## Motion Control Solutions

### Motion Control Solutions Overview

**Selection Guide**

### Distributed Motion Control Cards

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Complete Application-Ready Platforms for General Motion Control Applications

Since the release of motion control cards in the 1990's, Advantech has kept developing various types of motion control cards for users world-wide. Today, Advantech is still focused on providing the most robust, cost-effective and application-ready platform for General Motion Control (GMC).

Advantech offers application-ready platforms that range from industrial workstations and industrial-grade CPUs, to motion control, encoder input and isolated I/O cards for general motion control (GMC) applications such as SMT/PCB, semiconductor and LCD manufacturing machinery. Advantech provides a full-range of industrial computing platforms that include high-brightness LCD displays, keypads, up to 20-slot backplanes and redundant power supplies for machine builders.

Advantech motion control solutions have 3-axis, 4-axis and 6-axis inputs with pulse-type and voltage-pulse models and the AMONet series of distributed motion modules. Furthermore, these cards are supported by complete motion control libraries under DOS and Windows OS, which are widely applied in GMC applications.

AMONet™ - Advantech Distributed Motion Control Solutions

Motion control is growing in complexity as the number of axes in newly developed machines with motion control increases each year. Distance is also becoming an issue, as motors are located further and further away from the host computer. AMONet™ (Advantech Motion Network) was engineered to tackle the problems of increasing spending on wiring and maintenance of these complex motion control systems, and it also gets rid of distance limitations.

The first series of distributed motion control products from Advantech are called the AMONet RS-485 Series. AMONET RS-485 products are categorized as Master cards or Slave modules. While the Master card is kept in the host PC, the slave modules can be distributed so that they are next to motor drivers on the factory floor. The communication speed between the AMONet RS-485 slave modules can be up to 20 Mbps. This makes it possible to scan 2048 I/O points within 1.04 ms (or 1024 I/O points in 0.56 ms). Furthermore, an AMONet RS-485 master will update the I/O status automatically, and map data into local memory. Software running on the host PC can then read the status by simply reading the onboarding memory, so no polling of slave modules is necessary.

Each port of a master card can control up to 2048 I/O connections or 64 motion axes, so future extensions are easily implemented. The distance between a master card and its slave modules can be up to 100 meters, and this distance is covered with a low-cost Cat 5 network cable. In addition to saving wiring costs - debugging and maintenance is also simplified.

Another advantage of AMONet RS-485 is its compatibility with motor drivers from different vendors. Advantech provides specially designed wiring boards for popular motion drivers from vendors such as Panasonic®, Mitsubishi® and Yaskawa®. This makes configuration easier, as pin-to-pin cables can be used. Having a selection of motor vendors can also be an advantage when sourcing of a certain motor is difficult.

Motion control and I/O functions with AMONet RS-485 use the same library. This unique feature saves time, as programmers do not need to study both a motion library and an I/O library. You can also connect to a manual pulse generator directly to adjust and calibrate the system without having to write programs first.

AMONet™ makes machine building with motion control easier. The savings made on wiring and programming effort, as well as the compatibility with a wide range of popular motors have already led to many requests for AMONet products. Advantech is not content with the current selection though. There are already plans to release more AMONet products based on PCI, PC/104, and 1-axis motion slave modules as well as D/I/O slave modules.
A Broad Array of Products for Centralized Motion Control

Advantech’s full product offering can accommodate all your motion control needs. You can choose from 3-axis, 4-axis or 6-axis controllers, pulse-output or voltage-output, ISA-bus-based or PCI-bus-based, and standard PC-based or embedded in a system. The functions of the motion cards also vary, from high-end 3-axis circular interpolation cards to low-cost point-to-point motion devices. And if you cannot find a controller to meet your exact requirements for an embedded motion controller, then Advantech can design one to your specifications. We are ready to build cost-effective controllers to meet your criteria, whether it be adding digital I/O channels or changing connector styles, or perhaps changing CPU grade. With all the inherent costs, time and risks involved, there’s no reason why you should design your own controller when you can instead rely on the expertise, cost-efficiency, experience and proven reliability of Advantech.

Figure 3: Development Architecture
## Motion Cards Series

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<th>Slow Down Limit Switches</th>
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<th>Servo On Output Channels</th>
<th>General Purpose DO Channels</th>
<th>BoardID Switch</th>
<th>Position Compare Event</th>
<th>Remote IO</th>
<th>Dimensions (mm)</th>
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### Bus
- **PCI**
- **ISA**

### Advanced Functions
- **Encoder Channels**
- **Limit Switch Input Channels**
- **Home Input Channel**
- **Emergency Stop Input Channels**
- **Slow Down Limit Switches**
- **General Purpose DI Channels**
- **Servo On Output Channels**
- **General Purpose DO Channels**
- **BoardID Switch**
- **Position Compare Event**
- **Remote IO**

### Dimensions (mm)
- 175 x 100
- 175 x 100
- 175 x 100
- 175 x 100
- 175 x 100
- 185 x 100
- 185 x 100
- 96 x 90
- 185 x 100

### Connectors
- 100-pin SCSI-II
- 100-pin SCSI-II
- 68-pin SCSI-II
- DB-62
- 100-pin SCSI-II
- 68-pin SCSI-II
- DB-37
- 1xDB-37 2x20-pin
- PCL-10150-1
- 1xDB-25

### Wiring Board
- ADAM-3962, ADAM-3952-2JS
- ADAM-3952, ADAM-3952-2JS
- ADAM-3968, ADAM-3941
- ADAM-3962
- ADAM-39100, ADAM-3961
- ADAM-3968, ADAM-3941
- ADAM-3937
- ADAM-3937
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## AMONet series

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NEW

PCI-1247

4-axis Motion Control Card with AMONet™ RS-485 Master

Features

- Max. 6.5 MHz, 4-axis pulse output
- Linear, circular and continuous interpolation
- High speed position latch function
- Manual pulse generator input interface
- Simultaneously start/stop on multiple axes
- Programmable acceleration and deceleration time
- Programmable pulse output and interrupt
- Position compare and trigger output
- 1 Ring of AMONet™ RS-485 master
- Programmable baud-rate up to 20 Mbps transfer rate
- Max. 64 AMONet digital slave modules support
- Easy installation with RJ45 phone jack and LED diagnostic

Introduction

PCI-1247 is an advanced motion controller with two major functions: 4-axis motion control (ASIC), and high-speed distributed motion control with AMONet™ RS-485.

With its 4-axis motion control functions, PCI-1247 provides 4 axes of linear interpolation, 2 axes of circular interpolation and also continuous interpolation with velocity continuity. There are 13 homing modes for different machine designs, and position compare and trigger output functions are supported to interface with applications such as on-the-fly image acquisition. For applications like tool length measurement, it provides position latch and interrupt functions. PCI-1247 provides digital I/O interfaces that are dedicated to servo drivers/motors, (e.g. ALM, INP, ERC) and also digital I/O interfaces that are dedicated to machines (e.g. ORG, PEL, EMG). These dedicated I/O signals guarantees functionality via hardware and therefore reduces software loading.

AMONet™ RS-485 is a new series of products designed for versatile and distributed automation applications with special motion control requirements. PCI-1247 is equipped with 1 master, that can connect with up to 64 slave modules. There are 2 categories of slave modules, one for motion control, and one for digital I/O. For motion control slave modules, there are 4 types of 1-axis motion modules in the ADAM-3210 Series. For digital I/O slave modules, there are 4 types, 32-IN, 32-OUT, 16-IN & 16-OUT and 24-IN & 8-OUT.

Specifications

Motion Control

- Pulse Output Modes: ±OUT/DIR, ±CW/CCW
- Pulse Output Rates: Max. 6.5 Mpps / Min. 0.05 pps
- Position Range: 28 bits (±134,217,728 pulses)
- Home Return Modes: 13 types
- Velocity Profiles: T-curve, S-curve
- Interpolation Modes: linear, circular and continuous
- Counter for Encoder Feedback Signals: 28 bits up/down x 4
- Position Latch Inputs: LTC x 4
- Position Compare Outputs: CMP x 4
- Incremental Encoder Inputs: ±EA x 4, ±EB x 4
- Encoder Index Signal Inputs: ±EZ x 4
- Machine Interfaces: PEL x 4, MEL x 4, ORG x 4, SLD x 4
- Servo Driver Interface: ALM x 4, RDY x 4, SVON x 4, INP x 4, ERC x 4
- Simultaneous Start/Stop Motion Inputs: STA, STP
- General Inputs: IN x 3
- General Outputs: OUT x 4
- I/O Pin Type: Optically isolated with 2.5 kVrms on all 68 SCSI pins

General

- PCI Spec. 2.2: Supports 32-bit, 3.3/5 Vcc operation
- Power Consumption: +5 Vcc, @ 0.5 A typical
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F)

Ordering Information

- PCI-1247: 4-axis Motion Control Card with AMONet Master
- ADAM-3210: 1-Axis Motion Slave Module
- ADAM-3211/PMA: 1-Axis Motion Slave for Panasonic® Minas A
- ADAM-3212/J2S: 1-Axis Motion Slave for Mitsubishi® MR-J2S
- ADAM-3213/YS2: 1-Axis Motion Slave for Yaskawa® Sigma-II
- ADAM-3968M: 68-pin Motor Wiring Board
- ADAM-3968M/PMA: Terminal Board for Panasonic® Minas A
- ADAM-3968M/J2S: Terminal Board for Mitsubishi® MR-J2S
- ADAM-3968M/YS2: Terminal Board for Yaskawa® Sigma-II
- ADAM-3752: 32-CH Digital Input Module
- ADAM-3754: 32-CH Digital Output Module
- ADAM-3756: 16-CH/16-CH Digital Input/Output Module
- ADAM-3758: 24-CH/8-CH Digital Input/Output Module
- PCL-10168M-2: 68-pin SCSI cable, 2m (One PCI-1247 works with two
System Architecture

Software

- **Windows® 2000/XP WDM Driver**
  Supports BCB/VB/VC++ programming on Windows® 2000/XP platforms with DLL
- **MotionNAVI**
  MotionNAVI is a Windows® utility for testing motion control functions
- **AMONet EzLink**
  AMONet EzLink is a Windows® utility for testing AMONet RS-485 configurations
Introduction
PCM-3202 is a PC/104 interface card which supports two AMONet™ RS-485 master ports, and transfers data between host and slaves directly without any operations in between. Each port of the master can control up to 2048 I/O points, 64 axes, or a combination of I/O points and axes for motion control. The master ports support up to 20 Mbps transfer rate and a maximum communication distance of up to 100 meters.

The communication between master and slave is based on a customized RS-485 solution that saves wires, covers a long distance, supports high-speed communication and has time-deterministic features. The communication interface between master and host PC is accomplished by memory mapping. Various functions can be chosen on the slave modules, and standard industrial DIN rail mounting design makes it easy to distribute them in the field. The master collects information from slave modules and publishes the information to its host PC.

Specifications
- 16-bit PC/104
- Number of Rings: 2
- IRQ Selection: 9, 10, 11 or 12
- Transmission Speed: 2.5, 5, 10 or 20 Mbps with automatic data flow control
- Serial Interface: Half duplex RS-485 with transformer isolation
- Cable Type: CAT5 UTP/STP Ethernet cable
- Surge Protection: 10 kV
- Communication Distance: Max. 100 m (20 Mbps/64 slave modules)
- Communication Slave Module Number: 2 Rings with Max. 128 (1 Ring with 64 slaves)
- Power Consumption: +5 VDC at 0.5 A typical
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F)

Ordering Information
- PCM-3202: PC/104 AMONet™ RS-485 Master Card
- ADAM-3210: 1-Axis Motion Slave Module
- ADAM-3211/PMA: 1-Axis Motion Slave for Panasonic® Minas A
- ADAM-3212/J2S: 1-Axis Motion Slave for Mitsubishi® MR-J2S
- ADAM-3213/YS2: 1-Axis Motion Slave for Yaskawa® Sigma-II
- ADAM-3752: 32-CH Digital Input Module
- ADAM-3754: 32-CH Digital Output Module
- ADAM-3756: 16-CH/16-CH Digital Input/Output Module
- ADAM-3758: 24-CH/8-CH Digital Input/Output Module

Features
- Max. 20 Mbps transfer rate
- Supports 2 independent AMONet™ RS-485 rings
- Supports up to 128 AMONet™ RS-485 slave modules
- Easy installation with RJ45 phone jack and LED diagnostics
- Max. 100 m (20 Mbps / 32 slave modules) communication distance

Software
- Windows® 2000/XP WDM driver
  Supports BCB/VB/VC++ programming on Windows® 2000/XP platform with DLL
- AMONet EzLink
  AMONet EzLink is a Windows® diagnosis utility

AMONet™ Slave Module Address Number Setting

![AMONet™ Slave Module Address Number Setting Diagram]
Introduction

PCI-1202 is a PCI interface card which supports two AMONet™ RS-485 master ports, and transfers data between host and slaves directly without any operations in between. Each port of the master can control up to 2048 I/O points, 64 axes, or a combination of I/O points and axes for motion control. The master ports support up to 20 Mbps transfer rate and a maximum communication distance of up to 100 meters.

The communication between master and slave is based on a customized RS-485 solution that saves wires, covers a long distance, supports high-speed communication and has time-deterministic features. The communication interface between master and host PC is accomplished by memory mapping. Various functions can be chosen on the slave modules, and standard industrial DIN rail mounting design makes it easy to distribute them in the field. The master collects information from slave modules and publishes the information to its host PC.

Specifications

- AMONet RS-485 Rings: 2
- Transmission Speed: 2.5, 5, 10 and 20 Mbps with automatic data flow control
- Serial Interface: Half duplex RS-485 with transformer isolation
- Cable Type: CAT5 UTP/STP Ethernet cable
- Surge Protection: 10 kV
- Communication Distance: Max. 100 m (20 Mbps/64 slave modules)
- Communication Slave Module number: 128 (2 rings with 64 slaves each)
- Digital Input: 8-Ch isolated, sink type, 0-24 V dc, Max. 50 mA current, 10 mA sink current
- Digital Output: 4-Ch isolated, open collector type, 5-30 V dc, voltage PCI Spec. 2.2, supports 32-bit, 3.3 V/S V dc operation
- Power Consumption: +5 V dc at 0.5 A typical
- Operating Temperature: 0 ~ 60° C (32 ~ 140° F)

Ordering Information

- PCI-1202: 2 port AMONet™ RS-485 master card
- ADAM-3210: 1-axis AMONet™ RS-485 Motion Slave Module
- ADAM-3211/PMA: 1-axis AMONet™ RS-485 Motion Slave for Panasonic® Minas A
- ADAM-3212/J2S: 1 axis AMONet™ RS-485 slave for Mitsubishi® MR-J2S
- ADAM-3213/YS2: 1-axis AMONet™ RS-485 Slave for Yaskawa® Sigma-II
- ADAM-3752: 32-CH AMONet™ RS-485 Digital Input Module
- ADAM-3754: 32-CH AMONet™ RS-485 Digital Output Module
- ADAM-3756: 16-CH/16 CH AMONet™ RS-485 Digital Input/Output Module

Pin Assignments

DIO Dsub-15 pins Definition
Introduction

Products in the ADAM-3240 Series are used to increase the number of axes with interpolation for an AMONet™ RS-485 distributed motion control network. These extension slave modules connect serially by a simple and affordable Cat.5 LAN cable, reducing the wiring between driver and controller. This is very suitable to highly integrated machine automation applications. AMONet™ RS-485 has driver specific motion slave modules to support a range of common motor vendors such as: Mitsubishi® J2-Super series, Panasonic® Minas A type, and Yaskawa® Sigma-II. Please select the respective cable SCSI-20P or SCSI-50P and plug this cable into the motor driver and motion slave module. AMONet™ RS-485 also supports a general purpose motion slave module for general motor drivers, including step motor drivers. This general purpose motion slave module is designed with many screw terminals to support easy wiring. Please refer to the related installation guides.

Specifications

- Communication Controller: AMONet™ slave motion controller ASIC
- Scheme Type: Half duplex RS-485 with transformer isolation
- Cable Type: CAT5 UTP/STP Ethernet cable
- Surge Protection: 10 kV
- Transmission Speed: 2.5, 5, 10 and 20 Mbps
- Programmable Pulse Output Mode: ±OUT/DIR, ±CW/CCW, ±A/B phase
- Programmable Pulse Command Speed: Max 6.5 Mpps / Min 0.05 pps
- Position Range: 28 bits (±134, 217, 728 pulses)
- Home Return Mode: 13 types
- Velocity Profiles: T-curve, S-curve
- Counter for Encoder Feedback Signals: 28 bits up/down
- Position Latch Input: LTC x 4
- Position Compares Output: CMP x 4
- Incremental Encoder Input: ±EA x 4, ±EB x 4
- Encoder Index Signal Input: ±EZ x 4
- Machine Interface: PEL x 4, MEL x 4, ORG x 4, SLD x 4
- Servo Driver Interface: ALM x 4, RDY x 4, SVON x 4, INP x 4, ERC x 4
- Simultaneous Start/Stop Motion Input: STA, STP
- LED Indicator: PWR, RUN, ERR, PEL, MEL, ORG, SLD
- Power Supply: +18 VDC to +30 VDC, consumption: 3 W typical
- Operating Temperature: 0 – 60° C (32 – 140° F)

Features

- Max. 20 Mbps transfer rate
- Max. 6.5 MHz, 4-Axes pulse output
- 28 bits counter for incremental encoder
- Programmable acceleration and deceleration time
- T-curve and S-curve velocity profiles support
- Change speed/position on-the-fly
- Simultaneously start/stop on multiple motion control modules
- Easy installation with RJ45 phone jack and LED diagnostic
- Easy installation for servo or stepping motor driver

Ordering Information

- ADAM-3240: 4-Axis General Purpose AMONet™ RS-485 Slave Module
- ADAM-3241/PMA: 4-Axis AMONet™ RS-485 Slave Module for Panasonic® Minas A Servo driver
- ADAM-3242/J2S: 4-Axis AMONet™ RS-485 Slave Module for Mitsubishi® MR-J2S Servo driver
- ADAM-3243/YS2: 4-Axis AMONet™ RS-485 Slave Module for Yaskawa® Sigma-II Servo driver
- PCL-10120M-2: SCSI 20-pin cable, 2m (Optional for ADAM-3242/J2S)
- PCL-10150M-2: SCSI 50-pin cable, 2m (Optional for ADAM-3241/PMA and ADAM-3243/YS2)
ADAM-3210 Series

1-Axis AMONet™
RS-485 Motion Slave Modules

Features
- DIN rail mounting (L-124 x W-72 x H-53 mm)
- Max. 20 Mbps transfer rate
- Max. 6.5 Mhz, 1-Axis pulse output
- 28 bits counter for incremental encoder
- Programmable acceleration and deceleration time
- T-curve and S-curve velocity profiles support
- Change speed on-the-fly
- Simultaneous start/stop on multiple motion control modules
- Easy installation with RJ45 phone jack and LED diagnostic
- Easy installation for servo or stepping motor driver

Introduction
Products in the ADAM-3210 Series are used to increase the number of axes for an AMONet™ RS-485 distributed motion control network. These extension slave modules connect serially by a simple and affordable Cat.5 LAN cable, reducing the wiring between driver and controller. This is very suitable for highly integrated machine automation applications.

AMONet™ RS-485 has driver specific motion slave modules to support a range of common motor vendors such as: Mitsubishi® J2-Super series, Panasonic® Minas A type, and Yaskawa® Sigma-II. Please select the respective cable SCSI-20P or SCSI-50P and plug this cable into the motor driver and motion slave module.

AMONet™ RS-485 also supports a general purpose motion slave module for general motor drivers, including step motor drivers. This general purpose motion slave module is designed with many screw terminals to support easy wiring. Please refer to the related installation guides.

Specifications
- **Series Interface**: Half duplex RS-485 with transformer isolation
- **Cable Type**: CAT5 UTP/STP Ethernet cable
- **Surge Protection**: 10 kV
- **Transmission Speeds**: 2.5, 5, 10 and 20 Mbps
- **Programmable Pulse Output Mode**: ±OUT/DIR, ±CW/CCW, ±A/B phase
- **Programmable Pulse Command Speed**: Max 6.5 Mpps / Min 0.05 pps
- **Position Range**: 28 bits (+134,217,728 pulses)
- **Home Return Mode**: 13 types
- **Velocity Profiles**: T-curve, S-curve
- **Counter for Encoder Feedback Signals**: 28 bits up/down
- **Position Latch Input**: LTC
- **Position Compare Output**: CMP
- **Incremental Encoder Input**: ±EA, ±EB
- **Encoder Index Signal Input**: ±EZ
- **Machine Interface**: PEL, MEL, ORG, SLD
- **Servo Driver Interface**: ALM, RDY, SVON, INP, ERC
- **Simultaneous Start/Stop Motion Input**: STA, STP
- **LED Indicator**: PWR, RUN, ERR, PEL, ORG, SLD
- **Power Supply**: +18 VDC to +30 VDC, consumption: 3 W typical
- **Operating Temperature**: 0 – 60° C (32 – 140° F)

Ordering Information
- **ADAM-3210**: 1-Axis General Purpose AMONet™ RS-485 Slave Module
- **ADAM-3211/PMA**: 1-Axis AMONet™ RS-485 Slave Module for Panasonic® Minas A Servo driver
- **ADAM-3212/J2S**: 1-Axis AMONet™ RS-485 Slave Module for Mitsubishi® MR-J2S Servo driver
- **ADAM-3213/YS2**: 1-Axis AMONet™ RS-485 Slave Module for Yaskawa® Sigma-II Servo driver
- **PCL-10120M-2**: SCSI 20-pin cable, 2m (Optional for ADAM-3212/J2S)
- **PCL-10150M-2**: SCSI 50-pin cable, 2m (Optional for ADAM-3211/PMA and ADAM-3213/YS2)
ADAM-3750F Series

**Summary**

- **Flat-Cable Type Digital NPN I/O Modules**

**Features**

- DIN rail mounting (L=124 x W=72 x H=53 mm)
- Max. 20 Mbps transfer rate
- Flat-Cable Connection
- Easy installation with RJ45 phone jack and LED diagnostic
- 3-wire terminal board for sensor
- LED indicator for each I/O channel
- Selection of I/O-channel configuration (32 DI, 32 DO or 16/16 DI/O)
- 2500 Vrms Isolation voltage

**Specifications**

- **Cable Type**: CAT5 UTP/STP Ethernet cable
- **Surge Protection**: 10 kV
- **Transmission Speed**: 2.5, 5, 10 and 20 Mbps
- **Online Module**: Insertion and Removal
- **I/O Isolation Voltage**: 2.5 kVrms
- **Input Impedance**: 2.4 kΩ±5% ; Input current: ±10 mA (Max)
- **Output Types**: NPN/PNP open collector Darlington transistors
- **Switch Capacity**: Each output channel is 60 mA at 24 VDC
- **Response Time**: On to Off, about 180 µs; Off to On, about 1.2 µs
- **Power Supply**: +18 VDC to +30 VDC, consumption: 3 W typical
- **Operating Temperature**: 0 ~ 60°C (32 ~ 140°F)

**Introduction**

The ADAM-3750F Series consists of digital slave modules for AMONet™ RS-485 that extend the digital I/O capacity. All the DoI slave extension modules are connected serially with a simple Cat5 cable. This reduces wiring between driver and controller and is very suitable for highly integrated machine automation applications. High speed, scalability and cost-effectiveness ensures a solid solution for machine builders.

There are 3 main types of DoI slave modules, 32in, 32out, and 16in/16out. With these slave modules, you can connect actuators/sensors directly with minimum hassle. You can access I/O points nearby or 100 meters away using simple and low-cost wiring, and the high speed of AMONet™ RS-485 makes it possible to scan 2048 IO channels in 1.04 ms.

**Pin Assignments**

<table>
<thead>
<tr>
<th>ADAM-3754F</th>
<th>ADAM-3756F</th>
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<tbody>
<tr>
<td>Pin</td>
<td>Label</td>
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<td>T30</td>
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</table>

**Ordering Information**

- **ADAM-3752FN**: Flat-cable type 32-CH Digital NPN Input Module
- **ADAM-3754FN**: Flat-cable type 32-CH Digital NPN Output Module
- **ADAM-3756FNN**: Flat cable, 16/16CH Digital NPN In/Output Module
- **ADAM-3934D**: Dual 34-pin wiring terminal with DIN-rail
- **PCL-10134-1**: 34-pin IDC flat cable, 1M
PCI-1242 4-Axis Pulse-Type Motor Control Card Servo Motor Control Card

Features
- PCI Bus interface
- 4-axis servo or stepping motor pulse command control
- 5-channel encoder input
- 13 dedicated input and 5 dedicated output
- 128 remote serial input/output interfaces

Introduction
PCI-1242 applied motion ASIC sends the pulse of each axis with DDA (Digital Differential Analyzer) algorithm to realize 4 axis servo positioning and synchronized control. Under the pulse output control, the encoder value can be read back from the encoder input port. So, it will be easier to carry out the software close loop control in stepping motor application. At the control of each axis, there is one set of sensor input point, including home point, plus limit point and minus limit point. In addition, there are inhibit signal output points, position ready output point, and emergency stop input point. For other input/output points, this board uses wire-saving I/O design, which can be expanded to 64 points input and 64 point output maximum.

Specifications
Hardware
- Size: 185 x 109 mm
- System Clock: 40 MHz
- Bus Interface: PCI

Motion
- Positioning Axes: 4
- DDA Pulses: 1024 ~ 32767 Pulse/DDA Cycle
- DDA Cycle: 25 µs ~ 3350 ms Programmable
- Pulse Output Format: Pulse/DirectionCW/CCW A/B Phase
- Error Counter (For Output Pulse): 16 Bits
- Remote IO: 64 IN/64 OUT Maximum
- Encoder Input: 5 Axes
- Interface: Differential Input with Photo-Isolation
- Input Format: A/B/Z Phase Pulse/DirectionCW/CCW
- Decoder: x0, x1, x2, x4, Software programmable in A/B/Z phase input
- Encoder Counter: 32 bits
- Latch: 15 trigger signal for each axis

Local I/O
- Home Sensor: 4 Signal Inputs
- Positive Over Travel: 4 Signal Inputs
- Negative Over Travel: 4 Signal Inputs
- Inhibit Signal Outputs: 4
- Emergency Stop Input: 1
- Position Ready Output: 1

Software Support
- Device driver for DOS, Windows® 95/98/2000/NT/XP
- Motion control library MCCL for DOS, Windows® 95/98/2000/NT/XP

Ordering Information
- PCI-1242: 4-axis Pulse-type Servo Motor Control 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
- ADAM-3941: Wiring terminal for PCI-1241/1242 with LEDs
- PCLD-8241: 64 DI / 64 DO Remote I/O Board

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

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
**Introduction**

Advantech introduces the PCI-1240U 4-axis Universal PCI (supports both 3.3V and 5V signal slot) stepping/pulse-type servo motor control card designed for general-purpose extreme motion applications. The PCI-1240U is a high-speed 4-axis motion control card for the PCI bus that simplifies stepping and pulse-type servo motor control, giving you added performance from your motors. The card’s intelligent NOVA™ MCX314-motion ASIC builds in a variety of motion control functions, such as 2/3-axis linear interpolation, 2-axis circular interpolation, T/S-curve acceleration/deceleration rate and more. In addition, the PCI-1240U performs these motion control functions without processor loading during driving. For advanced applications, Advantech supplies Windows® DLL drivers and user-friendly examples to decrease your programming load. Moreover, through a free bundled PCI-1240U motion utility, you can complete configuration and diagnosis easily.

**Specifications**

**Motion Axis**

- Number of Axes: 4
- 2/3-axis Linear Interpolation
  - Range: +/– 2,147,483,646 for each axis
  - Speed: 1 PPS ± 0.5 MPSS
  - Precision: ± 1 LSB
- 2-axis Circular Interpolation
  - Range: +/– 2,147,483,646 for each axis
  - Speed: 1 PPS ± 0.5 MPSS
  - Precision: ± 1 LSB
- Continuous Interpolation
  - Range: 1 PPS ± 2 MPSS
  - Speed: 1 PPS ± 2 MPSS
  - Precision: ± 1 LSB

**Drive Output Pulses**

- Change of Acceleration for S Curve
  - 964 ± 31.25 x 10^6 PPS/sec^2
- Change of Acceleration/Deceleration
  - 125 ± 500 x 10^6 PPS/sec^2
- Initial Velocity
  - 1 PPS ± 4 MPSS
- Drive Speed
  - 1 PPS ± 4 MPSS (can be changed during driving)
- Number of Output Pulses
  - 0 ~ 4,294,967,295 (fixed pulse driving)
- Pulse Output Type
  - Pulse/Direction (1-pulse, 1-direction type) or Up/Down (2-pulse type)
- Output Signal Mode
  - Differential Line driving output/single-ended output

**Input Pulse for Encoder Interface**

- Encoder Pulse Input Type
  - Quadrature (A/B phase or Up/Down)
- Counts per Encoder Cycle
  - x1, x2, x4 (A/B phase only)
- Protection
  - 2,500 V D.C. isolation
- Input Range
  - +5V ± 30V
- Input Voltage Filtering
  - Photo coupler isolation; accept mechanical connection point

**Position Counter (read/write at any time)**

- Range of Command Position Counter (for output pulse)
  - +/– 2,147,438,646 ~ +/– 2,147,438,647
- Range of Actual Position Counter (for output pulse)
  - +/– 2,147,438,646 ~ +/– 2,147,438,647

**Comparison Register**

- COMP+ Register Range
  - +/– 2,147,438,646 ~ +/– 2,147,438,647
- COMP– Register Range
  - +/– 2,147,438,646 ~ +/– 2,147,438,647

**Features**

- Independent 4-axis motion control
- Hand wheel and jog function
- 2/3-axis linear interpolation function
- 2-axis circular interpolation function
- Continuous interpolation function
- Programmable T/S-curve acceleration/deceleration rate
- Up to 4 MPPS pulse output for each axis
- Two pulse output types: Up/Down or Pulse/Direction
- Up to 1 MHz encoder input for each axis
- Two encoder pulse input types: A/B phase or Up/Down
- Constant speed control
- Position management and software limit switch function
- BoardID™ switch

**Interrupt Functions (excluding interpolation)**

<table>
<thead>
<tr>
<th>Interrupt Condition</th>
<th>Position Counter ≥ COMP–</th>
<th>Position Counter ≥ COMP+</th>
<th>Position Counter &lt; COMP–</th>
<th>Position Counter &lt; COMP+</th>
</tr>
</thead>
</table>

**External Signals Driving**

- Input Signal
  - nINI ~ 3
- Max. Input Frequency
  - 4 kHz
- Driving Mode
  - Fixed pulse driving or continuous driving
  - Supports Hand wheel/Jog
- Protection
  - 2,500 V<sub>D.C.</sub>, Photo coupler isolation and RC filtering

**External Deceleration/Instantaneous Stop Signal**

- Input Signal
  - nLMT+ and nLMT–
- Max. Input Frequency
  - 2 PPS/sec
- Driving Mode
  - Fixed pulse driving or continuous driving
  - Supports Hand wheel/Jog
- Protection
  - 2,500 V<sub>D.C.</sub>, Photo coupler isolation and RC filtering

**General**

- I/O Connector Type
  - 100-pin SCSI-II female
- Dimensions
  - 175 x 100 mm (6.9” x 3.9”)
- Power Consumption
  - Typical: +5 V @ 350 mA
- External Power Voltage
  - DC +12 ~ +24 V
- Temperature
  - Operating: 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)
- Certification
  - CE certified

**Note:** *: “n” represents the axis (X, Y, Z or U) that is concerned.
**Feature Details**

Programmable T/S-curve Acceleration and Deceleration

Each of four axes can be preset individually with S-curve or trapezoidal acceleration/deceleration rates. When using S-curve acceleration to control driving speed, output pulse is generated in parabolic-shaped acceleration or deceleration curves, and the triangular curve phenomenon will not occur through the NOVA® MCX314-motion ASIC design concept.

Linear and Circular Interpolation

Any two or three axes can be selected to execute linear interpolation driving and any two axes can be selected to execute circular arc interpolation control. The interpolation speed range is from 1 PPS to 4 MPPS.

Powerful Position Management Function

Each axis is equipped with a 32-bit logical position counter and a 32-bit real position counter. The logical position counter counts the axis’ pulse output number and the real position counter is recorded with the feedback pulse from the outside encoder or linear scale.

**Applications**

- General motion control (GMC)
- Packaging and assembly machinery
- Robotics and semiconductor manufacturing and measurement
- Precise X-Y-Z position and rotation control

**Block Diagram**

[Diagram showing various components and pins for the PCI-1240U card, including oscillator, CLK, XOUT-4, XOUT, MCX314, XECA, XECAO, and various control signals for the axes and interfaces.]

**Ordering Information**

- PCI-1240U: 4-axis universal PCI stepping/pulse-type servo motor control card
- ADAM-3952: 50-pin SCSI-II terminal for DIN-rail mounting
- PCL-10251-1: 100-pin SCSI to two 50-pin SCSI cable for PCI-1240U, 1m
- PCL-10251-3: 100-pin SCSI to two 50-pin SCSI cable for PCI-1240U, 3m

**Pin Assignments**

- VXX, EMA, XMT, XMI, XU1, XN2: Various signal lines for different functions
- XECA, XECAO, XECAO: Encoder signals for different directions
- XECAO, XECAO: Emergency stop signals
- XECAO, XECAO: Drive motor signal
- XECAO, XECAO: Servo alarm
- XECAO, XECAO: External power (DC12-24V)
- XECAO, XECAO: Limit input
- XECAO, XECAO: Servo motor signal
- XECAO, XECAO: Encoder signal output

**Pin Definitions**

- XECA: Encoder signals
- XECAO: Emergency stop signals
- XECAO: Drive motor signal
- XECAO: Servo alarm
- XECAO: External power (DC12-24V)
- XECAO: Limit input
- XECAO: Servo motor signal
- XECAO: Encoder signal output
**PCI-1261**

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**6-Axis Pulse-Type Stepping Motion Control Card**

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### Features

- PCI bus interface
- Asynchronous/synchronous 6-axis motion control
- Linear, helical interpolation functions
- 2/3-axis arc, circle interpolation functions
- Jog functions
- Continuous interpolation functions
- T/S-curve acceleration/decelerations
- Constant speed and over speed control
- In position and compensation functions
- Go home functions
- Position management and software limit switch functions
- Event trigger functions
- 19 dedicated inputs and 7 dedicated outputs
- Up to 4 MPPS pulse output for each axis

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**Introduction**

The PCI-1261 realizes 6-axis asynchronous/synchronous control with a DDA (Digital Differential Analyzer) that ensures even movement of each axis. At pulse output control, it can also read back motor encoder values via its encoder input port. In the control of each axis, there is a set of sensor input points, including home points, plus limit points and minus limit points. Further, there are servo-on signal output points, position ready output point and an emergency stop input point. For advanced applications, we supply Windows® DLL drivers and user-friendly examples to decrease your programming load. Moreover, through a free bundled PCI-1261 motion utility, you can complete configuration and diagnosis easily.

---

**Specifications**

**Motion Axis**

<table>
<thead>
<tr>
<th>Number of Axes</th>
<th>6 Axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpolation</td>
<td>Range: -2, 147, 483, 648 – 2, 147, 483, 647 for each axis</td>
</tr>
<tr>
<td></td>
<td>Time Interval: 1 ms – 10 ms</td>
</tr>
<tr>
<td></td>
<td>Speed: 1 PPS – 4 MPPS</td>
</tr>
<tr>
<td>Command Type</td>
<td>Jog, Point to Point, Line, Arc, Circle, Helical</td>
</tr>
<tr>
<td>Speed Curve</td>
<td>T/S-Curve Acceleration/Deceleration</td>
</tr>
<tr>
<td>Command Mode</td>
<td>Position Command</td>
</tr>
<tr>
<td>Pulse Output Format</td>
<td>Pulse/Direction, CW/CCW, A/B Phase</td>
</tr>
<tr>
<td>Position Accuracy</td>
<td>In Position Check</td>
</tr>
<tr>
<td>Continuous Moving</td>
<td>Blending Mode</td>
</tr>
<tr>
<td>Compensation</td>
<td>256 Divisions</td>
</tr>
<tr>
<td>Over Traveling Limit</td>
<td>Software and Hardware OT Check</td>
</tr>
<tr>
<td>Go Home</td>
<td>3 Modes (Normal, Encoder Index, Home Sensor)</td>
</tr>
<tr>
<td>Motion Operation</td>
<td>Hold, Continuous, Abort</td>
</tr>
<tr>
<td>Changing Speed in Moving</td>
<td>Over Speed Control</td>
</tr>
</tbody>
</table>

**Encoder Interface**

<table>
<thead>
<tr>
<th>Encoder Input Type</th>
<th>A/B/Z Phase, Pulse/Direction, CW/CCW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts per Encoder Cycle</td>
<td>X0, X1, X2, X4 (A/B phase only)</td>
</tr>
<tr>
<td>Latch</td>
<td>15 Trigger Signals for each axis</td>
</tr>
<tr>
<td>Interface</td>
<td>Differential with Photo Coupler</td>
</tr>
<tr>
<td>Max. Input Frequency</td>
<td>2 MHz</td>
</tr>
<tr>
<td>Input</td>
<td>6 Channels</td>
</tr>
</tbody>
</table>

**Position Counter**

| Range of Command Position Counter | -2, 147, 483, 648 – 2, 147, 483, 647 for each axis |

---

**Ordering Information**

- PCI-1261: 6-axis Pulse-type Stepping Motion Control Card
- ADAM-39100: 100-pin SCSI-II Wiring Terminal for DIN-rail Mounting
- PCL-101100M-1: 100-pin SCSI cable, 1m
- PCL-101100M-3: 100-pin SCSI cable, 3m
- ADAM-3961: Wiring terminal for PCI-1261 with LED

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**FCC**

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**CE**
Applications

- General Motion Control (GMC)
- Packing and assembly machinery
- Robotics and semiconductor manufacturing and measurement
- Precise X-Y-Z-U-V-W position and rotation control

Feature Details

Programmable T/S-curve Acceleration and Deceleration

Each axis can be individually configured with S-curve or trapezoidal acceleration/ deceleration rates. When using S-curve acceleration to control motion speed, output pulse is generated in parabolic-shaped acceleration or deceleration curves.

Linear and Circular Interpolation

Any two or three axes can be selected to execute linear or circular arc interpolation control. The interpolation speed range is from 1PPS to 4 MPPS.

Powerful Position Management Function

Each axis is equipped with a 32-bit logical position counter and a 32-bit real position counter. The logical position counter counts the axis pulse output number and the real position counter is recorded with the feedback pulse from the outside encoder or linear scale.
PCI-1784

4-axis Quadrature Encoder and Counter Card

Features
- Four 32-bit up/down counters
- Single ended or differential inputs
- Pulse/direction and up/down counter
- x1, x2, x4 counts for each encoder cycle
- Optically isolated up to 2,500 V_{DC}
- 4-stage digital filter with selectable sampling rate
- On-board 8-bit timer with wide range time-base selector
- Multiple interrupt sources for precision application
- 4 isolated digital input
- 4 isolated digital output
- BoardID™ switch

Introduction
The PCI-1784 is a 4-axis quadrature encoder and counter add-on card for PCI bus. The card includes four 32-bit quadruple AB phase encoder counters, 8-bit timer with multi range time-base selector and 4 isolated digital inputs as well as 4 isolated digital outputs. Its flexible interrupt sources are suitable for motor control and position monitoring.

Specifications

Encoder Input
- Number of Axes: 4 (independent)
- Resolution: 32-bit
- Max. Quadrature Input: 1.0 MHz with Digital Filter
- Max. Quadrature Input: 2.0 MHz without Digital Filter
- Digital Filter: 4 stage
- Drive Type: Single-ended or differential
- Counter Mode: Quadrature, Up/Down, Count/Direction
- Optical Isolation: 2,500 V_{DC}
- Max. Input Pulse Freq.: x1, x2, x4
- Sample Clock Freq.: 8, 4, 2, or 1 MHz

Input Range
- Single Ended Configuration:
  - CH+ > 2.8V: High
  - CH+ = 0V (GND): Low
  - CH+ max. input voltage: ±12V

- Differential Configuration:
  - CH+ - CH- > 0.2V: High
  - -0.2V < CH+ - CH- < 0.2V: Unknown
  - CH+ - CH- < -0.2V: Low
  - CH+/CH- max. input voltage: ±12V

Timer
- Resolution: 8-bit
- Time Base: 50, 5 k, 500, 50, 5 Hz

Isolated Digital Input
- Channels: 4
- Optical Isolation: 2,500 V_{DC}
- Opto-Isolator Rsp.Time: 25 ms
- Over-Voltage Protection: 70 V_{DC}
- Input Voltage:
  - VIL (max.): 3 V_{DC}
  - VIL (min.): 10 V_{DC}
  - VIH (max.): 30 V_{DC}

Isolated Digital Output
- Channels: 4
- Optical Isolation: 2,500 V_{DC}
- Response Time: 20 ms (max.)
- Supply Voltage: TTL level
- Sink/Source Current: 50 mA max./channel

Interrupt
- Source: Counter overflow, Counter underflow, Index input, Timer, Digital input

Counter Latch
- Source: Software, Timer, Index input, Digital input

General
- I/O Connector Type: 37-pin D-sub female
- Dimensions (L x H): 175 x 100 mm (6.9” x 3.9”)
- Power Consumption:
  - Typical: +5 V @ 200 mA
  - Max.: +5 V @ 450 mA
- Operating Temperature: 0 – 60° C (32 – 140° F)
- Storage Temperature: -20 – 70° C (-4 – 158° F)
- Relative Humidity: 5~95% RH non-condensing (refer to IEC 68-2-3)
- Certifications: CE certified
PCI-1784

Ordering Information
- PCI-1784  4-axis Quadrature Encoder and Counter Card
- PCL-10137H-1  High-speed DB37 cable assembly, 1m
- PCL-10137H-3  High-speed DB37 cable assembly, 3m
- ADAM-3937  DB37 Wiring Terminal Board for DIN-rail mounting

Feature Details

Encoder Interface
Each channel includes a decoding circuit for incremental quadrature encoding. Inputs accept either single-ended or differential signals. Quadrature input works with or without an index, allowing linear or rotary encoder feedback.

Counters
The PCI-1784 has four independent 32-bit counters. The maximum quadrature input rate is 2 MHz, and the maximum input rate in counter mode is 8 MHz. You can individually configure each counter for quadrature decoding, pulse/direction counting or up/down counting.

Digital Input and Interrupts
The PCI-1784 provides four digital input channels. Each channel accepts digital input as an index input for a rotary encoder or as a home sensor input for a linear encoder. The card can generate an interrupt to the system based on a signal from its digital inputs, overflow/underflow and overcompare/undercompare of its counters, or on a programmed time interval. It can repeatedly generate interrupts at any time interval you specify, from 20 microseconds to 51 seconds. These interrupts let you precisely monitor the speed of a control system.

Flexible Digital Output function
The PCI-1784 provides four digital output channels. Each channel accepts digital output as a normal TTL output for a rotary encoder, or as an indicated output with pulse/level mode for a linear encoder. The PCI-1784 can generate an indicated output based on a signal from overcompare/undercompare of its counters. The pulse width of an indicated output depends on the counter clock or clear interrupt.

Special Shielded Cable for Noise Reduction
The PCL-10137H shielded cable is specially designed for the PCI-1784 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
The PCI-1784 has a built-in DIP switch that helps define each card’s unique ID when multiple PCI-1784 cards have been installed on the same PC chassis. The BoardID switch setting function is very useful when users build their system with multiple PCI-1784 cards. With correct BoardID switch settings, you can easily identify and access each card during hardware configuration and software programming.

Pin Assignments

Block Diagram
Introduction
The PCL-839+ three axis intelligent stepping motor control card turns your IBM-compatible PC into a 3-axis motion-control station. The card’s one PCD-4541 intelligent controller chips can execute a variety of motion-control commands. For advanced applications, we supply function libraries which you can link to your C program.

Programming the PCL-839+
You can control each axis directly through the card’s I/O registers. but use of the card’s high-level interpreter is recommended. This interpreter reads high-level commands from a text file to perform specific tasks. We also supply function libraries which you can call from your C program. The libraries come with ‘Turbo C’ source code which you can recompile if you want to access the libraries from other C compilers.

Specifications
- **Axes**: 3, independent
- **Max. Step Count**: 0~16,777,215
- **Max. Step Rate**: 200 kpps
- **Acceleration/Deceleration**: Automatic trapezoidal, ramping, programmable start run and sampling rate
- **Output Pulse Signal**: Two pulse (CW/CCW) mode or one pulse (pulse, direction) mode. Optically coupled with 10 K pull-up resistor
- **Output Driving Capability**: 20 mA @ 0.4 V (sink)
- **Output Polarity**: Positive/negative, programmable
- **Limit Switches**: Five per channel (home, forward/reverse end limit, forward/reverse high speed limit)

DI/O and Interrupt
- **DI/O**: 16 digital inputs and 16 digital outputs, TTL compatible
- **Interrupt**: IRQ 2, 4, 5, 7, 11, 12 or 15 for limit switches, jumper selectable

General
- **I/O Addresses**: 16
- **Power Consumption**: 5 V @ 390 mA max.
- **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**: DB37 for limit switches and pulse output; 20-pin flat cable for general DI/O
- **Dimensions (L x H)**: 185 x 100 mm (7.3" x 3.9")

Ordering Information
- **PCL-839+**: Intelligent 3-axis stepping motor control card, user's manual and driver CD-ROM (cable not included)
- **PCL-10137-1**: DB37 cable assembly, 1 m
- **PCL-10137-2**: DB37 cable assembly, 2 m
- **PCL-10137-3**: DB37 cable assembly, 3 m
- **ADAM-3937**: DB37 wiring terminal for DIN-rail mounting

Applications
- X-Y table control
- Rotary machine control
- Robotics control
- Precision position control using stepping motors

Features
- Independent, simultaneous control of three stepping motors
- Optically-isolated outputs
- Five isolated digital inputs per axis for limit switches
- Half-size PC add-on card
- Up to 250 kpps step rate
- 16 DI and 16 DO
Introduction

The PCL-833 is a 3-axis quadrature encoder and counter add-on card for the IBM PC/AT and compatibles (ISA bus). This card lets your PC perform position monitoring for motion control systems.

Encoder Interface

Each input includes a decoding circuit for incremental quadrature encoding. Inputs accept either single-ended or differential signals. Quadrature input works with or without an index, allowing linear or rotary encoder feedback.

Counters

The PCL-833 has three independent 24-bit counters. The maximum quadrature input rate is 1.0 MHz, and the maximum input rate in counter mode is 2.4 MHz. You can individually configure each counter for quadrature decoding, pulse/direction counting or up/down counting.

Digital Input and Interrupts

The PCL-833 provides five digital input channels. Each channel accepts digital input as an index input for a rotary encoder or as a home sensor input for a linear encoder. The card can generate an interrupt to the system based on a signal from its digital inputs, overflow/underflow of its counters, or on a programmed time interval. It can repeatedly generate interrupts at any time interval you specify, from 0.1 msec. to 255 sec. These interrupts let you precisely monitor the speed of a control system.

Specifications

Encoder Input

- **Axes**: 3, independent
- **Max. Quadrature Input Frequency**: 1.0 MHz
- **Max. Input Pulse Frequency**: 2.4 MHz
- **Counts per Encoder Cycle**: x1, x2, x4 (S/W selectable)
- **Encoder Type**: Single-ended or differential
- **Counter Size**: 24 bits, easily daisychains for up to 48 bits
- **Counter Modes**: quadrature, up/down, pulse/direction (S/W selectable)
- **Digital Filter**: 4 stage
- **Sample Clock Frequency**: 8, 4 or 2 MHz (S/W selectable)
- **Input Isolation**: 2,500 V<sub>rms</sub> using optical isolators

Digital Input

- **Number of Channels**: Five digital, with interrupt
- **Input Isolation**: 2,500 V<sub>rms</sub> using optical isolators

Programmable Interrupt Controller

1 Hz, 10 Hz, 1 kHz or 10 kHz time base (S/W selected) with a programmable multiplier of 1, 2, 3, 4, ..., 255

General

- **Power Consumption**: +5 V @ 700 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)
- **Connector**: DB25 female connector
- **Dimensions (L x H)**: 185 x 100 mm (7.3” x 3.9”)

Ordering Information

- **PCL-833**: 3-axis quadrature encoder and counter card, user’s manual and driver CD-ROM (cable not included)
- **ADAM-3925**: DB25 wiring terminal for DIN-rail mounting
- **PCL-10125-1**: DB25 cable assembly, 1m
- **PCL-10125-3**: DB25 cable assembly, 3m

All product specifications are subject to change without notice.

Last updated: January 2005
Introduction

PCI-1243U is a 4-axis intelligent stepping motor control card with PCI interface. The card’s PCD-4541 motion controller can execute a variety of motion-control commands. For advanced applications, we supply a DLL so that programs can be created for the Microsoft® Windows® environment.

PCI-1243U is a cost-effective solution for PCI based motion control. Each axis can be controlled directly through the card’s I/O registers. However, use of the card’s high-level DLL driver is recommended. With the DLL driver, you can easily link to VC++, Visual Basic® or BCB.

Specifications

- **Axes**: 4, independent
- **Max. Step Count**: 16,777,215
- **Max. Step Rate**: 400 kpps
- **Acceleration Mode**: T or S-curve acceleration/deceleration
- **Pulse Output Mode**: Pulse/direct and CW/CCW
- **I/O for each Axis**: ORG, +SD, -SD, +Lmt, -Lmt
- **General I/O**: 8 ch Opto-isolated digital output and input
- **Input Range**: 5 V ~ 30 V
- **Isolated Voltage**: 1500 Vrms
- **Max. Sink Current**: 200 mA

**General**

- **Power Consumption**: +5 V @ 340 mA; +5 V @ 500 mA (max)
- **Operating Temperature**: 0 ~ 60° C (32 ~ 140° F)
- **Operating Humidity**: 5 ~ 95% non-condensing
- **Storage Temperature**: -20 ~ 80° C

Ordering Information

- **PCI-1243**: 4-Axis Stepping Motor Control card
- **PCI-10162-1**: DB62 Cable Assembly, 1M
- **PCI-10162-3**: DB62 Cable Assembly, 3M
- **ADAM-3962**: DB62 wiring terminal with DIN-rail mounting

Features

- 4 axis stepping motor control
- PCI universal bus
- Up to 400 k pulse output rate
- T-curve acc/dec
- Pulse/Dir and CW/CCW pulse output mode
- Up 24-bit step count
- Opto-Isolated Digital input and output
- Up to 1500 Vrms system isolation

Pin Assignments

![Pin Assignments Diagram](image-url)
PCI-1241

4-Axis Voltage-type Servo Motor Control Card

Features
- PCI Bus interface
- 4-axis servo positioning control
- 5-channel encoder input
- 4 channel 16-bit D/A Converters
- 13 dedicated input and 5 dedicated output
- 6 channel 12-bit A/D converter (Optional)
- 256 remote serial input/output interfaces

Introduction
PCI-1241 uses an ASIC for 4-axis servo positioning and synchronized control with a DDA (Digital Differential Analyzer) to evenly move each axis. Closed-Loop control is implemented with P control, and -10 to +10 V signals are used for outputs to the speed type servo motor driver. It can be applied to multi-axis precision servo control, and it can also read back motor encoder values via its encoder input port to allow stepping motor control. In the control of each axis, there is a set of sensor input points, including: home points, plus limit points and minus limit points. Furthermore, there are inhibit signal output points, position ready output points and an emergency stop input point. It can be expanded up to 128 points input and 128 points output. Additionally, the board reserves a set of 6-channel A/D conversion.

Specifications

Hardware
- Size: 185 x 109 mm
- System Clock: 40 MHz
- Bus Interface: PCI

Motion
- Positioning Axes: 4
- Max. DDA Commands: 210-15 pulses
- DDA Cycle: 25 µs - 3350ms Programmable
- Velocity Command: +/- 10V

Signal Input
- Negative Over Travel: 4
- Inhibit Signal Outputs: 4
- Emergency Stop Inputs: 1
- Position Ready Outputs: 1

Software Support
- Device driver for DOS, Windows® 95/98/2000/NT/XP
- Motion control library MCCL for DOS, Windows® 95/98/2000/NT/XP

Ordering Information
- PCI-1241: 4-axis Voltage-type Servo Motor Control 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
- ADAM-3941: Wiring terminal for PCI-1241/1242 with LEDs
- PCLD-8241: 64 DI / 64 DO Remote IO Board

All product specifications are subject to change without notice

Last updated: January 2005
**PCM-3240**

4-Axis Stepping/Pulse-type Servo Motor Control Card

### Features
- PC/104 interface
- Independent 4-axis motion control
- Hand wheel and jog function
- 2/3-axis linear interpolation function
- 2-axis circular interpolation function
- Continuous interpolation function
- Programmable T/S-curve acceleration/deceleration rate
- Up to 4 MPPS pulse output for each axis
- Two pulse output types: Up/Down or Pulse/Direction
- Up to 1 MHz encoder input for each axis
- Two encoder pulse input types: A/B phase or Up/Down
- Constant speed control
- Position management and software limit switch function
- BoardID™ switch

### Introduction
PCM-3240 is a 4-axis stepping/pulse-type servo motor control card designed for general-purpose motion applications. PCM-3240 is a high-speed 4-axis motion control card for the PC/104 bus that simplifies stepping and pulse-type servo motor control, giving you added performance from your motors. The card’s intelligent NOVA® MCKX14-motion ASIC builds in a variety of motion control functions, such as 2/3-axis linear interpolation, 2-axis circular interpolation, T/S-curve acceleration/deceleration rate and more. In addition, the PCM-3240 performs these motion control functions without processor loading during driving. For advanced applications, we supply Windows® DLL drivers and user-friendly examples to decrease your programming load. Moreover, with a free bundled PCM-3240 motion utility, you can easily complete configuration and diagnosis.

### Specifications

#### Motion Axes

<table>
<thead>
<tr>
<th>Number of Axes</th>
<th>4 Axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3-axis Linear Interpolation</td>
<td>Range: +/-2,147,483,646 for each axis</td>
</tr>
<tr>
<td>Speed</td>
<td>1 PPS ~ 4 MPPS</td>
</tr>
<tr>
<td>Precision</td>
<td>± 0.5 LSB</td>
</tr>
<tr>
<td>2-axis Circular Interpolation</td>
<td>Range: +/-2,147,483,646 for each axis</td>
</tr>
<tr>
<td>Speed</td>
<td>1 PPS ~ 4 MPPS</td>
</tr>
<tr>
<td>Precision</td>
<td>± 1 LSB</td>
</tr>
<tr>
<td>Continuous Interpolation</td>
<td>Range: 1 PPS ~ 2 MPPS</td>
</tr>
<tr>
<td>Speed</td>
<td>1 PPS ~ 4 MPPS</td>
</tr>
<tr>
<td>Precision</td>
<td>± 1 LSB</td>
</tr>
</tbody>
</table>

#### Drive Output Pulses

| Number of Output Pulses | 0 ~ 4294967295 (fixed pulse driving) |
| Pulse Output Type | Pulse/Direction (1-pulse, 1-direction type) or Up/Down (2-pulse type) |
| Output Signal Modes | Differential line driving output (single-ended output) |
| Speed Curve | T/S-curve acceleration/deceleration |
| Encoder Pulse Input Type | Quadrature (A/B phase or Up/Down) |
| Counts per Encoder Cycle | x1, x2, x4 (A/B phase only) |
| Protection | 2.500 Vcc isolation |
| Input Range | 5 V ~ 30 V |
| Position Counter (read/write at any time) | Range of Command Position Counter (for output pulse) = -2,147,438,648 ~ +2,147,483,647 |
| Range of Actual Position Counter (for output pulse) = -2,147,438,648 ~ +2,147,483,647 |
| Comparison Register | COMP+ Register Range = -2,147,438,648 ~ +2,147,438,648 |
| COMP- Register Range = -2,147,438,648 ~ +2,147,438,648 |
| Can be used for software over traveling limit |

#### Interrupt Functions (excluding interpolation)

| Interrupt CONDITION (All conditions could be enable individually) |
| Position Counter ≥ COMP+ |
| Position Counter < COMP+ |
| Position Counter ≥ COMP- |
| Position Counter < COMP- |
| Constant speed begin or end during acceleration/deceleration driving pulse finished |

#### External Signals Driving

| Input Signal* | nEXOP+ and nEXOP* |
| Max. Input Frequency | 100 Hz |
| Driving Mode | Fixed pulse driving or continuous driving |
| Protection | 2,500 Vcc Photo coupler isolation; accept mechanical connection point. |

#### External Deceleration/Instantaneous Stop

| Input Signal* | nINPOS (servo alarm) |
| Protection | nINPOS (position command complete) |

#### General Purpose Output Signal

| Input Signal* | nOUT4 ~ 7 |
| Protection | 2,500 Vcc Photo coupler isolation and RC filtering |

#### Emergency Stop

| Input Signal* | nLMT+ and nLMT- |
| Protection | 2,500 Vcc Photo coupler isolation and RC filtering; accept mechanical connection point. |

#### General

| U/V Connector Type | Dual IDC 50-pin male |
| Dimensions | 96 x 91 mm |
| Power Consumption | Typical: 5 V @ 850 mA |
| External Power Voltage | DC +12 ~ 24 V |
| Temperature Operating | 0 ~ 60° C (32 ~ 140° F) |
| Storage | -20 ~ 85° C (-4 ~ 185° F) |
| Relative Humidity | 5 ~ 95% RH non-condensing (refer to IEC 68-2-3) |
| Certifications | CE certified |

Note: *: “n” represents the axis (X, Y, Z or U) that is concerned.
Ordering Information

- PCM-3240  4-axis stepping/pulse-type servo motor control card
- PCL-10150-1.2  50-pin flat cable, 1.2 m
- ADAM-3950  50-pin flat cable wiring terminal for DIN-rail mounting
- PCL-12250-1  Two 50-pin flat cable to 100-pin SCSI connector, 1 m
- ADAM-3952-J2S  4-axis wiring terminal for Mitsubishi® J2S series driver
- ADAM-39100  SCSI-100 wiring terminal for DIN-rail mounting

Pin Assignments
ADAM-3900 Series

Wiring Terminals for DIN-Rail Mounting

**ADAM-3952**
PCI-1240 50-Pin SCSI-II Wiring Terminal for DIN-rail Mounting

**Features**
- DIN-rail mounting wiring terminal for PCI-1240 applications
- Case dimensions (W x L x H): 77.5 x 179.5 x 41.5mm (3.1" x 7.1" x 1.6")
- SCSI 50-pin connector
  To be used with PCI-1240U

**ADAM-3952/J2S**
PCI-1240 Wiring terminal for Mitsubishi® MR-J2S

**Features**
- DIN-rail mounting wiring terminal for PCI-1240 connecting with Mitsubishi® MR-J2S servo motor driver
- Case dimensions (W x L x H): 121 x 202 x 45mm (4.76" x 7.95" x 1.77")
- One SCSI-100-pin connector to connect with PCI-1240/PCI-1240UU
- Eight SCSI 20-pin connector to connect with Mitsubishi motor driver
- Optional cable PCL-101100M-1 and PCL-10120M-2
  To be used with PCI-1240U/PCM-3240

**ADAM-3968M**
PCI-1247 Wiring terminal

**Features**
- General purpose wiring terminal for PCI-1247 applications with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Optional cable PCL-10168M-2

**ADAM-3968M-PMA**
PCI-1247 Wiring terminal for Panasonic® Minas A Series

**Features**
- PCI-1247 wiring terminal for Panasonic® Minas A series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Two SCSI 50-pin connector to connect with Panasonic motor driver
- Optional cable PCL-10168M-2 and PCL-10150M-2

**ADAM-3968M-J2S**
PCI-1247 wiring terminal for Mitsubishi MR-J2S series driver

**Features**
- PCI-1247 wiring terminal for Mitsubishi® MR-J2S series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Four SCSI 20-pin connector to connect with Mitsubishi motor driver
- Optional cable PCL-10168M-2 and PCL-10120M-2

**ADAM-3968M-YS2**
PCI-1247 wiring terminal for Yaskawa Sigma-II series driver

**Features**
- PCI-1247 wiring terminal for Yaskawa® Sigma-II series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Two SCSI 50-pin connector to connect with Yaskawa motor driver
- Optional cable PCL-10168M-2 and PCL-10150M-2

Features
- DIN-rail mounting wiring terminal for PCI-1240 applications
- Case dimensions (W x L x H): 77.5 x 179.5 x 41.5mm (3.1" x 7.1" x 1.6")
- SCSI 50-pin connector
  To be used with PCI-1240U

**Features**
- DIN-rail mounting wiring terminal for PCI-1240 connecting with Mitsubishi® MR-J2S servo motor driver
- Case dimensions (W x L x H): 121 x 202 x 45mm (4.76" x 7.95" x 1.77")
- One SCSI-100-pin connector to connect with PCI-1240/PCI-1240UU
- Eight SCSI 20-pin connector to connect with Mitsubishi motor driver
- Optional cable PCL-101100M-1 and PCL-10120M-2
  To be used with PCI-1240U/PCM-3240

**Features**
- General purpose wiring terminal for PCI-1247 applications with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Optional cable PCL-10168M-2

**Features**
- PCI-1247 wiring terminal for Panasonic® Minas A series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Two SCSI 50-pin connector to connect with Panasonic motor driver
- Optional cable PCL-10168M-2 and PCL-10150M-2

**Features**
- PCI-1247 wiring terminal for Mitsubishi® MR-J2S series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Four SCSI 20-pin connector to connect with Mitsubishi motor driver
- Optional cable PCL-10168M-2 and PCL-10120M-2

**Features**
- PCI-1247 wiring terminal for Yaskawa® Sigma-II series driver with DIN-rail mounting
- Case dimensions (W x L x H): 72 x 124 x 53 mm (2.83" x 4.88" x 2.09")
- One SCSI-68-pin connector to connect with PCI-1247
- Two SCSI 50-pin connector to connect with Yaskawa motor driver
- Optional cable PCL-10168M-2 and PCL-10150M-2