# Motion Control Products

ADLINK offers a variety of control interfaces and cost-effective, easy-to-use function library motion control solutions for industrial application platforms such as semiconductor/LCD/solar equipment, electrical assembly equipment, and packaging applications. Machine manufacturers will benefit from the precise positioning and advanced motion trajectory control technology provided by ADLINK.

ADLINK's PC-based motion control solutions include pulse train motion controllers, DSP-based analog motion controllers, and the SSCNET (Servo System Control Network) series. ADLINK motion control solutions deliver accurate and high-performance motion trajectories for target objects. Position comparing and trigger output functions match the performance of high-end frame grabbers in carrying out on-the-fly image inspection with line scanning. SSCNET solutions can provide up to 18-bit high-resolution, high-speed movement and simultaneous absolute synchronization via a serial connection. ADLINK also provides distributed motion and I/O control solutions to further reduce wiring costs. The latest MotionCreatorPro and MotionCreatorPro 2 utilities from ADLINK are graphical user interfaces to provide an intuitive way to discover ADLINK motion control solutions. Windows Vista 32-bit drivers, multi-core CPU drivers, and RTX are also supported.

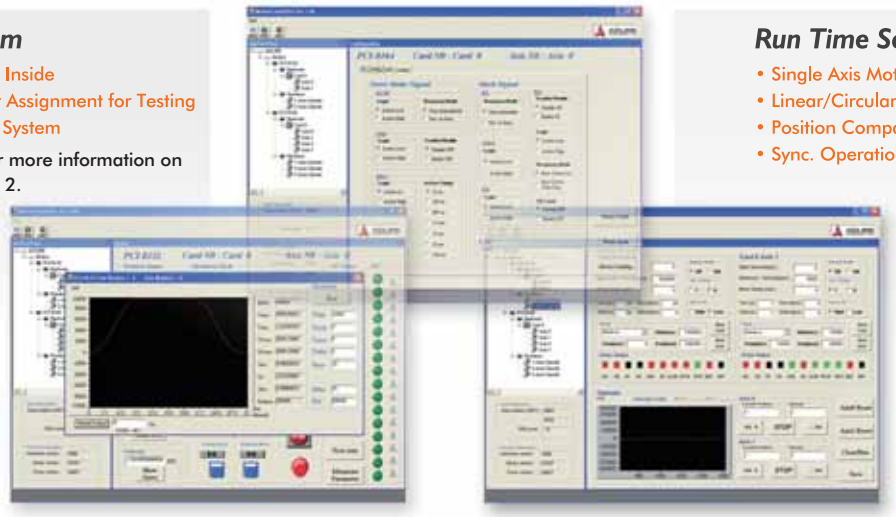
### *Develop System*

- MotionCreatorPro Inside
- Motion Parameter Assignment for Testing
- Debugging of the System

See page 1-23 for more information on MotionCreatorPro 2.

### *Run Time Software Support*

- Single Axis Motion
- Linear/Circular Interpolated Motion
- Position Compare & Trigger Output
- Sync. Operation, etc.



### *Hardware Platform*

- Pulse Train Motion
- DSP-based Analog Motion
- Distributed Motion
- Multi-channel Encoder Boards
- CompactPCI Solution
- PXI Solution

## ADLINK Motion Control Solutions:

### *Pulse Train Motion*

Pulse train motion cards generate high-frequency digital signals to control servo motors and steppers, matching the performance and precise position of high-performance servo amplifiers.

### *DSP-based Analog Motion*

Analog motion cards generate voltage commands to control servo motors or brushless DC motors to achieve higher performance, higher precision positioning, and higher response times.

### *Distributed Motion (SSCNET)*

SSCNET (Servo System NETwork) is a serial connection protocol proposed by Mitsubishi. The SSCNET protocol has real-time response and absolute synchronization. With this technology, a single board can connect to up to 16 axes. The cycle time is 0.444 ms for 8 axes and 0.888 ms for 16 axes.

# Key Features

### *DSP*
DSP, or Digital Signal Processing, allows for time-critical motion control, multiple axes synchronization, and standalone control in a variety of applications.

### *Closed-Loop Control*
Motion control cards can accept feedback signals to perform closed-loop control. The control loop gain can be tuned for optimal positioning and velocity control.

### *PID Plus Feedforward Gain Control*
All servo applications require specified safe and stable PID loop parameters in order to perform position control, ADLINK Softmotion provides a proportional-integral-derivative (PID) algorithm with adjustable velocity and feed-forward gain to simplify servo application development.

### *Speed Override*
Change the rotation speed on-the-fly while the axis is running.

### *Position Override*
After movement begins, the position target can be changed on-the-fly even if the motion speed goes into maximum velocity.

### *Card ID*
Card identification to support multiple cards in one system.

### *Manual Pulser Input Interface*
Some motion control solutions provide an interface that connects manual pulser input devices, which can be used to move the axes.

### *Digital I/O Capacity*
Digital input and output channels are provided.

### *Analog Output / Analog Input Channels*
Some products offer analog output/input channels for voltage signals.

### *Linear and Circular Interpolation*
For interpolative operations, ADLINK provides linear interpolation by any 2, any 3, or even all 4 axes. Any 2 axes can perform circular interpolation. Linear or circular interpolated movements can be executed at the same time with advanced pulse train motion controllers.

### *Helical Interpolation*
If the start point and destination of circular interpolation move does not lie in the same plane, ADLINK provides helical interpolation between any 3 of the 4 axes. Helical interpolated movements can be executed at same time on the PCI-8154/PCI-8158.

### *Home Return Modes*
ADLINK's advanced pulse train motion controllers can provide up to 13 home modes for high-precision home position to meet the needs of various mechanical designs and operating restrictions.

### *T-Curve / S-Curve Velocity Profile*
The acceleration and deceleration times are programmable. Acceleration and deceleration rates can be set individually and S-curve movement can compensate for mechanical vibration during movement.

### *Absolutely Synchronization*
ADLINK motion controllers can perform simultaneously start/stop functions on multiple axes in one card or multiple axes across multiple cards by using software or external input signals. This is especially beneficial for complicated motion patterns requiring absolute synchronization of multiple axes. The simultaneous stop function is selectable to be active when certain axes are stopped abnormally.

### *Hardware Emergency Input*
This function is a safety protection feature for system designers to provide emergency shut-down in case of malfunction.

### *Security*
Hardware security prevents duplication of the software developed by the system designer.

### *HSL Network Support*
HSL is a High Speed Link bus designed specifically for distributed real-time I/O control and motion systems. Functionality can be extended to one HSL network and control I/O in remote site.

### *Mechanism Interface*
Pre-defined limit switch sensors are often used on a table are to protect the mechanism. ADLINK's motion control cards provide dedicated I/O which can be used end-limit and origin sensors which are very useful for the system integration of such applications.

### *Servo Drive Interface and GPIO*
Most servo motor drivers provide interfacing signals such as in-position (INP), alarm (ALM), error counter clear (ERC), servo ready signals. These signal interfaces are supported. General-purpose digital input/output for each axis is also provided.

### *Position Latch*
The latch function captures the instant counter value of one certain axis when the latch signal activates. The LTC channel is used to receive the latch pulse and the latch function is implemented with hardware.

### *Automatic Backlash Compensation*
Whenever direction change occurs, this function is to output backlash corrective pulses before sending commands. This function only supports single-axis movement.

### *Continuous Contouring*
ADLINK motion controllers can provide hardware-based contouring control in order to provide a variety of trajectories controls for smooth motion. The pre-register architecture of the controllers offers the feature to build continuous interpolation functions so that the second motion may follow previous motion instantly without latency. Thus perfect velocity continuity can be established.

### *Hardware Position Compare and Trigger Output (TRO)*
By sending several position compare points to the buffer, the triggering pulse will be triggered upon reaching each compare position at a high-speed rate (up 1 MHz for ADLINK products) without any loss. Comparison is performed via hardware. The on-board SDRAM can store large amounts of compare points. The high-frequency trigger pulse can also signal line scan frame grabbers.

# Selection Guide

## Pulse Train Motion

| Form Factor | | PCI | | | |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Model Name | | PCI-8158 | PCI-8154 | PCI-8164 | PCI-8102 |
| Number of Axes | | 8 | 4 | 4 | 2 |
| Support Motor | | stepper / servo | stepper / servo | stepper / servo | stepper / servo |
| Encoder Input Frequency (Max) | | 6.55 MHz @ 1 M, under 4 x AB phase | 6.55 MHz @ 1 M, under 4 x AB phase | 6.55 MHz @ 1 M, under 4 x AB phase | 6.55 MHz @ 1 M, under 4 x AB phase |
| Pulse Output Rate (Max) | | 6.55 Mpps | 6.55 Mpps | 6.55 Mpps | 6.55 Mpps |
| Motion Features | Linear Interpolation | Any 2 to 4 of 4 axes | Any 2 to 4 of 4 axes | Any 2 to 4 of 4 axes | 2 axes |
| | Circular Interpolation | Any 2 axes | Any 2 axes | Any 2 axes | 2 axes |
| | Helical Interpolation | √ | √ | - | - |
| | Home Return Mode | 13 (including auto homing) | 13 (including auto homing) | 13 (including auto homing) | 13 (including auto homing) |
| | Continuous Contouring | by 3 command buffer | by 3 command buffer | by 3 command buffer | by 3 command buffer |
| Motion Profile | | T/S curve (non-symmetric acceleration/deceleration settings are supported) | | | |
| Dedicated Moiton I/O | | ±EL/ORG/SVON/INP/ALM/RDY for each axis | | | |
| DI/O Channels | | 8 DI / 8 DO | 4 DI / 4 DO | 6 TTL DO | 16 DI / 16 DO |
| Card Index Switch | | √ (0 to 15) | √ (0 to 15) | - | √ (0 to 15) |
| Hardware Emergency Input | | √ | √ | - | √ |
| Advanced Motion Function | Position Compare & Triggering | √ (with DB-8150, up to 1 MHz ) | √ (with DB-8150, up to 1 MHz ) | √ (up to 15 kHz) | √ (up to 1 kHz by interrupt function) |
| | Backlash Compensation | √ | √ | √ | √ |
| | Simultanous Move | √ | √ | √ | √ |
| | Ring Counter Support | √ | √ | √ | √ |
| Page No. | | 7-9 | 7-9 | 7-13 | 7-14 |

| Form Factor | | PCI | | | PXI | cPCI |
|---|---|---|---|---|---|---|
| | |  |  |  |  |  |
| Model Name | | PCI-8144 | PCI-8132 | PCI-8134 | PXI-8164 | cPCI-8168 |
| Number of Axes | | 4 | 2 | 4 | 4 | 8 |
| Support Motor | | stepper / servo | stepper / servo | stepper / servo | stepper / servo | stepper / servo |
| Encoder Input Frequency (Max) | | - | 2.4 MHz @ 3 M | 2.4 MHz @ 3 M | 6.55 MHz @ 1 M | 6.55 MHz @ 1 M |
| Pulse Output Rate (Max) | | 6.55 Mpps | 2.4 Mpps | 2.4 Mpps | 6.55 Mpps | 6.55 Mpps |
| Motion Features | Linear Interpolation | - | 2 axes | 2 axes | Any 2 to 4 of 4 axes | Any 2 to 4 of 4 axes |
| | Circular Interpolation | - | - | - | Any 2 axes | Any 2 axes |
| | Helical Interpolation | - | - | - | - | - |
| | Home Return Mode | 1 | 3 | 8 auto homing by software | 13 (including auto homing) | 13 (including auto homing) |
| | Continuous Contouring | - | - | - | √ | by 3 command buffer |
| Motion Profile | | T/S curve (Non-symmetric acceleration/deceleration settings are supported) | | | T/S curve (Non-symmetric acceleration/ deceleration settings are supported) | |
| Dedicated Moiton I/O | | ±EL/ORG/SVON/INP/ ALM/RDY for each axis | ±EL/ORG/SVON/INP/ALM/RDY/SD for each axis | | ±EL/ORG/SVON/INP/ALM/RDY for each axis | |
| DI/O Channels | | 8 DI / 8 DO | 16 DI / 16 DO | - | 4 DI / 4 DO | 8 DI / 8 DO |
| Card Index Switch | | - | - | - | - | - |
| Hardware Emergency Input | | √ | - | - | - | - |
| Advanced Motion Function | Position Compare & Triggering | - | √ (up to 1 kHz by interrupt function) | - | - | √ |
| | Backlash Compensation | - | - | - | √ | √ |
| | Simultanous Move | - | √ | √ | √ | - |
| | Ring Counter Support | - | - | - | √ | √ |
| Page No. | | 7-17 | 7-15 | 7-16 | 7-13 | 7-18 |

# DSP-based Analog Motion

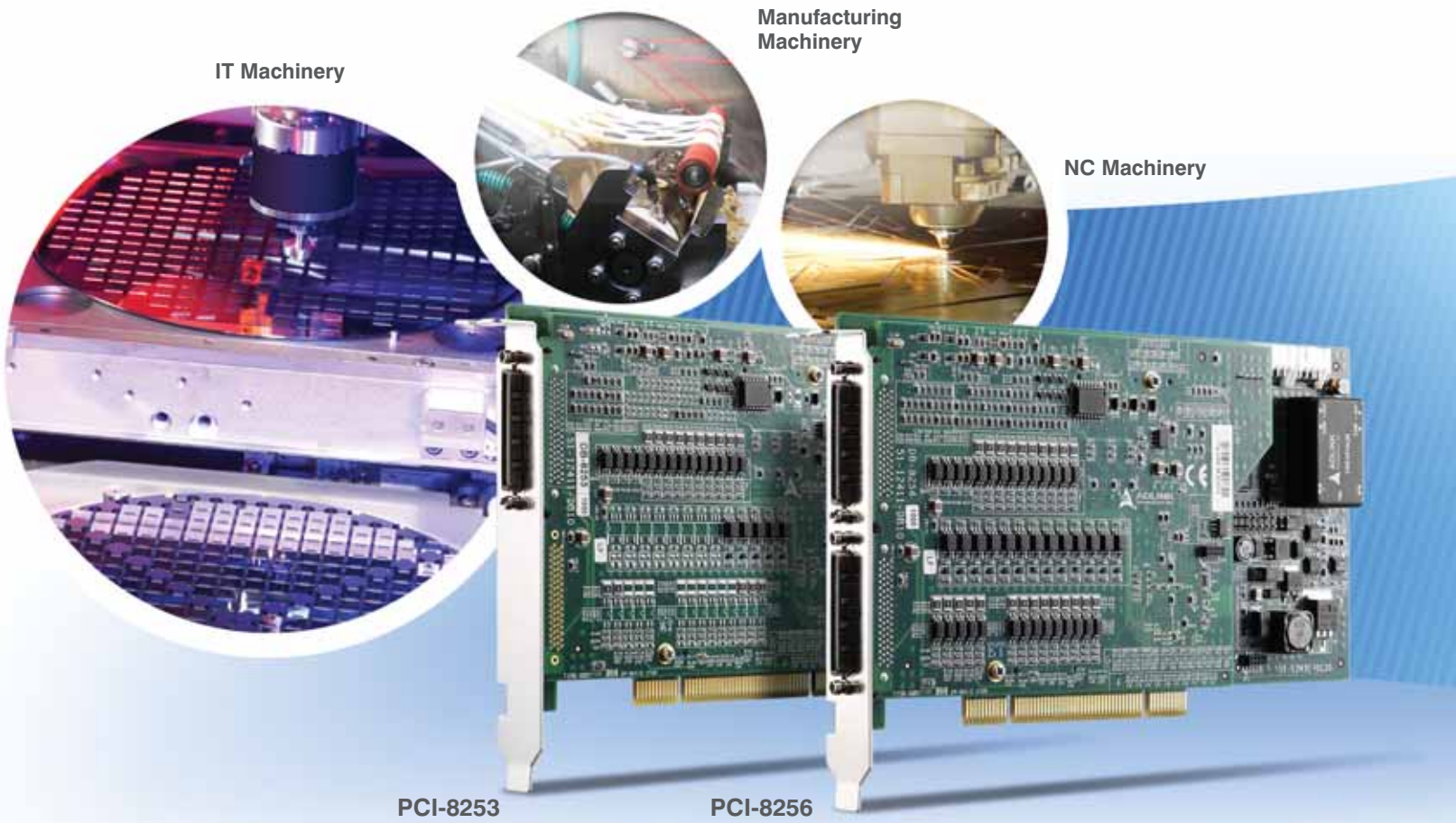
| Form Factor | | PCI | |
|---|---|---|---|
| | |  |  |
| Model Name | | PCI-8253 | PCI-8256 |
| Number of Axes | | 3 | 6 |
| Support Motor | | servo / brushless DC | servo / brushless DC |
| Encoder Input Frequency (Max) | | 20 MHz, under 4 x AB phase | 20 MHz, under 4 x AB phase |
| Servo Update Rate | | 150 μs / 3 axes | 300 μs / 6 axes |
| Motion Features | Linear Interpolation | Any 2 to 3 of 3 axes | Any 2 to 4 of 6 axes |
| | Circular Interpolation | Any 2 axes | Any 2 axes |
| | Home Return | √ | √ |
| | Gearing | √ | √ |
| | Continuous Contouring | √ | √ |
| Motion Profile | | T/S curve (Non-symmetric acceleration/deceleration settings are supported) | |
| Dedicated Moiton I/O | | ±EL/ORG/SVON/INP/ALM/RDY for each axis | |
| AI Channels | | 3 (14-bit garuantee) | 6 (14-bit garuantee) |
| DI/O Channels | | 4 DI / 4 DO | 8 DI / 8 DO |
| Card Index Switch | | √ (4-bit) | √ (4-bit) |
| Hardware Emergency Input | | √ | √ |
| Advanced Motion Function | Position Compare & Triggering | up to 1 MHz | up to 1 MHz |
| | Simultanous Move | √ | √ |
| | Ring Counter Support | √ | √ |
| | Gantry Function | √ | √ |
| | Software Limit | √ | √ |
| Page No. | | 7-7 | 7-7 |

# SSCNET Distributed Motion

| SSCNET (Servo System Control NETwork) | SSCNET III (Cycle Time: 0.888 ms for 16 axes; 0.444 ms for 8 axes) | | SSCNET II (Cycle Time: 0.888 ms) | | |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| Model Name | PCI-8392 | PCI-8392H | PCI-8366+ | PCI-8372+ | cPCI-8312H |
| Number of Axes | 16 | 16 | 6 | 12 | 12 |
| Linear Interpolation | Any 2 to 4 axes | Any 2 to 4 axes | Any 2 to 3 axes | Any 2 to 3 axes | Any 2 to 3 axes |
| Circular Interpolation | Any 2 axes | - | Any 2 axes | Any 2 axes | Any 2 axes |
| Pulse Output Channel | - | - | - | - | 2 |
| Analog Input Channel | - | - | - | - | 2 |
| Analog Output Channel | - | - | 2 | 2 | 2 |
| DI/O Channels | - | via HSL bus, up to 2016 points | 2 DI / 2 DO | 2 DI / 2 DO | 2 DO |
| Programmable I/O | - | - | √ | √ | √ |
| External Encoder Counter | - | - | 3 (32-bit) | 3 (32-bit) | 2 (32-bit) |
| Speed Profile | T/S curve | T/S curve | T/S curve | T/S curve | T/S curve |
| Position Compare | - | - | 2CH/axis | 2CH/axis | 2CH/axis |
| Trigger Output Channels | - | - | 2 (via DO channel, up to 1 kHz) | | |
| Continuous Triggering | - | - | √ | √ | √ |
| Continuous Contouring | - | - | √ | √ | √ |
| Continuous Interpolation | - | - | √ | √ | √ |
| Dedicated Moiton I/O | PEL/MEL/ORG are on Mitsubishi J3B servos (CN3). All signal information will be monitored by SSCNET III protocol | | PEL/MEL/ORG for each axis | | |
| HSL Inside | - | √ (MKY36) | - | - | √ (MKY33) |
| HSL Network Port | - | 1 | - | - | 2 |
| Page No. | 7-21 | 7-21 | 7-23 | 7-23 | 7-24 |

# Advanced DSP-based Servo Motion Controller

## Fully closed-loop control with high accuracy and fast response time for AOI/gantry/contouring applications

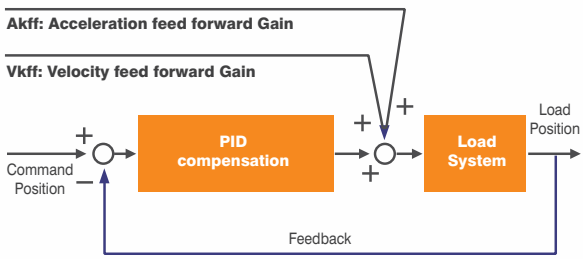



ADLINK recently released their most advanced DSP-based servo motion controllers, the PCI-8253 (three axes) and PCI-8256 (six axes). Based on over ten years of experience in developing PC-based motion controllers, ADLINK designed the PCI-8253/8256 to take full advantage of the latest digital signal processing technologies to provide a ±10 V analog motion controller with full-closed loop control with PID plus feed-forward and 20 MHz encoder input frequency.
The PCI-8253/8256 not only provide general motion control, but also support comprehensive and application-specific functions ideal for automated optical inspection (AOI), gantry, and manufacturing machine applications, as well as complete compatibility with all the top third-party servo drivers in the market.

By incorporating a digital signal processor (DSP), the PCI-8253/8256 are able to provide advanced, flexible, and comprehensive motion functions that cannot be achieved through ASIC-based solutions. Such functions include multiple dimension interpolation and high-speed position comparison. All motion profile algorithms are developed by ADLINK and implemented on the DSP. Therefore, application-specific functions can be custom develop for customers.

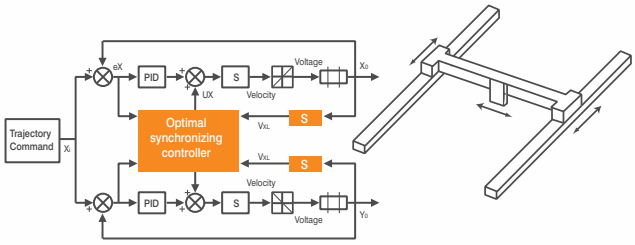
By incorporating FPGA technology, the PCI-8253/8256 provide higher motion control performance by a fast encoder input frequency up to 20 MHz. Control signals run at ±10 V and the controllers are fully closed loop. The PCI-8253/8256 also offer a point table that supports over 5,000 points for each axis.
The hardware-based highspeed position comparison and trigger output speed of up to 1 MHz further make the PCI-8253/8256 ideal for AOI applications.

### *Closed-loop Control with PID plus Feed Forward Gain*



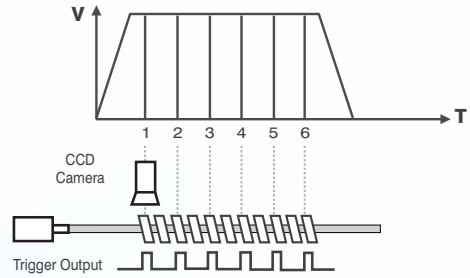

The PCI-8253/56 adopt fully closed-loop control with PID filter plus feed forward gain to realize high-speed and high-precise motion control capacity. Feed forward gain can reduce speed profiles following errors for faster rising times.

## Dynamic Gantry Error Compensation



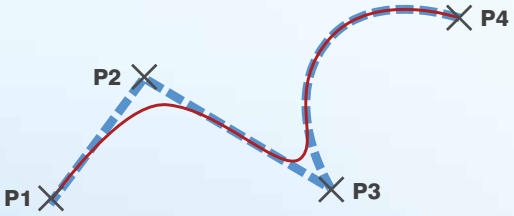

Gantry control with dynamic error compensation is part of the real-time feature of the PCI-8253/56, providing superior control of large stage movement in TFT/LCD, PCB, and machine tool industries.

## High-Speed Position Comparison & Trigger Output



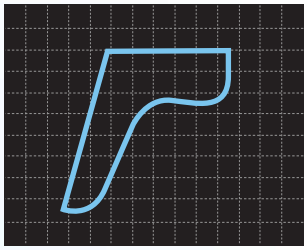

The PCI-8253/8256 provide higher motion control performance by a fast encoder input frequency up to 20 MHz and also provide hardware-based high-speed position comparison and trigger output speed of up to 1 MHz, ideal for AOI applications.

## Blend Motion




To ensure smooth movement along the path, the PCI-8253/56 incorporate blend motion which looks several points ahead and combines splining motion for continuous and smooth velocity movement. If more than one move is specified in succession with no pause in between, the first movement will blend into the second with the same type of controlled acceleration as is done to and from a stop.

## Contouring

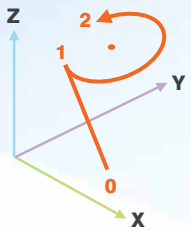


```
%  [R114.000]
   N10  G91
   N30  G00  X0.001     Y-540.911
   N50  G01  X-0.000    Y-10.000
   N60  G01  X0.116     Y0.000
   N70  G01  X0.116     Y0.000
   N80  G01  X0.116     Y0.000
   N90  G01  X0.116     Y0.000
   N100 G01  X0.116     Y0.000
   N110 G01  X0.116     Y0.000
   N120 G01  X0.116     Y0.001
   N130 G01  X0.116     Y0.001
   N140 G01  X0.116     Y0.001
   N150 G01  X0.116     Y0.001
   N160 G01  X0.116     Y0.001
```

In the most "Contouring" applications such as laser/fire cutting, PCB drilling, dispensing, 2D machine tooling, the path trajectory cannot decelerate or stop temporarily as such operation will damage the substrate or workpiece. The PCI-8253/56 provide a G-code interface and auto-compensation when moving to resolve this concern.

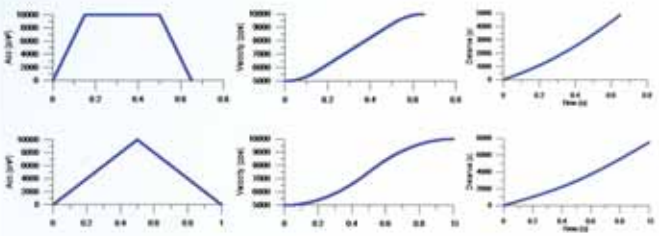
## Point-Table mixed Motion & I/O Control

| Index | Axis0 | AxisN |
|---|---|---|
| 0 | POINT_DATA | POINT_DATA |
| 1 | POINT_DATA | POINT_DATA |
| ⋮ | | |
| 4998 | POINT_DATA | POINT_DATA |
| 4999 | POINT_DATA | POINT_DATA |



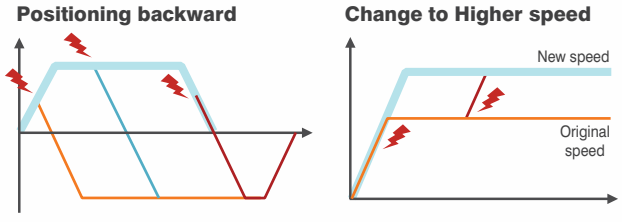

The PCI-8253/56 provides point-table moving to execute continuous motion. Each axis supports more than 5,000 buffers with a **POINT INDEX** to monitor the motion and movement status. The point table also supports mixed motion and I/O operations where the I/O can triggered by a "motion done" status or motion can be triggered by an I/O input signal.

## Position / Velocity / Acceleration vs.Time



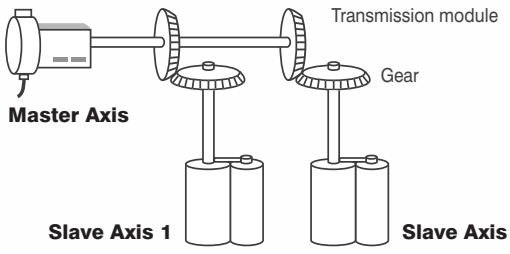
In the most "Pick & Place" applications, optimized throughput through an S-curve profile is often required. The S-curve profile eliminates possible overshooting, otherwise the part could be damaged when it comes into contact with the substrate. The PCI-8253/56 provide Scurves with different degrees of smooth velocities.

## Position / Speed Override




PCI-8253/56 allow position / speed change at any time regardless if motion is accelerating, decelerating or constant. The next position in the forward or backward direction can be easily and flexibly overridden.

## Electronic-Gearing

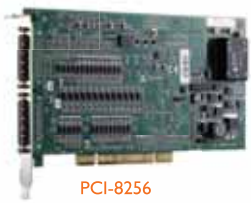



The PCI-8253/56 controllers support slaving any axis or axes to a master. Moving the master axis will cause the slave to move based on the specified slave ratio. The optimal position of the slave axis is calculated by multiplying the optimal position of the master by the gearing ratio of the slave.

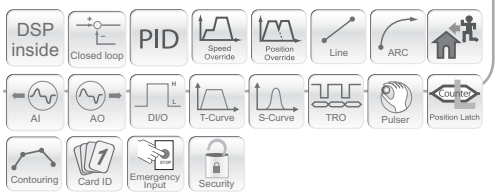
# PCI-8253 / PCI-8256

## DSP-based 3/6-axis Analog Motion Control Cards

PCI-8253



PCI-8256




## Features

- 32-bit PCI bus, Rev. 2.2, 33 MHz
- On-board 250 MHz DSP
- 3/6 axes of ±10 volts analog command for controlling servo motors by differential command signal
- Maximum servo update rate is less than 300 μs for 6 axes
- Encoder feedback frequency up to 20 MHz
- Digital filter for encoder input to reduce noise disturbance
- 1/2 channel up to 1 MHz high speed trigger pulse output for PCI-8253/PCI-8256
- A/D inputs (3/6 channels, 14-bit, ±10 V)
- Manual pulse generator inteface
- One dedicated emergency input pin
- High speed position latch function via ORG and Index signals
- On-board 512 kb flash ROM for motion kernel and non-volatile data – PID parameters
- Programmable interrupt source control to host PC
- General purpose I/O: 4 DI/4 DO for PCI-8253 and 8 DI/8 DO for PCI-8256
- Watch dog timer for safety control
- Support for up to 16 cards in one system
- Motion Functions
  - Jogging mode
  - Any 2-4 axes linear interpolation
  - Any 2 axes circular interpolation
  - Multi-axis synchronized motion
  - Trapezoidal, S-curve velocity profile
  - Position override & speed override in anytime
  - Programmable acceleration/deceleration
  - Variety of homing modes via signals
  - Linear and FIFO position comparison method for high speed trigger output
  - Filter: 2nd order Notch filter and 1 order low pass filter
  - Blend motion (LookAhead)
  - E-gear (Electronic gear)
  - Contouring function by point table description
  - Gantry mode
  - Ring counter (32-bit) for rotatory encoder input
  - Motion trajectory & PID parameters can be changed on-the-fly

## Specifications

| | |
|---|---|
| **Analog Input / Output Channels** | |
| Number of Channels | 3 for PCI-8253; 6 for PCI-8256 |
| Analog Output | ±10 Volt with 16-bit D/A Converter |
| Analog Input | ±10 Volt with 14-bit A/D Converter |
| **Encoder Input Channels** | |
| Number of Channels | 3 for PCI-8253; 6 for PCI-8256 |
| Max. Encoder Input Frequency | 20 MHz under 4 x AB mode |
| Encoder Counter | 6-CH, 32-bit |
| Pulse Command Type | AB phase and CW/CCW modes |
| **Trigger Channels** | |
| Number of High speed Channels | 1 for PCI-8253; 2 for PCI-8256 |
| Number of Low Speed Channels | 1 for PCI-8253; 2 for PCI-8256 |
| Maximum Trigger Pulse Frequency | 1 MHz for high speed trigger; 25 KHz for low speed trigger |
| Trigger Pulse Width | 0.3 μs to 300 ms |
| **Motion I/O Interface Signals** | |
| I/O Pins | Differential and 2500 VRMS, optically isolated |
| Incremental Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pins | ±EL and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC, SVON, RDY |
| Position Compare Output Pin | CMP |
| **General Purpose I/O** | |
| Digital Input | 4-CH (PCI-8253) / 8-CH (PCI-8256) isolated digital input |
| Input Voltage | 0 to 24 V |
| Input Resistance | 2.4 KΩ @ 0.5 W |
| Digital Output | 4-CH (PCI-8253) / 8-CH (PCI-8256) isolated digital output |
| Output Voltage | 5 V (min.); 35 V (max.) |
| Output Type | NPN open collector Darlington transistors |
| Current Sink | 90 mA |
| **Analog Input (A/D)** | |
| Resolution | 14-bit |
| Input Channel | 4 single-ended |
| Input Range | ±10 V, bipolar |
| Conversion Time | 8 μs |
| Sampling Rate | 110 K samples/sec (Max.) |
| Accuracy | 0.01% of FSR, ±1 LSB |
| **General Specifications** | |
| Connectors | 68-pin SCSI-type connector |
| Operating Temperature | 0°C to +55°C |
| Storage Temperature | +20°C to +80°C |
| Humidity | 5% to 95%, non-condensing |

## Software Support

Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: Visual Basic, Visual C++, Borland C++ Builder, and Delphi

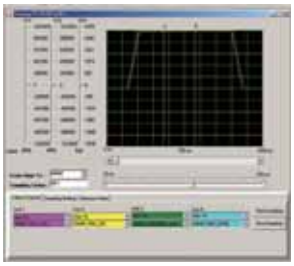
ADLINK GREEN RoHS Compliant

## MotionCreatorPro 2™

**Powerful & Useful Utility Windows**

MotionCreatorPro 2™ is a Windows-based application development software package included with the PCI-8253/PCI-8256. MotionCreatorPro 2™ is useful for debugging a motion control system during the design phase of a project. Anon-screen display lists all installed axes information and I/O signal status of the PCI-8253/PCI-8256. By using this utility, you can easy tune the axis parameter servo gain (PID plus feed forward gain) reducing the efforts on gain tuning. Furthermore, the sampling windows makes more accurate in motion data analysis, moreover, integrates with axis parameter and PID gain on-the-fly change, thus, the PCI-8253/PCI-8256 provides precise positioning control with less effort.

(See page 1-23 for more information on MotionCreatorPro 2.)



- **Board & Axis Configuration**
- **Oscilloscope**
- **PID Tuning Page**
- **Motion & I/O Manipulation Page**
- **Specific Applications Manipulation Pages**
  - **> Gantry**
  - **> 2D G-code Import**
  - **> Position Comparison Trigger Set Up**

## Ordering Information

**PCI-8253**
DSP-based 3-axis analog motion control card

**PCI-8256**
DSP-based 6-axis analog motion control card

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-825-J3A0
Terminal board for Mitsubishi MR-J3S-A servo amplifiers

DIN-68S-01
Terminal board with 68-pin SCSI-II connector with DIN socket

**Cabling**

ACL-10568-1
68-pin SCSI-VHDCI cable (mating with AMP-787082-7), 1 M

## Pin Assignment

*SP1 / SP2 (PCI-8253 & PCI-8256)*

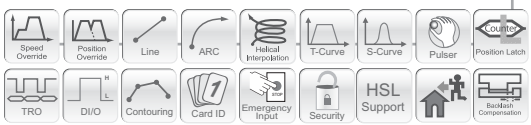
| No. | Name | I/O | Function of Axis | No. | Name | I/O | Function of Axis |
|---|---|---|---|---|---|---|---|
| 1 | AOUT1+ | O | Analog output (+),(1) | 35 | AOUT1- | O | Analog output (-),(1) |
| 2 | AOUT2+ | O | Analog output (+),(2) | 36 | AOUT2- | O | Analog output (-),(2) |
| 3 | AOUT3+ | O | Analog output (+),(3) | 37 | AOUT3- | O | Analog output (-),(3) |
| 4 | AGND | SG | Analog ground | 38 | AGND | SG | Analog ground |
| 5 | AIN1 | I | Analog input, (1) | 39 | AGND | SG | Analog ground |
| 6 | AIN2 | I | Analog input, (2) | 40 | Rsv. | - | Reserved |
| 7 | AIN3 | I | Analog input, (3) | 41 | Rsv. | - | Reserved |
| 8 | EA1+ | I | Encoder A-phase (+),(1) | 42 | EA1- | I | Encoder A-phase (-),(1) |
| 9 | EB1+ | I | Encoder B-phase (+),(1) | 43 | EB1- | I | Encoder B-phase (-),(1) |
| 10 | EZ1+ | I | Encoder Z-phase (+),(1) | 44 | EZ1- | I | Encoder Z-phase (-),(1) |
| 11 | ALM1 | I | Servo alarm,(1) | 45 | ORG1 | I | Home limit, (1) |
| 12 | SVON1 | O | Servo-ON, (1) | 46 | PEL1 | I | Positive limit, (1) |
| 13 | ZSP1 | I | ZeroSpeed 1 | 47 | MEL1 | I | Negative limit, (1) |
| 14 | TRG1+ | O | Trigger Output, (+)(1) | 48 | TRG1- | O | Trigger Output, (-)(1) |
| 15 | TRG2+ | O | Trigger Output, (+)(2) | 49 | TRG2- | O | Trigger Output, (-)(2) |
| 16 | EA2+ | I | Encoder A-phase (+),(2) | 50 | EA2- | I | Encoder A-phase (-),(2) |
| 17 | EB2+ | I | Encoder B-phase (+),(2) | 51 | EB2- | I | Encoder B-phase (-),(2) |
| 18 | EZ2+ | I | Encoder Z-phase (+),(2) | 52 | EZ2- | I | Encoder Z-phase (-),(2) |
| 19 | DOCOM | - | Digital output common | 53 | DICOM | - | Digital input common |
| 20 | ALM2 | I | Servo alarm, (2) | 54 | ORG2 | I | Home limit, (2) |
| 21 | SVON2 | O | Servo-ON, (2) | 55 | PEL2 | I | Positive limit, (2) |
| 22 | ZSP2 | I | ZeroSpeed 2 | 56 | MEL2 | I | Negative limit, (2) |
| 23 | EA3+ | I | Encoder A-phase (+),(3) | 57 | EA3- | I | Encoder A-phase (-),(3) |
| 24 | EB3+ | I | Encoder B-phase (+),(3) | 58 | EB3- | I | Encoder B-phase (-),(3) |
| 25 | EZ3+ | I | Encoder Z-phase (+),(3) | 59 | EZ3- | I | Encoder Z-phase (-),(3) |
| 26 | ALM3 | I | Servo alarm,(3) | 60 | ORG3 | I | Home limit, (3) |
| 27 | SVON3 | O | Servo-ON, (3) | 61 | PEL3 | I | Positive limit, (3) |
| 28 | ZSP3 | I | ZeroSpeed 3 | 62 | MEL3 | I | Negative limit, (3) |
| 29 | DOCOM | - | Digital output common | 63 | IEMG | I | Emergency Stop |
| 30 | DOCOM | - | Digital output common | 64 | DICOM | - | Digital input common |
| 31 | EDO1 | O | Digital Output, (1) | 65 | EDI1 | I | Digital Input, (1) |
| 32 | EDO2 | O | Digital Output, (2) | 66 | EDI2 | I | Digital Input, (2) |
| 33 | EDO3 | O | Digital Output, (3) | 67 | EDI3 | I | Digital Input, (3) |
| 34 | EDO4 | O | Digital Output, (4) | 68 | EDI4 | I | Digital Input, (4) |

# PCI-8158 / PCI-8154

## Advanced 8/4-axis Stepper & Servo Motion Control Cards with Modular Design

PCI-8158

PCI-8154




## Features

- 3 axes helical interpolation
- Hardware-controlled position compare and trigger (with DB-8150, up to 1 MHz)
- One HSL network support (with DB-8151)
- ECAM (Electronic CAM) control (with DB-8152)
- One Motionnet master support (with DB-8153)
- 32-bit PCI bus, Rev. 2.2, 33 MHz
- High density (200-pin) 8-axis motion controller
- Pulse output rate: up to 6.55 MHz
- Pulse output options: OUT/DIR, CW/CCW, AB Phase
- 2 to 4 axes linear interpolation
- 2 axes circular interpolation
- Helical interpolation
- Multi-axis continuous interpolation
- Position/Speed change override
- 13 home return modes and auto home search
- High speed position latch function
- Programmable acceleration and deceleration time
- Trapezoidal and S-curve velocity profiles
- 28-bit up/down counter for incremental encoder
- Multi-axis, simultaneous start/stop
- Programmable interrupt sources
- Hardware backlash compensator
- Manual pulser input interface
- Softwares limit function
- Hardware emergency input
- More than 100 thread safe API functions
- Security protection for user's program
- Easy interface to any stepping motors, AC or DC servo, linear or rotary motors
- All digital inputs and outputs are 2500 Vrms isolated
- Supports up to 12 cards in one system

## Specifications

| | |
|---|---|
| **Pulse Type Motion Control** | |
| Max. Number of Axes | 8 |
| Pulse Output Rate | 0.01 pps to 6.5 Mpps |
| Max. Acceleration Rate | 245 Mpps$^2$ |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 6.55 MHz under 4 x AB phase @ 1 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Counters | x 4 for each axis |
| Comparators | x 5 for each axis |
| **Motion Interface I/O Signals** | |
| Position Latch Input Pin | LTC |
| Position Compare Output Pin | CMP |
| I/O Pin | Differential and 2500 Vrms optically isolated |
| Incremental Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Signal Input Pin | ±EL, SD, and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC, RDY, SVON |
| General DO Pin | DO x 8 for DO/CMP |
| General DI Pin | GDI x 8 for DI/LTC/PCS/SD/CLR/EMG |
| Pulser Signal Input | PA and PB |
| Simultaneous Start/Stop Signal I/O Pin | STA and STP |

## Software Support

- Windows® Platform
  - Available for Windows Vista (32-bit)/XP/2000
  - Recommended programming environments: VB/VC++/BCB/Delphi/VB.NET
  - Various sample programs with source codes
  - Customized API functions are possible
- RTX ( Windows Real Time Extension)
  - RTX 5.x/6.x/8.1a
- Linux Platform
  - Redhat 9, kernel 2.4.x
  - Fedora Core 3, kernel 2.6.9
  - Fedora Core 4, kernel 2.6.11
  - Fedora Core 5, kernel 2.6.15
- MotionCreatorPro 2™

MotionCreatorPro 2 is a user-friendly Windows-based application development software package included with all distributed motion and I/O control modules.

MotionCreatorPro 2 provides simple configuration and real-time statuses of modules, in addition to precise positioning control with no effort.

(See page 1-23 for more information on MotionCreatorPro 2.)

## Ordering Information

- **PCI-8158**
  Advanced 8-axis stepping & servo motion control card
- **PCI-8154**
  Advanced 4-axis stepping & servo motion control card
- **DB-8150**
  High-speed triggering daughter board
- **DB-8151**
  Single HSL master controller daughter board
- **DB-8152**
  Electronic CAM slave motion solution daughter board
- **DB-8153**
  Single Motionnet master controller daughter board

## Accessories

See section 14 for more information on Accessories.

**Terminal Boards**

- DIN-100S-01
  Terminal board with one 100-pin SCSI-II connector and DIN-rail mounting
- DIN-814M0
  Terminal board for Mitsubishi MR-J2S-A servo amplifier
- DIN-814M -J3A0
  Terminal board for Mitsubishi MR-J3S-A amplifier
- DIN-814Y0
  Terminal board for Yaskawa Sigma II/III/V amplifier
- DIN-814P-A40
  Terminal board for Panasonic MINAS A4 amplifier
- DIN-814PA0
  Terminal board for Panasonic MINAS A servo amplifier

**Cabling**

- ACL-102100-1 (for PCI-8154)
  100-pin SCSI-II cable (mating with AMP-787082-9), 1 M
- SCSI-VHDCI 100P (for PCI-8158)
  100-pin SCSI-VHDCI cable, available for 2 M, 3 M

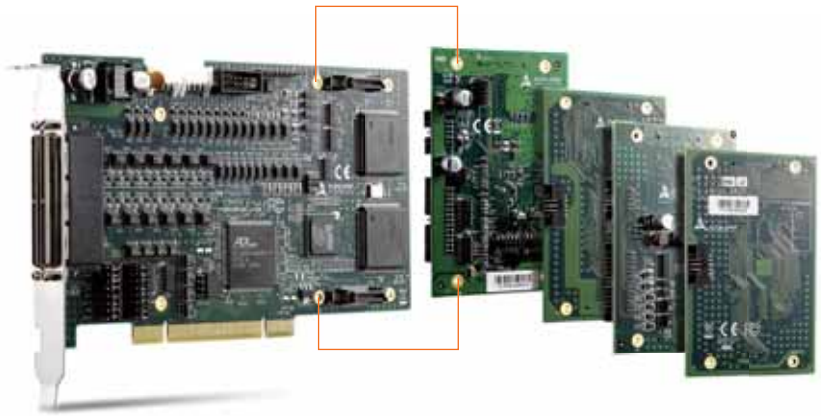
## Pin Assignment

*PCI-8158/PCI-8154 100-pin Mini SCSI Connector Pin Assignment*

| | | | |
|---|---|---|---|
| VDD | 1 | 51 | VDD |
| EXGND | 2 | 52 | EXGND |
| OUT0+ | 3 | 53 | OUT2+ |
| OUT0- | 4 | 54 | OUT2- |
| DIR0+ | 5 | 55 | DIR2+ |
| DIR0- | 6 | 56 | DIR2- |
| SVON0 | 7 | 57 | SVON2 |
| ERC0 | 8 | 58 | ERC2 |
| ALM0 | 9 | 59 | ALM2 |
| INP0 | 10 | 60 | INP2 |
| RDY0 | 11 | 61 | RDY2 |
| EXGND | 12 | 62 | EXGND |
| EA0+ | 13 | 63 | EA2+ |
| EA0- | 14 | 64 | EA2- |
| EB0+ | 15 | 65 | EB2+ |
| EB0- | 16 | 66 | EB2- |
| EZ0+ | 17 | 67 | EZ2+ |
| EZ0- | 18 | 68 | EZ2- |
| VDD | 19 | 69 | VDD |
| EXGND | 20 | 70 | EXGND |
| OUT1+ | 21 | 71 | OUT3+ |
| OUT1- | 22 | 72 | OUT3- |
| DIR1+ | 23 | 73 | DIR3+ |
| DIR1- | 24 | 74 | DIR3- |
| SVON1 | 25 | 75 | SVON3 |
| ERC1 | 26 | 76 | ERC3 |
| ALM1 | 27 | 77 | ALM3 |
| INP1 | 28 | 78 | INP3 |
| RDY1 | 29 | 79 | RDY3 |
| EXGND | 30 | 80 | EXGND |
| EA1+ | 31 | 81 | EA3+ |
| EB1- | 32 | 82 | EA3- |
| EB1+ | 33 | 83 | EB3+ |
| EB1- | 34 | 84 | EB3- |
| EZ1+ | 35 | 85 | EZ3+ |
| EZ1- | 36 | 86 | EZ3- |
| PEL0 | 37 | 87 | PEL2 |
| MEL0 | 38 | 88 | MEL2 |
| GDI0 | 39 | 89 | GDI2 |
| DO0 | 40 | 90 | DO2 |
| ORG0 | 41 | 91 | ORG2 |
| EXGND | 42 | 92 | EXGND |
| PEL1 | 43 | 93 | PEL3 |
| MEL1 | 44 | 94 | MEL3 |
| GDI1 | 45 | 95 | GDI3 |
| DO1 | 46 | 96 | DO3 |
| ORG1 | 47 | 97 | ORG3 |
| EXGND | 48 | 98 | EXGND |
| EXGND | 49 | 99 | E_24V |
| EXGND | 50 | 100 | E_24V |

## *A variety of extension boards to meet your needs…*

**(See page 7-11 for the details)**



PCI-8158/PCI-8154 DB Series/Extension Modules

## *The PCI-8158/PCI-8154 supports these modules:*

**DB-8150**
High-speed trigger

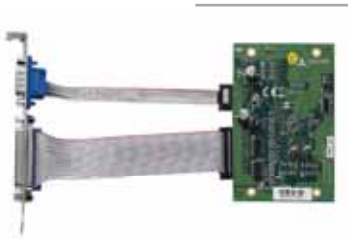
**DB-8151**
HSL bus distributed motion & I/O

**DB-8152**
ECAM slave motion control

**DB-8153**
Motionnet bus distributed motion

# DB-8150

## High-speed Triggering Daughter Board



### Features

- High performance FPGA inside
- On-board SDRAM for comparing point table (2 M points for one channel)
- Simultaneous 8 channel TTL compatible differential output
- One general-purpose digital output channel, current sink capacity up to 20 mA
- Two general-purpose digital input channels, 10 kHz response time
- Two high speed digital input channels
- Three 32-bit comparators for position comparing
- Trigger output pulse polarity and pulse width adjustable
- Two 32-bit position counters by two EA/EB encoder signals input from carrier board
- Two EA/EB encoder signals input from daughter board
- Counter clear signal via EZ input from carrier board
- Supports trigger output toggle modes
- Equal and window condition comparison available
- Linear function and point table mode for continuous trigger output
- Counter latched by digital input pins

### Specifications

**High-speed Trigger**

| | |
|---|---|
| FPGA on-board to process the trigger function without consuming CPU resources | |
| Max. Trigger Pulse Frequency | Up to 1 MHz |
| FIFO Capacity | 2 M x 32-bit |
| Max. Encoder Input Frequency | 6.5 MHz under 4xAB mode, 1.5 meter cable |
| Dimension | 96.42 (L) x 62 (W) mm |
| Operating Temperature | 0°C to +60°C |
| Storage Temperature | -20°C to +80°C |
| Power Consumption | +3.3 V @ 250 mA typical, +5 V @ 100 mA typical |

**Connections**

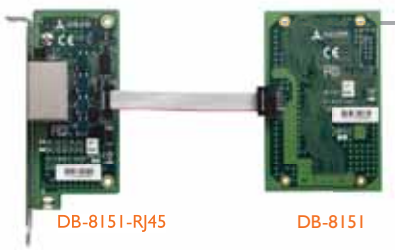
| PIN No. | Name | Function (Axis) | PIN No. | Name | Function (Axis) |
|---|---|---|---|---|---|
| 1 | CMP0+ | Compare output+ | 14 | CMP0- | Compare output- |
| 2 | CMP1+ | Compare output+ | 15 | CMP1- | Compare output- |
| 3 | CMP2+ | Compare output+ | 16 | CMP2- | Compare output- |
| 4 | CMP3+ | Compare output+ | 17 | CMP3- | Compare output- |
| 5 | CMP4+ | Compare output+ | 18 | CMP4- | Compare output- |
| 6 | CMP5+ | Compare output+ | 19 | CMP5- | Compare output- |
| 7 | CMP6+ | Compare output+ | 20 | CMP6- | Compare output- |
| 8 | CMP7+ | Compare output+ | 21 | CMP7- | Compare output- |
| 9 | EGND | Ext. Ground | 22 | EGND | Ext. Ground |
| 10 | DO | Open collectoroutput | 23 | DO_COM | Output COM |
| 11 | EXGND | Ext. Ground | 24 | EXGND | Ext. Ground |
| 12 | DI_0 | Digital Input Ch_0 | 25 | DI_1 | Digital Input Ch_1 |
| 13 | N/A | Empty | 26 | N/A | Empty |

### Ordering Information

- **DB-8150**
  High-speed triggering daughter board for PCI-8158/PCI-8154

# DB-8151

## Single HSL Master Controller Daughter Board



DB-8151-RJ45 DB-8151

### Features

- Programmable timer interrupt
- RJ-45 jack for easy installation (with DB-8151-RJ45)
- Provides both 4 to 8-axis control and distributed I/O and does not occupy a PCI slot when attached to a PCI-815x
- Software selectable transmission speed and mode
- Supports HSL-HUB3/HSL-Repeater
- DI data transmission interrupt

### Specifications

**HSL Master Controller**

| | |
|---|---|
| Full duplex, RS-485 with transformer isolation | |
| Transmission Speed | 3/6/12 Mbps |
| Dimension | 96.42 (L) x 62 (W) mm |
| Operating Temperature | 0°C to +60°C |
| Storage Temperature | -20°C to +80°C |
| Power Consumption | +3.3 V @ 250 mA, +5 V @ 100 mA typical |

**Connections**

| PIN NO. | PIN OUT |
|---|---|
| PIN 1 | +5V |
| PIN 2 | FG |
| PIN 3 | DG |
| PIN 4 | LED Signal |
| PIN 5 | RXD1 |
| PIN 6 | TXD |
| PIN 7 | RXD2 |
| PIN 8 | TXE |
| PIN 9 | DG |
| PIN 10 | FG |

CN3: Main DB-8151 connector

**Connections**

| PIN NO. | PIN OUT |
|---|---|
| PIN 1 | NC |
| PIN 2 | NC |
| PIN 3 | RX+ |
| PIN 4 | TX- |
| PIN 5 | TX+ |
| PIN 6 | RX- |
| PIN 7 | NC |
| PIN 8 | NC |

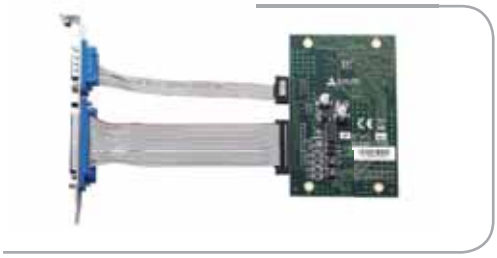
RJ1: DB-8151-RJ45 RJ-45 connector

### Ordering Information

- **DB-8151**
  Single HSL master controller daughter board for PCI-8158/PCI-8154
- **DB-8151-RJ45**
  Bracket with RJ-45 jack for DB-8151

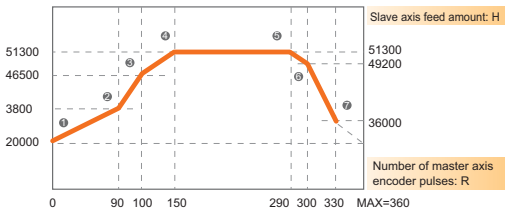
# DB-8152

## Electronic CAM Slave Motion Solution Daughter Board



### Features

- Up to 1 MHz from encoder signals of the master axis
- Supports OUT/DIR and CW/CCW pulse output mode
- Supports 4 x AB phase and CW/CCW pulse input mode
- Programmable interrupt
- CAM table setting by API function

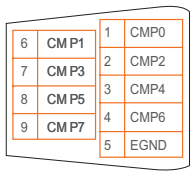



### Specifications

**ECAM Controller**

| | |
|---|---|
| D-Sub 9 and 25 bracket required when using the DB-8152 | |
| D-Sub 25 for master encoder and slave encoder, pulse out and DIO with isolation | |
| D-Sub 9 for CMP output with 2 high speed and 6 general speed | |
| Dimension | 96.42 (L) x 62 (W) mm |
| Operating Temperature | 0°C to +60°C |
| Storage Temperature | -20°C to +80°C |
| Power Consumption | +3.3 V @ 200 mA typical, +5 V @ 100 mA typical |


CN3 on DB-8152 Bracket



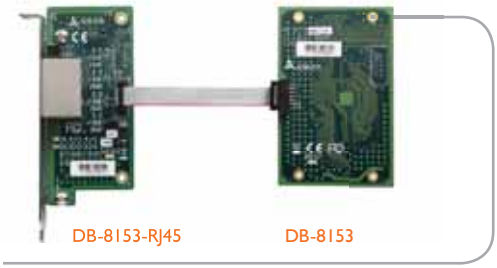

CN4 on DB-8152 Bracket

### Ordering Information

**DB-8152**
Electronic CAM slave motion solution daughter board for PCI-8158/PCI-8154

# DB-8153

## Single Motionnet Master Controller Daughter Board



DB-8153-RJ45 DB-8153

### Features

- RJ-45 jack for easy installation (with DB-8153-RJ45)
- Provides both distributed and on-board motion control does not occupy a PCI slot when attached to a PCI-815x
- Software selectable transmission speed

### Specifications

**Motionnet Master Controller**

| | |
|---|---|
| Half duplex, RS-485 with transformer isolation | |
| Transmission Speed | 2.5/5/10/20 Mbps (Default: 20 Mbps) |
| Dimension | 96.42 (L) x 62 (W) mm |
| Operating Temperature | 0°C to +60°C |
| Storage Temperature | -20°C to +80°C |
| Power Consumption | +3.3 V @ 250 mA typical, +5 V @ 100 mA typical |

**Connections**
**CN3: Main DB-8153 connector**

| PIN NO. | PIN OUT |
|---|---|
| PIN 1 | +5 V |
| PIN 2 | FG |
| PIN 3 | DG |
| PIN 4 | LED Signal |
| PIN 5 | RXD1 |
| PIN 6 | TXD |
| PIN 7 | RXD2 |
| PIN 8 | TXE |
| PIN 9 | DG |
| PIN 10 | FG |

**Connections**
**RJ1: DB-8153-RJ45 RJ-45 connector**

| PIN NO. | PIN OUT |
|---|---|
| PIN 1 | NC |
| PIN 2 | NC |
| PIN 3 | NC |
| PIN 4 | Data- |
| PIN 5 | Data+ |
| PIN 6 | NC |
| PIN 7 | NC |
| PIN 8 | NC |

### Ordering Information

**DB-8153**
Single Motionnet master controller daughter board for PCI-8158/PCI-8154

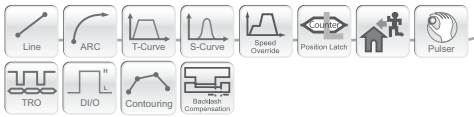
**DB-8153-RJ45**
Bracket with RJ-45 jack for DB-8153

# PCI-8164 / PXI-8164

## Advanced 4-axis Stepper & Servo Motion Control Cards with High-Speed Triggering

PCI-8164

PXI-8164




## Features

- **32-bit PCI/PXI bus, Rev. 2.2, 33 MHz**
- **Pulse output rates up to 6.55 MHz**
- **Pulse output options: OUT/DIR, CW/CCW, AB Phase**
- **2 to 4 axes linear interpolation**
- **2 axes circular interpolation**
- **Multi-axis continuous interpolation**
- **Position/Speed change override**
- **13 home return modes and auto home search**
- **Hardware position compare and trigger with auto-loading FIFO as a buffer**
- **High-speed position latch function**
- **Programmable acceleration and deceleration time**
- **Trapezoidal and S-curve velocity profiles**
- **28-bit up/down counter for incremental encoder**
- **Multi-axis, simultaneous start/stop**
- **Programmable interrupt sources**
- **Supports up to 12 cards in one system**
- **Hardware backlash compensator**
- **Softwares limit function**
- **Easy interface to any stepping motors, AC or DC servo, linear or rotary motors**
- **All digital inputs and outputs are 2500 VRMS isolated**
- **Manual pulser input interface**
- **More than 250 thread safe API functions**

## Software Support

**Windows® Platform**

- Available for Windows Vista (64-bit) (PCI-8164 only)
- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source codes
- Customized API functions are possible

**RTX ( Windows Real Time Extension)**

- RTX 5.x/6.x/8.1a

**Linux Platform**

- Redhat 9, kernel 2.4.x
- Fedora Core 3, kernel 2.6.9
- Fedora Core 4, kernel 2.6.11
- Fedora Core 5, kernel 2.6.15
- FC 6, kernel 2.6.18

**MotionCreatorPro™**

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming.

## Specifications

| Pulse Type Motion Control | |
|---|---|
| Number of Axes | 4 |
| Pulse Output Rate | 0.01 pps to 6.5 Mpps |
| Max. Acceleration Rate | 245 Mpps[2] |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 6.55 MHz under 4 x AB phase @ 1 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Counters | x 4 for each axis |
| Comparators | x 5 for each axis |
| **Motion Interface I/O Signals** | |
| Position Latch Input Pin | LTC |
| Position Compare Output Pin | CMP (15 kHz for continuous triggering) |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| Incremental Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pin | ±EL, SD, and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC, RDY, SVON |
| General DO Pin | SVON |
| General DI Pin | RDY |
| Pulser Signal Input | PA and PB |
| Simultaneous Start/Stop Signal I/O Pin | STA and STP |

## Ordering Information

**PCI-8164**
Advanced PCI 4-axis stepping & servo motion control card with high-speed triggering

**PXI-8164**
Advanced PXI 4-axis stepping & servo motion control card with high-speed triggering

## Accessories

See section 14 for more information on Accessories.

**Terminal Boards**

**DIN-100S-01**
Terminal board with one 100-pin SCSI-II connector and DIN-rail mounting

**DIN-814M0**
Terminal board for Mitsubishi MR-J2S-A servo amplifier

**DIN-814M -J3A0**
Terminal board for Mitsubishi MR-J3S-A amplifier

**DIN-814Y0**
Terminal board for Yaskawa Sigma II/III/V amplifiers

**DIN-814P-A40**
Terminal board for Panasonic MINAS A4 amplifier

**DIN-814PA0**
Terminal board for Panasonic MINAS A servo amplifier

**Cabling**

**ACL-102100-1**
100-pin SCSI-II cable (mating with AMP-787082-9), 1 M

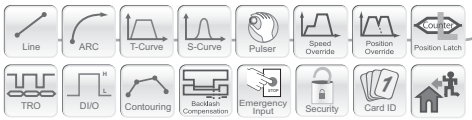
## Pin Assignment

*PCI-8164/PXI-8164 Pin Assignment of the 100-pin SCSI-type Connector*

| | | | |
|---|---|---|---|
| VPP | 1 | 51 | VPP |
| GND | 2 | 52 | GND |
| OUT1+ | 3 | 53 | OUT3+ |
| OUT1- | 4 | 54 | OUT3- |
| DIR1+ | 5 | 55 | DIR3+ |
| DIR1- | 6 | 56 | DIR3- |
| SVON1 | 7 | 57 | SVON3 |
| ERC1 | 8 | 58 | ERC3 |
| ALM1 | 9 | 59 | ALM3 |
| INP1 | 10 | 60 | INP3 |
| RDY1 | 11 | 61 | RDY3 |
| GND | 12 | 62 | GND |
| EA1+ | 13 | 63 | EA3+ |
| EA1- | 14 | 64 | EA3- |
| EB1+ | 15 | 65 | EB3+ |
| EB1- | 16 | 66 | EB3- |
| EZ1+ | 17 | 67 | EZ3+ |
| EZ1- | 18 | 68 | EZ3- |
| VPP | 19 | 69 | VPP |
| GND | 20 | 70 | GND |
| OUT2+ | 21 | 71 | OUT4+ |
| OUT2- | 22 | 72 | OUT4- |
| DIR2+ | 23 | 73 | DIR4+ |
| DIR2- | 24 | 74 | DIR4- |
| SVON2 | 25 | 75 | SVON4 |
| ERC2 | 26 | 76 | ERC4 |
| ALM2 | 27 | 77 | ALM4 |
| INP2 | 28 | 78 | INP4 |
| RDY2 | 29 | 79 | RDY4 |
| GND | 30 | 80 | GND |
| EA2+ | 31 | 81 | EA4+ |
| EA2- | 32 | 82 | EA4- |
| EB2+ | 33 | 83 | EB4+ |
| EB2- | 34 | 84 | EB4- |
| EZ2+ | 35 | 85 | EZ4+ |
| EZ2- | 36 | 86 | EZ4- |
| PEL1 | 37 | 87 | PEL3 |
| MEL1 | 38 | 88 | MEL3 |
| CMP1 | 39 | 89 | CMP3 |
| SD1 | 40 | 90 | SD3 |
| ORG1 | 41 | 91 | ORG3 |
| GND | 42 | 92 | GND |
| PEL2 | 43 | 93 | PEL4 |
| MEL2 | 44 | 94 | MEL4 |
| CMP2 | 45 | 95 | CMP4 |
| SD2 | 46 | 96 | SD4 |
| ORG2 | 47 | 97 | ORG4 |
| GND | 48 | 98 | GND |
| GND | 49 | 99 | GND |
| GND | 50 | 100 | GND |

# PCI-8102

## Advanced 2-axis Stepper & Servo Motion Control Card




## Features

- **32-bit PCI bus, Rev. 2.2, 33 MHz**
- **Pulse output rates up to 6.55 MHz**
- **Pulse output options: OUT/DIR, CW/CCW**
- **2 axes linear/circular interpolation**
- **Continuous interpolation**
- **Position/Speed change override**
- **13 home return modes and auto home search**
- **Hardware position compare**
- **High-speed position latch function**
- **Programmable acceleration and deceleration time**
- **Trapezoidal and S-curve velocity profiles**
- **Multi-axis, simultaneous start/stop**
- **Programmable interrupt sources**
- **Supports up to 12 cards in one system**
- **Hardware backlash compensator**
- **Softwares limit function**
- **On-board GPIO: 16IN/16OUT (P2 connector)**
- **Card index switch setting**
- **Hardware emergency input**
- **Security protection for user's program**
- **Easy interface to any stepping motors, AC or DC servo, linear or rotary motors which have pulse train input mode**
- **All digital inputs and outputs are 2500 VRMS isolated**
- **Manual pulser input interface**
- **More than 100 thread safe API functions**

## Software Support

### Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source codes
- Customized API functions are possible

### Linux Platform

- Redhat 9, kernel 2.4.x
- Fedora Core 5, kernel 2.6.15
- Fedora Core 3, kernel 2.6.9
- Fedora Core 4, kernel 2.6.11

### MotionCreatorPro™

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming.

## Specifications

| Pulse Type Motion Control | |
|---|---|
| Number of Axes | 2 |
| Pulse Output Rate | 0.01 pps to 6.5 Mpps |
| Max. Acceleration Rate | 245 Mpps$^2$ |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 6.55 MHz under 4 x AB phase @ 1 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Counters | x 4 for each axis |
| Comparators | x 5 for each axis |
| **Motion Interface I/O Signals** | |
| Position Latch Input Pin | LTC |
| Position Compare Output Pin | CMP |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| Incremental Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pin | ±EL, SD, and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC, RDY, SVON |
| General DO Pin | x 16 (P2 connector) |
| General DI Pin | x 16 (P2 connector) |
| Pulser Signal Input | PA and PB |
| Simultaneous Start/Stop Signal I/O Pin | STA and STP |

## Ordering Information

**PCI-8102**
Advanced 2-axis stepping & servo motion control card

## Accessories

See section 14 for more information on Accessories.

### Terminal Boards

**DIN-68S-01**
Terminal board with 68-pin SCSI-II connector with DIN socket

**DIN-68M-J3A0**
Terminal board for Mitsubishi MR-J3S-A servo amplifier with 68-pin SCSI-II connector

**DIN-68M-J2A0**
Terminal board for Mitsubishi MR-J2S-A servo amplifier with 68-pin SCSI-II connector

**DIN-68Y-SGII0**
Terminal board for Yaskawa Sigma II/III/V servo amplifiers with 68-pin SCSI-II connector

**DIN-68P-A40**
Terminal board for Panasonic MINAS A4 servo amplifier with 68-pin SCSI-II connector

### Cabling

**ACL-10568-1**
68-pin SCSI-VHDCI cable (mating with AMP-787082-7), 1 M

## Pin Assignment

*68-pin SCSI type Connector*

| | | | |
|---|---|---|---|
| VPP | 1 | 35 | VPP |
| EXGND | 2 | 36 | EXGND |
| OUT0+ | 3 | 37 | OUT1+ |
| OUT0- | 4 | 38 | OUT1- |
| DIR0+ | 5 | 39 | DIR1+ |
| DIR0- | 6 | 40 | DIR1- |
| SVON0 41 | 7 | 41 | SVON1 |
| ERC0 | 8 | 42 | ERC1 |
| ALM0 | 9 | 43 | ALM1 |
| INP0 | 10 | 44 | INP1 |
| RDY0 | 11 | 45 | RDY1 |
| EA0+ | 12 | 46 | EA1+ |
| EA0- | 13 | 47 | EA1- |
| EB0+ | 14 | 48 | EB1+ |
| EB0- | 15 | 49 | EB1- |
| EZ0+ | 16 | 50 | EZ1+ |
| EZ0- | 17 | 51 | EZ1- |
| VPP | 18 | 52 | VPP |
| N/C | 19 | 53 | N/C |
| PEL0 | 20 | 54 | PEL1 |
| MEL0 | 21 | 55 | MEL1 |
| EXGND | 22 | 56 | EXGND |
| LTC/SD/PCS0/CLR0 | 23 | 57 | LTC/SD/PCS1/CLR1 |
| ORG0 | 24 | 58 | ORG1 |
| N/C | 25 | 59 | EXGND |
| PA+_ISO | 26 | 60 | EMG |
| PA-_ISO | 27 | 61 | DIN0 |
| PB+_ISO | 28 | 62 | DIN1 |
| PB-_ISO | 29 | 63 | DIN2 |
| CMP0 | 30 | 64 | DIN3 |
| CMP1 | 31 | 65 | DOUT0 |
| EXGND | 32 | 66 | DOUT1 |
| EXGND | 33 | 67 | EXGND |
| EX+24V | 34 | 68 | EX+24V |

# PCI-8132

## Entry-level 2-axis Stepper & Servo Motion Control Card with 32-CH GPIO


## Features

- **32-bit PCI bus, Rev2.2, 33 MHz**
- **Pulse output rate up to 2.4 MHz**
- **Pulse output options: OUT/DIR, CW/CCW**
- **Encoder input frequency up to 2.4 MHz under 4 x AB mode**
- **2 axes linear interpolation**
- **Programmable acceleration and deceleration time**
- **Trapezoidal and S-curve velocity profiles**
- **Easy interface to any stepping motors, AC or DC servo, linear or rotary motors which have pulse train input mode**
- **28-bit up/down counter for incremental encoder**
- **All digital inputs and outputs are 2500 VRMS isolated**
- **Change speed override**
- **Multi-axis, simultaneous start/stop**
- **Dedicated I/O interface for PEL, MEL, ORG, EZ, INP, ERC, ALM**
- **Programmable interrupt sources**
- **Manual pulser input interface**
- **Supports up to 12 cards in one system**
- **Hardware position compare and trigger pulse output**
- **16-CH general purpose input/16-CH general purpose output**
- **3 home return modes**
- **More than 100 thread safe API functions**

## Software Support

**Windows® Platform**

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source codes
- Customized API functions

**LabVIEW® VIs**

- Motion VIs of the PCI-8132 for LabVIEW are available.

**Linux Platform**

- Redhat 9, kernel 2.4.x
- Fedora Core 3, kernel 2.6.9
- Fedora Core 4, kernel 2.6.11
- Fedora Core 5, kernel 2.6.15

**MotionCreatorPro™**

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming.

## Specifications

| | |
|---|---|
| **Pulse Type Motion Control** | |
| Number of Axes | 2 |
| Pulse Output Rate | 0.03 pps to 2.4 Mpps programmable |
| Pulse Command Output | DIR/OUT, CW/CCW |
| Max. Acceleration Rate | 91 Mpps$^2$ |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 2.4 MHz @ 3 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Max. Number of Cards in One System | 12 |
| **Motion Interface I/O Signals** | |
| Position Latch Input Pin | LTC (1 kHz for continous triggering) |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| Incremental Encoder Signals Input Pin | DIR/OUT, EA/EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pin | ±EL, ±SD, and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC |
| General DO Pin | SVON |
| General DI Pin | RDY |
| Pulser Signal Input | PA and PB |
| Simultaneous Start/Stop Signal I/O Pin | STA and STP |
| **General-purpose I/O** | |
| 16-CH input & 16-CH output | |

## Ordering Information

**PCI-8132**
Entry-level 2-axis stepper & servo motion control card with 32-CH GPIO

## Accessories

See section 14 for more information on Accessories.

**Terminal Boards**

DIN-812M0
Terminal board for Mitsubishi MR-J2S-A servo amplifier

DIN-100S-01
Terminal board with one 100-pin SCSI-II connector and DIN-rail mounting

**Cabling**

ACL-102100-1
100-pin SCSI-II cable
(mating with AMP-787082-9), 1 M

## Pin Assignment

*PCI-8132 Pin Assignment of the 100-pin SCSI-type Connector*

| | | | |
|---|---|---|---|
| VPP+5V | 1 | 51 | DO COM+ |
| EXGND | 2 | 52 | EXGND |
| OUT1+ | 3 | 53 | DO0 |
| OUT1- | 4 | 54 | DO1 |
| DIR1+ | 5 | 55 | DO2 |
| DIR1- | 6 | 56 | DO3 |
| SVON1 | 7 | 57 | DO4 |
| ERC1 | 8 | 58 | DO5 |
| ALM1 | 9 | 59 | DO6 |
| INP1 | 10 | 60 | DO7 |
| RDY1 | 11 | 61 | DO8 |
| EXGND | 12 | 62 | DO9 |
| EA1+ | 13 | 63 | DO10 |
| EA1- | 14 | 64 | DO11 |
| EB1+ | 15 | 65 | DO12 |
| EB1- | 16 | 66 | DO13 |
| EZ1+ | 17 | 67 | DO14 |
| EZ1- | 18 | 68 | DO15 |
| VPP+5V | 19 | 69 | EXGND |
| EXGND | 20 | 70 | EXGND |
| OUT2+ | 21 | 71 | DI COM+ |
| OUT2- | 22 | 72 | DI COM- |
| DIR2+ | 23 | 73 | DI0 |
| DIR2- | 24 | 74 | DI1 |
| SVON2 | 25 | 75 | DI2 |
| ERC2 | 26 | 76 | DI3 |
| ALM2 | 27 | 77 | DI4 |
| INP2 | 28 | 78 | DI5 |
| RDY2 | 29 | 79 | DI6 |
| EXGND | 30 | 80 | DI7 |
| EA2+ | 31 | 81 | DI8 |
| EA2- | 32 | 82 | DI9 |
| EB2+ | 33 | 83 | DI10 |
| EB2- | 34 | 84 | DI11 |
| EZ2+ | 35 | 85 | DI12 |
| EZ2- | 36 | 86 | DI13 |
| PEL1 | 37 | 87 | DI14 |
| MEL1 | 38 | 88 | DI15 |
| PSD1 | 39 | 89 | EXGND |
| MSD1 | 40 | 90 | EXGND |
| ORG1 | 41 | 91 | PA+ |
| EXGND | 42 | 92 | PA- |
| PEL2 | 43 | 93 | PB+ |
| MEL2 | 44 | 94 | PB- |
| PSD2 | 45 | 95 | EXGND |
| MSD2 | 46 | 96 | CMP1 |
| ORG2 | 47 | 97 | CMP2 |
| EXGND | 48 | 98 | EXGND |
| EXGND | 49 | 99 | VPP+24V |
| EXGND | 50 | 100 | VPP+24V |

# PCI-8134

## Entry-level 4-axis Stepper & Servo Motion Control Card


## Features

- **32-bit PCI bus, Rev. 2.2, 33 MHz**
- **Pulse output rates up to 2.4 MHz**
- **Pulse output options: OUT/DIR, CW/CCW**
- **Encoder input frequency up to 2.4 MHz under 4 x AB mode**
- **2 axes linear interpolation**
- **Programmable acceleration and deceleration time**
- **Trapezoidal and S-curve velocity profiles**
- **Easy interface to any stepping motors, AC or DC servo, linear or rotary motors**
- **28-bit up/down counter for incremental encoder**
- **All digital inputs and outputs are 2500 VRMS isolated**
- **Change speed override**
- **Multi-axis, simultaneous start/stop**
- **Dedicated I/O interface for PEL, MEL, ORG, EZ, INP, ERC, ALM**
- **Programmable interrupt sources**
- **Manual pulser input interface**
- **Supports up to 12 cards in one system**
- **3 ASIC-based home return modes and 9 software-based home return modes**
- **More than 75 thread safe API functions**

## Software Support

**Windows® Platform**

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source codes
- Customized API functions are possible

**LabVIEW® VIs**

- Motion VIs of the PCI-8134 for LabVIEW are available.

**Linux Platform**

- Redhat 9, kernel 2.4.x
- Fedora Core 3, kernel 2.6.9
- Fedora Core 4, kernel 2.6.11
- Fedora Core 5, kernel 2.6.15

**MotionCreatorPro™**

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming

## Specifications

| | |
|---|---|
| **Pulse Type Motion Control** | |
| Number of Axes | 4 |
| Pulse Output Rate | 0.03 pps to 2.4 Mpps programmable |
| Pulse Command Output | DIR/OUT, CW/CCW |
| Max. Acceleration Rate | 91 Mpps[2] |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 2.4 MHz @ 3 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Max. Number of Cards in One System | 12 |
| **Motion Interface I/O Signals** | |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| Incremental Encoder Signals Input Pin | DIR/OUT, EA/EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pin | ±EL, ±SD, and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC |
| General DO Pin | SVON |
| General DI Pin | RDY |
| Pulser Signal Input | PA and PB |
| Simultaneous Start/Stop Signal I/O Pin | STA and STP |

## Ordering Information

**PCI-8134**
Entry-level 4-axis stepper & servo motion control card

## Accessories

See section 14 for more information on Accessories.

**Terminal Boards**

- **DIN-100S-01**
  Terminal board with one 100-pin SCSI-II connector and DIN-rail mounting
- **DIN-814M0**
  Terminal board for Mitsubishi MR-J2S-A servo amplifier
- **DIN-814M-J3A0**
  Terminal board for Mitsubishi MR-J3S-A amplifier
- **DIN-814Y0**
  Terminal board for Yaskawa Sigma II/III/V amplifiers
- **DIN-814P-A40**
  Terminal board for Panasonic MINAS A4 amplifier
- **DIN-814PA0**
  Terminal board for Panasonic MINAS A servo amplifier

**Cabling**

- **ACL-102100-1**
  100-pin SCSI-II cable
  (mating with AMP-787082-9), 1 M

## Pin Assignment

*PCI-8134 Pin Assignment of the 100-pin SCSI-type Connector*

| | | | |
|---|---|---|---|
| EX+5V | 1 | 51 | EX+5V |
| EXGND | 2 | 52 | EXGND |
| OUT 1+ | 3 | 53 | OUT 3+ |
| OUT 1- | 4 | 54 | OUT 3- |
| DIR 1+ | 5 | 55 | DIR 3+ |
| DIR 1- | 6 | 56 | DIR 3- |
| SVON1 | 7 | 57 | SVON3 |
| ERC1 | 8 | 58 | ERC3 |
| ALM1 | 9 | 59 | ALM3 |
| INP1 | 10 | 60 | INP3 |
| RDY1 | 11 | 61 | RDY3 |
| EXGND | 12 | 62 | EXGND |
| EA1+ | 13 | 63 | EA3+ |
| EA1- | 14 | 64 | EA3- |
| EB1+ | 15 | 65 | EB3+ |
| EB1- | 16 | 66 | EB3- |
| EZ1+ | 17 | 67 | EZ3+ |
| EZ1- | 18 | 68 | EZ3- |
| EX+5V | 19 | 69 | EX+5V |
| EXGND | 20 | 70 | EXGND |
| OUT2+ | 21 | 71 | OUT4+ |
| OUT2- | 22 | 72 | OUT4- |
| DIR2+ | 23 | 73 | DIR4+ |
| DIR2- | 24 | 74 | DIR4- |
| SVON2 | 25 | 75 | SVON4 |
| ERC2 | 26 | 76 | ERC4 |
| ALM2 | 27 | 77 | ALM4 |
| INP2 | 28 | 78 | INP4 |
| RDY2 | 29 | 79 | RDY4 |
| EXGND | 30 | 80 | EXGND |
| EA2+ | 31 | 81 | EA4+ |
| EA2- | 32 | 82 | EA4- |
| EB2+ | 33 | 83 | EB4+ |
| EB2- | 34 | 84 | EB4- |
| EZ2+ | 35 | 85 | EZ4+ |
| EZ2- | 36 | 86 | EZ4- |
| +EL1 | 37 | 87 | EL3+ |
| +EL1 | 38 | 88 | EL3- |
| +SD1 | 39 | 89 | SD3+ |
| -SD1 | 40 | 90 | SD3- |
| ORG1 | 41 | 91 | ORG3 |
| EXGND | 42 | 92 | EXGND |
| +EL2 | 43 | 93 | EL4+ |
| -EL2 | 44 | 94 | EL4- |
| +SD2 | 45 | 95 | SD4+ |
| -SD2 | 46 | 96 | SD4- |
| ORG2 | 47 | 97 | ORG2 |
| EXGND | 48 | 98 | EXGND |
| EXGND | 49 | 99 | EX+24V |
| EXGND | 50 | 100 | EX+24V |

# PCI-8144

## 4-axis Stepper Motion Control Card


## Features

- 32-bit PCI bus, Rev. 2.2, 33 MHz
- Card index switch selection
- Pulse output rates up 2.4 Mpps for stepper motor control
- Pulse output options: CW/CCW
- Speed change on-the-fly
- 3 home return modes
- Programmable acceleration and deceleration time
- Trapezoidal and S-curve velocity profile
- Simultaneously start/stop with external signal control (STA/STP)
- Programmable interrupt control
- Supports up to 12 cards in one system
- Security protection for user's program
- General purpose isolated I/O: 8 DI and 8 DO
- Emergency stop input via STP pin
- All digital I/O are 2500 VRMS isolated
- More than 30 thread safe API functions
- 2-phase stepping motor excitation optional

## Specifications

| | |
|---|---|
| **Pulse Type Motion Control** | |
| Number of Axes | 4 |
| Pulse Output Rate | 0.5 pps to 2.4 Mpps |
| Max. Acceleration Rate | 737 Mpps$^2$ |
| Speed Resolution | 16-bit |
| **Motion Interface I/O Signals** | |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| End Limit Signal Pin | PEL and MEL |
| Slow Down Signal Pin | PSD and MSD |
| Home Sensor | ORG |
| GPIO | 8 DI and 8 DO |
| **General Specifications** | |
| Connector | 68-pin SCSI-type connector |
| Operating Temperature | 0°C to +50°C |
| Storage Temperature | -20°C to +80°C |
| Humidity | 5% to 85%, non-condensing |
| **Power Consumption** | |
| Power Supply (Input) | +24 VDC ±5% |
| External Power Supply (Output) | +5 VDC ±5%, 100 mA (max.) |

## Software Support

**Windows® Platform**

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source code
- Customized API functions

**MotionCreatorPro 2™**

MotionCreatorPro 2 is a user-friendly Windows-based application development software package included with all distributed motion and I/O control modules.

MotionCreatorPro 2 provides simple configuration and real-time statuses of modules, in addition to precise positioning control with no effort.

(See page 1-23 for more information on MotionCreatorPro 2.)

## Ordering Information

**PCI-8144**
4-axis stepper motion control card

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-68S-01
Terminal board with 68-pin SCSI-II connector with DIN socket

**Cabling**

ACL-10569-1
68-pin SCSI-II cable
(mating with AMP-787082-7), 1 M

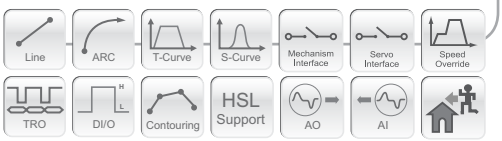
## Pin Assignment

| | | | |
|---|---|---|---|
| VDD | 1 | 35 | VDD |
| EGND | 2 | 36 | EGND |
| CW+ | 3 | 37 | CW+ |
| CWCCW+ | 4 | 38 | CWCCW+ |
| CCWPEL0 | 5 | 39 | CCWPEL2 |
| MEL0 | 6 | 40 | MEL2 |
| PSD0 | 7 | 41 | PSD2 |
| MSD0 | 8 | 42 | MSD2 |
| ORG0 | 9 | 43 | ORG2 |
| EGND | 10 | 44 | EGND |
| CW+ | 11 | 45 | CW+ |
| CWCCW+ | 12 | 46 | CWCCW+ |
| CCWPEL1 | 13 | 47 | CCWPEL3 |
| MEL1 | 14 | 48 | MEL3 |
| PSD1 | 15 | 49 | PSD3 |
| MSD1 | 16 | 50 | MSD3 |
| ORG1 | 17 | 51 | ORG3 |
| STP/EMG | 18 | 52 | STA |
| DIN0 | 19 | 53 | DOUT0 |
| DIN1 | 20 | 54 | DOUT1 |
| DIN2 | 21 | 55 | DOUT2 |
| DIN3 | 22 | 56 | DOUT3 |
| DIN4 | 23 | 57 | DOUT4 |
| DIN5 | 24 | 58 | DOUT5 |
| DIN6 | 25 | 59 | DOUT6 |
| DIN7 | 26 | 60 | DOUT7 |
| VDD | 27 | 61 | DO_COM |
| VDD | 28 | 62 | DO_COM |
| EGND | 29 | 63 | EGND |
| EX +24V | 30 | 64 | EX +24V |

# cPCI-8168

## Advanced 6U CompactPCI 8-axis Motion Control Card with One HSL Network

ADLINK GREEN RoHS Compliant




## Features

- 32-bit CompactPCI, PICMG 2.0 Rev 2.1
- 6U ComactPCI Form factor
- Pulse output rates up to 6.55 MHz
- Pulse output options: OUT/DIR, CW/CCW, AB Phase
- 2 to 4 axes linear interpolation, 2 axes circular interpolation
- Multi-axis continuous interpolation
- Programmable acceleration and deceleration time
- Trapezoidal and S-curve velocity profiles
- Easily interface to any stepping motors, AC or DC servo, linear or rotary motors
- 28-bit up/down counter for incremental encoder of each axis
- All digital input or output signals are 2500 VDC, isolated
- Change speed/position on-the-fly
- Simultaneously start/stop on multiple axes
- Supports up to 6 cards in one system (48 axes)
- High speed position compare and trigger output
- 4 single-ended 16-bit DA outputs
- 4 single-ended 12-bit AD inputs
- High speed remote I/O interface: scan 1000 points/ms
- Programmable interrupt source
- 13 home return modes including auto searching
- More than 400 thread safe API functions

## Software Support

### Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi
- Various sample programs with source codes
- Customized API functions are possible

### MotionCreatorPro™

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming.

## Ordering Information

**cPCI-8168**
Advanced 6U CompactPCI 8-axis motion control card with one HSL network

## Specifications

| | |
|---|---|
| **Pulse Type Motion Control** | |
| Number of Axes | 8 |
| Pulse Output Rate | 0.01 pps to 6.5 Mpps |
| Max. Acceleration Rate | 245 Mpps² |
| Speed Resolution | 16-bit |
| Encoder Input Rate | 6.55 MHz under 4 x AB phase @ 1 M cable |
| Encoder Counter Resolution | 28-bit |
| Positioning Range | -134,217,728 to +134,217,727 pulses (28-bit) |
| Counters | x 4 for each axis |
| Comparators | x 5 for each axis |
| **Motion Interface I/O Signals** | |
| I/O Pin | Differential and 2500 VRMS optically isolated |
| Incremental Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Switch Signal Input Pin | ±EL and ORG |
| Servomotor Interface I/O Pin | INP, ALM, ERC, SVON, RDY |
| Position Compare Output Pin | CMP |
| **General Purpose I/O** | |
| Digital Input | 8-CH isolated digital input |
| Input Voltage | 0 to 24 V |
| Input Resistance | 2.4 KΩ @ 0.5 W |
| Digital Output | 8-CH isolated digital output |
| Output Voltage | 5 V (min.); 35 V (max.) |
| Output Type | NPN open collector Darlington transistors |
| Current Sink | 90 mA |
| **Analog Input (A/D)** | |
| Resolution | 12-bit |
| Input Channel | 4 single-ended |
| Input Range | ±10 V; bipolar |
| Conversion Time | 8 μs |
| Sampling Rate | 110 K samples/sec (max.) |
| Accuracy | 0.01% of FSR ±1 LSB |
| **Analog Output (D/A)** | |
| Converter and Resolution | 16-bit; AD1866R |
| Output Channel | 4 single-ended |
| Output Range | ±10 V; bipolar |
| Setting Time | 2 μs (-10 V to +10 V) |
| Sampling Rate | 110 K samples/sec (max.) |
| **HSL Speed Link (HSL) Port** | |
| Connector | RJ-45 |
| Cable | CAT5 / CAT5E |
| Wiring Distance | 200 M; multi-drop full duplex RS-485 with transformer isolation scheme |
| Transmission Speed | 6 Mbps |
| I/O Refreshing Rate | 30.4 μs second per slave ID |
| Max Slave Index | Control maximum 63 slave I/O index |

## Accessories

See section 14 for more information on Accessories.

**Terminal Boards**

- DIN-68S-01
  Terminal board with 68-pin SCSI-II connector with DIN socket
- DIN-68M-J2A0
  Terminal board for Mitsubishi MR-J2S-A servo amplifier with 68-pin SCSI-II connector
- DIN-68M-J3A0
  Terminal board for Mitsubishi MR-J3S-A
- DIN-68Y-SGII0
  Terminal board for Yaskawa Sigma II/III/V servo amplifier with 68-pin SCSI-II connector
- DIN-68P-A40
  Terminal board for Panasonic MINAS A4 servo amplifier with 68-pin SCSI-II connector

**Cabling**

- ACL-10568-1
  68-pin SCSI-VHDCI cable (mating with AMP-787082-7), 1 M

## Pin Assignment

| | | | |
|---|---|---|---|
| VPP | 1 | 51 | VPP |
| IGND | 2 | 52 | IGND |
| OUT1+ | 3 | 53 | OUT2+ |
| OUT1- | 4 | 54 | OUT2- |
| DIR1+ | 5 | 55 | DIR2+ |
| DIR1- | 6 | 56 | DIR2- |
| SVON1 | 7 | 57 | SVON2 |
| ERC1 | 8 | 58 | ERC2 |
| ALM1 | 9 | 59 | ALM2 |
| INP1 | 10 | 60 | INP2 |
| RDY1 | 11 | 61 | RDY2 |
| EA1+ | 12 | 62 | EA2+ |
| EA1- | 13 | 63 | EA2- |
| EB1+ | 14 | 64 | EB2+ |
| EB1- | 15 | 65 | EB2- |
| EZ1+ | 16 | 66 | EZ2+ |
| EZ1- | 17 | 67 | EZ2- |
| VPP | 18 | 68 | VPP |
| IGND | 19 | 69 | IGND |
| PEL1 | 20 | 70 | PEL2 |
| MEL1 | 21 | 71 | MEL2 |
| IGND | 22 | 72 | IGND |
| IGND | 23 | 73 | IGND |
| ORG1 | 24 | 74 | ORG2 |
| AGND | 25 | 75 | AGND |
| AIN1 | 26 | 76 | AIN2 |
| AGND | 27 | 77 | AGND |
| AOUT1 | 28 | 78 | AOUT2 |
| DI_COM | 29 | 79 | DI_COM |
| DIN1 | 30 | 80 | DIN2 |
| DOUT1 | 31 | 81 | DOUT2 |
| IGND | 32 | 82 | IGND |
| IGND | 33 | 83 | IGND |
| E_24V | 34 | 84 | E_24V |

# PCI-8124-C

## Advanced 4-CH Encoder Card with High-speed Triggering Function


## Features

- 32-bit PCI bus, Rev. 2.2, 33 MHz
- Card index switch selection
- Four 32-bit quadrature encoder input and trigger output channels
- Encoder input interface: OUT/DIR, CW/CCW, and 1x, 2x, 4x A/B phase
- Trigger output up to 5 MHz
- Encoder input up to 20 MHz
- Programmable trigger pulse width: 0.2 us to 6.5 ms
- Input/Output circuit source can be selectable: TTL/Open collector (with isolation)
- Switch setting for trigger output default level while power on
- Trigger output pin logic programmable
- Digital filter for individual encoder input channel
- Internal high-speed FIFO for four 32-bit comparators as data reload buffer
- Each channel can store 1,023 points (32-bit)
- Each trigger output channel is selected from all comparators, and manual trigger commands
- Each encoder counter source is selected from comparators and manual trigger commands
- Trigger Pulse Counter
- 14 comparators can select one of 4 trigger output channels individually
- 4 comparators for comparing encoder counter and FIFO data
- 10 comparators for comparing encoder counter and linear data
- 4 channel TTL output pins for general purpose output or trigger output
- 4 channel TTL input pins for general purpose or timer start signal
- 4 channel high speed latch input pins for counters
- EZ and Latch input pins can be used for general purpose input
- Encoder counter clear via EZ input pin as zero operation by rising or falling edge
- Programmable interrupt sources from linear data finished, triggered, FIFO empty/full/low, latched, and TTL input on

## Specifications

| | |
|---|---|
| **Counter** | |
| Number of Channels | 4-CH |
| Trigger Pulse Frequency | 5 MHz (max.) |
| Encoder Counter | 4, 32-bit |
| Comparator | 14, 32-bit |
| FIFO Capacity | 1,023 points/channel |
| Encoder Input Frequency | 20 MHz (max.) @ 4 x AB mode |
| Trigger Pulse Width | 0.2 us to 6.55 ms |
| **I/O Signals** | |
| Partial I/O Signals | Optically isolated with 2500 $V_{RMS}$ isolation voltage |
| Partial I/O Signals | TTL type |
| Encoder Signals Input Pins | EA and EB |
| Encoder Index Signal Input Pin | EZ |
| Position latch Input Pin | LTC |
| Trigger Pulse Output Pin | TRG, 5 V pulse output reference to ground |
| **General Specifications** | |
| Connectors | 50-pin SCSI-type connector |
| Operating Temperature | 0°C to +50°C |
| Storage Temperature | -20°C to +80°C |
| Humidity | 5% to 85%, non-condensing |
| **Power Consumption** | |
| Slot Power Supply (input) | 900 mA (Max.) ±5%, 900 mA (Max.) |
| External Power Supply (output) | +5 $V_{DC}$ ±5%, 500 mA (Max.) |

## Software Support

### Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi

### TriggerMaster

The PCI-8124-C is currently available and supports Microsoft® Windows® XP and Microsoft® Windows® Vista (32-bit) operating system. An easy-to-use graphic user interface – "TRIGGER MASTER" was also provided to accelerate the developing time for AOI application. This utility is Windows-based application development software which is available to configure and observe the current compared point and trigger pulse output information. Also this utility can setup several mapping method that is able to link the PWM that support adjusting the trigger pulse width and pulse logic.

## Ordering Information

**PCI-8124-C**
Advanced 4-CH encoder card with high-speed triggering function

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-50S-01
Terminal board with one 50-pin SCSI-II connector and DIN-rail mounting

**Cabling**

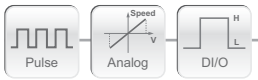
ACL-10250-1
50-pin SCSI-II cable (mating with AMP-787082-5), 1 M

## Pin Assignment

| | | | |
|---|---|---|---|
| INCOM1 | 1 | 26 | INCOM3 |
| LTC1 | 2 | 27 | LTC3 |
| INCOM2 | 3 | 28 | INCOM4 |
| LTC2 | 4 | 29 | LTC4 |
| OUTCOM1 | 5 | 30 | OUTCOM3 |
| TRG1 | 6 | 31 | TRG3 |
| OUTCOM2 | 7 | 32 | OUTCOM4 |
| TRG2 | 8 | 33 | TRG4 |
| EA1+ | 9 | 34 | EA3+ |
| EA1- | 10 | 35 | EA3- |
| EB1+ | 11 | 36 | EB3+ |
| EB1- | 12 | 37 | EB3- |
| EZ1+ | 13 | 38 | EZ3+ |
| EZ1- | 14 | 39 | EZ3- |
| EA2+ | 15 | 40 | EA4+ |
| EA2- | 16 | 41 | EA4- |
| EB2+ | 17 | 42 | EB4+ |
| EB2- | 18 | 43 | EB4- |
| EZ2+ | 19 | 44 | EZ4+ |
| EZ2- | 20 | 45 | EZ4- |
| TTL-IN1 | 21 | 46 | TTL-IN3 |
| TTL-IN2 | 22 | 47 | TTL-IN4 |
| TTL-OUT1 | 23 | 48 | TTL-OUT3 |
| TTL-OUT2 | 24 | 49 | TTL-OUT4 |
| DGND | 25 | 50 | DGND |

# PCI-8136

## 6-CH Quadrature Encoder and Multi-Function I/O Card




## Features

- **32-bit PCI bus, plug & play**
- **6-CH 32-bit industrial counter for 3 kinds of differential pulse trains:**
  - **A/B phase**
  - **CW/CCW**
  - **Pulse/Direction**
- **6-CH differential pulse generators up to 500 kHz**
- **6-CH 32-bit position compare with interrupt function**
- **6-CH 16-bit ±10 V analog output**
- **6-CH 12-bit 133 kHz analog single-ended input**
- **19-CH opto-isolated DI, 7-CH open collector DO**
- **Digital I/Os and counters are 2500 VDC opto-isolated**
- **One 24-bit programmable timer with interrupt**
- **Auto-calibration for analog I/O**
- **More than 50 thread safe API functions**

## Software Support

### Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi

### Linux Platform

- Redhat 9, kernel 2.4.x
- Fedora Core 3, kernel 2.6.9
- Fedora Core 4, kernel 2.6.11
- Fedora Core 5, kernel 2.6.15

## Ordering Information

**PCI-8136**
6-CH quadrature encoder and multi-function I/O card

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-100S-01
Terminal board with one 100-pin SCSI-II connector and DIN-rail mounting

**Cable**

ACL-102100-1
100-pin SCSI-II cable
(mating with AMP-787082-9), 1 M

## Specifications

| | |
|---|---|
| **General Specifications** | |
| Connectors | 100-pin SCSI-type connector |
| | DB25 female connector |
| | DB9 male connector |
| Operating Temperature | 0°C to +50°C |
| Storage Temperature | -20°C to +80°C |
| Humidity | 5% to 85%, non-condensing |
| Power Consumption | Slot power supply (input): to ±5%, 900 mA (max.) |
| | External power supply (input): +5 VDC ±5%, 500 mA (max.) |
| | External power supply (output): +5 VDC ±5%, 500 mA (max.) |
| Dimension | 164 x 98.4 mm (L x H) |
| **Pulse Input (Industrial Counter)** | |
| Number of Input Channel | 6, differential type |
| Pulse Command Type | 32-bit counter for AB-phase, CW/CCW, Pulse/Direction |
| Max. Counter Speed | 3 MHz, 2500 VDC optical isolation |
| **Pulse Output (Industrial Generator)** | |
| Number of Output Channel | 6, differential type |
| Pulse Command Type | CW/CCW, Puls /Direction, A/B Phase |
| Max. Pulse Rate | 500 kHz |
| **Analog Input** | |
| Number of Channels | 6 differential/single-end input channels |
| Input Range | Voltage: ±10 V |
| Sink Current Capability | 0 to 20 mA |
| Resolution | 12-bit ADC with 1-bit non-linearity |
| Input Impedance | Approximately 440 KΩ (Voltage), 120 Ω (Current) |
| Sampling Rate | 133 kHz multiplexing |
| **Analog Output** | |
| Number of Channels | 6 output channels |
| Output Range | ±10 V; bipolar |
| Sink Current Capability | 0 to 20 mA |
| Resolution | 16-bit DAC resolution, 14-bit accuracy guarantee |
| Setting Time | 2 μs |
| **Digital Output** | |
| Number of Channels | 7 output channels |
| Output Type | Open collector |
| Sink Current | 100 mA/CH (typical); 268 mA/CH (max.); 500 mA/total |
| Isolated Voltage | 2500 VRMS |
| Throughput | 10 kHz (0.1 ms) |
| **Timer** | |
| One programmable timer interrupt | |
| Base Clock | 33 MHz by PCI bus |
| Timer Range | 24-bit |

# PCI-8392 / PCI-8392H

## DSP-based 16-axis SSCNET III Motion Control Cards

PCI-8392

PCI-8392H


## Introduction

ADLINK's PCI-8392/PCI-8392H are advanced 16-axis motion controller based on the PCI bus which features plug-and-play function and supports a maximum installation of up to 12 cards in one system.

### Advantages:

- Easy wiring and time-deterministic servo updates
- Command synchronization
- Easy maintenance
- Meets maximum motor speed and maximum resolution (20-bit) simultaneously
- Parameter setting and tuning via software
- Absolute encoder control

### Additional advantages for PCI-8392H users

- One card to simultaneously meet the servo network and distributed I/O configuration
- High cost/performance
- Distributed I/Os are up to 2016 points and refreshed within 1 ms
- Reduced controller size. (large backplane to install multiple cards no longer required)

## Board Features

- **32-bit PCI bus, Rev 2.2, 33 MHz**
- **Servo Interface: SSCNET 3 protocol**
- **Controllable axes up to 16 axes**
- **High speed network communication bus up to 50 Mbps**
- **Servo update rate: 0.444 ms for 8 axes, 0.888 ms for 16 axes**
- **On-board DSP: TI TMS320C6711 250 MHz to process the synchronization**
- **Fiber cable connection ensure the best communication quality**
- **Easy wiring up to 50 meters between servo drivers (POF/HPCF fiber cable)**
- **32-bit position command resolution**

## Function Features

- **No command frequency limitation**
- **Runtime data sampling for motion analysis**
- **On-line servo tuning and full servo parameter management**
- **High speed servo information logging**
- **Excellent performance in axis synchronous control**
- **Programmable acceleration rate for T/S-curve profile**
- **Any 4 axes linear interpolation positioning**
- **Any 2 axes circular interpolation positioning velocity moving function**
- **Jogging function**
- **Absolute positioning system**
- **Speed override and position override function**
- **Programmable interrupt events**
- **Board ID switch selection from 0 to 15**
- **Watch dog timer for safety**
- **External emergency input pin (jumper selected)**
- **One HSL bus is available for PCI-8392H**
- **Supports up to 16 boards in one system**

## Specifications

| | |
|---|---|
| Motion Control | Cycle time: 0.888 ms for 16 axes; 0.444 ms for 8 axes |
| | Maximum number of controllable axes: Up to 16 |
| | Maximum number of cards in one system: 12 |
| | Connection: Via FB1 with fiber |
| Emgergency Control (EMG1) | Normal close |
| | Stop controlling once the EMG to be open |
| LED Indicator (LED) | Red & green light to indicate the communication status of SSCNET III and HSL bus |
| Board ID Selection | DIP switch selection |
| | ID is available from 0 to 15 |
| HSL bus | Only available for PCI-8392H version |
| | For HSL bus, please refer to Chapter 7, Distributed I/O Section |
| General Specifications | Operating Temperature: 0°C to +50°C |
| | Storage Temperature: -20°C to +80°C |
| | Humidity: 5% to 85%, non-condensing |

## Software Support

### MotionCreatorPro 2™

MotionCreatorPro 2™ is a Windows-based application development software package that included with the PCI-8392/PCI-8392H. MotionCreatorPro 2™ is useful for debugging a motion control system during the design phase of a project. An on-screen display lists all installed axes information and I/O signal status of the PCI-8392/PCI-8392H. By using this utility, you can easy tune the axis parameter and servo gain. Furthermore, the sampling windows makes more accurate in motion data analysis, moreover, integrates with axis parameter, thus, the PCI-8392/PCI-8392H provides precise positioning control with less effort.

(See page 1-23 for more information on MotionCreatorPro 2.)

### Windows® Platform

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi

## Ordering Information

- **PCI-8392**
  DSP-based 16-axis SSCNET III motion control card
- **PCI-8392H**
  DSP-based 16-axis SSCNET III motion control card with HSL

## Accessories

See section 14 for more information on Accessories.

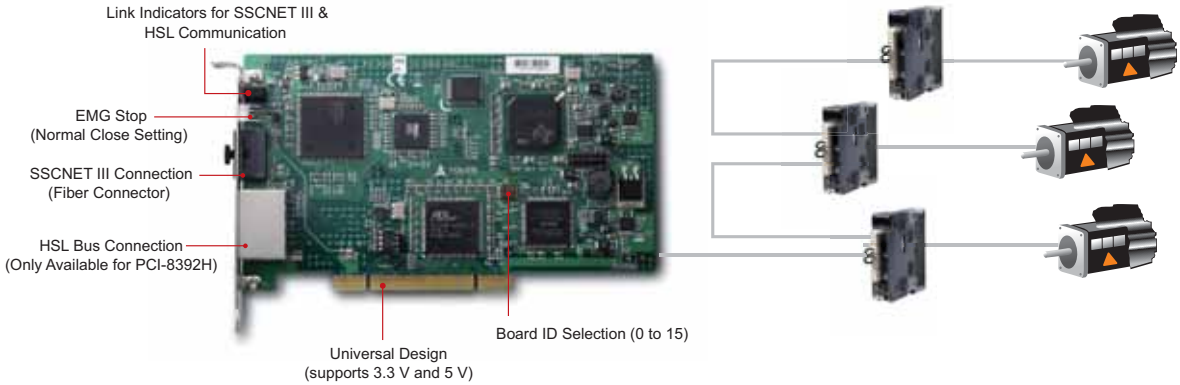
**Terminal Board**

- DIN-839-J3B
  Terminal board for Mitsubishi MR-J3S-B servo amplifier

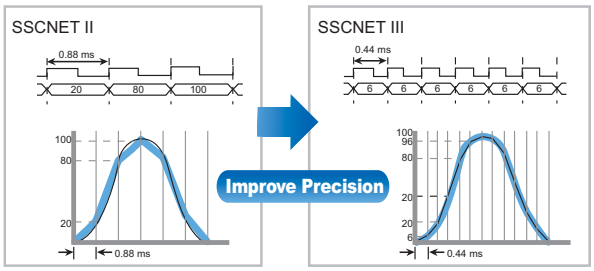
**Cable**

- MR-J3BUS M
  SSCNET III fiber cable
- MR-J2HBUS M
  Controller to amplifier bus cable

## PCI-8392/PCI-8392H Profile




## SSCNET III

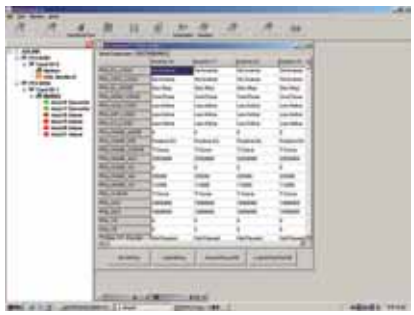



Source: Mitsubishi Electric Corporation

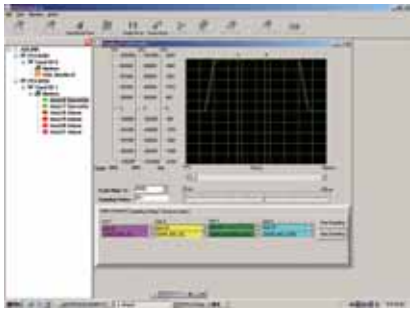
## MotionCreatorPro 2™

(See page 1-23 for more information on MotionCreatorPro 2.)

Single Axis Operations



Servo Driver Parameters



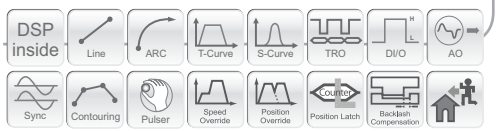
Servo Tuning

XY Move Operations

# PCI-8372+ / PCI-8366+

## DSP-based SSCNET II 12/6-axis Motion Control Cards

PCI-8372+/PCI-8366+




## Features

- **32-bit PCI bus, Rev 2.2, 33 MHz**
- **Servo Interface: SSCNET II protocol**
- **On-board DSP: TI TMS320C6711 200 MHz**
- **Maximum controllable axes: 12/6 for PCI-8372+/PCI-8366+**
- **32-bit position command resolution**
- **On-line servo tuning and data monitoring**
- **Easy wiring up to 30 meters for servo drivers connection**
- **2 isolated DI/DO**
- **3 external encoder/linear scale interface**
- **Multiple axes linear interpolation**
- **Any 2 axes circular interpolation**
- **Contour following motion with smoothing function**
- **On-the-fly velocity change**
- **Programmable interrupt sources**
- **Hardware synchronization between multiple cards**
- **Easy-to-use function library**
- **More than 250 thread safe API functions**
- **Sequence motion control for speed profile timing chart between axes**
- **Absolute encoder access**
- **2-CH 16-bit analog output**

## Specifications

| | |
|---|---|
| **SSCNET Distributed Motion Control** | |
| Cycle Time | 0.888 ms |
| Number of Controllable Axes | 12 axes for PCI-8372+; 6 axes for PCI-8366+ |
| Max. Number of Cards in One System | 12 |
| Encoder Feedback | 3-CH, 32-bit, up/down counter up to 5 MHz |
| **Motion Interface I/O Signals** | |
| External Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Seitch and Origin Signal Input Pin | ±EL and ORG |
| **General-purpose I/O** | |
| 2 channels isolated digital inputs; 2 channal open collector output | |
| Input Volotage | 0 to 24 V |
| Input Resistance | 2.4 KΩ @ 0.5 W |
| Sink Current | 4 mA |
| Bandwidth | 10 kHz |
| **Analog Output (D/A)** | |
| Resolution | 16-bit |
| Output Channel | 2 single-ended channels |
| Output Range | ±10 V, bipolar |
| Setting Time | 10 μs |
| Output Driving | ±5 mA |

## Software Support

**Windows® Platform**

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi

**MotionCreatorPro™**

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming

## Ordering Information

**PCI-8372+**
DSP-based 12-axis SSCNET II motion control card

**PCI-8366+**
DSP-based 6-axis SSCNET II motion control card

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-68S-01
Terminal board with 68-pin SCSI-II connector with DIN socket

**Cabling**

ACL-10568-1
68-pin SCSI-VHDCI cable (mating with AMP-787082-7), 1 M

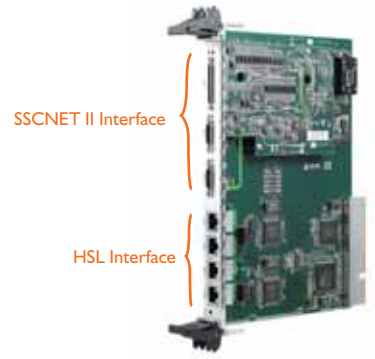
MR-J2HBUS M
Controller to amplifier bus cable

## Pin Assignment

| | | | |
|---|---|---|---|
| A.COM | 1 | 35 | DA1 |
| PEL1 | 2 | 36 | DA2 |
| MEL1 | 3 | 37 | PEL2 |
| ORG1 | 4 | 38 | MEL2 |
| PEL3 | 5 | 39 | ORG2 |
| MEL3 | 6 | 40 | PEL4 |
| ORG3 | 7 | 41 | MEL4 |
| PEL5 | 8 | 42 | ORG4 |
| MEL5 | 9 | 43 | PEL6 |
| ORG5 | 10 | 44 | MEL6 |
| IPT_COM | 11 | 45 | ORG6 |
| EA1+ | 12 | 46 | EA2+ |
| EA1- | 13 | 47 | EA2- |
| EB1+ | 14 | 48 | EB2+ |
| EB1- | 15 | 49 | EB2- |
| EZ1+ | 16 | 50 | EZ2+ |
| EZ1- | 17 | 51 | EZ2- |
| PEL7 | 18 | 52 | PEL8 |
| MEL7 | 19 | 53 | MEL8 |
| ORG7 | 20 | 54 | ORG8 |
| PEL9 | 21 | 55 | PEL10 |
| MEL9 | 22 | 56 | MEL10 |
| ORG9 | 23 | 57 | ORG10 |
| PEL11 | 24 | 58 | PEL12 |
| MEL11 | 25 | 59 | MEL12 |
| ORG11 | 26 | 60 | ORG12 |
| IPT_COM | 27 | 61 | IPT_COM |
| DO_COM | 28 | 62 | D11 |
| EA3+ | 29 | 63 | D12 |
| EA3- | 30 | 64 | EMG |
| EB3+ | 31 | 65 | EMG_COM |
| EB3- | 32 | 66 | DO1 |
| EX3+ | 33 | 67 | DO2 |
| EZ3- | 34 | 68 | DO_COM |

# cPCI-8312H

## Advanced 6U CompactPCI SSCNET II 12-axis Motion Control Card with HSL Network





## Features

**SSCNET II Part**

- 32-bit CompactPCI, PICMG 2.0 Rev. 2.1
- Servo interface: SSCNET II protocol
- On-board DSP: TI TMS320C6711 200 MHz
- Maximum controllable axes: 12
- 32-bit position command resolution
- On-line servo tuning and data monitoring
- Easy wiring up to 30 meters
- 2 isolated DO channels
- 2 analog input and 2 analog output channels
- 2 pulse train output channels support, connecting pulse train type servo amplifiers
- 2 external encoder/linear scale interface
- Multiple axes linear interpolation
- Any 2 axes circular interpolation
- Contour following motion
- On-the-fly velocity change
- Programmable interrupt sources
- Easy-to-use function library
- Sequence Motion Control for speed profile timing chart between axes
- Absolute encoder access

**HSL Part**

- Dual independent network operation
- One network port with 2 separate connectors
- Max. 300 m x 2 communication distance at 3 Mbps
- Jumper selectable transmission rate: 3/6/12 Mbps
- Jumper selectable transmission mode: full/half duplex on-board memory
- Programmable timer interrupt
- RJ45 phone jack for easy installation
- More than 400 thread safe API functions

## Specifications

| | |
|---|---|
| **SSCNET Distributed Motion Control** | |
| Cycle Time | 0.888 ms |
| Number of Controllable Axes | 12 |
| Max. Number of Cards in One System | 12 |
| Encoder Feedback | 3-CH, 32-bit, up/down counter up to 5 MHz |
| **Motion Interface I/O Signals** | |
| External Encoder Signals Input Pin | EA and EB |
| Encoder Index Signal Input | EZ |
| Mechanical Limit Seitch and Origin Signal Input Pin | ±EL and ORG |
| **General-purpose I/O** | |
| 2 channels isolated digital inputs | |
| Sink Current | 4 mA |
| Bandwidth | 10 kHz |
| **Analog Input (AI)** | |
| Auto-calibration | |
| Resolution | 16-bit |
| Programmable Input Range | ±10 V, ±5 V, ±2.5 V |
| Sampling Rate | 250 ks/sec |
| **Analog Output (D/A)** | |
| Resolution | 16-bit |
| Output Channel | 2 single-ended channels |
| Output Range | ±10 V, bipolar |
| Setting Time | 10 μs |
| Output Driving | ±5 mA |
| **Pulse Train Output** | |
| Pulse Command Type | OUT/DIR, CW/CCW AB phase selectable |
| Max. Output Frequency | 4.16 MHz |
| Isolated Voltage | 500 VRMS |

## Software Support

**Windows® Platform**

- Available for Windows Vista (32-bit)/XP/2000
- Recommended programming environments: VB/VC++/BCB/Delphi

**MotionCreatorPro™**

MotionCreatorPro™ assists motion system developers in debugging any cabling problems and resolving complex system configuration before programming.

## Ordering Information

**cPCI-8312H**
Advanced 6U CompactPCI SSCNET II 12-axis motion control card with HSL network

## Accessories

See section 14 for more information on Accessories.

**Terminal Board**

DIN-68S-01
Terminal board with 68-pin SCSI-II connector with DIN socket

**Cabling**

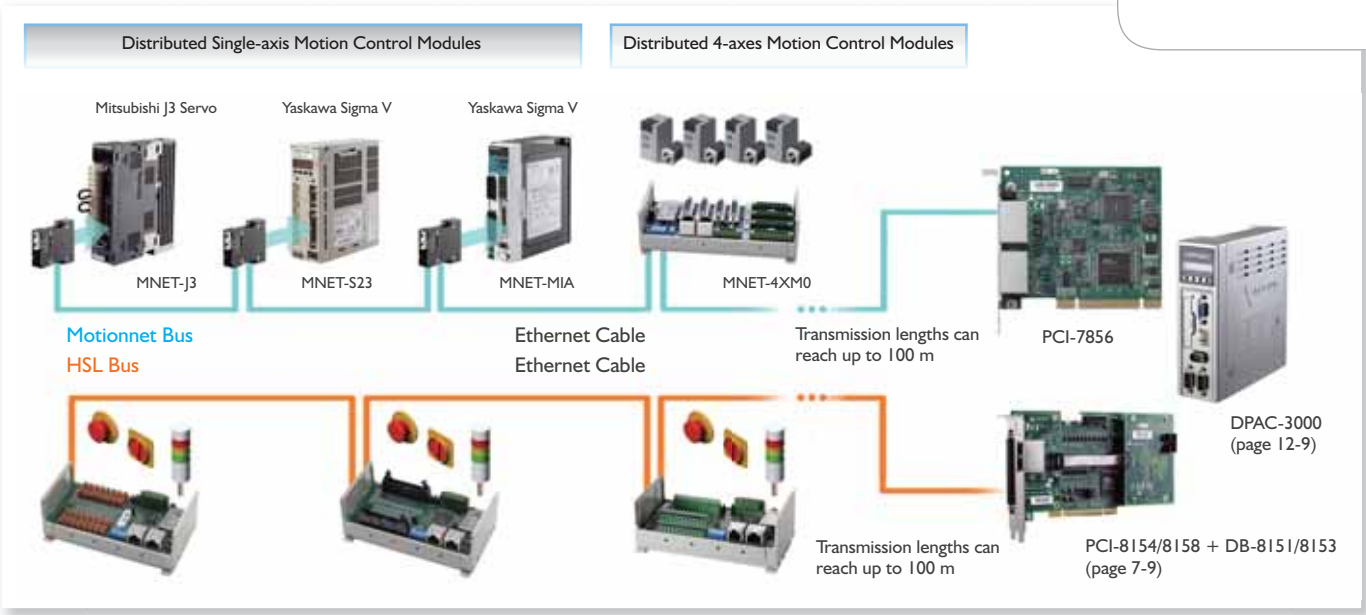
ACL-10568-1
68-pin SCSI-VHDCI cable
(mating with AMP-787082-7), 1 M

## Pin Assignment

| | | | |
|---|---|---|---|
| DO_COM | 1 | 35 | DO1 |
| PEL1 | 2 | 36 | DO2 |
| MEL1 | 3 | 37 | PEL2 |
| ORG1 | 4 | 38 | MEL2 |
| PEL3 | 5 | 39 | ORG2 |
| MEL3 | 6 | 40 | PEL4 |
| ORG3 | 7 | 41 | MEL4 |
| PEL5 | 8 | 42 | ORG4 |
| MEL5 | 9 | 43 | PEL6 |
| ORG5 | 10 | 44 | MEL6 |
| IPT_COM/EMG_COM | 11 | 45 | ORG6 |
| EA1+ | 12 | 46 | EA2+ |
| EA1 - | 13 | 47 | EA2- |
| EB1+ | 14 | 48 | EB2+ |
| EB1 - | 15 | 49 | EB2- |
| EZ1+ | 16 | 50 | EZ2+ |
| EZ1 - | 17 | 51 | EZ2- |
| PEL7 | 18 | 52 | PEL8 |
| MEL7 | 19 | 53 | MEL8 |
| ORG7 | 20 | 54 | ORG8 |
| PEL9 | 21 | 55 | PEL10 |
| MEL9 | 22 | 56 | MEL10 |
| ORG9 | 23 | 57 | ORG10 |
| PEL11 | 24 | 58 | PEL12 |
| MEL11 | 25 | 59 | MEL12 |
| ORG11 | 26 | 60 | ORG12 |
| IPT_COM/EMG_COM | 27 | 61 | EMG |
| P_GND | 28 | 62 | AD1 |
| OUT1+ | 29 | 63 | DIR1+ |
| OUT1 - | 30 | 64 | AD2 |
| OUT2+ | 31 | 65 | DIR1- |
| OUT2 - | 32 | 66 | DA1 |
| DIR2+ | 33 | 67 | DA2 |
| DIR2 - | 34 | 68 | A_COM |

# Distributed Motion and I/O Solutions

High-performance motion control of up to 256 axes and fast 1 ms scanning time of up to 2,016 I/O control points




## *Introduction*

As the size of automation equipment increases, more motion axes and I/O points are required. Following this trend, ADLINK offers complete distributed motion and I/O solutions targeting machine automation application and which combine a master controller and comprehensive distributed motion and I/O modules as slaves. ADLINK's family of master controllers include the PCI-7856 PCI-based control board for standard applications, and the DPAC-3000 ruggedized and compact fanless controller for applications requiring greater reliability and stability. ADLINK's family of slave modules includes the MNET-J3, MNET-S23, and MNET-MIA Motionnet distributed single-axis control modules, the MNET-4XMO series of general-purpose 4-axis control modules, and comprehensive HSL digital and analog I/O modules.

## *Features*

- **Longer distance on motion control and I/O control over 100 meters**
- **Vast number of motion axes control & I/O control in line**
- **Motionnet & HSL can support up to 256 motion axes & 2,016 I/O points**
- **Real-time control & response**
- **Motionnet provides time-deterministic motion control capability.**
- **HSL updates over 2,000 I/O points within 1 ms.**

## *Applications*

- **Conveyor machines**
- **Long distance LCD equipment**
- **Long distance solar cell machines**
- **Injection machines**
- **Dispensing machines**
- **PCB manufacturing machines**

# Motionnet Bus

## *Introduction*

### Distributed Motion Control Solution

A Motionnet system (referred to as “MNET”) is a distributed motion solution for machine systems. MNET is an innovative distributed motion technology which provides distributed motion axis control of up to 256 axes for any servo / stepper motor controlled using mater-slave architecture. This not only provides general purpose 4-axes motion control, but also allows specific 64 of single axis motion control module to be scanned in millisecond-level in real time.

# PCI-7856

## Master-Slave Distributed Motion & I/O Master Controller


## Introduction

The PCI-7856 is a PCI interface card which offers two ports for Motionnet and HSL systems for distributed motion and I/O in machine automation applications.

HSL technology allows thousands of I/O points to be scanned at the millisecond-level in real time by using mater-slave architecture. Commercial Ethernet cables with RJ45 connector are used for simplified setup of the HSL slaves modules as close as possible to sensor devices which results in a dramatic reduction of wiring. System integrators can benefit from HSL network because it integrates discrete I/O and analog I/O modules. This local network features rapid response, real-time scanning.

## Features

- **Connect I/O points up to 2,016 points**
- **Connect motion axis up to 256 axes**
- **Programmable timer interrupt**
- **RJ-45 jack for easy installation**
- **Software selectable transmission speed: 3/6/12 Mbps for HSL**
- **Software selectable transmission speed: 2.5/5/10/20 Mbps for Motionnet**
- **Non-volatility RAM onboard**

## Software Support

### Windows® Platform

- Available for Windows® Vista (32-bit)/XP
- Recommended programming environments: VB/VC++/BCB/Delphi

### MotionCreatorPro 2

MotionCreatorPro 2™ is a Windows-based application development software package included with ADLINK Motion control products. An on-screen display lists all installed axes information and I/O signal status. This utility thus enables the most of ADLINK motion control products to provide precise positioning control with less effort.

(See page 1-23 for more information on MotionCreatorPro 2.)

## Ordering Information

**PCI-7856**
Master-slave distributed motion & I/O master controller

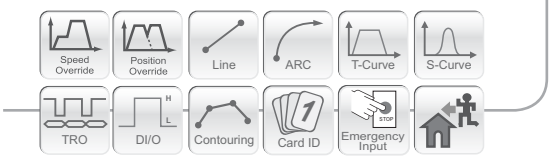
## Specifications

| | |
|---|---|
| Bus | PCI local bus specification Rev. 2.1 compliant |
| Master Controller | • Dedicated Motion Controller:<br>Motionnet ASIC master control (80 MHz external clock) |
| | • Dedicated I/O Controller:<br>HSL ASIC master control (48 MHz external Clock) |
| Interface | **Motionnet**<br>• RS-485 with transformer isolation |
| | • Half duplex communication |
| | • 2.5/5/10/20 Mbps transmission rate can be set by software (20 Mbps default) |
| | **HSL**<br>• RS-485 with transformer isolation |
| | • Full duplex communication |
| | • 3/6/12 Mbps transmission rate can be set by software (6 Mbps default) |
| Connector | RJ45 connector x 4 (MRJ45 connector for Motionnet; HRJ45 connector for HSL) |
| Interrupt | Status read back |
| LED Indicator | Link status (Red for Motionnet Link status; Green for HSL Link status) |
| Storage Temperature | -20°C to 80°C |
| Power Consumption | +3.3 V @ 1.2 A (typical)<br>+5 V @ 1.5 A (typical) |
| Dimensions | 119.50 mm (L) x 100.20 mm (W) |

# MNET-4XMO / MNET-4XMO-C

## Motionnet Distributed 4-axis Motion Control Modules (with High-Speed Trigger Function)

NEW




## Introduction

The MNET-4XMO is a 4-axis motion controller module for Motionnet distributed motion systems. It can generate fast frequency pulses (9.9 MHz) to drive stepper or servomotors in the machine automation field. As a motion controller, it can provide comprehensive motion functions which include 2 axis circular interpolation, 2-4 axis linear interpolation, or continuous interpolation for continual velocity and so on. Also, changing position/speed on the fly is available with a single axis operation.

In addition to the motion functions offered, ADLINK offers other model (MNET-4XMO-C) that comes equipped with the real-time position comparison and trigger pulse output function to easy integrate into Automated Optical Inspection application system. Up to 100 KHz trigger output frequency and easy trigger the most frame grabber or CCD to realize the line scan application. The path move function features the continuous moving with constant velocity. By using the path moving function, you can save the host PC resource with path auto-reload function and is able to guarantee the time-deterministic, continuous and smooth in whole motion progression.

## Features

- Up to 256 axes on a single Motionnnet network
- Transmission speed selectable: 2.5/5/10/20 Mbps
- Maximum wiring distance up to 100 meters
- 4-axis pulse train output channels; frequency up to 9.9 MHz
- Encoder frequency up to 20 MHz under 4xAB feedback mode
- 26 homing modes which includes 13 auto-homing modes
- Pulse output mode: OUT/DIR, CW/CCW, AB phase
- Linear interpolation: any 2 to 4 axes
- Circular interpolation: any 2 of 4 axes
- Position/Speed override
- Triangle Driver Elimination
- Programmable acceleration and deceleration
- 4 channels high-speed trigger pulse output frequency up to 100 kHz (MNET-4XMO-C only)
- One ultra-high speed linear trigger pulse output up to 1 MHz (MNET-4XMO-C only)
- Point table for continuous contouring up to 2,048 points (MNET-4XMO-C only)
- Dedicated motion I/O: EL, ORG, INP, RDY, SVON, ERC, and ARM
- Hardware emergency stop interface
- All digital inputs and outputs are 2500 $V_{RMS}$ isolated
- Hardware backlash compensation

## Specifications

| | |
|---|---|
| **Hardware** | |
| Number of Controllable Axes | 4 |
| Pulse Output Rate | 0.01 pps to 9.9 Mpps |
| Positioning Range | -2,147,483,648 to +2,147,483,647 |
| Acceleration / Deceleration | 1 to 65,535 (16-bit) |
| Speed Resolution | 16-bit |
| **Trajectories** | |
| Acceleration / Deceleration Type | Pure S, T, bell curve programmable |
| Interpolation Mode | Any 2 - 4 axes linear interpolation<br>Any 2 axes circular interpolation |
| **I/O** | |
| EMG Input | 1 |
| CMP Output | 4 (differential type) |
| **General Specifications** | |
| Dimension | 163.5 mm (W) × 74.9 mm (D) × 52.7 mm (H) |
| Module Power Supply Input (I24 V, IGND) | 24 VDC ±10% (Consumption current, 0.3 A max.) |
| I/O Power Supply Input (E24 V, EGND) | 24 VDC input (can be common to module power input by jumper) |
| Operating Temperature | 0°C to 70°C |

### The following specifications are only applicable to the MNET-4XMO-C.

| | |
|---|---|
| **Trigger Function (channel to channel ONLY)** | |
| Trigger Spec. | Max. 100 KHz (4-axis) |
| Table Size | 32,768 points/4-axes (8,192 points/axis) |
| **High-Speed Trigger Function (Linear function ONLY)** | |
| Trigger Pulse Frequency | Max. 1 MHz/1-axis |
| Trigger Pulse Width | 0.1 us to 1 s (programmable) |
| **Path Move** | |
| Path Number | 2,048 points total (min.) |
| Auto Reload | Point index check |
| Continuous move | 1 group (includes single axis move or linear / circular interpolation move) |

## Software Support

- Windows® Platform
  - Available for Windows® Vista (32-bit)/XP

## Ordering Information

- **MNET-4XMO**
  Motionnet distributed 4-axis motion control module
- **MNET-4XMO-C**
  Motionnet distributed 4-axis motion control module with high-speed trigger function

## Accessories

See section 14 for more information on Accessories.

**Cabling**

- HSL-4XMO-DM Cable
  For Mitsubishi MR-J2S-A servo amplifier, available for 1 M, 2 M, and 3 M
- HSL-4XMO-DP Cable
  For Panasonic MINAS A4 servo amplifier, available for 1 M, 1.5 M, and 2 M
- HSL-4XMO-DY Cable
  For Yaskawa SIgma II/III/V servo amplifier, available for 1 M, 2 M, and 3 M
- 4XMO-DA Cable
  For Delta ASDA A2 servo, available for 3 M
- 4XMO-Open Cable
  Controller to amplifier bus (26-pin SCSI to open wire), available for 1 M and 2 M

# MNET-J3/S23/MIA

## Distributed Single-axis Motion Control Modules


## Introduction

ADLINK's Motionnet products provide system integrators with a simple configuration and reduced wiring method for a cost-effective solution for motion applications utilizing multiple single axes. With this new concept of direct plug-in modules, the amount of space used and the amount of wiring required is greatly reduced from traditional terminal board connections.

After the module is plugged into the servo driver, all that is needed is a LAN cable to make the serial connection between the modules. Different servo drivers can be lined up on the Motionnet bus, making motion control configuration much simpler than PCI board solutions. The Motionnet bus can support up to 64 single-axis modules.

## Features

- **No command frequency limitation**
- **Available for Mitsubishi J3S, Panasonic MINAS A4, and Yaskawa Sigma II, III, V**
- **Up to 64 axes, serially connected**
- **No need for terminal boards – reduces space**
- **The scanning cycle time up to 0.97 ms at 20 Mbps when 64 axes are connected**
- **Point-to-point application can be easily completed with multiple single-axis modules**
- **Supports linear/s-curve acceleration and deceleration**

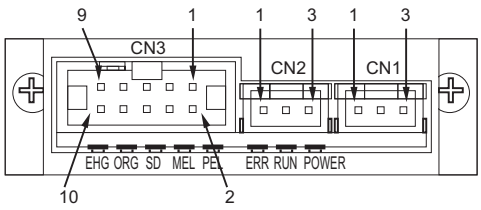
## Ordering Information

- **MNET-J3**
  Motionnet distributed single-axis motion control module for Mitsubishi J3S-A
- **MNET-S23**
  Motionnet distributed single-axis motion control module for Yaskawa Sigma II, III, and V
- **MNET-MIA**
  Motionnet distributed single-axis motion control module for Panasonic MINAS A4

## Specifications

| | |
|---|---|
| Power Indicator | Displays the status of the 3.3 VDC internal control power (red LED) |
| Operating Temperature | 0°C to +50°C |
| Operating Ambient Humidity | 80% RH or less (non-condensing within the 10°C to 50°C range) |
| Environmental | RoHS compliant |
| Vibration | JIS C0040 compliant |
| Weight | Approximately 50 g |
| Dimensions | 52.4 x 16.3 x 69.5 mm (W x H x D) |

## Pin Assignment




**CN1/CN2 Pin Assignment**

| No | Name | Function | Signal Direction |
|---|---|---|---|
| 1 | RS485+ | Serial communicationdata+ | I/O |
| 2 | RS485- | Communication data+ | I/O |
| 3 | FG | Frame ground | - |

**CN3 Pin Assignment**

| No | Name | Function | Signal Direction |
|---|---|---|---|
| 1 | PEL | Positive end limit | I |
| 2 | MEL | Negative end limit | I |
| 3 | SD/CPP | Slowdown input / comparator output (+) | I/O |
| 4 | ORG | Zero position input | I |
| 5 | EMGI | Emergency stop input | I |
| 6 | CPN | Comparator output (-) | O |
| 7 | 24V | 24 VDC Power source | I |
| 8 | GND | Ground | I |
| 9 | GND | Ground | I |
| 10 | FG | Frame ground | - |