – 65535) \times 5 \text{ms}] + 5 \text{ms}
  Minimum effective low input period \geq [(2 – 65535) \times 5 \text{ms}] + 5 \text{ms}
- **16-bit UP Counter**: Maximum effective input frequency: 500 Hz
  - Minimum High period \geq 1 \text{ms}
  - Minimum Low period \geq 1 \text{ms}

**Relay Output**

- **Channels**: 8
- **Relay Type**: Single-pole double-throw (SPOT, Form C)
- **Output Type**: CH0 and CH1: NC and NO outputs
  CH2 – CH7: NC or NO outputs (selected by jumper)
- **Rating Contact Load**: 120 \text{V}_{\text{AC}} \pm 0.5 \text{A} or 30 \text{V}_{\text{AC}} \pm 1 \text{A}
- **Contact Resistance**: Less than 100 m\text{\Omega} \pm 1/4 \%
- **Dielectric Strength**: Coil to contacts (deenergized): 1,500 \text{V}_{\text{RMS}} (1 minute)
  Between open contacts (deenergized): 1,000 \text{V}_{\text{RMS}} (1 minute)
- **Life Expectancy**: 200,000 operations @ 0.5 \text{A} 120 \text{V}_{\text{AC}}
  500,000 operations @ 1.0 \text{A} 30 \text{V}_{\text{AC}}
- **Operating Time**: 5 ms max.
- **Releasing Time**: 5 ms max.

**Isolated PWM output**

- **Channels**: 2
- **Isolation Voltage**: 2,500 \text{V}_{\text{DC}}
- **Scaling Resolution**: 16 bits (100 ms for each step)
  - High period = [(1 – 65535) \times 100 \text{ms}] + 50 \text{ms} (max.)
  - Low period = [(1 – 65535) \times 100 \text{ms}] + 50 \text{ms} (max.)
- **Output Level**: High: (5 \pm 0.5) \text{V}
  Low: < 0.8 \text{V}

**General**

- **Power Consumption**: +5 \text{V} @ 450 mA (typical), 850 mA (max.)
- **Operating Temperature**: 0 – 60\degree \text{C} (32 – 140\degree \text{F}) (IEC 68-2-1, 2)
- **Storage Temperature**: -20 – 70\degree \text{C} (-4 – 158\degree \text{F})
- **Operating Humidity**: 5 – 95 \% RH non-condensing (IEC 68-2-3)

**Physical**

- **Connector**: One 37-pin D-type connector
- **Dimensions (L x H)**: 175 x 100 mm (6.9" x 3.9")

**Ordering Information**

- **PCI-1760U**: Relay Actuator and Isolated D/I Card, user’s manual and driver CD-ROM (cable not included)
- **PCI-1760**: 8-ch Relay Actuator and Isolated D/I card
- **PCL-10137-1**: DB37 cable assembly, 1m
- **PCL-10137-2**: DB37 cable assembly, 2m
- **PCL-10137-3**: DB37 cable assembly, 3m
- **ADAM-3937**: DB37 wiring terminal for DIN-rail mounting

**Applications**

- Digital signal and contact status monitoring
- Industrial On/Off control
- Signal switching
- External relay driving
Introduction

The PCI-1762 relay actuator and isolated D/I card is a PC add-on card for the PCI bus. It provides 16 opto-isolated digital inputs with isolation protection of 2,500 V$_{DC}$ for collecting digital inputs in noisy environments, 16 relay actuators for serving as on/off control devices or small power switches. For easy monitoring, each relay is equipped with one red LED to show its on/off status. The PCI-1762's sixteen optically-isolated digital input channels are ideal for digital input in noisy environments or with floating potentials.

Specifications

### Isolated Digital Input
- **Input Channels**: 16
- **Optical Isolation**: 2,500 V$_{DC}$
- **Opto-Isolator Response Time**: 25 µs
- **Over-Voltage Protection**: 70 V$_{DC}$
- **Input Voltage**:
  - VIH (max.) 50 V$_{DC}$
  - VIH (min.) 10 V$_{DC}$
  - VIL (max.) 3 V$_{DC}$
  - VIL (max.) 10 V$_{DC}$ 1.6 mA (typical)
  - 12 V$_{DC}$ 1.9 mA (typical)
  - 24 V$_{DC}$ 4.1 mA (typical)
  - 48 V$_{DC}$ 8.5 mA (typical)
  - 50 V$_{DC}$ 8.9 mA (typical)

### Relay Output
- **Output Channels**: 16
- **Relay Type**: SPDT (Form A or Form B, Jumper selectable)
- **Rating (resistive)**:
  - 0.5 A @ 125 V$_{AC}$
  - 1 A @ 30 V$_{DC}$
- **Max. Switching Power**: 62.5 AV, 30 W
- **Max. Switching Voltage**: 250 V$_{AC}$, 220 V$_{DC}$
- **Max. Switching Current**: 2 A
- **Minimum Switching Load**: 10 µA @ 10 m V$_{DC}$
- **Breakdown Voltage**: 1,500 V$_{DC}$ for 1 min. (between coil and contacts)
- **Operate Time**: 6 ms max.
- **Release Time**: 4 ms max.
- **Insulation Resistance**: 1,000 MΩ min. (at 500 V$_{AC}$)
- **Life Expectancy**: 2 x 105 ops. min. (0.5 A @ 125 V$_{DC}$), 5 x 105 ops. min. (1 A @ 30 V$_{DC}$)

General
- **I/O Connector Type**: DB62 D-type female connector
- **Dimensions**: 175 x 100 mm (6.9” x 3.9”)
- **Power Consumption**:
  - +5V @ 250 mA (typical)
  - +5V @ 620 mA (max.)
- **Operating Temperature**: 0 – 60° C (32 – 140° F) (IEC 68-2-1,2)
- **Storage Temperature**: -20 – 70° C (-4 – 158° F)
- **Relative Humidity**: 5 - 95 % non-condensing (IEC 68-2-3)
- **Certification**: CE Class A

Ordering Information
- **PCI-1762**: 16-ch Isolated Digital Input and 16-ch Relay Output Card
- **PCL-10162-1**: PCL-10162-1 DB-62 cable assembly, 1m
- **PCL-10162-3**: PCL-10162-3 DB-62 cable assembly, 3m
- **PCL-10162-5**: PCL-10162-5 DB-62 cable assembly, 5m
- **ADAM-3962**: DB62 Wiring Terminal for Din-rail Mounting

Applications
- **Industrial On/Off control**
- **Switch status sensing**
- **Digital I/O control**
- **Industrial and lab automation**
- **SMT/PCB machinery**
- **Semi-conductor machinery**
- **PC-based Industrial Machinery**
- **Testing & Measurement**
- **Laboratory & Education**
- **External relay driving**

All product specifications are subject to change without notice.
PCI-1780

8-ch Counter/Timer Card

Introduction

PCI-1780 is a general purpose multiple channel counter/timer card for the PCI bus. It targets the AM9513 to implement the counter/timer function by CPLD. Plus, it provides eight 16-bit counter channels and 8 digital outputs and 8 digital inputs. Advantech has designed powerful counter functions to for a broad range of industrial and laboratory applications.

Flexible Counter Modes

The PCI-1780 features up to 12 programmable counter modes, to provide one shot output, PWM output, periodic interrupt output, time-delay output, and to measure the frequency and the pulse width. The PCI-1780 is an ideal solution for various counter/timer applications.

Special Shielded Cable for Noise Reduction

The PCL-10168 shielded cable is specially designed for the PCI-1780 for reducing noise. Its wires are all twisted pairs, and the input signals and output signals are separately shielded, providing minimal cross talk between signals and the best protection against EMI/EMC problems.

BoardID™ Switch

PCI-1780 has a built-in BoardID™ DIP switch that helps define each card’s unique identity when multiple identical PCI cards have been installed in the same computer. The BoardID switch is very useful when you build your system with multiple identical PCI cards. With the correct BoardID switch settings, you can easily identify and access each card during hardware configuration and software programming.

Plug & Play Function

PCI-1780 is a Plug & Play device which fully complies with PCI Specification Rev 2.2. During card installation, there is no need to set jumpers or DIP switches. Instead, all

Specifications

<table>
<thead>
<tr>
<th>Programmed Counter</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>8 (independent)</td>
<td></td>
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<tr>
<td>Resolution</td>
<td>16-bit</td>
<td></td>
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<tr>
<td>Programmable Counter Modes</td>
<td>8 independent</td>
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<tr>
<td>Clock Source</td>
<td>12</td>
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<tr>
<td>Max. Frequency</td>
<td>20 MHz</td>
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<tr>
<td>Interrupt Source</td>
<td>8 counter outputs</td>
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<thead>
<tr>
<th>Digital Input/Output</th>
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<tbody>
<tr>
<td>Input Channels</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>Low: 0.8 V max.</td>
<td></td>
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<tr>
<td>High: 2.4 V min.</td>
<td></td>
<td></td>
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<tr>
<td>Interrupt Source</td>
<td>Channel 0</td>
<td></td>
</tr>
<tr>
<td>Output Channels</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Output Voltage</td>
<td>Low: 0.5 V max. @ 24 mA (sink)</td>
<td></td>
</tr>
<tr>
<td>High: 2.4 V min. @ -15 mA (source)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>General</th>
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<tbody>
<tr>
<td>I/O Connector Type</td>
<td>68-pin SCSI-II female</td>
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<tr>
<td>Dimensions</td>
<td>175 x 100 mm (6.9” x 3.9”)</td>
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</tr>
<tr>
<td>Power Consumption</td>
<td>Typical: +5 V @ 900 mA</td>
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<tr>
<td>Max.: +5 V @ 1.2 A</td>
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<tr>
<td>Operating Temperature</td>
<td>0 – 60° C (32 – 140° F) (IEC 68-2-1, 2)</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 – 70° C (-4 – 158° F)</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 – 95 % RH non-condensing (IEC 68-2-3)</td>
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<tr>
<td>Certifications</td>
<td>CE certified</td>
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</tr>
<tr>
<td>PWM Range</td>
<td>0.0005 – 60 Sec.</td>
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</tr>
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</table>

Ordering Information

- PCI-1780: 8-channel Counter/Timer Card
- PCL-10168: 68-pin SCSI-II cable with male connectors on both ends and special shielding for noise reduction, 1 and 2 m
- ADAM-3968: 68-pin SCSI-II Wiring Terminal Board for DIN-rail mounting

All product specifications are subject to change without notice

Last updated: January 2005
Features
- Eight single-ended analog inputs
- Programmable A/D input range
- A/D, D/A with pacer
- One analog output
- 12-bit A/D and D/A resolution
- 16 digital inputs
- 16 digital outputs
- Includes versatile drivers in popular programming languages plus calibration, demo and example programs
- Screw-terminal board and cable included

Introduction
PCL-711 is a fully-integrated package that offers four of the most popular I/O functions for PC/AT and compatible systems: A/D conversion, D/A conversion, digital input and digital output.

The inexpensive PCL-711 is ideal for entry level applications. The features of this half-sized card include: eight 12-bit analog inputs, one 12-bit analog output, 16 digital inputs and 16 digital outputs. In addition, it comes with a 20-point screw-terminal board and a flat cable connector.

PCL-711 performs a variety of I/O jobs, and features solid software support and a large selection of available daughterboards and accessories. It is an ideal and affordable performer for OEMs, schools and hobbyists who require a combination of analog and digital I/O.

Specifications

Analog Input
- Channels: 8 single-ended
- A/D Converter: 12 bit, 25 µs conversion time
- Input Range (V): ±5, ±2.5, ±1.25, ±0.625, ±0.3125
- Trigger Mode: Software, pacer or external trigger
- Data Transfer: Program control, interrupt (IRQs 2 – 7)
- Accuracy: ±2 LSB
- Common Mode Rejection: 60 dB typical
- Input Impedance: >10 MΩ
- Common Mode Rejection: ±50 Vdc, max.

Analog Output
- Channels: One 12-bit double-buffered channel
- D/A Range: 0 – 5 V or 0 – 10 V
- Settling Time: 30 µs

Digital Input
- Channels: 16, TTL level

Digital Output
- Channels: 16
- Logic level 0: 0.5 V max. @ 8 mA (sink)
- Logic level 1: 2.4 V min. @ 0.4 mA (source)

General
- Power Consumption: +5 V @ 500 mA typical, 1.0 A max.
- +12 V @ 50 mA typical, 100 mA max.

Applications
- DC voltage measurement
- Transducer/sensor interfacing
- Process control
- Contact closure monitoring
- Digital signal and BCD interfacing
- Industrial On/Off control
- Multiplexer and relay control

Ordering Information
- PCL-711S: PCL-711B card, user’s manual, driver CD-ROM, PCLD-7115 and 1 m 20-pin flat cable (PCL-10120-1)
- PCL-711B: PCL-711B card only (PCLD-7115, 1 m 20-pin cable, user manual and driver CD-ROM NOT included)
- PCL-10120-1: 20-pin flat cable, 1m
- PCL-10120-2: 20-pin flat cable, 2m

-12 V @ 14 mA typical, 20 mA max.
- Operating Temperature: 0 – 50°C (32 – 122°F)
- Storage Temperature: -20 – 65°C (-4 – 149°F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- I/O Ports: 16 consecutive I/O ports per card
- Connectors: One 20-pin flat cable connector for A/D and D/A
- One 20-pin flat cable connector for digital input
- One 20-pin flat cable connector for digital output
- Dimensions (L x H): 155 x 100 mm (6.1” x 3.9”)

All product specifications are subject to change without notice.

Last updated: January 2005
Introduction

PCL-812PG is a multifunction analog and digital I/O card that features the five most desired measurement and control functions for PC/AT and compatible systems: A/D conversion, D/A conversion, digital input, digital output and counter/timer. This half-size card neatly packages 16 12-bit analog input channels, two 12-bit analog output channels, 16 digital input channels, 16 digital output channels and a programmable counter/timer.

In addition to all the features listed above, PCL-812PG offers the convenience of programmable analog input ranges, where the analog input range can be switched by software commands instead of DIP switches. PCL-812PG also delivers convenience and maximum resolution for applications that need different gains for different channels or different gains for different stages of a process.

Comprehensive software support, numerous I/O options and a wide range of available daughterboards make the PCL-812PG ideal for industrial applications that require a combination of analog and digital I/O.

Specifications

Analog Input
- Channels: 16 single-ended
- A/D Converter: 12-bit, 25 µs conversion time
- Input Range (V, software programmable): ±10, ±5, ±2.5, ±1.25, ±0.625, ±0.3125
- Trigger Mode: Software, pacer or external trigger
- Data Transfer: Program controlled, interrupt 2 – 7, 9 – 12, 14, 15 or DMA (Channel 1 or 3) for single channel scan
- Accuracy: 0.01% of reading ±1 LSB
- Common Mode Rejection: 60 dB typical
- Input Impedance: >10 MΩ
- Overvoltage: Continuous ±30 V, max.

Analog Output
- Channels: Two double-buffered 12-bit channels
- D/A Range (in V): 0 – 5, 0 – 10 w/internal reference; ±10 V max. with external AC or DC reference (accuracy for output above ±9 V may vary depending on power supply used)
- Settling Time: 30 µs
- Throughput: 30 K/S max.
- Output Current: ±5 mA max.
- Linearity: ±½ bit

Digital Input
- Channels: 16, TTL level

Digital Output
- Channels: 16, TTL compatible
- Driving Capacity: 8.0 mA @ 0.5 V (sink); 0.4 mA @ 2.4 V (source)

A/D Pacer and counter (8254 compatible)
- A/D Pacer: 32-bit timer with a 20 MHz time base
- Max. and Min. Rates: 500 kHz – 0.00046 Hz (one sample every 36 minutes)
- Counter: One 16-bit counter with a 2 MHz time base

General
- Power Consumption: +5 V @ 500 mA typical; 1.0 A max.
- Operating Temperature: 0 – 50° C (32 – 122° F)
- Storage Temperature: -20 – 65° C (-4 – 149° F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- I/O Ports: 16 consecutive bytes
- Connectors: Two 20-pin flat cable connectors
- Dimensions (L x H): 165 x 100 mm (7.3" x 3.9")

Ordering Information
- PCL-812PG: MultiLab Analog and Digital I/O Card, user's manual and driver CD-ROM. (cable not included)
- PCL-10120-1: 20-pin flat cable, 1m
- PCL-10120-2: 20-pin flat cable, 2m
- PCLD-780: Screw terminal board
- PCLD-8115: Industrial wiring terminal board with CJC circuit
PCL-818 Series

High-Performance Multifunction Cards

Introduction

The PCL-818 series is a family of high-performance, multifunction cards that offer the five most desired measurement and control functions: 12-bit A/D conversion, D/A conversion, digital input, digital output and counter/timer.

Automatic Channel/Gain Scanning

All PCL-818 cards feature an automatic channel/gain scanning circuit. This circuit, instead of your software, controls multiplexer switching during sampling. On-board SRAM stores different gain values for each channel. This combination lets you perform multi-channel high-speed sampling (up to 100 kHz) with different gains for each channel and DMA data transfer.

Unique Technology

PCL-818 cards share a custom-designed 160-pin ASIC chip that has a gate count of over 7,000 and utilizes 1.0 mm CMOS technology. This custom integration gives higher performance and reliability with lower power consumption on a smaller board.

Wide Selection with Migration Path

The PCL-818 series lets you choose the card that exactly matches your application and price range. The PCL-818L is designed for lower budgets, with the best price/performance ratio in the market. If you need more power, you can easily upgrade to any other card in the series.

Specifications

Analog Input

- **Channels**: 16 single-ended or 8 differential
- **Resolution**: 12 bits
- **Input Range Selection**: Software controlled
- **Auto Channel/Gain Scanning**: Software, pacer or external
- **Data Transfer**: Program control, interrupt (IRQ 2 – 7) or DMA (Ch. 1 or 3)
- **Input Impedance**: 10 MΩ
- **Input Overvoltage**: ±30 V DC max.

Analog Output (D/A Converter)

- **Channels**: One 12-bit (double-buffered)
- **Output Range**: 0 – +5 V or 0 – +10 V with internal reference
  0 – +10 V or 0 – –10 V with external reference

Digital Input/Output

- **Channels**: 16 inputs, 16 outputs (all TTL compatible)
- **Input Voltage**: Low (0 – +0.8 V)
  High (min. +2.0 V)
- **Input Load**: Low: +0.5 V @ 0.4 mA max.
  High: +2.7 V @ 0.05 mA max.
- **Output Voltage**: Low: 0 – +0.4 V
  High: min. +2.4 V
- **Driving Capacity**: Low: (sink) 8 mA @ 0.5 V max.
  High: (source) -0.4 mA @ 2.4 V min.

A/D Pacer and Counter (8254)

- **A/D Pacer**: 32-bit with 10 MHz or 1 MHz time base
- **Max. and Min. Rates**: 2.5 MHz to 0.00023 Hz
- **Counter**: One 16-bit counter with 100 KHz time base

General

- **Operating Temperature**: 0 – 50°C (32 – 122°F)
- **Storage Temperature**: -20 – 65°C (-4 – 149°F)
- **Operating Humidity**: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
**Introduction**

The PCL-818L is the entry-level model in the PCL-818 series. We designed it with the cost-sensitive customer in mind. It offers the same functions as the rest of the series, except that it has a 40 kHz sampling rate and only accepts bipolar inputs. It is fully software and connector compatible with the PCL-818HD and PCL-818HG. This lets you upgrade your applications to these higher performance cards without hardware or software changes.

**The PCL-818LS Bundle**

The PCL-818LS bundle consists of the PCL-818L card, the PCLD-8115 wiring terminal board and a DB37 cable assembly. The PCLD-8115 accommodates on-board passive signal conditioning components (resistors and capacitors), allowing you to easily implement a low-pass filter, a voltage attenuator or a 4 ~ 20 mA voltage converter.

**Specifications**

### Analog Input

- **Input Range (V)**
  - Bipolar: ±10, ±5, ±1.25, ±0.625
- **Maximum Sampling Rate**
  - 40 kS/s for all input ranges
- **Accuracy**
  - Gain = 0.5, 1: 0.01% of FSR ±1 LSB
  - Gain = 2, 4: 0.02% of FSR ±1 LSB
  - Gain = 8: 0.04% of FSR ±1 LSB

### General

- **Power Consumption**
  - 5 V @ 210 mA typical, 500 mA max.
  - +12 V @ 20 mA typical, 100 mA max.
  - -12 V @ 20 mA typical, 40 mA max.
- **I/O Ports**
  - 16 consecutive bytes
- **A/D, D/A Connector**
  - DB37
- **Dimensions (L x H)**
  - 155 x 100 mm (6.1" x 3.9")

### Ordering Information

- **PCL-818L**
  - Low-cost high-performance half-size multi-function card, user’s manual and driver CD-ROM (cable not included)
- **PCL-818LS**
  - PCL-818L with PCLD-8115 and DB-37 cable assembly (PCL-10137-1)
- **PCL-10137-1**
  - DB37 cable assembly, 1m
- **PCL-10137-2**
  - DB37 cable assembly, 2m
- **PCL-10137-3**
  - DB37 cable assembly, 3m
- **PCLD-8115**
  - Industrial Wiring Terminal with CJC circuit and DB37 connector
- **PCLD-880**
  - Industrial Wiring Terminal with DB37 connector

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All product specifications are subject to change without notice.
Introduction

The PCL-818HD has guaranteed 100 kHz sampling and transfer speeds at all gains (x 1, 2, 4 or 8, programmable) and input ranges. It features an onboard 1 K sample FIFO (First In First Out) buffer for faster data transfer and more predictable performance under Windows.

Specifications

Analog Input
- Input Range (V)
  - Bipolar: ±10, ±5, ±2.5, ±1.25, ±0.625
  - Unipolar: 0 ~ 10, 0 ~ 5, 0 ~ 2.5, 0 ~ 1.25
- Maximum Sampling Rate
  100 kHz for all input ranges
- Accuracy
  - Gain = 0.5, 1  0.01% of FSR ±1 LSB
  - Gain = 2, 4  0.02% of FSR ±1 LSB
  - Gain = 8  0.04% of FSR ±1 LSB

General
- On-board Memory
  1K samples FIFO for A/D. Can generate an interrupt when full or half full
- Power Consumption
  +5 V @ 500 mA max., +12 V @ 200 mA max
- I/O Ports
  32 bytes with FIFO active or 16 bytes with FIFO disabled
- A/D, D/A Connector
  DB37
- Dimensions (L x H)
  185 x 100 mm (7.3” x 3.9”)

Ordering Information
- PCL-818HD
  High-performance half-size multifunction card with DB-37 connector, user's manual and driver CD-ROM (cable not included)
- PCL-10137-1
  DB37 cable assembly, 1m
- PCL-10137-2
  DB37 cable assembly, 2m
- PCL-10137-3
  DB37 cable assembly, 3m
- PCLD-8115
  Industrial Wiring Terminal with CJC circuit and DB37 connector
- PCLD-880
  Industrial Wiring Terminal with DB37 connector

Introduction

The PCL-818HG offers the same functions as the PCL-818HD, but it features a special high-gain programmable instrument amplifier for reading very low level input signals (x 0.5, 1, 5, 10, 50, 100, 500 or 1000).

The PCL-818HG package includes a special wiring board (PCLD-8115) with a DB-37 connector and CJC. This combination lets you measure low-level thermocouple signals without an external signal-conditioning board.

Specifications

Analog Input
- Conversion Time
  8 µsec.
- Input Range (V)
  - Bipolar: ±10, ±5, ±1, ±0.5, ±0.1, ±0.05, ±0.01, ±0.005
  - Unipolar: 0 ~ 10, 0 ~ 1, 0 ~ 0.1, 0 ~ 0.01
- Maximum Sampling Rate
  (depends on input amplifier settling time and slew rate)
- Gain
  0.5, 1, 0.5, 1, 5, 10
  35 kHz Multiple
  7 kHz Multiple
  1 kHz Multiple
- Accuracy
  - Gain = 0.5, 1  0.01% of FSR ±1 LSB
  - Gain = 5, 10  0.02% of FSR ±1 LSB
  - Gain = 50, 100  0.04% of FSR ±1 LSB
  - Gain = 500, 1000  0.08% of FSR ±1 LSB

General
See PCL-818HD

Ordering Information
- PCL-818HG
  High-performance and High-gain multifunction card
- PCL-10137-1
  DB37 cable assembly, 1m
- PCL-10137-2
  DB37 cable assembly, 2m
- PCL-10137-3
  DB37 cable assembly, 3m
- PCLD-8115
  Industrial Wiring Terminal with CJC circuit and DB37 connector
- PCLD-880
  Industrial Wiring Terminal with DB37 connector
Introduction

The PCL-813B is a 12-bit 32-channel A/D card which offers high-voltage isolation on each analog input. The PCL-813B is an extremely cost effective solution for applications in industrial measurement and monitoring. The card offers 32 A/D channels with software programmable gain on each channel and two DC-to-DC converters on a 4-layer PCB with an integral ground plane. Optically-isolated inputs provide over 500 V<sub>DC</sub> of isolation between the analog inputs and the PC, protecting the PC and peripherals from damage due to high voltages on the input lines. The PCL-813B is ideal for situations where the budget-conscious user requires flexibility, stability and a high level of isolation protection. The PCL-813B comes with the PCL-881 wiring terminal board and a DB-37 cable assembly.

Specifications

**Input**
- **Channels**: 32 single-ended with isolation
- **Resolution**: 12 bits, SAR
- **Input Ranges**:
  - Bipolar: ±5 V, ±2.5 V, ±1.25 V, ±0.625 V (software programmable)
  - Unipolar: 0 ~ 10 V, 0 ~ 5 V, 0 ~ 2.5 V, 0 ~ 1.25 V (jumper selectable)
- **Over Voltage**: Continuous ±30 V (max.)
- **Converter**: AD574 (or equivalent) w/25 µsec. conversion time
- **Data Transfer Rate**: 25 kHz maximum, software control only
- **Offset Error**:
  - 0 ~ 5 V: ±1 LSB
  - +5 V, 0 ~ 10 V: ±2 LSB
- **Accuracy**:
  - 0.01% of reading ±1 LSB
  - Isolation Voltage > 500 V<sub>DC</sub> from analog input to PC
- **Trigger Mode**: software trigger
- **Input Impedance**: > 10 MΩ
- **Temperature Coefficient**: ±25 PPM/° C

**General**
- **Power Consumption**:
  - +5 V @ 660 mA max.
  - +12 V @ 140 mA max.
- **Operating Temperature**: 0 ~ 50°C (32 ~ 122°F)
- **Storage Temperature**: -20 ~ 65°C (-4 ~ 149°F)
- **Operating Humidity**: 5 ~ 95% RH non-condensing (refer to IEC 68-2-3)
- **I/O Connector**: DB37 female connector for input port
- **Dimensions (L x H)**: 219 x 100 mm (8.6” x 3.9”)

**Features**
- 32 single-ended analog input channels
- Over 500 V<sub>DC</sub> isolation
- 12-bit successive approximation A/D converter
- Analog input ranges (V): ±5, ±2.5, ±1.25, ±0.625, 0 ~ 10, 0 ~ 5, 0 ~ 2.5, 0 ~ 1.25
- Program-controlled A/D trigger and data transfer

**Ordering Information**
- **PCL-813B**: 32-ch. isolated analog input card, PCL-813B wiring terminal board, DB-37 cable assembly, manual and driver CD-ROM.
- **PCLD-881B**: Industrial terminal board for PCI-1713 & PCL-813B
- **PCL-10137-1**: DB37 cable assembly, 1m
- **PCL-10137-2**: DB37 cable assembly, 2m
- **PCL-10137-3**: DB37 cable assembly, 3m
- **ADAM-3937**: DB37 wiring terminal for DIN-rail mounting
Introduction
The PCL-726 provides six 12-bit D/A channels on a full-size add-on card. You can individually configure each channel to any of the following ranges: 0 to +5 V, 0 to +10 V, ±5 V, ±10 V and 4 to 20 mA current loop (sink). Designed for use in industrial environments, the PCL-726 is an ideal, economical solution for applications that require multiple analog outputs or current loops.

In addition to its analog outputs, the PCL-726 also provides 16 digital output channels plus 16 digital input channels. Its TTL-compatible D/I and D/O ports easily interface with our line of daughterboards for industrial On/Off control and sensing applications.

Specifications
Analog Output (D/A Converter)
- Channels: 6
- Resolution: 12 bits, double buffered
- Output Ranges:
  - Unipolar: 0 ~ +5 V, 0 ~ +10 V
  - Bipolar: ±5 V, ±10 V
  - Current loop (sink): 4 ~ 20 mA, ±10 V with external DC or AC reference
- Throughput: 15 kHz
- Settling Time: ≤ 70 µs
- Accuracy: ±0.012% full scale range
- Temperature Drift: 5 PPM/° C (0° ~ 50° C)
- Linearity: ±½ bit
- Voltage Output Current: ±5 mA max.
- Current Loop Excitation:
  - Minimum: +8 V, maximum: +36 V for 4 ~ 20 Voltage mA current loop
- Reset (Power-on) Status: all D/A channels will be at 0 V output after reset or power-on (both bipolar and unipolar modes)

Digital Input
- Channels: 16 ch TTL compatible DI
- Logic Level 0: 0.8 V max.
- Logic Level 1: 2.0 V min.
- Input Loading:
  - 0.5 V @ 0.4 mA max. (low)
  - 2.7 V @ 50 mA max. (high)

Digital Output
- Channel: 16-ch TTL compatible DO
- Logic Level 0: 0.5 V @ 8.0 mA (sink)
- Logic Level 1: 2.4 V @ 0.05 mA (source)

General
- Power Consumption:
  - +5 V @ 500 mA typical, 1 A max.
  - +12 V @ 80 mA typical, 110 mA max.
  - -12 V @ 60 mA typical, 90 mA max.
- Operating Temperature: 0 ~ 50° C (32 ~ 122° F)
- Storage Temperature: 0 ~ 65° C (32 ~ 149° F)
- Operating Humidity: 5% ~ 95% RH non-condensing (refer to IEC 68-2-3)
- Connectors:
  - One 37-pin D type female connector
  - Two 20-pin male ribbon cable connectors
- Dimensions (LxH): 340 x 100 mm (13.4" x 3.9")

Ordering Information
- PCL-726: 6-channel D/A output and DIO card, user's manual and driver CD-ROM (cable not included)
- PCL-727: 6-ch Digital Analog Output Card
- PCL-728: 12-ch Digital Analog Output Card
- PCL-10120-1: 20-pin flat cable, 1 m
- PCL-10120-2: 20-pin flat cable, 2 m
- PCLD-780: Screw terminal board
- PCLD-782: Opto-Isolated D/I board (16-ch)
- PCLD-785: Relay output board (16-ch)
- ADAM-3920: 20-pin wiring terminal for DIN-rail mounting

Applications
- PID loop control
- Programmable voltage source
- Servo control
- Programmable current sink
- Function generator

Features
- 6 independent analog output channels
- 12-bit resolution double-buffered D/A converter
- Multiple voltage ranges: ±10 V, ±5 V, 0 ~ +5 V, 0 ~ +10 V and 4 ~ 20 mA current loop (sink)
- 16 digital input channels and 16 digital output channels
Introduction

The PCL-720+ digital I/O and counter card is a PC-compatible add-on card with 32 digital input channels, 32 digital output channels and three programmable counter/timer channels. Its digital I/O channels are TTL-compatible and use 74LS244 driver/buffer circuits to provide high output driving capacity. These buffered circuits also require lower input loading current than regular TTL circuits. The PCL-720+’s 8254 programmable counter/timer provides three flexible 16-bit counter/timer channels. You can generate waves and pulses by programming the 8254. Jumper settings determine the clock crystal frequency. The PCL-720+ also includes a breadboard area perfect for customized circuits.

Specifications

Digital Input
- Input Lines: 32
- Logic Level 0: 0.8 V max.
- Logic Level 1: 2.0 V min.

Digital Output
- Output Lines: 32
- Logic Level 0: 0.5 V max. @ 24 mA (sink)
- Logic Level 1: 2.0 V min. @ 15 mA (source)

Programmable Counter/Timer
- Frequency Range: 0 – 2.6 MHz
- Counters: 3 independent 16-bit counters
- Modes: 6 programmable modes
- Usable Pins: CLOCK and GATE for each channel

Clock Source
- Clock Frequency: 2 MHz, 1 MHz, 500 kHz or 250 kHz; jumper selectable
- Frequency Divider: Divided by 1, 10, 100 or user adjustable

General
- I/O Port Address: Eight consecutive bytes from hex 200 – 3F8
- Breadboard Area: 540 (30 x 18) plated-through "donuts", each with a .036" hole on .10" centers. Further, provide +5 V on the left side, and provide GND on the right side
- Power Consumption: +5 V @ 500 mA typical
- Operating Temperature: 0 – 60° C (32 – 140° F)
- Storage Temperature: -20 – 70° C (-4 – 158° F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- Connectors: Five 20-pin male ribbon-cable connectors
- Dimensions (L x H): 185 x 100 mm (7.3" x 4")

Ordering Information

- PCL-720: Digital I/O and counter card, user’s manual, user’s manual and driver CD-ROM (cable not included)
- PCL-10120-1: 20-pin flat cable, 1 m
- PCL-10120-2: 20-pin flat cable, 2 m
- PCLD-780: Screw terminal board
- PCLD-782: 24/16 Channel opto-isolated D/I board
- PCLD-785: 24/16 Channel relay output board
- PCLD-786: SSR and relay driver board
- PCLD-885: 16-Channel power relay (form A) output board
- ADAM-3920: 20-pin flat cable wiring terminal for DIN-rail mounting

Applications

Digital Input
- Contact-closure monitoring
- Switch-panel status sensor
- BCD interface receiver
- Digital signal interface

Digital Output
- Industrial on/off controller
- Digital signal interface
- BCD interface driver

Counter/Timer
- Period and pulse-width measurement
- Event and frequency counting
- Waveform and pulse generation
Features
- Emulates 8255 PPI mode 0
- Buffered circuits for higher driving capacity than the 8255
- Interrupt handling
- Output status readback
- Pin compatible with Opto-22 I/O module racks

Specifications
- I/O Lines 144 (24 bits x 6 ports)
- Programming Mode 8255 PPI mode 0
- Interrupts bits 0 and 3 of Port C can generate an interrupt to IRQ 2, 3, 4, 5, 6 or 7

Digital output
- Port A and Port B Logic 0: 0.4 V max. @ 12 mA (sink) Logic 1: 2.4 V min. @ 8.0 mA (source)
- Port C Logic 0: 0.5 V max. @ 24 mA (sink) Logic 1: 2.0 V min. @ 15 mA (source)

Digital input
- Port A and Port B Logic Level 0: 0.4 V max. Logic Level 1: 2.4 V min.
- Port C Logic Level 0: 0.8 V max. Logic Level 1: 2.0 V min.

General
- Power Consumption +5 V @ 0.5 A (typical) +5 V @ 0.8 A (max.)
- Operating Temperature 0 ~ 60° C (-4 ~ 158° F)
- Storage Temperature -20 ~ 70° C (-4 ~ 158° F)
- Operating Humidity 5 ~ 95% RH non-condensing (refer to IEC 68-2-3)
- Connectors Six 50-pin male ribbon-cable connectors
- Dimensions (L x H) 125 x 100 mm (4.9” x 3.9”)

Pin Assignments

144-bit Digital I/O Card

24-bit Digital I/O Card

48-bit Digital I/O Card

Ordering Information
- PCL-722 144-bit digital I/O card, user’s manual and driver CD-ROM (cable not included)
- PCL-724 24-bit digital I/O card, user’s manual and driver CD-ROM (cable not included)
- PCL-731 48-bit digital I/O card, user’s manual and driver CD-ROM (cable not included)
- PCL-10150-1.2 50-pin flat cable, 1.2 m
- PCLD-782B 24/16-ch. opto-isolated digital input board
- PCLD-785B 24/16-ch. relay output board
- PCLD-7216 16-ch. carrier board for SSR I/O modules
- PCLD-885 16-ch. power relay (Form A) output board
- ADAM-3950 50-pin flat cable wiring terminal for DIN-rail mounting
### Introduction

PCL-735 is a relay actuator card, while PCL-725 is a combination of a relay actuator and isolated digital input card. Both half-size cards provide electromechanical SPDT relays. An on-board DB-37 connector provides access to all input and output channels.

### Specifications

#### PCL-725

**Isolated Digital Input**
- Input Channels: 8
- Opto-Isolator: 4N25
- Input Voltage: 5 – 24 V
- Input Resistance: 560 Ω (1 W @ 24 V input)
- Input Buffers: Voltage comparators
- Threshold Voltage: 1.5 V_{OC}, adjustable
- Breakdown Voltage: 300 V_{OC}
- Throughput: 10 kHz (max)

**Relay Output**
- Output Channels: 8
- Relay Type: Single-pole double-throw (SPDT, Form C)
- Output Type: CH0 – CH5 with Normally Open and Normally Closed, CH4 – CH7 with Normally Open only
- Contact Rating: 120 V_{OC} @ 0.5 A or 30 V_{OC} @ 1 A
- Breakdown Voltage: 300 V AC/DC min.
- Relay on Time: 5 ms. typical
- Relay off Time: 5 ms. typical
- Total Switching Time: 10 ms. typical
- Insulation Resistance: 100 MΩ min.
- Life Expectancy: > 5 x 10^6 operations at AC: 110 V/0.3 A, DC: 24 V/1.25 A
- Relay Driver: + 12 V @ 33 mA for each relay

**General**
- Power Consumption: +5 V @ < 0.2 A, +12 V @ 33 mA for each relay, < 0.27 A if all eight relays are energized
- Operating Temperature: 0 – 60°C (32 – 140°F)
- Storage Temperature: -20 – 70°C (-4 – 158°F)
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- I/O Port Address: Two consecutive bytes from hex 200 – 3F8
- Connector: 37-pin D-type female connector
- Dimensions (L x H): 147 x 100 mm (5.75" x 3.9")

#### PCL-735

**Relay Output**
- Relay Type: Single-pole double-throw (SPDT, Form C)
- Output Type: CH0 to CH11, normally open/normally closed
- Contact Rating: 2 A @ 30 V_{OC}, 1 A @ 125 V_{OC}
- Breakdown Voltage: 1,000 V_{OC} min.
- Relay on Time: 5 ms. typical
- Relay off Time: 5 ms. typical
- Total Switching Time: 10 ms. typical
- Insulation Resistance: 1,000 MΩ @ 500 V_{OC} min.
- Life Expectancy: > 5 x 10^7 operations @ 30 V_{OC} and 2 A
  > 2 x 10^7 operations @ 30 V_{OC} and 1 A

**General**
- Power Consumption: +5 V @ 280 mA (typical)
  +12 V @ 200 mA (max.)
- Operating Temperature: 0 – 60°C (32 – 140°F)
- Storage Temperature: -20 – 70°C (-4 – 158°F)
- Connector: One 37-pin D-type female connector
- Operating Humidity: 5 – 95% RH non-condensing (refer to IEC 68-2-3)
- I/O Port Address: Two consecutive bytes from hex 200 – 3F8
- Dimensions (L x H): 155 x 100 mm (6.1" x 3.9")

### Ordering Information

**PCL-725**
- Relay actuator and isolated D/I Card, user’s manual, driver CD-ROM and one DB-37 male connector (P/N: PCL-10437-0)
- Dimensions (L x H): 147 x 100 mm (5.75" x 3.9")

**PCL-735**
- 12-channel relay actuator card, user’s manual, driver CD-ROM and one DB-37 male connector (P/N: PCL-10437-0)
- Dimensions (L x H): 155 x 100 mm (6.1" x 3.9")
- DB37 cable assembly, 1m
- DB37 cable assembly, 2m
- Screw terminal board
- DB37 wiring terminal for DIN-rail mounting
### Introduction

The PCL-730/733/734 cards offer isolated digital input channels as well as isolated digital output channels with isolation protection up to 2,500 V\(_{DC}\), which makes it ideal for industrial applications where high-voltage isolation is required. In addition, all output channels are provide high-voltage protection.

### Specifications

#### Isolated Digital Input

<table>
<thead>
<tr>
<th>PCL-730</th>
<th>PCL-733</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Channels</td>
<td>16 (16-ch/group)</td>
</tr>
<tr>
<td>Interrupt Inputs</td>
<td>2 (IDI0, IDI1)</td>
</tr>
<tr>
<td>Interrupt Level</td>
<td>2 – 7</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>5 – 24 V(_{DC})</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>1.2 k(_{\Omega}) @ 0.5 W</td>
</tr>
<tr>
<td>Optical Isolation</td>
<td>2,500 V(_{DC})</td>
</tr>
</tbody>
</table>

#### Isolated Digital Output

<table>
<thead>
<tr>
<th>PCL-730</th>
<th>PCL-734</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Channels</td>
<td>16 (16-ch/group)</td>
</tr>
<tr>
<td>Optical Isolation</td>
<td>2,500 V(_{DC})</td>
</tr>
<tr>
<td>Throughput</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>5 – 40 V(_{DC})</td>
</tr>
<tr>
<td>Sink Current</td>
<td>200 mA max./channel</td>
</tr>
</tbody>
</table>

#### Features

- 32 isolated DIO channels (16 inputs and 16 outputs)
- 32 TTL-level DIO channels (16 inputs and 16 outputs)
- High output driving capacity
- High-voltage isolation on isolated I/O channels (2,500 V\(_{DC}\))
- Interrupt capability
- Two 20-pin connectors for isolated digital I/O channels and two for TTL digital I/O channels
- D-type connector for isolated input and output channels

- 32 isolated digital output channels
- High output driving capacity
- High-voltage isolation on output channels (1,000 V\(_{DC}\))
- High sink current on isolated output channels (200 mA/channel)
- Integral suppression diodes for inductive loads
- Wide output range (5 – 40 V\(_{DC}\))
- D-type connectors for isolated output channels

### General

<table>
<thead>
<tr>
<th>I/O Connector Type</th>
<th>PCL-730</th>
<th>PCL-733</th>
<th>PCL-734</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (L x H)</td>
<td>185 x 100 mm (7.3” x 3.9”)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td>+5 V @ 330 mA</td>
<td>+5 V @ 320 mA</td>
<td>+5 V @ 330 mA</td>
</tr>
<tr>
<td>Max.</td>
<td>+5 V @ 500 mA</td>
<td>+5 V @ 500 mA</td>
<td>+5 V @ 500 mA</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>0 – 60° C (32 – 140° F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-20 – 70° C (-4 – 158° F)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 – 95% RH non-condensing (refer to IEC 68-2-3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Note:


### Ordering Information

- **PCL-730**: 32-channel isolated digital I/O card, user’s manual and driver CD-ROM (cable not included)
- **PCL-733**: 32-channel isolated digital input card, user’s manual and driver CD-ROM (cable not included)
- **PCL-734**: 32-channel isolated digital output card, user’s manual and driver CD-ROM (cable not included)
- **PCL-10120-1**: 20-pin flat cable, 1 m (for PCL-730 only)
- **PCL-10120-2**: 20-pin flat cable, 2 m (for PCL-730 only)
### Pin Assignments

#### CN1 of PCL-730

| ID0 | 1 | 2 | IDO | 1 | 2 | ID1 |
| ID2 | 3 | 4 | ID3 | 1 | 2 | ID3 |
| ID4 | 5 | 6 | ID5 | 1 | 2 | ID5 |
| ID6 | 7 | 8 | ID7 | 1 | 2 | ID7 |
| ID8 | 9 | 10 | ID9 | 1 | 2 | ID9 |
| ID10 | 11 | 12 | ID11 | 1 | 2 | ID11 |
| ID12 | 13 | 14 | ID13 | 1 | 14 | ID12 |
| ID14 | 15 | 16 | ID15 | 1 | 16 | ID15 |
| +5V | 19 | 20 | +12V | 19 | 20 | +12V |

#### CN2 of PCL-730

| ID0 | 1 | 2 | ID1 |
| ID2 | 3 | 4 | ID3 |
| ID4 | 5 | 6 | ID5 |
| ID6 | 7 | 8 | ID7 |
| ID8 | 9 | 10 | ID9 |
| ID10 | 11 | 12 | ID11 |
| ID12 | 13 | 14 | ID13 |
| ID14 | 15 | 16 | ID15 |
| E.GND | 17 | 18 | E.GND |
| PCOM1/E.GND | 19 | 20 | PCOM2 |
| EL.GND | 19 | 20 | EL.GND |

#### CN3 of PCL-730

| DO | 1 | 2 |
| DO | 3 | 4 |
| DO | 5 | 6 |
| DO | 7 | 8 |
| DO | 9 | 10 |
| DO | 11 | 12 |
| DO | 13 | 14 |
| DO | 15 | 16 |
| DO | 17 | 18 |
| DO | 19 | 20 |

#### CN4 of PCL-730

| DI | 1 | 2 |
| DI | 3 | 4 |
| DI | 5 | 6 |
| DI | 7 | 8 |
| DI | 9 | 10 |
| DI | 11 | 12 |
| DI | 13 | 14 |
| DI | 15 | 16 |
| D.GND | 17 | 18 |
| PCOM | 19 | 20 |

### Applications

- Industrial On/Off control
- Contact closure monitoring
- Switch status sensing
- BCD interfacing
- Digital input control
- Industrial and lab automation

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**Isolated Input Circuit Diagram**

- **EXTERNAL CIRCUITRY**
  - DC (5-30 V)
  - ECOM
- **INTERNAL CIRCUITRY**
  - VCC
  - R
  - 2.7 kΩ @ 1 W
  - PC354

**Isolated Output Circuit Diagram**

- **EXTERNAL CIRCUITRY**
  - DC (5-30 V)
  - ECOM
- **INTERNAL CIRCUITRY**
  - VCC
  - R
  - PC357
- **LOAD**
  - 20 mA
- **NPN**
  - NC

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**PCL-730**

- **PCL-731**
- **PCL-732**
- **PCL-733**
- **PCL-734**
PCL-836
6-ch Counter/Timer Card

Introduction
PCL-836 is a general purpose counter/timer and digital I/O card for PC/AT compatible computers. It provides six 16-bit counter channels. It also includes 16 digital outputs and 16 digital inputs. Two 8254 chips provide a variety of powerful counter/timer function modes to match your industrial and/or laboratory applications.

Unique Digital Filter
PCL-836 includes a unique digital filter to eliminate noise on the input signal. The frequency can be adjusted to provide more stable output readings.

Specifications

Programmable Counter
- Counter: Six independent 16-bit counter channels
- Modes: Six programmable counter modes
- Programmable Digital: 1.6 ms to 52 ms

Noise Filter
- 3 PWM Output
- TTL Compatible Input/Output
- Interrupt: IRQ 2, 4, 5, 7, 10, 11, 12, 15 (jumper selectable)

Digital Input/Output
- 16 TTL Input Channels
  - Logic level 0: 0.8 V max.
  - Logic level 1: 2.4 V min.
- 16 TTL Output Channels
  - Logic level 0: 0.8 V max. @ 8 mA
  - Logic level 1: 2.4 V min. @ 0.4 mA

General
- Power Consumption: +5 V @ 360 mA (typical)
- +5 V @ 400 mA (max.)
- Operating Temperature: 0 to 60°C (32 to 140°F)
- Storage Temperature: -20 to 70°C (-4 to 158°F)
- Operating Humidity: 5 to 95% RH non-condensing (refer to IEC 68-2-3)
- Connector: One 37-pin D-type female connector for counter I/O
  Two 20-pin male flat-cable connector for digital I/O
- Dimensions (L x H): 185 x 100 mm (7.3” x 3.9”)

Ordering Information
- PCL-836: 6-channel counter/timer card, user’s manual and driver CD-ROM (cable not included)
- PCL-10137-1: DB37 cable assembly, 1m
- PCL-10137-2: DB37 cable assembly, 2m
- PCL-10137-3: DB37 cable assembly, 3m

Features
- Periodic interrupt generation
- 6 independent 16-bit counters
- Digital filter for noise reduction
- Binary or BCD counting
- Programmable frequency output
- Complex duty-cycle output
- Single-shot output
- 16-bit TTL input and 16-bit TTL output ports
- Selectable interrupt input channel
- Up to 10 MHz input frequency
- Pulselength and period measurement
- Time-delay generation
- F/V conversion and accumulation

Pin Assignments

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLK1</td>
</tr>
<tr>
<td>2</td>
<td>GATE1</td>
</tr>
<tr>
<td>3</td>
<td>CLK2</td>
</tr>
<tr>
<td>4</td>
<td>GATE2</td>
</tr>
<tr>
<td>5</td>
<td>CLK3</td>
</tr>
<tr>
<td>6</td>
<td>GATE3</td>
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<td>7</td>
<td>CLK4</td>
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<td>8</td>
<td>GATE4</td>
</tr>
<tr>
<td>9</td>
<td>CLK5</td>
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<tr>
<td>10</td>
<td>GATE5</td>
</tr>
<tr>
<td>11</td>
<td>CLK6</td>
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<tr>
<td>12</td>
<td>GATE6</td>
</tr>
<tr>
<td>13</td>
<td>Interrupt</td>
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<tr>
<td>14</td>
<td>PWM1</td>
</tr>
<tr>
<td>15</td>
<td>PWM3</td>
</tr>
<tr>
<td>16</td>
<td>Fout1</td>
</tr>
<tr>
<td>17</td>
<td>Fout3</td>
</tr>
<tr>
<td>18</td>
<td>Fout5</td>
</tr>
<tr>
<td>19</td>
<td>+5V</td>
</tr>
<tr>
<td>20</td>
<td>OUT1</td>
</tr>
<tr>
<td>21</td>
<td>GND</td>
</tr>
<tr>
<td>22</td>
<td>OUT2</td>
</tr>
<tr>
<td>23</td>
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<tr>
<td>24</td>
<td>OUT3</td>
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<tr>
<td>25</td>
<td>GND</td>
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<tr>
<td>26</td>
<td>OUT4</td>
</tr>
<tr>
<td>27</td>
<td>GND</td>
</tr>
<tr>
<td>28</td>
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</tr>
<tr>
<td>29</td>
<td>GND</td>
</tr>
<tr>
<td>30</td>
<td>OUT6</td>
</tr>
<tr>
<td>31</td>
<td>GND</td>
</tr>
<tr>
<td>32</td>
<td>Interrupt Enable</td>
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Applications
- Event counting
- Industrial automation (flowmeter/wattmeter monitoring)
- Programmable frequency synthesis
- Frequency counter

Last updated: January 2005
### PCM-3712

**Features**
- 2 channels analog output module
- 0 to 5 V, 0 to 10 V, -2.5 V to +2.5 V, -5 V to +5 V, -10 V to +10 V, or 4 to 20 mA output range
- 12-bit resolution

**Specifications**
- Analog Output Channels 2
- Voltage Range Unipolar 0 to 5 V, 0 to 10 V
- Bipolar ±2.5 V, ±5 V, ±10 V
- Current Range ±5 mA
- Impedance 10 μA typ.
- Resolution 12-bit
- Nonlinearity ±1 LSB
- Differential Nonlinearity ±0.05% of full scale
- System Accuracy ±0.025% of full range
- Dynamic Performance
  - 5V step: 16 μs
  - 3V step: 16 μs (Voltage)
  - 1.2mA step: 16 μs (Current)
- Settling Time to 1/2 LSB 10 V: 33 μs
- Slew Rate 0.3 V/μs typ. (Voltage)
- 12 μmA/μs typ. (Current)
- D/A Converter Single Channel 33 kHz bit resolution

**Ordering Information**
- PCM-3712 2-channel analog output module (18 cm flat cable 10-pin to DB9 (F) included)
- ADAM-3909 DB9 cable wiring for DIN-rail mounting

### PCM-3718H/HG/HO

**Features**
- 16 single-ended or 8 differential analog inputs
- 12-bit A/D converter, up to 100 KHz sampling rate with DMA transfer
- Two 8-bit digital input/output TTL level channels
- One 12-bit Analog output channel (PCM-3718HO only)

**Specifications**
- Analog Input
  - Channels 16 single-ended or 8 differential inputs
  - Resolution 12 bits
- Analog Output
  - Channel 12-bit
  - Output Range 0 to ±5 V or 0 to ±10 V with int. reference
  - Output Range 0 to ±10 V or 0 to ±10 V with ext. reference
  - Bipolar: ±10, ±5, ±0.5, ±0.05, ±0.01
  - Voltage Range Unipolar (PCM-3718HG): 0 to 10, 0 ~ 0, 0 ~ 0, 0 ~ -0.01
- Digital Input/Output
  - Channels 2 channels analog output module with programmable gain (cable not included)
  - Input Voltage Logic 0: 0.8 V max.
  - Logic 1: 2.0 V min.
  - Output Voltage Logic 0: 15 mA (sink) Logic 1: 2.0 V min. @ 15 mA (source)
  - Power Requirements +5 V, ±5 % tolerance on power supply
  - Size/Weight 96 x 90 mm (3.8” x 3.5”), 0.084 kg (0.185 lb)
  - Temperature Operating: 0 ~ 60° C (-40 ~ 185° F) Storage: -40 ~ 85° C (-40 ~ 185° F)
  - Operating Humidity 0 ~ 90% relative humidity, non-condensing

**Ordering Information**
- PCM-3718H 12-bit multifunction module with programmable gain (cable not included)
- PCM-3718HG
- PCM-3718HO
- ADAM-3920 20-pin flat cable wiring terminal for DIN-Rail mounting
- PCLD-780 Screw-terminal board for 20-pin flat cable
- PCL-10120-1 20-pin flat cable, 1 m
- PCL-10120-2 20-pin flat cable, 2 m

### PCM-3724

**Features**
- Output status read back
- Channels simulate 8255 PPI mode 0
- Interrupt triggering, rising/falling edge

**Specifications**
- Digital I/O
  - Channels 48 digital I/O channels
  - Throughput 400 Kbps max.
  - Input Voltage Logic 0: 0.8 V max.
  - Logic 1: 2.0 V min.
  - Output Voltage Logic 0: 24 mA (sink) Logic 1: 2.0 V min. @ 15 mA (source)
  - Power Requirements +5 V, ±5 % tolerance on power supply
  - Size/Weight 96 x 90 mm (3.8” x 3.5”), 0.084 kg (0.185 lb)
  - Temperature Operating: 0 ~ 60° C (-40 ~ 185° F) Storage: -40 ~ 85° C (-40 ~ 185° F)
  - Operating Humidity 0 ~ 90% relative humidity, non-condensing

**Ordering Information**
- PCM-3724 48-channel digital I/O module (cable not included)
- ADAM-3950 50-pin flat cable wiring terminal for DIN-Rail mounting
- PCLD-785B 24-channel relay output board
- PCLD-782B 24-channel opto-isolated digital input board
- PCL-10150-1.2 50-pin flat cable, 1.2 m
PCM-3725
PCM-3730
PCM-3780

8-ch Isolated DI and 8-ch Relay Output Module
16-ch Isolated Digital I/O Module
3-ch Counter/Timer with 24-ch TTL DI/O Module

Features
- LED indicators to show activated relays
- Interrupt handling capability

Specifications
Isolated Digital Input
- Channels: Opto-Isolated 8 DI channels
- Over-Voltage Protection: 70 V (max)
- Isolation Voltage: 2500 V (typ)
- Isolator Response Time: 25 µs

Relay Output
- Channels: 8-ch SPDT (Form C) relays
- Nominal Switch: 1.5 A @ 30 V (max)

Capacity
- Switching Power: 45 W max.
- Switching Voltage: 220 V (max)
- Switching Current: 1.5 A max.
- Breakdown Voltage: 2000 V (max) for 1 min.

General
- Power Consumption: 100 mA @ +5 V (typical); 280 mA @ +5 V (max)

Isolated DI Connector
- 20-pin post header

Relay Output Connector
- 50-pin post header

Ordering Information
- PCM-3725
  8-ch Isolated Digital Input and 8-ch Relay Output Module, user's manual and driver CD-ROM. (cable not included)
- PCL-10120-1
  20-pin Flat Cable 1m
- PCL-10120-2
  20-pin Flat Cable 2m
- PCL-10150-1.2
  50-pin Flat Cable 1.2m
- ADAM-3920
  20-pin Flat Cable Wiring Terminal for DIN-Rail
- ADAM-3950
  50-pin Flat Cable Wiring Terminal for DIN-Rail
- PCLD-780
  Screw-Terminal Board for 20-pin Flat Cable

Specifications
Programmable counter
- 3 independent 16-bit counters
- 4 independent programmable clock sources (10 M, 1 M, 100 K, 10 K)
- 12 programmable counter modes
- TTL compatible logical level
- Maximum frequency 20 MHz

Digital input/output
- 24 TTL input/output channels (8255 mode 0)
  Input: Logic 0: 0.8 V max.
  Logic 1: 2.4 V min.
  Output TTL output channels:
  Logic 0: 0.5 V max. @ 24 mA (sink)
  Logic 1: 2.4 V min. @ 15 mA (source)

Counter/Timer
- Channels: 3
- Resolution: 16-bit
- Compatibility: TTL level
- Max. Input Frequency: 20 MHz

General
- I/O Connector Type: One 50 pin and one 20 pin box header
- Dimensions: 175 x 99 mm
  (6.9" x 3.9")
- Power Consumption: Typical: +5 V @ 0 mA
  Max.: +5 V @ 0 A
- Temperature: Operating: 0 ~ 60°C (32 ~ 158°F)
  (refer to IEC 68-1,2,3)
  Storage: -20 ~ 70°C (-4 ~ 158°F)
- Relative Humidity: Operating: 5 ~ 85%RH non-condensing
  (refer to IEC 68-1,2,3)
  Storage: 5 ~ 95%RH non-condensing
  (refer to IEC 68-1,2,3)

Ordering Information
- PCM-3780
  16-ch isolated digital I/O module, user's manual and driver CD-ROM.
  (cable included)
- PCL-10120-1
  20-pin flat cable, 1m
- PCL-10120-2
  20-pin flat cable, 2m
- ADAM-3920
  20-pin flat cable wiring terminal for DIN-Rail
- PCLD-780
  Screw-terminal board for 20-pin flat cable
- PCLD-785/885
  16-ch relay/power relay output board

All product specifications are subject to change without notice
Last updated: January 2005
PCI-1670

GPIB Interface PCI-bus Card

Features
- Complete IEEE 488.2 compatibility
- Supports Windows® 95/98/NT/ME/2000/XP and DOS.
- Full driver, library, and example support, including Visual C++®, C++ Builder®, LabWindows/CVI, Visual Basic®, Delphi® and LabView® drivers.
- Provides NI-like driver & function libraries.
- PCI bus specification 2.1 compliant
- I/O address automatically assigned by PCI Plug & Play
- Provides powerful and easy-to-use configuration utility

Introduction
PCI-1670 is a high-performance PCI-bus card with a GPIB interface. The card is fully compatible with IEEE 488.1 and 488.2 standards with its PCI 2.1 bus specification. With two driver control modes: controller mode and slave mode; PCI-1670 can perform basic the IEEE 488 talker, listener and controller functions required by IEEE 488.2. You can also connect up to 15 GPIB instruments. Therefore, PCI-1670 is especially suitable for instrument measurements and control.


Furthermore, PCI-1670 also offers powerful testing features and a configuration utility that allows users to easily access and control instruments.

PCI-1670 offers a comprehensive supplementary controller driver database and provides NI-like commands to help users develop applications. Users can use an interactive GPIB window interface to control devices directly without any need of programming.

Specifications
- Bus interface: PCI specification 2.1 compliant
- IRQ and I/O memory automatically assigned by PCI plug-and-play
- IEEE 488, IEEE 488.1 and IEEE 488.2 standard compatible
- A maximum of 15 GPIB-instruments can be connected.
- Connector: IEEE 488 standard 24-pin
- Speed: GPIB-bus transfer rate up to 1M bytes/sec
- OS: Windows® 95/98/NT/2000/XP, DOS
- Dimensions: 131 x 106 mm (5.15” x 4.17”)
- Operating Temperature: 0 – 55° C
- Operating Humidity: 10 – 90% Relative Humidity, non-condensing.

Ordering Information
- PCI-1670
- PCL-10488-1
- PCL-10488-2
- PCL-10488-4

GPIB Interface PCI-bus Card, IEEE-488 Cable, 1M
GPIB Interface PCI-bus Card, IEEE-488 Cable, 2M
GPIB Interface PCI-bus Card, IEEE-488 Cable, 2M
GPIB Interface PCI-bus Card, IEEE-488 Cable, 4M

All product specifications are subject to change without notice. Last updated: January 2005
Introduction

The PCI-1671 IEEE-488 interface converts any PCI bus personal computer into an instrumentation control and data acquisition system. Connect up to 14 instruments using standard IEEE-488 cables such as the PCL-10488-2, 2 meter IEEE-488 interface cable.

Greater than 1MB/s Transfer Rates

The PCI-GPIB transfers data over the GPIB at rates in excess of 1 million bytes per second using the maximum IEEE-488 specification cable length (2 meters times the # of devices). A 1024-word FIFO buffer and the advanced REP-INSW ISR data transfer method provide the horsepower required to then transfer the data between the GPIB board and the host computer. The high-speed state machine also provides byte-to-word packing and unpacking, and because words carry twice the information that bytes do, packed data requires fewer bus cycles to transfer the same GPIB information.

IEEE-488.2 (GPIB) Compatibility

The PCI-GPIB adheres to ANSI/IEEE Standard 488-1978. Often referred to as the IEEE-488.2 bus, GPIB bus or HP-IB bus, the GPIB (General Purpose Interface Bus) is a standard for instrumentation communication and control for instruments from manufacturers the world over. The GPIB provides handshaking and interface communications over an 8-bit data bus employing 5 control and 3 handshake signals. Equipped with a PCI-1671, a personal computer can:
- Control GPIB instruments, gather data from GPIB test equipment, or become a data acquisition station in a GPIB system.

Software

The PCI-1671 includes powerful GPIB-Library. The library greatly simplifies your programming effort. The PCI-1671 is also supported by a wide variety of application software packages including SoftWIRE®, LabVIEW® and many others.

Windows® 95/98/2000/XP and DOS Compatibility

The PCI-GPIB hardware supports all popular operating systems and languages regardless of the operating systems support for Plug & Play. The installation software will manage resources for you on systems without Plug & Play.

Specifications

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<th>Feature</th>
<th>Specification</th>
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<tr>
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<td>IEEE-488.1 and IEEE-488.2</td>
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<tr>
<td>Maximum Transfer Rate</td>
<td>&gt;1 Mbyte/s</td>
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<tr>
<td>Power</td>
<td>5 Vcc @ 375 mA Typical</td>
</tr>
<tr>
<td>I/O Connector</td>
<td>IEEE-488 Standard 24 pin</td>
</tr>
<tr>
<td>Operating Temperature and Humidity</td>
<td>0 – 60° C @ 0-90% RH</td>
</tr>
<tr>
<td>Storage Temperature &amp; Humidity</td>
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</tr>
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</table>

Ordering Information

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<th>Description</th>
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<td>High-Performance IEEE-488.2 Interface for PCI-Bus Computers</td>
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<td>IEEE-488 Cable, 1M</td>
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<td>IEEE-488 Cable, 2M</td>
</tr>
<tr>
<td>PCL-10488-4</td>
<td>IEEE-488 Cable, 4M</td>
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</tbody>
</table>
USB-4711

100 kS/s, 12-bit USB Multifunction Module

Introduction
The USB-4700 series consists of true Plug & Play data acquisition modules. No more opening up your computer chassis to install boards. Just plug in the module, then get the data. It’s easy and efficient.
USB-4711 offers 16SE / 8DI inputs with 12-bit resolution, up to 100 kS/s throughput, 16 digital I/O lines and 1 user counter/timers, and optional 12-bit analog outputs. Reliable and rugged enough for industrial applications, yet inexpensive enough for home projects, USB-4711 is perfect for adding measurement and control capability to any computer with an USB port. USB-4711 is fully USB Plug & Play compatible and easy to use. It obtains all required power from the USB port, so no external power supply is required.

Specifications

Analog Input

- Channels: 16 Single-Ended
- Resolution: 12-bit
- FIFO Size: 1K samples
- Sampling Rate: 100 kS/s max.
- Conversion Time: 10 µs
- Input Range: ± 10 V ± 5 V ± 2.5 V ± 1.25 V ± 0.625 V
- Input Protection: 30 Vp-p
- Input Impedance: 2 Ω/5 pF
- Trigger Mode Software: On-board or external programmable pacer

Digital Input / Output

- Input Channels: 8
- Input Voltage: Low 0.8 V max.
- High 2.0 V max.
- Output Channels: 8
- Output Voltage: Low 0.8 V max. (sink)
- High 2.0 V min. (source)

Analog Output

- Channels: 2
- Resolution: 12-bit
- Throughput: 100 kS/s

Ordering Information

- USB-4711
  100 kS/s, 12-bit USB multifunction module

Features

- Supports USB 2.0
- Portable
- No need for external power
- 16 analog input channels
- 12-bit resolution AI
- Sampling rate up to 100 kS/s
- 8DI/8DO, 2 AO and 1 16-bit counter (USB-4711L w/o AO)
- Wiring terminal on Modules

Last updated: January 2005
**Introduction**

The USB-4700 series consists of true Plug & Play data acquisition devices. No more opening up your computer chassis to install boards—just plug in the module, then get the data. It’s easy and efficient. USB4716 offers 16SE inputs with 16-bit resolution, up to 100 kS/s throughput, 16 digital I/O lines and 2 user counter/timers, and optional 12-bit analog outputs.

Reliable and rugged enough for industrial applications, yet inexpensive enough for home projects, the USB-4716 is the perfect way to add measurement and control capability to any USB capable computer. The USB-4716 is fully USB Plug & Play and easy to use. It obtains all required power from the USB port, so no external power connection is ever required.

**Specifications**

**Analog Input**
- Channels: 16 Single-Ended
- Resolution: 16-Bit
- Max. SPS: 100 kS/s
- Conversion Time: 10 µs
- Input Range/Gain: +/-15V
- Trigger Mode: Software / Internal Or External Pacer
- DC/INL/DNL/ENOB: +/-1LSB / Gain Error
- AC/SNR/ENOB: 68dB / 11-Bit

**Digital Input / Output**
- Input Channels: 6
- Input Voltage: Low 0.8 V max., High 2.0 V max.
- Output Channels: 16
- Output Voltage: Low 0.8 V max., High 2.0 V min.

**Programmable Counter / Timer**
- Channels: 1
- Resolution: 16-bit
- Compatibility: TTL Level
- Base Clock: 10 MHz
- Max. Input Frequency: 10 MHz

**Ordering Information**
- USB-4716 100 kS/s, 16-bit USB multifunction module

**Features**
- Supports USB 2.0
- Portable
- No need for the external power
- 16 analog input channels
- 16-bit resolution AI
- Sampling rate up to 100 kS/s
- 16 DIO, 2 AO and 1 32-bit counter (USB-4716L w/o AO)
- Wiring terminal on Modules
Introduction
The USB-4700 series consists of true Plug & Play data acquisition devices. No more opening up your computer chassis to install boards—just plug in the module, then get the data. It's easy and efficient. USB4718 offers 8 thermocouple inputs with 16-bit resolution, up to 0.1% input range accuracy, or 4–20mA inputs.

Reliable and rugged enough for industrial applications, yet inexpensive enough for home projects, the USB-4718 is the perfect way to add measurement and control capability to any USB capable computer. The USB-4718 is fully USB plug and play and easy to use. It obtains all required power from the USB port, so no external power connection is ever required.

Specifications
Analog Input
- Effective Resolution: 16-bit
- Channels: 8 differential
- Ch. Independent Conf.: Yes
- Input Type: T/C & 4–20 mA
- T/C Type and Temperature Ranges:
  - J 0 – 760° C
  - K 0 – 1370° C
  - R 500 – 1750° C
  - S 500 – 1750° C
  - T -100 – 400° C
  - B 500 – 1800° C
  - E 0 – 1000° C
- Isolation Voltage: 3000 V<sub>oc</sub>
- Fault and Over-voltage Protection: Resists over-voltage up to 35 V
- Sampling Rate: 10 samples/sec
- Accuracy: 0.1% for voltage input
- CMR @ 50/60 Hz: 92 dB min

Features
- Supports USB 2.0
- Portable
- No need for the external power
- 8 thermocouple input channels
- 3000 V<sub>oc</sub> isolation
- Supports 4–20mA
- Wiring terminal on Modules

Ordering Information
- USB-4718 8-channel Thermocouple Input Module
Advantech ISA-Compatible Series

To support current ISA I/O card users and help the migration to PCI, Advantech has released several PCI I/O cards that are compatible with existing ISA cards. The new PCI cards are compatible with the ISA cards' functions, connectors, and software APIs.

With functionally compatible PCI cards, ISA users can upgrade design-ready objects from their ISA platform to the PCI platform, and enjoy the improved performance of a new computer. With connector compatibility, ISA users can keep using all accessories, including the connected wiring boards and circuits. Lastly, the ISA-compatible cards use the same software API as the ISA cards, so there is no need to re-write the program when upgrading the system.

The ISA-compatible PCI cards are designed to assist users who would like to transfer their current application to a new platform in the shortest time possible. This not only saves time and money, but also raises the efficiency of the design. Following is a list of ISA-compatible products.

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