PCI-1247

Advanced MotionNet™ PCI Master card with 4-Axis Motion Control

User Manual

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

In addition to this User Manual, the package should also include the following items:

1. PCI-1247: Advanced MotionNet™ PCI Master card with 4-Axis Motion Control
2. Advantech Driver Disc

Contents

CHAPTER 1

Introduction

This chapter gives an overview of the product features, applications, and specifications for PCI-1247.

Sections include:

- Card Description
- Application Development

Chapter 1 Introduction

The Advantech PCI-1247 motion controller is designed for users who need to develop powerful applications quickly and easily. The PCI-1247 is an advanced motion controller consisting of 2 main parts, one is 4-axis motion ASIC and the other is high-speed real-time network extension called MotionNet™.

Advantech has optimized the configuration software to help you get your advanced motion profiles up and running as quickly as possible. With PCI-1247's 4-axis motion control functions, 4 axes of linear interpolation, 2 axes of circular interpolation and also continuous interpolation with velocity continuity are provided.

You also have a selection of 13 homing modes to fit different machine designs. And there are position compare and trigger output functions to interface with other applications. For example: On-the-fly image acquisition. Position latch and interrupt functions are provided to interface with other applications such as tool length measurements.

PCI-1247 provides a servo driver/motor that is dedicated to digital I/O interfaces. For example: ALM, INP, ERC and also dedicated digital I/O interfaces for machines such as ORG, PEL, and EMG. These dedicated I/O signals guarantees functionality via hardware and therefore reduces the software requirements.

MotionNet is a series of products designed for versatile automation applications that have demanding motion control requirements. PCI-1247 is equipped with 1 master that can connect and control up to 64 slave modules. There are 3 categories of slave modules, one is for motion control, the second is for digital I/O, and the last is for miscellaneous functions. For motion control slave modules, there are three types: 1-axis, 2-axis, and 4-axis. For digital I/O slave modules, there are four types: 32-IN, 32-OUT, 16-IN & 16-0UT and 24-IN & 8-OUT.

1.1 Card Description

PCI-1247 is an Advanced MotionNet PCI Interface Master card with 4-Axis Motion Control. It can generate high frequency pulses (6.4 MHz) to drive stepper or servomotors, and as a motion controller, it can provide 2-axis circular interpolation, 4-axis linear interpolation, or continuous interpolation for velocity continuity. Also, changing position/speed on the fly is available in single axis operation.

Multiple PCI-1247 cards can be used in one system. An incremental encoder interface on all four axes provides the ability to correct positioning errors generated by inaccurate mechanical transmissions. PCI-1247 can also perform precise and extremely fast position comparison and trigger functions without demanding too much from the CPU. In addition, the mechanical sensor interface, servo motor interface and general-purpose I/O signals are provided for easy system integration.

Figure 1 shows the functional block diagram of the PCI-1247 card. The PCI-1247 uses two ASICs to perform motion control on all 4 axes and MotionNet slave module controls. The motion control functions include linear and S-curve acceleration / deceleration, circular interpolation between two axes, linear interpolation between 2~4 axes, continuous motion, in positioning and 13 home return modes that are done by the ASIC. Since these functions need complex computations and are done internally by the ASIC, the PC's CPU is free to supervise and perform other tasks.

MotionNAVI is a Windows based software package that comes along with the PCI-1247 card to support application development. MotionNAVI is handy for debugging a motion control system during the design phase of a project. The on-screen display lists all installed axis information and I/O signal status of the PCI-1247 cards. In addition to MotionNAVI, both DOS and Windows programming libraries are included for C++ and Visual Basic. Sample programs are provided to illustrate the operations of the functions.

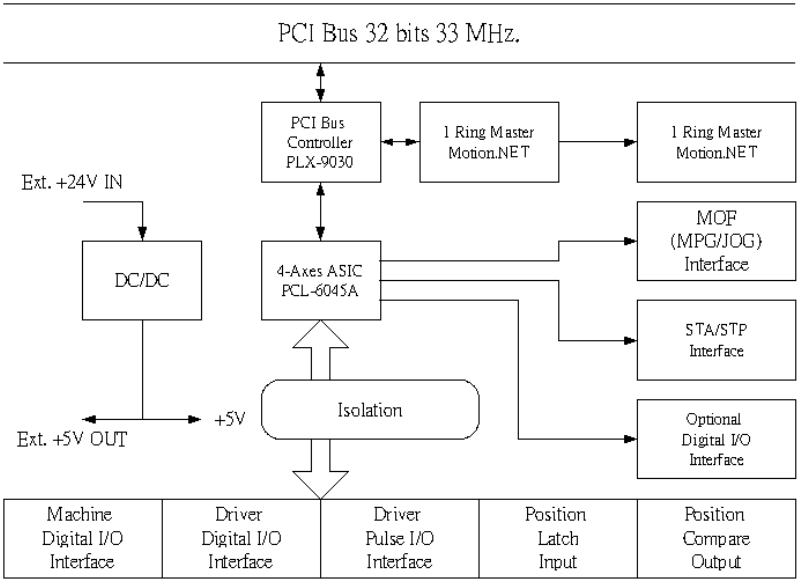


Figure 1.1: Functional Block Diagram of PCI-1247

1.1.1 Features

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

1.1.2 Specifications

Motion Control

- Pulse Output Mode: ±OUT/DIR, ±CW/CCW
- Pulse Output Rate: Max. 6.5Mpps / Min. 0.05pps
- Position Range: 28bits(±134,217,728 pulses)
- Home Return Modes: 13 types
- Velocity Profiles: T-curve, S-curve
- Interpolation Mode: linear, circular and continuous
- Counter for Encoder Feedback Signals: 28 bits up/down x 4
- Position Latch Input: LTC x 4
- Position Compare Output: CMP x4
- Incremental Encoder Input: ±EA x 4, ±EB x 4
- Encoder Index Signal Input: ±EZ x 4
- Machine Interface: PEL x 4, MEL x 4, ORG x 4, SLD x 4
- Servo Driver Interface: ALM x 4, RDY x 4, SVON x 4, INP x 4, ERC x 4
- Simultaneous Start/Stop Motion Input: STA, STP
- General Input: IN x 3
- General Output: OUT x 4
- I/O Pin Type: Optically isolated with 2.5 kVrms on all SCSI 68 pins

MotionNet

- Number of Rings: 1
- Serial interface: half duplex RS-485 with transformer isolation
- Cable type: CAT5 UTP/STP Ethernet cable
- Surge protection: 10 kV
- Transmission speed: 2.5 Mbps, 5 Mbps, 10 Mbps and 20 Mbps
- Data flow control: automatic
- Communication distance: Max. 100m (20 Mbps/32 slave module)
- Slave module function: digital I/O slave module

General

- PCI Spec. 2.2; supports 32-bit, 3.3V/5V DC operation
- Power Consumption: +5V DC at 0.5A typical
- Operating Temperature: 0 ~ 60° C

1.1.3 Supported Software

Programming Library

For those who wish to write their own programs, PCI-1247 comes with MS-DOS Borland C/C++ (Version: 3.1) programming libraries Windows 2000/XP DLL. These function libraries are shipped with the board. There is also support for DOS/Windows 2000/XP, Embedded XP and Windows CE.

MotionNAVI

MotionNAVI is a Windows-based utility to setup cards, motors and system. It can also aid with debugging hardware and software problems, as well as set the logic I/O parameters, which can be loaded in their own program. This product is bundled with this card.

Refer to Chapter 5 for details.

EzLink

EzLink is a user-friendly utility for the purpose of testing and debugging MotionNet.

1.2 Application Development

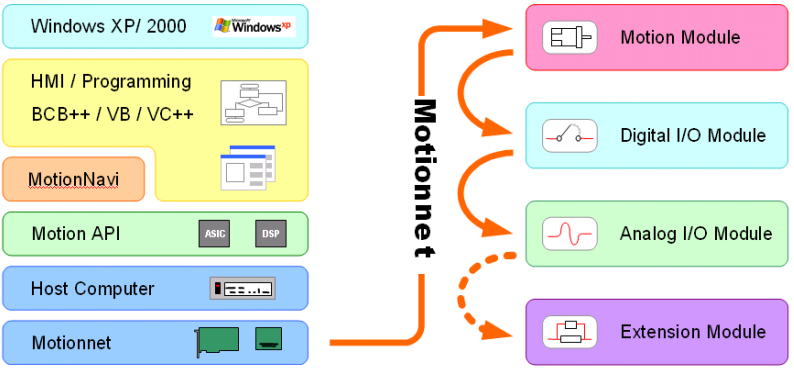


Figure 1.2: Application Development

Figure 1-3 is a flow chart that illustrates the recommended process when using this manual to develop an application. Refer to the related chapters for details on each step.

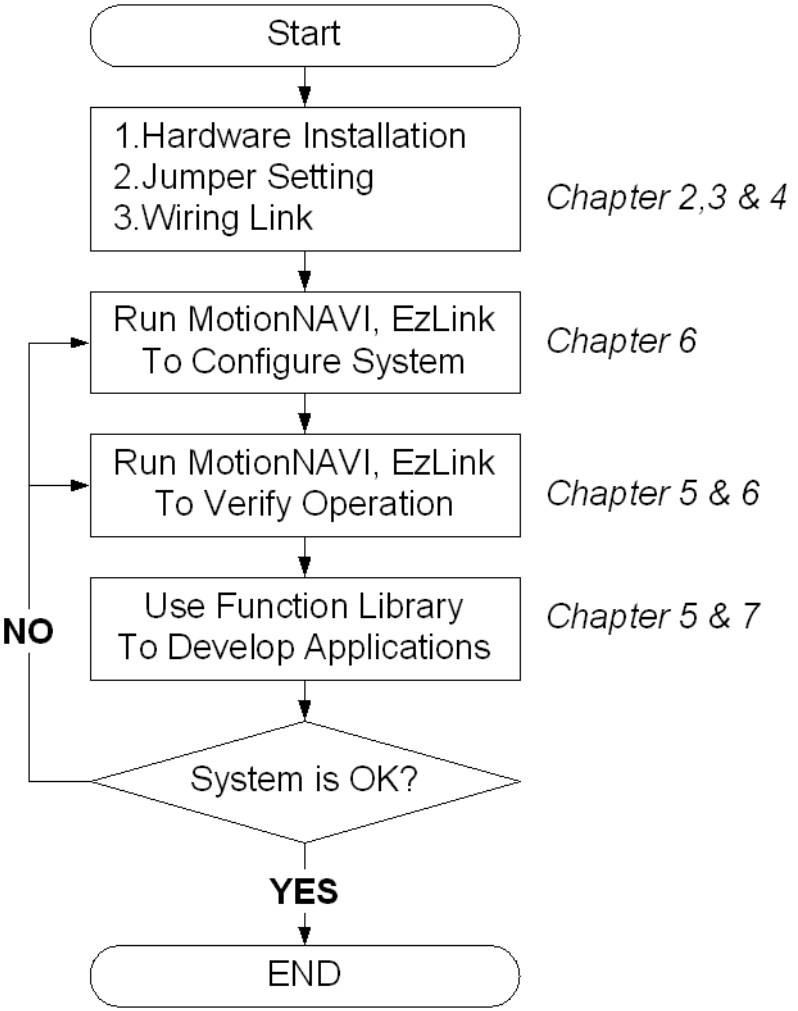


Figure 1.3: Flow Chart for Building an Application

CHAPTER 2

Installation

This chapter describes how to install the PCI-1247.

Sections include:

- Check What You Have
- PCB Board Layout
- Hardware Installation
- Driver Installation
- Connector Descriptions

Chapter 2 Installation

This chapter describes how to install the PCI-1247. Please follow these steps below to install the PCI-1247.

- Check what you have (section 2.1)
- Check PCB Board (section 2.2)
- Install hardware (section 2.3)
- Install software driver (section 2.4)

Understanding the I/O signal connections and their operation (chapter 3,4)

Understanding the connectors' pin assignments (the rest of the sections) and wiring the connections

2.1 Check What You Have

In addition to this User Manual, the package should also include the following items:

- PCI-1247: Advanced 4-Axis Servo / Stepper Motion Control Card
- Advantech Driver Disc
- An optional terminal board for wiring purposes. (If a different model is ordered.)

If any of these items are missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

2.2 PCB Board Layout

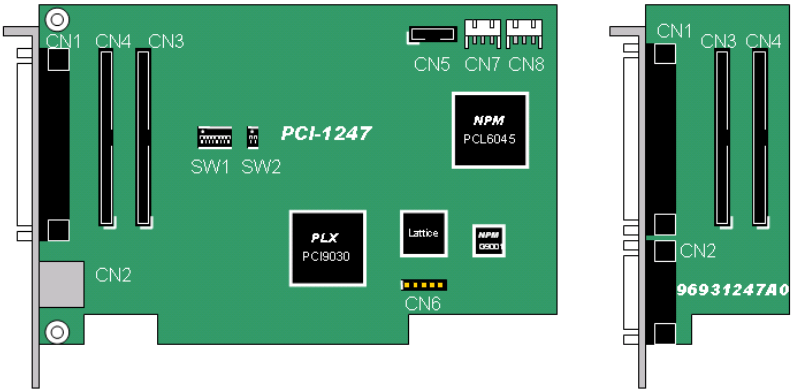


Figure 2.1: PCB Layout of the PCI-1247

Name	Description
PCI-1247	
CN1	SCSI 68 pins, 2 axes motion Input / Output signal connector (1st and 2nd Axis)
CN2	RJ-45, MotionNet slave module link port
CN3	Motion signal Input / Output connector for 3rd and 4th axis
CN4	Motion signal Input / Output connector for 3rd and 4th axis
CN5	General purpose TTL Input / Output
CN6	CPLD code download port
CN7	Simultaneous start/stop connector
CN8	Simultaneous STA / STP connector
SW1	Pulse output type selection switch
SW2	EMG with manual pulse generator ON/OFF switch
LED	Status indicator lights
96931247A0	
CN1	SCSI 68 pins, 2 axes motion Input / Output signal connector (3rd and 4th Axis)
CN2	SCSI 20 pins, manual pulse generator connector
CN3	Motion signal Input / Output connector for 3rd and 4th axis
CN4	Motion signal Input / Output connector for 3rd and 4th axis

2.3 Hardware Installation

2.3.1 Hardware Configuration

The PCI-1247 is fully Plug-and-Play compliant. Hence memory allocation (I/O port locations) of the PCI card is assigned by the system BIOS. The address assignment is done on a board-by-board basis for all PCI cards in the system.

2.3.2 PCI slot selection

Your computer will probably have both PCI and ISA slots. Do not force the PCI card into an ISA slot. The PCI-1247 can be used in any PCI slot.

2.3.3 Installation Procedures

Read through this manual, and arrange the jumpers to fit your application.

Turn off your computer, Turn off all accessories (printer, modem, monitor, etc.) connected to the computer. Remove the cover from your computer.

Select a 32-bit PCI expansion slot. PCI slots are shorter than ISA or EISA slots and are usually colored white or ivory.

Before handling the PCI-1247, discharge any static buildup on your body by touching the metal case of the computer. Hold the edge and do not touch the components.

Position the board into the PCI slot you have selected.

Secure the card in place at the rear panel of the system unit using screws removed from the slot.

2.3.4 Troubleshooting:

If your system doesn't boot or if you experience erratic operation with your PCI board in place, it's most likely caused by an interrupt conflict. This could be caused by an incorrect ISA setup. But, in general, the solution, once you determine it is not a simple oversight, is to consult the BIOS documentation that comes with your system.

Check the control panel of your Windows system if the card is listed by the system. If it's not listed, check your PCI settings in BIOS or plug the card into another PCI slot.

2.4 Driver Installation

Auto-Run from the Advantech Driver CD. Choose Driver Installation -> PCI-1247.

Follow the procedures of the installer.

After setup installation is completed, restart windows.

2.5 Connector Descriptions

2.5.1 4-Axis Motion

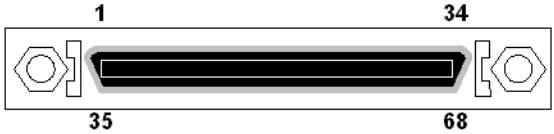


Figure 2.2: SCSI-68pin define (CN1 for PCI-1247 & 96931247A0)

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
1	+5V	Power +5V/200mA Output	35	+5V	Power +5V/200mA Output
2	GND	External Ground	36	GND	External Ground
3	OUTX+	Pulse Signal (+)	37	OUTY+	Pulse Signal (+)
4	OUTX-	Pulse Signal (-)	38	OUTY-	Pulse Signal (-)
5	DIRX+	Dir. Signal (+)	39	DIRY+	Dir. Signal (+)
6	DIRX-	Dir. Signal (-)	40	DIRY-	Dir. Signal (-)
7	GND	External Ground	41	GND	External Ground
8	EAX+	Encoder A Phase (+)	42	EAY+	Encoder A Phase (+)
9	EAX-	Encoder A Phase (-)	43	EAY-	Encoder A Phase (-)
10	EBX+	Encoder B Phase (+)	44	EBY+	Encoder B Phase (+)
11	EBX-	Encoder B Phase (-)	45	EBY-	Encoder B Phase (-)

12	EZX+	Encoder Z Phase (+)	46	EZY+	Encoder Z Phase (+)
13	EZX-	Encoder Z Phase (-)	47	EZY-	Encoder Z Phase (-)
14	COM	NPN:+24V / PNP:GND	48	COM	NPN:+24V / PNP:GND
15	PELX	End limit signal (+)	49	PELY	End limit signal (+)
16	MELX	End limit signal (-)	50	MELY	End limit signal (-)
17	COM	NPN:+24V / PNP:GND	51	COM	NPN:+24V / PNP:GND
18	ORGX	Home Signal Input	52	ORGY	Home Signal Input
19	SLDX	Ramp-down Signal Input	53	SLDY	Ramp-down Signal Input
20	GND	External Ground	54	GND	External Ground
21	SVONX	Servo On	55	SVONY	Servo On
22	ALMX	Servo Alarm	56	ALMY	Servo Alarm
23	INPX	Servo In-Position signal	57	INPY	Servo In-Position signal
24	ERCX	Clear Servo Error Counter	58	ERCY	Clear Servo Error Counter
25	RALMX	Reset Servo Alarm	59	RALMY	Reset Servo Alarm
26	RDYX	Servo Ready	60	RDYY	Servo Ready
27	GND	External Ground	61	GND	External Ground
28	LTCX	External Latch Input	62	LTCY	External Latch Input
29	CMPX	Position Compare Output	63	CMPY	Position Compare Output
30	GND	External Ground	64	GND	External Ground
31	EMG / DIX	EMG for 1st / GPIO Input for 3rd	65	DIY	GPIO Input
32	DOX	GPIO Output	66	DOY	GPIO Output
33	GND	External Ground	67	GND	External Ground
34	+24V	Power +24V/ 300mA Input	68	+24V	Power +24V/300mA Input

2.5.2 MPG

Figure 2.3: SCSI-20 pins Define (CN2 for 96931247A0)

Pin	Label	Description	Pin	Label	Description
1	+24V	Power +24V/200mA Output	11	GND	External Ground
2	HX	X Axis selected	12	HY	Y Axis selected
3	HZ	Z Axis selected	13	HU	U Axis selected
4	H1	Multiple control bit0	14	H10	Multiple control bit1
5	H100	Multiple control bit2	15	HCOM	NPN:+24V / PNP:GND
6	+5V	Power +5V/200mA Output	16	GND	Ground
7	HPA	Pulser A Phase input	17	HPB	Pulser B Phase input
8	HCOM	NPN:+24V / PNP:GND	18	HEN	Hand Wheel Enable Signal
9	HJOGP	JOG Positive Input signal	19	HJOGN	JOG Negative Input signal
10	EMG_A	Emergent contact A	20	EMG_K	Emergent contact K

2.5.3 MotionNet Extension

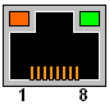


Figure 2.4: MotionNet extension (CN2 for PCI-1247)

Pin	Label	Description
1	FG	
2	FG	
3	RS485+	
4	FG	
5	FG	
6	RS485-	
7	FG	
8	FG	

2.5.4 STA/STP

Figure 2.5: STA/STP pin definition (CN7 & CN8 for PCI-1247)

Pin	Label	Description
1	GND	Ground
2	STA	Simultaneous Start
3	STP	Simultaneous Stop
4	GND	Ground

2.5.5 TTL Input / Output

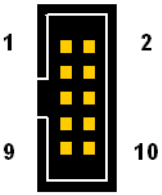


Figure 2.6: TTL Input / Output (CN5 for PCI-1247)

Pin	Label	Description	Pin	Label	Description
1	DI-0	TTL Digital Input 0	2	DI-1	TTL Digital Input 1
3	DI-2	TTL Digital Input 2	4	DI-3	TTL Digital Input 3
5	GND	Ground	6	DO-1	TTL Digital Output 1
7	DO-0	TTL Digital Output 0	8	DO-3	TTL Digital Output 3
9	DO-2	TTL Digital Output 2	10	+5V	Power +5V/200mA Output

2.5.6 DIP Switches

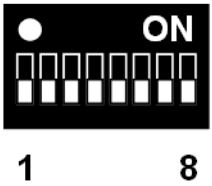


Figure 2.7: DIP Switch for Pulse Output type (SW1 for PCI-1247)

SW	Label	ON	OFF
1	OUTX	Open collector output	Differential line driver output (Default)
2	DIRX		
3	OUTY		
4	DIRX		
5	OUTZ		
6	DIRZ		
7	OUTU		
8	DIRU		

Figure 2.8: DIP Switch for EMG (SW2 for PCI-1247)

SW	Label	ON	OFF
1	Connect EMG source to MPG	Disable (default)	Enable
2			
Note: If the MPG (Manual Pulse Generator) is not connected to PCI-1247, the SW2 has to be "On" (disable)			

CHAPTER 3

Signal Connections

There are three groups of signal connections for PCI-1247. The first is for Machine I/O interfaces. The second is for Pulse I/O interfaces. And the third is for Servo Driver I/O interfaces. They are all described in the following sections:

- General Description
- Servo/Driver Motor Connection

Chapter 3 Signal Connections

3.1 General Description

3.1.1 Machine I/O Interface Signals

PEL and MEL (End Limit / Digital Input Signal)

There are two end-limit signals called PEL and MEL for each axis. Usually they are Normal-Close type signals from external sensors. PEL indicates the limit of motion in the plus direction and MEL indicates the limit of motion in the minus direction. The relative signal names, pin number and axis number are shown in the following table.

Table 3.1: PEL and MEL Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
14	COM	+24 V for NPN , GND for PNP	48	COM	+24 V for NPN , GND for PNP
15	PELX	Plus End Limit for Axis 1/3	49	PELY	Plus End Limit for Axis 2/4
16	MELX	Minus End Limit for Axis 1/3	50	MELY	Minus End Limit for Axis 2/4

The signals connections are shown in figures 3.1 and 3.2.

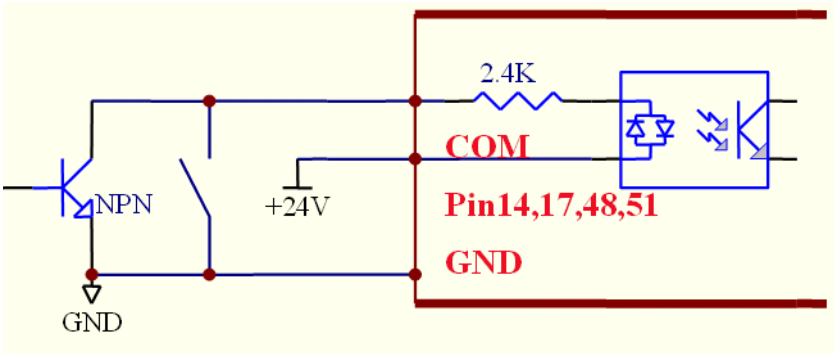


Figure 3.1: PEL, MEL Wiring for NPN -Sink Mode

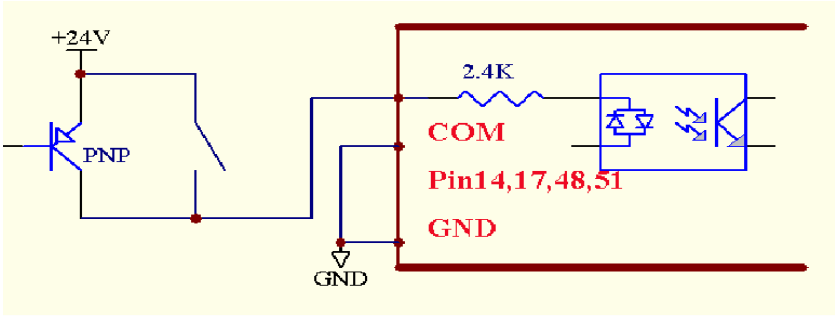


Figure 3.2: PEL, MEL Wiring for PNP-Source Mode

Note: Pulse command output will be stopped when PEL/ MEL is active

ORG (Origin / Digital Input Signal)

The origin signals (ORG1~ORG4) are necessary when the position feedback is of the incremental type or if no feedback encoders are used. The origin signals are used to indicate the origin of the system. Please refer to table 3.2 for detailed information.

Table 3.2: ORG Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24V for NPN , GND for PNP	51	COM	+24V for NPN , GND for PNP
18	ORGX	ORG signal	52	ORGY	ORG signal

The signals connections are shown in figures fig.3.3 and fig.3.4.

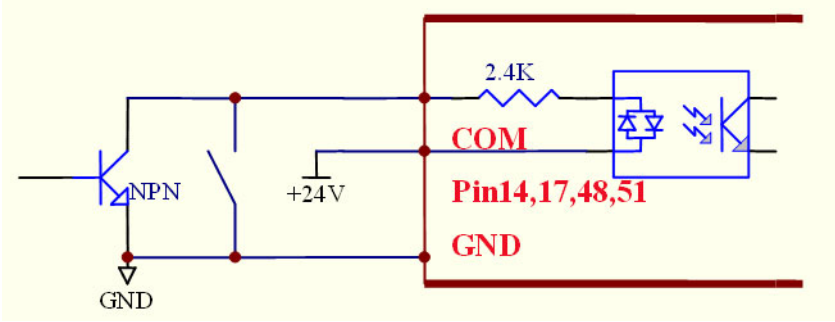


Figure 3.3: ORG Wiring for NPN -Sink Mode

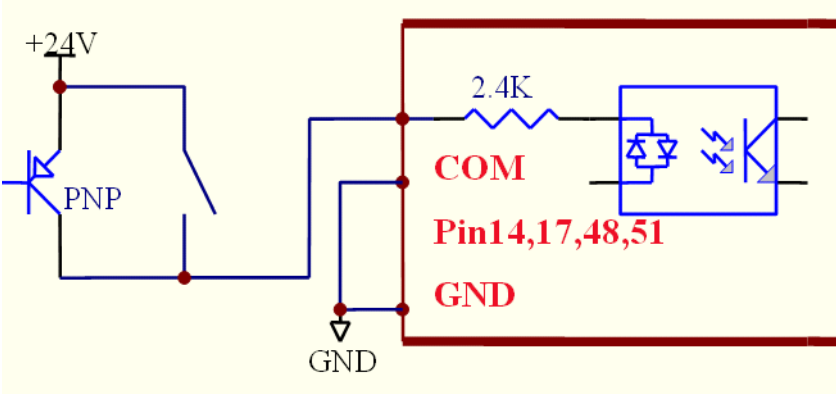


Figure 3.4: ORG Wiring for PNP-Source Mode

SLD (Slow Down / Input Signal)

The SLD signals are used to help the axis decelerate to stop by hardware. Please refer to table 3.3 for descriptions of the signal name, pin number and axis number.

Table 3.3: SLD Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24 V for NPN, GND for PNP	51	COM	+24 V for NPN, GND for PNP
19	SLDX	SLD Signal	53	SLDY	SLD Signal

Signals connections are shown in figures fig.3.5 and fig.3.6.

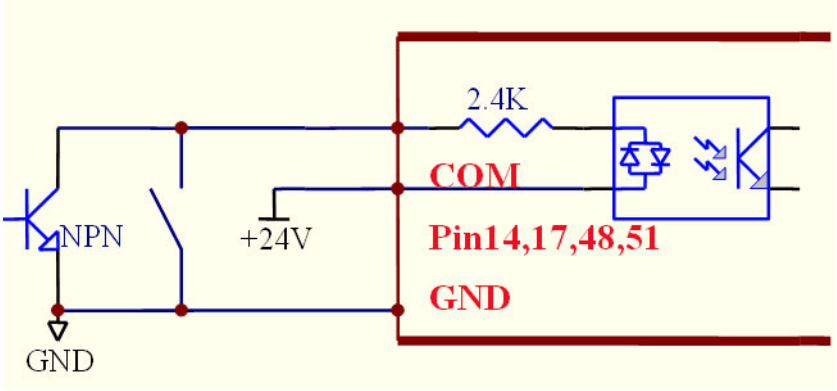


Figure 3.5: SLD Wiring for NPN -Sink Mode

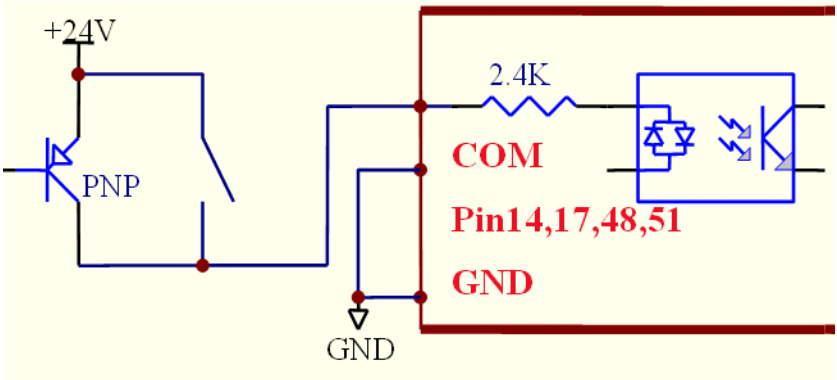


Figure 3.6: SLD Wiring for PNP-Source Mode

CMP (Position Compare / Output Signal)

CMP signals are used to make a comparison between target value and actual value and generate a trigger signal output. Please refer to table 3.4 for the signal name, pin number and axis number..

Table 3.4: CMP Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
29	CMPX	CMP Output	63	CMPY	CMP Output
30	GND	External Ground	64	GND	External Ground

The signals connections are shown in figure.3.7.

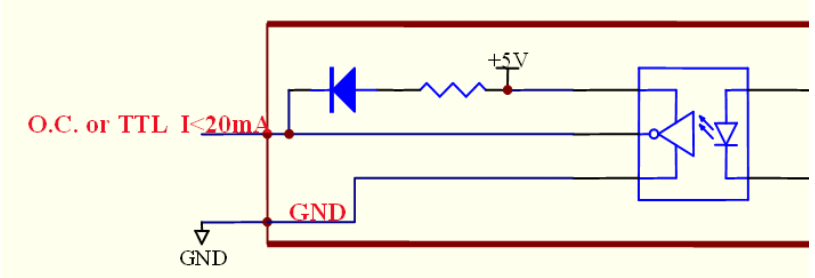


Figure 3.7: CMP Signal Output

Warning : The sink current limit is 20 mA!

LTC (Counter Latch)

LTC is used to latch the value in the counter when the LTC input is active. Table.3.5 lists the signal name, pin number and axis number.

Table 3.5: LTC Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
28	LTCX	LTC input	62	LTCY	LTC input

The signal connections are shown in figure 3.8.

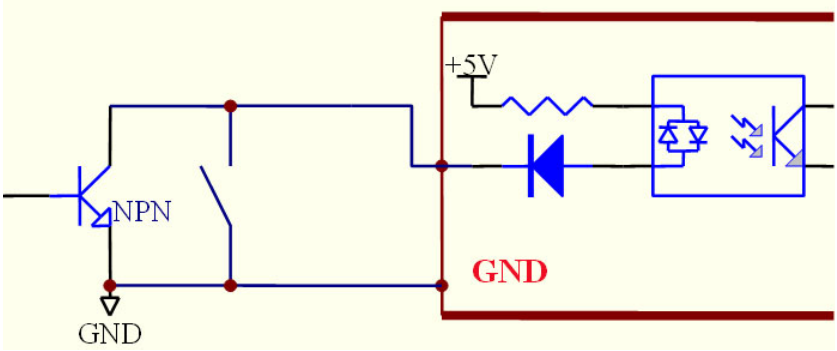


Figure 3.8: LTC Wiring for NPN Mode

DI (Axis Digital Input / Digital Input Signal)

Digital input for each axis is shown in Table 3.6. The DI for the 1st input is designed for EMG connection. The other inputs are for general purpose of each axis.

Table 3.6: DI Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
31	EMG / DIX	EMG (1st)/ DI (3rd)	65	DIY	General DI

The signal connection is shown in fig.3.9

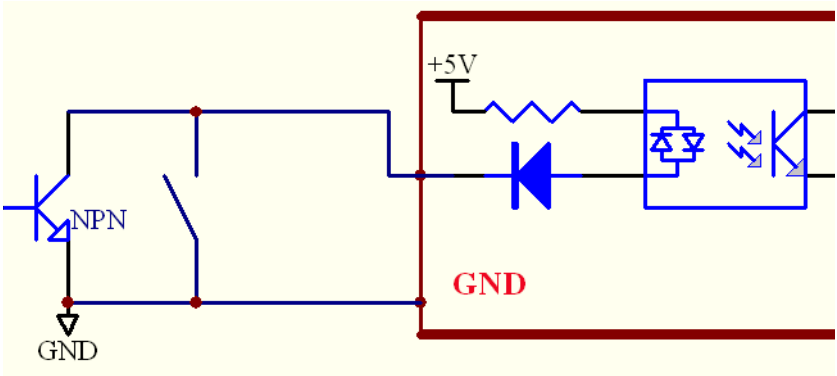


Figure 3.9: DI Wiring for NPN Mode

DO(Axis Digital Output / Digital Output Signal)

Digital output for each axis is designed for general-purpose output function. Please refer to the following table 3.7.

Table 3.7: DO Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
32	DOX	Axis related DO	66	DOY	Axis related DO

The signal connection is shown in fig.3.10

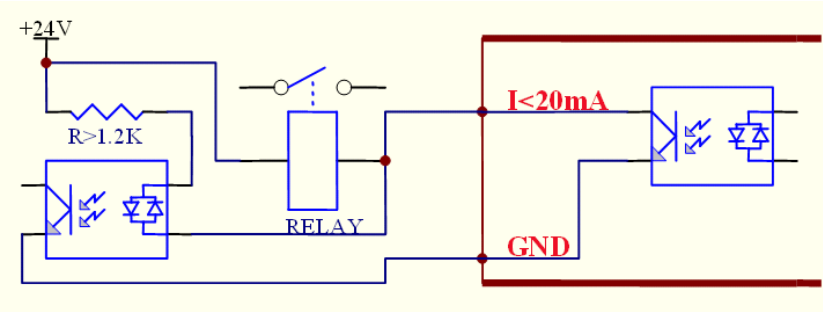


Figure 3.10: DO Wiring Diagram.

Note: The Max. Output current limit is 20 mA!

3.1.2 Driver I/O Interface Signals

ALM (Servo Alarm / Digital Input Signal)

ALM- input signal from ALM signal at servo driver. The servo driver will issue ALM output when it is under abnormal operation or overload. Please refer to table 3.8 for a description.

Table 3.8: ALM Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24 V for NPN , GND for PNP	51	COM	+24 V for NPN , GND for PNP
22	ALMX	Servo ALM input	56	ALMY	Servo ALM input

The signal connection is shown in fig.3.11

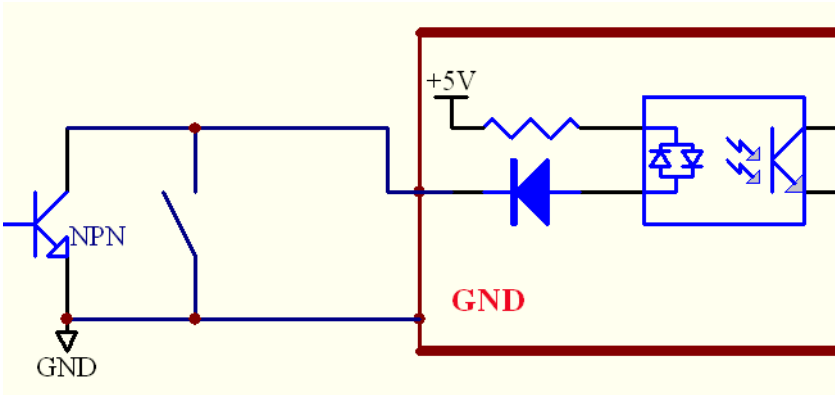


Figure 3.11: ALM Wiring for NPN Mode

Note: *When ALM is active and enabled, PCI-1247 will stop pulse output*

RALM (Servo Alarm Reset / Digital Output Signal)

This RALM signal is designed to reset ALM status inside the servo driver if the alarm status can be reset. Please refer to Table 3.9 for a description.

Table 3.9: RALM Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24 V for NPN , GND for PNP	51	COM	+24 V for NPN , GND for PNP
25	RALMX	ALM reset output	59	RALMY	ALM reset output

The signal connection is shown in fig.3.12

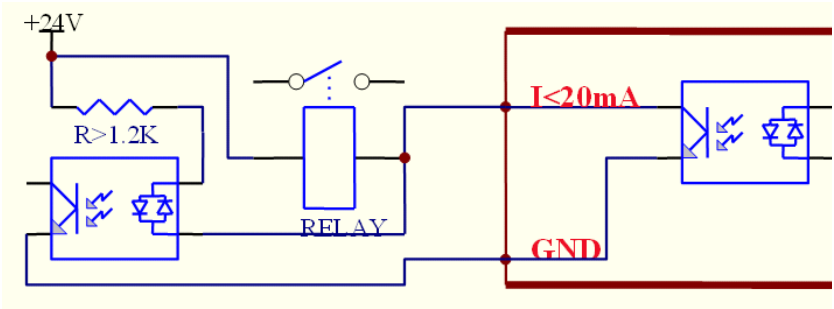


Figure 3.12: RALM Output Wiring Diagram

Note: The Max. output current is limited to 20 mA!

SVON (Servo On / Digital Output Signal)

SVON is an output signal from PCI-1247 and is used to make driver servo-on to hold the motor. Please refer to table 3.10.

Table 3.10: SVON Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
21	SVONX	SVON Output	55	SVONY	SVON Output

The signal connection is shown in fig.3.13

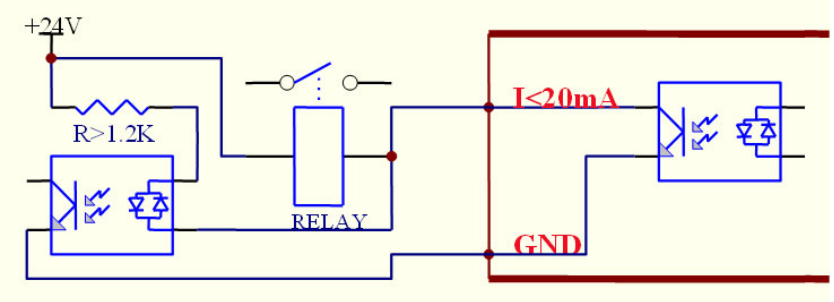


Figure 3.13: SVON Output Wiring Diagram

Note: The Max. output current is limited by 20 mA!

RDY (Driver Ready Signal / Digital Input Signal)

RDY is an input signal and is used to read the RDY signal at servo driver. Please refer to table 3.11.

Table 3.11: RDY Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24 V for NPN , GND for PNP	51	COM	+24 V for NPN , GND for PNP
26	RDYX	Servo RDY input	60	RDYY	Servo RDY input

The signal connection is shown in fig.3.14

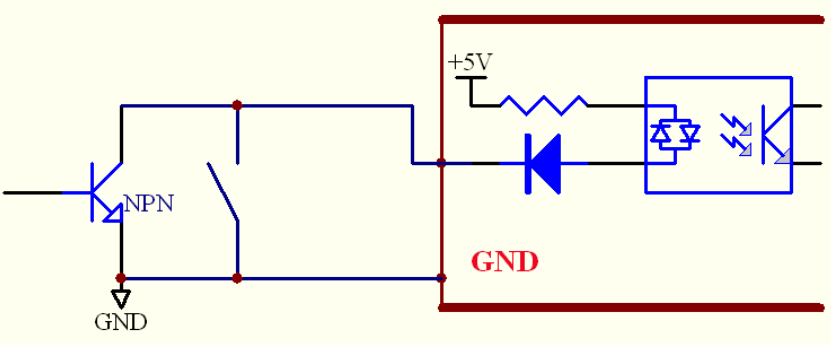


Figure 3.14: RDY Wiring for NPN Mode

INP (Axis In Position Signal / Digital Input Signal)

INP is an input signal at PCI-1247 and is used to read the INP status inside servo driver. Please refer to table 3.12 for descriptions.

Table 3.12: INP Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
17	COM	+24 V for NPN , GND for PNP	51	COM	+24 V for NPN , GND for PNP
23	INPX	Servo In-Position Input	57	INPY	Servo In-Position Input

The signal connection is shown in fig.3.15

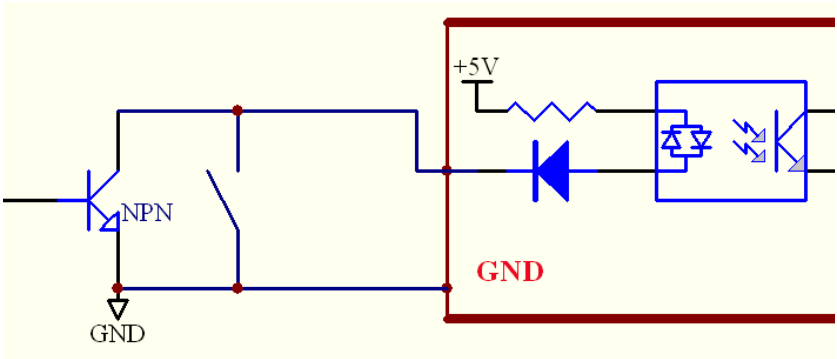


Figure 3.15: NP Wiring for NPN Mode

ERC (Deviation Counter Clear / Digital Output Signal)

ERC output will be active when the following condition is activated.

- Homing is complete
- PEL/MEL is active
- ALM is active
- User issues EMG by software

For safety reasons, please issue ERC before SVON. Please refer to table 3.13.

Table 3.13: ERC Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
24	ERCX	Reset Driver error counter	58	ERCY	Reset Driver error counter

The signal connection is shown in fig.3.16

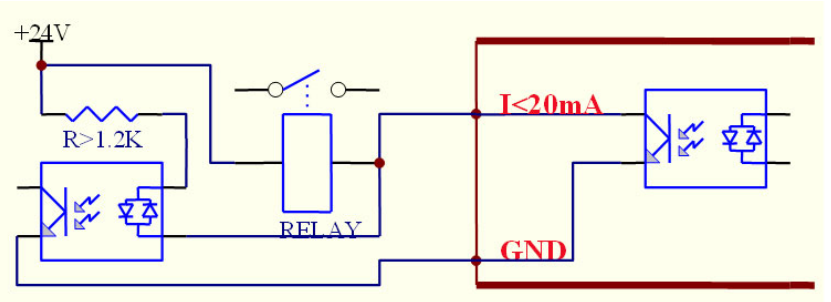


Figure 3.16: ERC Output Wiring Diagram

Note: The Max. output current is limited by 20 mA!

3.1.3 Driver Pulse I/O Interface Signals

OUT and DIR (Pulse Output Control / Digital Output Signal)

There are six types of pulse output for PCI-1247. Specify the electrical specification as differential or open collector. Then select DIR/OUT or CW/CCW. Refer to table 3.14 for the pin definition of the DIR/OUT pins. You can also refer to the dipswitch setting in chapter 2.

Table 3.14: OUT and DIR Pins

Pin	Label	1st / 3rd Axis Description	Pin	Label	2nd / 4th Axis Description
3	OUTX+	OUT(+)	37	OUTY+	OUT(+)
4	OUTX-	OUT(-)	38	OUTY-	OUT(-)
5	DIRX+	DIR(+)	39	DIRY+	DIR(+)
6	DIRX-	DIR(-)	40	DIRY-	DIR(-)

The signal connection is shown in fig.3.17 and fig.3.18.

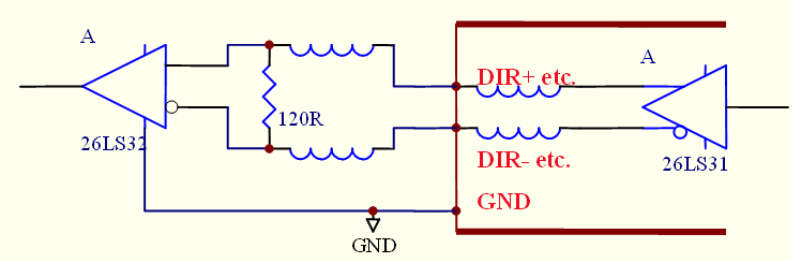


Figure 3.17: Differential Line Driver Output

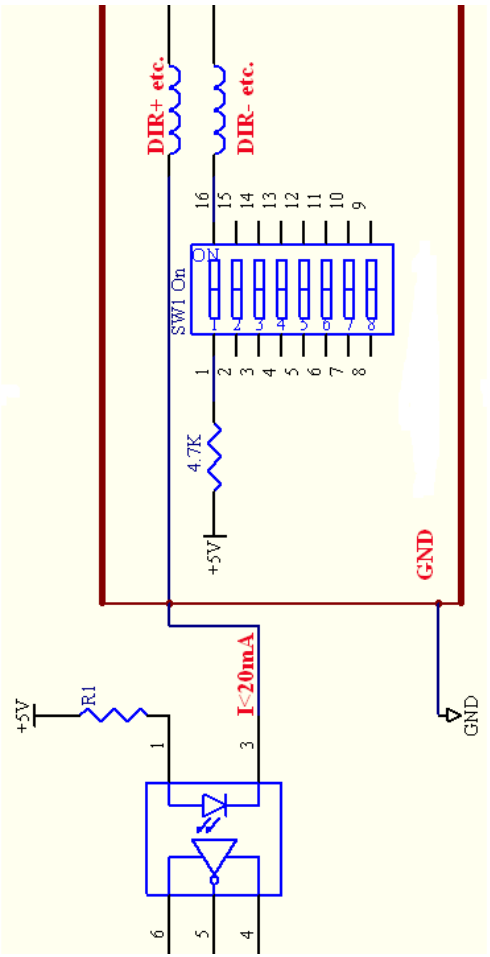


Figure 3.18: Open Collector Output

Note: The Max.. output current for OUT and DIR is limited by 20 mA!

EA, EB and EZ (Encoder A, B and Z Phase)

Please refer to table 3.15 for the encoder input signal descriptions.

Table 3.15: EA, EB and EZ Pins					
Pin	**Label**	**1st / 3rd Axis Description**	**Pin**	**Label**	**2nd / 4th Axis Description**
8	EAX+	Encoder A (+)	42	EAY+	Encoder A (+)
9	EAX-	Encoder A(-)	43	EAY-	Encoder A(-)
10	EBX+	Encoder B (+)	44	EBY+	Encoder B(+)
11	EBX-	Encoder B(-)	45	EBY-	Encoder (-)
12	EZX+	Encoder Z(+)	46	EZY+	Encoder Z(+)
13	EZX-	Encoder Z(-)	47	EZY-	Encoder Z(-)

The signal connection is shown in fig.3.19

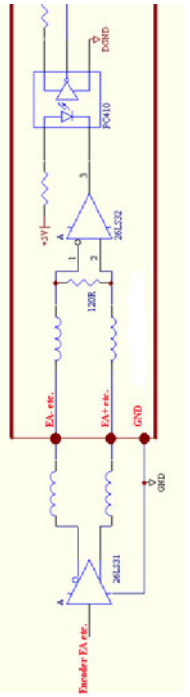


Figure 3.19: Differential Line Driver Encoder Input

3.1.4 MOF Interface I/O signals

MOF (Manual Operation Function) interface signals are shown in the following table 3.16. MOF is designed to support 3 modes of manual function including MPG, JOG, and STEP.

Pin	Label	Description	Pin	Label	Description
1	+24V	+24 V/ 200 mA Power Output	11	GND	Ground
2	HX	X axis input	12	HY	Y axis input
3	HZ	Z axis input	13	HU	U axis input
4	H1	Rate input bit0	14	H10	Rate inputbit1
5	H100	Rate input bit2	15	HCOM	NPN: +24 V / PNP:GND
6	+5V	+5V/200mA power output	16	GND	Ground
7	HPA	MPG A Phase input	17	HPB	MPG B Phase input
8	HCOM	NPN: +24V / PNP:GND	18	HEN	MOF Enable input
9	HJOGP	JOG + input	19	HJOGN	JOG - input
10	EMG	Emergent contact	20	EMG_K	Emergent contact K

The signal connection is shown in figure 3.20 to 3.23.

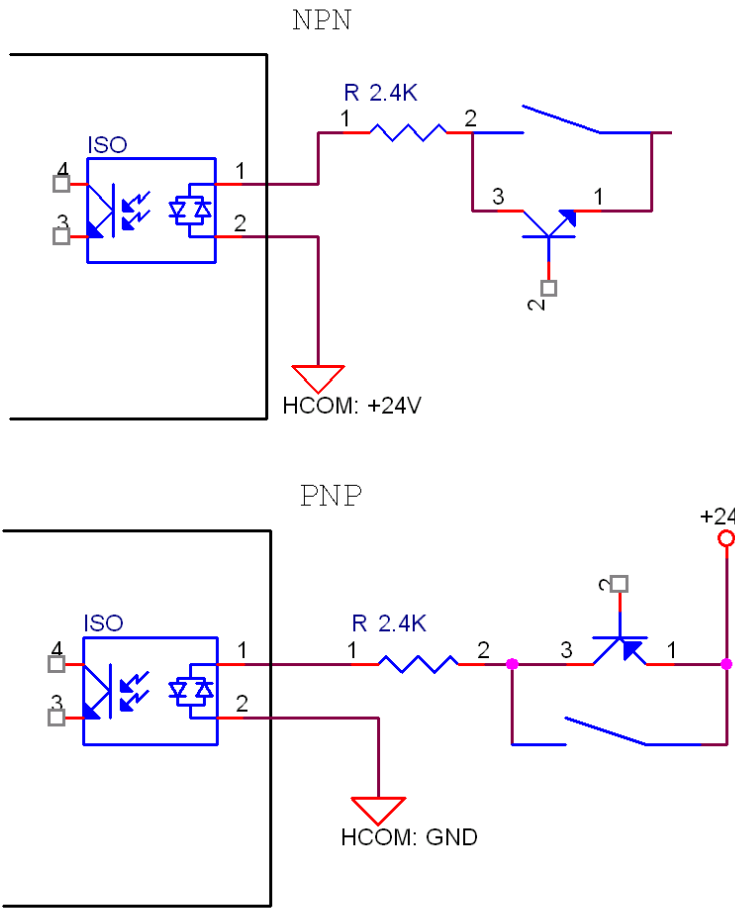


Figure 3.20: HX/HY/HZ/HU/H1/H10/H100

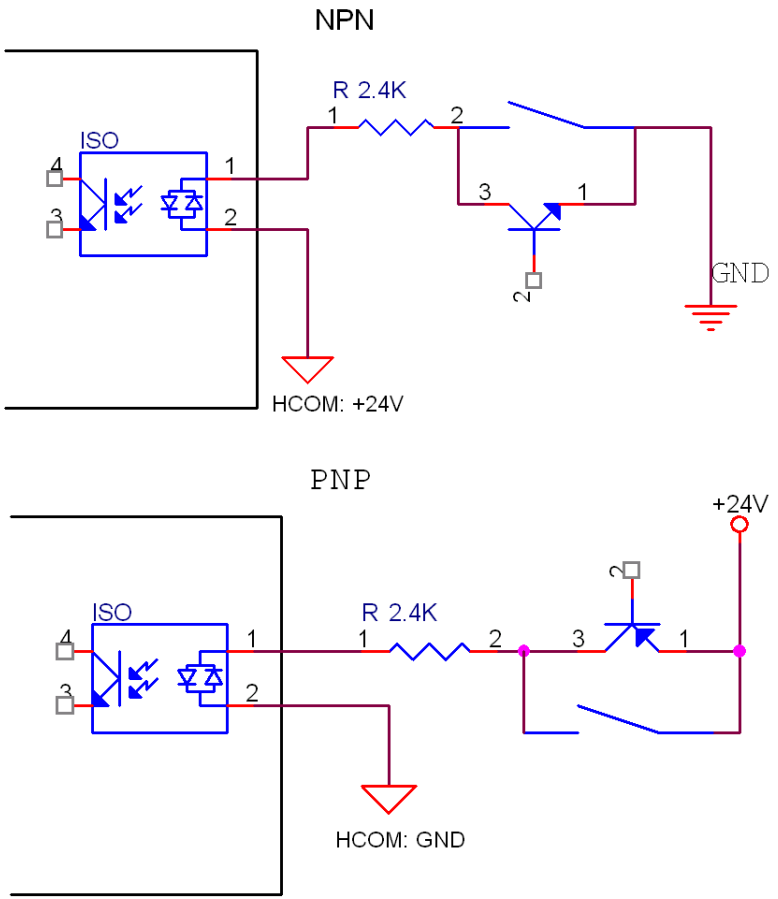


Figure 3.21: HPA/HPB

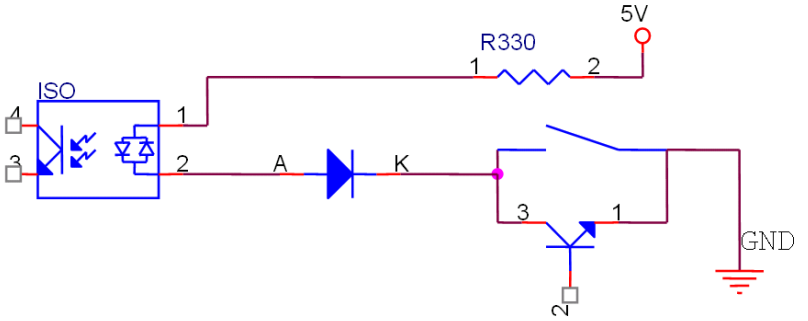


Figure 3.22: HJOGP/HJOGN/HEN

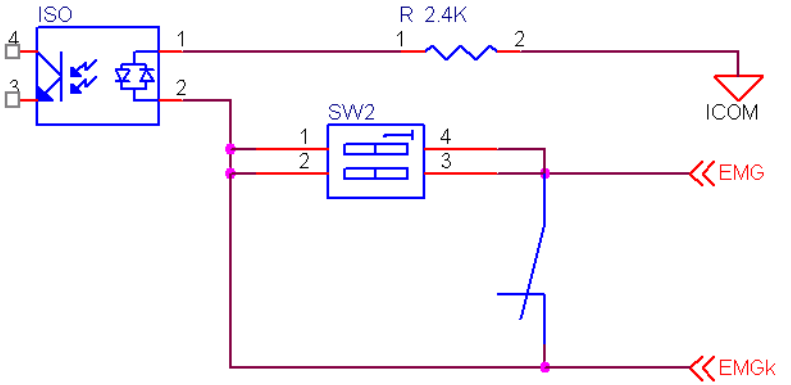


Figure 3.23: EMG/EMGk

3.1.5 MotionNet Extension Interface

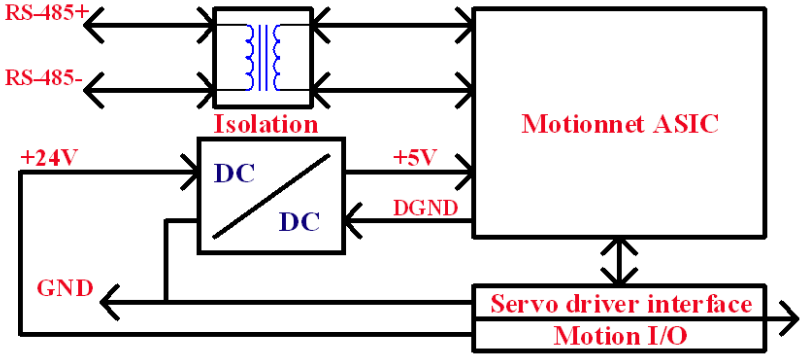
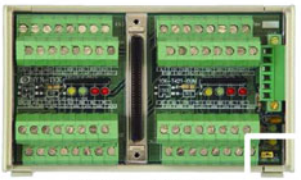
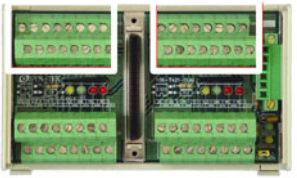


Figure 3.24: RS485 Extension Port

3.2 Servo Driver/Motor Connection Interface

3.2.1 General Servo/Stepping Driver

<table>
<tr>
<td>J1Type Selecting Jumper
 
ADAM-3968M</td>
<td>Warning: Damage can happen with wrong wiring
 
PNP Type
 
NPN Type</td>
</tr>
<tr>
<td> 
ADAM-3968M</td>
<td>
<table>
<tr><th>Label</th><th>General Description</th></tr>
<tr><td>ALM</td><td>Servo Alarm Signal Input</td></tr>
<tr><td>ERC</td><td>Clear Servo Error Counter Signal Output</td></tr>
<tr><td>SVON</td><td>Servo On Signal Output</td></tr>
<tr><td>INP</td><td>In-Position Signal Input</td></tr>
<tr><td>RDY</td><td>Servo Ready Signal input</td></tr>
<tr><td>RALM</td><td>Rest Servo Alarm Signal Output</td></tr>
<tr><td>EA+</td><td>Encoder A Phase (+)</td></tr>
<tr><td>EA-</td><td>Encoder A Phase (-)</td></tr>
<tr><td>EB+</td><td>Encoder B Phase (+)</td></tr>
<tr><td>EB-</td><td>Encoder B Phase (-)</td></tr>
<tr><td>EZ+</td><td>Encoder Z Phase (+)</td></tr>
<tr><td>EZ-</td><td>Encoder Z Phase (-)</td></tr>
<tr><td>OUT+</td><td>Pulse Signal Output (+)</td></tr>
<tr><td>OUT-</td><td>Pulse Signal Output (-)</td></tr>
<tr><td>DIR+</td><td>Direction Signal Output(+)</td></tr>
<tr><td>DIR-</td><td>Direction Signal Output(-)</td></tr>
</table>
</td>
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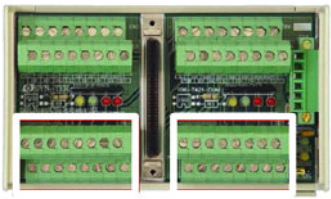
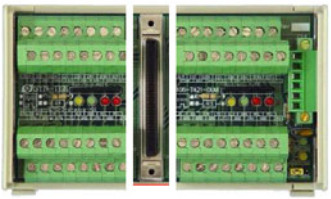
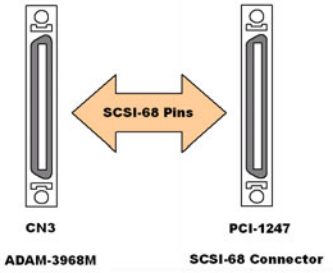


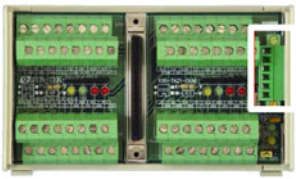
ADAM-3968M

Label	General Description
24V	DC 24V Power Output
GND	Ground
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input
LTC+	Latch Signal Input (+)
LTC-	Latch Signal Input (-)
EMG	Emergency Stop Input
CMP	Position Compare signal Output
DI	Digital Input Signal
DO	Digital Output Signal



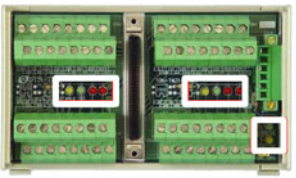
ADAM-3968M





ADAM-3968M

Pin	Label	Description
1	24V	DC 24V
2	ND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

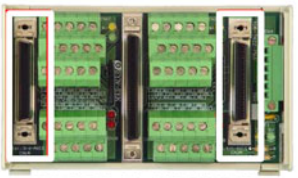


ADAM-3968M

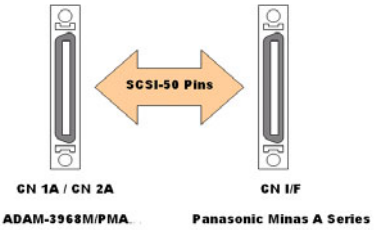
Label	General Description
5VON	DC 5V Power Input Ready
24VON	DC 24V Power Input Ready
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input

3.2.2 Panasonic Minas A Series

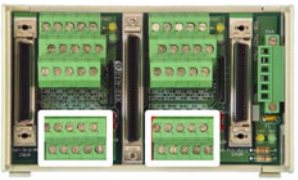
CN1A/CN2A Connector to Servo Driver



ADAM-3968M/PMA



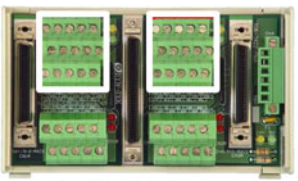
CN2B/CN2B Pin Description



ADAM-3968M/PMA

Label	General Description
24V	DC 24V Power Output
GND	Ground
EMG	Emergency Stop Input
CMP	Position Compare signal Output
DI	Digital Input Signal
DO	Digital Output Signal
BRK+	Machinery Break Signal (+) Input
BRK-	Mechanical Brake Release Signal (-) Input

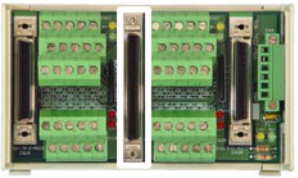
CN1C/CN2C Pin Description



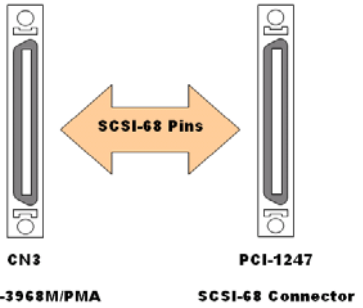
ADAM-3968M/PMA

Label	General Description
24V	DC 24V Power Output
GND	Ground
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input
LTC+	Latch Signal Input (+)
LTC-	Latch Signal Input (-)

CN3 connector to PCI-1247



ADAM-3968M/PMA

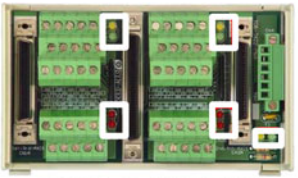


CN4 External Power Input Connector

ADAM-3968M/PMA

Pin	Label	Description
1	24V	DC 24V
2	GND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

LED Status Display

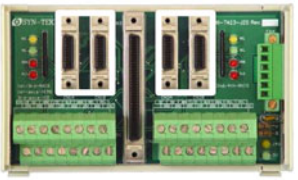


ADAM-3968M/PMA

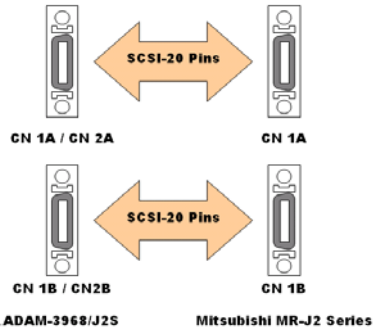
Label	General Description
5VON	DC 5V Power Input Ready
24VON	DC 24V Power Input Ready
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input

3.2.3 Mitsubishi J2-Super Series

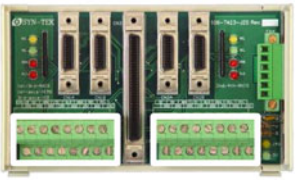
CN1A/CN1B and CN2A/CN2B Connector to Servo Driver



ADAM-3968M/J2S



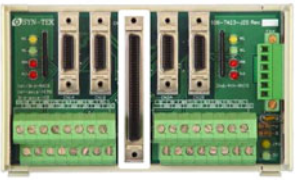
CN1C Pin Description



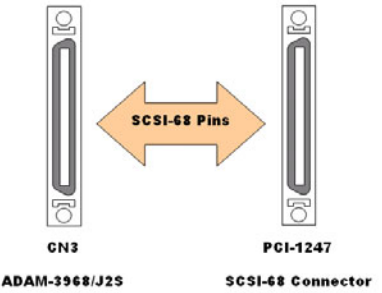
ADAM-3968M/J2S

Label	General Description
24V	DC 24V Power Output
GND	Ground
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input
LTC	Latch Signal Input
EMG	Emergency Stop Input
BRK	Machinery Break Signal Input
CMP	Position Compare signal Output
DI	Digital Input Signal
DO	Digital Output Signal

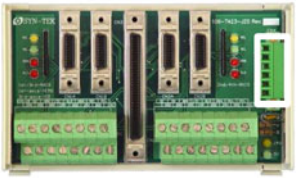
CN3 Connector to PCI-1247



ADAM-3968M/J2S



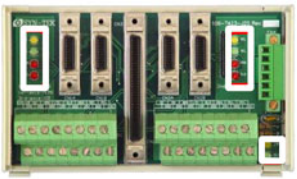
CN4 External Power Input Connector



ADAM-3968M/J2S

Pin	Label	Description
1	24V	DC 24V
2	GND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

LED Status Display

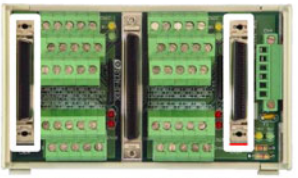


ADAM-3968M/J2S

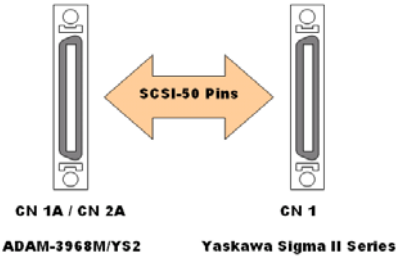
Label	General Description
5VON	DC 5V Power Input Ready
24VON	DC 24V Power Input Ready
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input

3.2.4 Yaskawa Sigma II Series

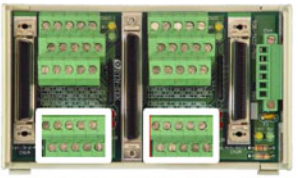
CN1A/CN2A Connector to Servo Driver



ADAM-3968M/YS2



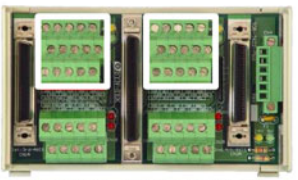
CN2B/CN2B Pin Descriptions



ADAM-3968M/YS2

Label	General Description
24V	DC 24V Power Output
GND	Ground
EMG	Emergency Stop Input
CMP	Position Compare signal Output
DI	Digital Input Signal
DO	Digital Output Signal
BRK+	Machinery Break Signal (+) Input
BRK-	Mechanical Brake Release Signal (-) Input

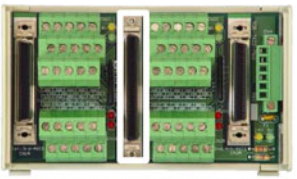
CN1C/CN2C Pin Descriptions



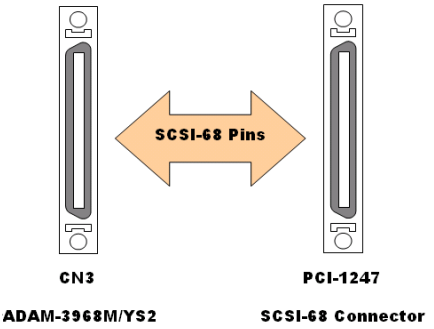
ADAM-3968M/YS2

Label	General Description
24V	DC 24V Power Output
GND	Ground
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input
LTC+	Latch Signal Input (+)
LTC-	Latch Signal Input (-)

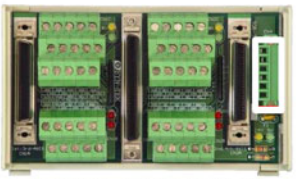
CN3 connector to PCI-1247



ADAM-3968M/YS2



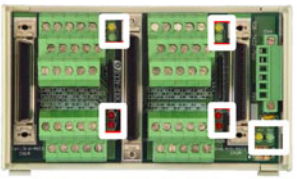
CN4 External Power Input Connector



ADAM-3968M/YS2

Pin	Label	Description
1	24V	DC 24V
2	GND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

LED Status Display



ADAM-3968M/YS2

Label	General Description
5VON	DC 5V Power Input Ready
24VON	DC 24V Power Input Ready
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input

CHAPTER 4

MotionNet Extension Modules

Sections include:

- Installation and Removal of Extension Modules
- DIO Slave Module
- Motion Slave Modules

Chapter 4 MotionNet Extension Modules

4.1 Installation and Removal of Extension Modules

4.1.1 Installation

Please make sure the extension (slave) modules have been plugged into the DIN rail correctly. Try to move the module by hand after installation. No vertical movement up and down will be possible if the installation is correct. Only horizontal movement right and left will be possible.

4.1.2 Removal

Please refer to figure 4.1 and proceed with the following steps.

1. Use a flat screwdriver

2. Plug this screwdriver into the bar on the right end

3. Push the screwdriver to pull out the bar

4. Slightly pull the slave module out of the DIN rail while keeping the screwdriver in its position pulling the bar. Make sure the module is no longer attached on the right side.

5. Follow the same steps 2 ~ 4 on the left side.

6. After steps 1 ~ 4 have been successfully completed for both sides, the slave module can be removed from the DIN rail.

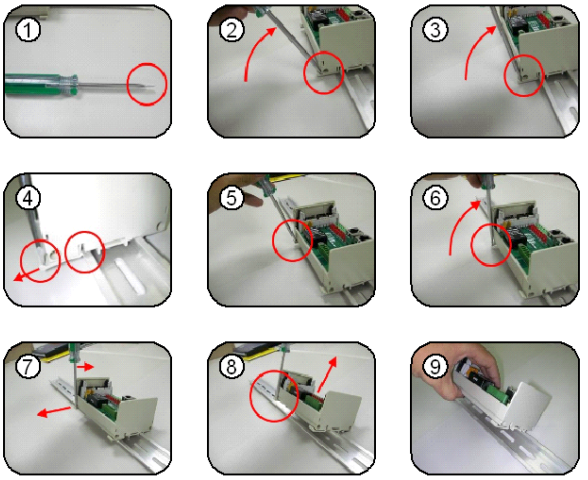


Figure 4.1: Installation and Removal of Extension Modules

4.2 DIO Slave Modules

4.2.1 Features

- DIN rail mounting (LxWxH): 124 x 72 x 53 mm
- Max. 20 Mbps transfer rate
- 3-Wire terminal board for actuator/sensor
- Easy installation with RJ45 phone jack and LED diagnostic
- Serial interface: half duplex RS-485 with transformer isolation

4.2.2 Specifications

- Cable type: CAT5 UTP/STP Ethernet cable
- Surge protection: 10 kV
- Transmission speed: 2.5, 5, 10 and 20 Mbps
- On-line module insertion and removal
- IO isolation voltage: 2.5 kVrms
- Input impedance: 2.4 k/0.5 W, Input current: ±10 mA (Max)
- Output types: NPN/PNP open collector Darlington transistors
- Switch capacity: each output channel is 60 mA at 24 V DC
- Response time: On to Off, about 180 µs; Off to On, about 1.2 µs
- Power supply: +18 V DC to +30 V DC, consumption: 3 W typical
- Operating temperature: 0 ~ 60° C

4.2.3 Products Introduction

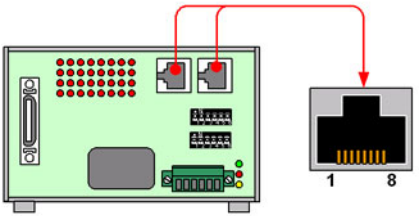
Figure 4.2: ADAM-375XX Products Series and ADAM-3936

There are two types of DIO slave modules, one is a 3-wire type called ADAM-37xx, and the other is a flat-cable type called ADAM-37xxF. For the 3-wire type slave, there is a PCL-10136M connector onboard. The ADAM-3968M wiring terminal will be used together with this type of slave. ADAM-3968M supports 3 screw terminals for each input and output. The ADAM-37xx is very suitable for system integration and quick development of machine prototypes.

ADAM-37xxF is an economic option for a DIO slave modules that is designed for customers that have their own I/O terminal boards.

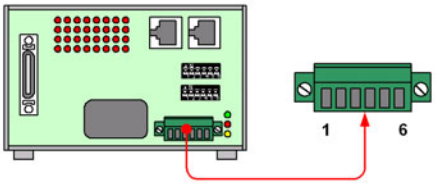
4.2.4 Common Connector Pin Definitions

Communication Conn. RJ-45



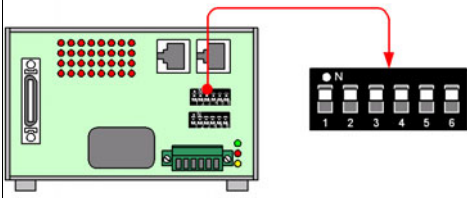
Pin	Label	Description
1	NC	
2	NC	
3	RS485+	
4	NC	
5	NC	
6	RS485-	
7	NC	
8	NC	

External Power Input connector



Pin	Label	Description
1	24V	DC 24V
2	GND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

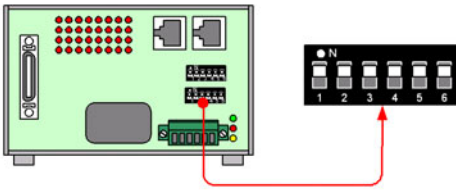
ID Setting DIP Switch



Pin	Label	ON	OFF
1	A5	1	0
2	A4	1	0
3	A3	1	0
4	A2	1	0
5	A1	1	0
6	A0	1	0

Note: Node Number= 32xA5+16xA4+8xA3+4xA2+2xA1+A0

Configuration Settings

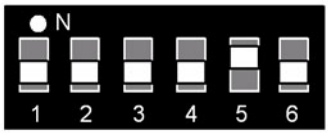


Pin	Label	Description	ON	OFF
1	B1	*Baud-Rate Setting	1	0
2	B0	*Baud-Rate Setting	1	0
3	TD	Reserved		
4	TM	Reserved		
5	BK	Reserved		
6	TR	Terminate Resistance	Enable	Disable

How to use Baud-Rate Setting

B0	B1	Baud-Rate Setting
OFF	OFF	1/4 System Clock
OFF	ON	1/8 System Clock
ON	OFF	1/16 System Clock
ON	ON	1/32 System Clock

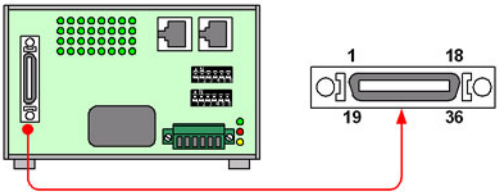
Note:
default system clock = 80 Mhz



Default Setting

4.2.5 Specific Connector Pin Definitions

ADAM-375x Pin Definitions



ADAM-3752

Pin	Label	Pin	Label
1	IN_00	19	IN_20
2	IN_01	20	IN_21
3	IN_02	21	IN_22
4	IN_03	22	IN_23
5	IN_04	23	IN_24
6	IN_05	24	IN_25
7	IN_06	25	IN_26
8	IN_07	26	IN_27
9	GND	27	GND
10	GND	28	GND
11	IN_10	29	IN_30
12	IN_11	30	IN_31
13	IN_12	31	IN_32
14	IN_13	32	IN_33
15	IN_14	33	IN_34
16	IN_15	34	IN_35
17	IN_16	35	IN_36
18	IN_17	36	IN_37

ADAM-3758

Pin	Label	Pin	Label
1	IN_00	19	IN_20
2	IN_01	20	IN_21
3	IN_02	21	IN_22
4	IN_03	22	IN_23
5	IN_04	23	IN_24
6	IN_05	24	IN_25
7	IN_06	25	IN_26
8	IN_07	26	IN_27
9	GND	27	GND
10	GND	28	GND
11	IN_10	29	OUT_30
12	IN_11	30	OUT_31
13	IN_12	31	OUT_32
14	IN_13	32	OUT_33
15	IN_14	33	OUT_34
16	IN_15	34	OUT_35
17	IN_16	35	OUT_36
18	IN_17	36	OUT_37

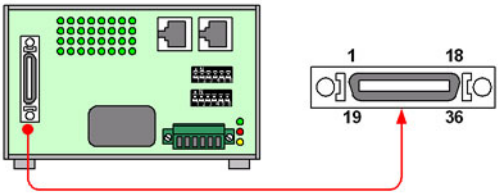
ADAM-3756

Pin	Label	Pin	Label
1	IN_00	19	OUT_20
2	IN_01	20	OUT_21
3	IN_02	21	OUT_22
4	IN_03	22	OUT_23
5	IN_04	23	OUT_24
6	IN_05	24	OUT_25
7	IN_06	25	OUT_26
8	IN_07	26	OUT_27
9	GND	27	GND
10	GND	28	GND
11	IN_10	29	OUT_30
12	IN_11	30	OUT_31
13	IN_12	31	OUT_32
14	IN_13	32	OUT_33
15	IN_14	33	OUT_34
16	IN_15	34	OUT_35
17	IN_16	35	OUT_36
18	IN_17	36	OUT_37

ADAM-3754

Pin	Label	Pin	Label
1	OUT_00	19	OUT_20
2	OUT_01	20	OUT_21
3	OUT_02	21	OUT_22
4	OUT_03	22	OUT_23
5	OUT_04	23	OUT_24
6	OUT_05	24	OUT_25
7	OUT_06	25	OUT_26
8	OUT_07	26	OUT_27
9	GND	27	GND
10	GND	28	GND
11	OUT_10	29	OUT_30
12	OUT_11	30	OUT_31
13	OUT_12	31	OUT_32
14	OUT_13	32	OUT_33
15	OUT_14	33	OUT_34
16	OUT_15	34	OUT_35
17	OUT_16	35	OUT_36
18	OUT_17	36	OUT_37

ADAM-375xF Pin Definitions



ADAM-3754F

CN1

Pin	Label	Pin	Label
1	OUT_00	2	+24V
3	OUT_01	4	GND
5	OUT_02	6	+24V
7	OUT_03	8	GND
9	OUT_04	10	+24V
11	OUT_05	12	GND
13	OUT_06	14	+24V
15	OUT_07	16	GND
17	OUT_10	18	+24V
19	OUT_11	20	GND
21	OUT_12	22	+24V
23	OUT_13	24	GND
25	OUT_14	26	+24V
27	OUT_15	28	GND
29	OUT_16	30	+24V
31	OUT_17	32	GND
33	FG	34	FG

ADAM-3754F

CN2

Pin	Label	Pin	Label
1	OUT_20	2	+24V
3	OUT_21	4	GND
5	OUT_22	6	+24V
7	OUT_23	8	GND
9	OUT_24	10	+24V
11	OUT_25	12	GND
13	OUT_26	14	+24V
15	OUT_27	16	GND
17	OUT_30	18	+24V
19	OUT_31	20	GND
21	OUT_32	22	+24V
23	OUT_33	24	GND
25	OUT_34	26	+24V
27	OUT_35	28	GND
29	OUT_36	30	+24V
31	OUT_37	32	GND
33	FG	34	FG

ADAM-3752F

CN1

Pin	Label	Pin	Label
1	IN_00	2	+24V
3	IN_01	4	GND
5	IN_02	6	+24V
7	IN_03	8	GND
9	IN_04	10	+24V
11	IN_05	12	GND
13	IN_06	14	+24V
15	IN_07	16	GND
17	IN_10	18	+24V
19	IN_11	20	GND
21	IN_12	22	+24V
23	IN_13	24	GND
25	IN_14	26	+24V
27	IN_15	28	GND
29	IN_16	30	+24V
31	IN_17	32	GND
33	FG	34	FG

ADAM-3752F

CN2

Pin	Label	Pin	Label
1	IN_20	2	+24V
3	IN_21	4	GND
5	IN_22	6	+24V
7	IN_23	8	GND
9	IN_24	10	+24V
11	IN_25	12	GND
13	IN_26	14	+24V
15	IN_27	16	GND
17	IN_30	18	+24V
19	IN_31	20	GND
21	IN_32	22	+24V
23	IN_33	24	GND
25	IN_34	26	+24V
27	IN_35	28	GND
29	IN_36	30	+24V
31	IN_37	32	GND
33	FG	34	FG

ADAM-3756F

CN1

Pin	Label	Pin	Label
1	IN_00	2	+24V
3	IN_01	4	GND
5	IN_02	6	+24V
7	IN_03	8	GND
9	IN_04	10	+24V
11	IN_05	12	GND
13	IN_06	14	+24V
15	IN_07	16	GND
17	IN_10	18	+24V
19	IN_11	20	GND
21	IN_12	22	+24V
23	IN_13	24	GND
25	IN_14	26	+24V
27	IN_15	28	GND
29	IN_16	30	+24V
31	IN_17	32	GND
33	FG	34	FG

ADAM-3756F

CN2

Pin	Label	Pin	Label
1	OUT_00	2	+24V
3	OUT_01	4	GND
5	OUT_02	6	+24V
7	OUT_03	8	GND
9	OUT_04	10	+24V
11	OUT_05	12	GND
13	OUT_06	14	+24V
15	OUT_07	16	GND
17	OUT_10	18	+24V
19	OUT_11	20	GND
21	OUT_12	22	+24V
23	OUT_13	24	GND
25	OUT_14	26	+24V
27	OUT_15	28	GND
29	OUT_16	30	+24V
31	OUT_17	32	GND
33	FG	34	FG

4.3 Motion Slave Modules

4.3.1 Features

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

4.3.2 Specifications

Series interface: Half duplex RS-485 with transformer isolation

Cable type: CAT5 UTP/STP Ethernet cable

Surge protection: 10 kV

Transmission speed: 2.5, 5, 10 and 20 Mbps

Programmable Pulse output mode: ±OUT/DIR, ±CW/CCW, ±A/B phase

Programmable pulse command speed: Max 6.5Mpps / Min 0.05pps

Position range: 28 bits (±134,217,728 pulses)

Home return mode: 13 types

Velocity profiles: T-curve, S-curve

Counter for encoder feedback signals: 28 bits up/down

Position latch input: LTC

Position compare output: CMP

Incremental encoder input: ±EA, ±EB

Encoder index signal input: ±EZ

Machine interface: PEL, MEL, ORG, SLD

Servo driver interface: ALM, RDY, SVON, INP, ERC

Simultaneous start/stop motion input: STA, STP

LED indicator: PWR, RUN, ERR, PEL, MEL, ORG, SLD

Power supply: +18V DC to +30V DC, consumption: 3W typical

Operating temperature: 0 to 60° C

4.3.3 Product Introductions

Figure 4.3: ADAM-32xx Products Series

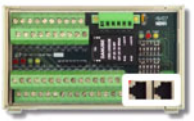
Unlike traditional motion card solutions, MotionNet supports remote motion slave modules for extended multiple-axis applications. All these extended motion slave modules are connected serially by a simple CAT5 cable with RJ45 connectors. This reduces wiring between the motion driver and controller and provides a motion control system that is very suitable for highly integrated machine automation applications.

MotionNet supports driver-specific motion slave modules such as the motion slave module for Mitsubishi J2-Super series Driver/Motor, and Panasonic Minas A type servo driver/motor.

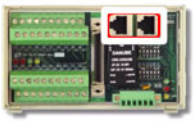
Please select the matching cable PCL-10120M or PCL-10150M and plug this cable into both the motion driver and motion slave module. Motion-Net also supports general purpose motion slave modules for general driver/motors including step driver/motors. This general-purpose motion slave module is designed with many screw terminals onboard to support easy wiring. Please refer to the relevant installation guides.

4.3.4 Common Connector Pin Definitions

Communication Connector RJ-45



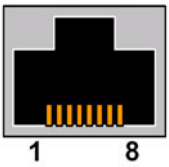
ADAM-3210



ADAM-3211/PMA

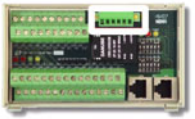
ADAM-3212/J2S

ADAM-3213/YS2



Pin	Label	Description
1	NC	
2	NC	
3	RS-485+	
4	NC	
5	NC	
6	RS-485-	
7	NC	
8	NC	

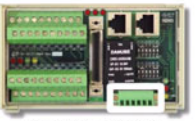
External Power Input Connector



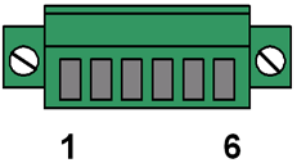
ADAM-3210

ADAM-3211/PMA

ADAM-3212/J2S

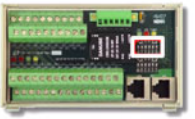


ADAM-3213/YS2



Pin	Label	Description
1	24V	DC 24V
2	GND	DC 24V Ground
3	FG	Field Ground
4	24V	DC 24V
5	GND	DC 24V Ground
6	FG	Field Ground

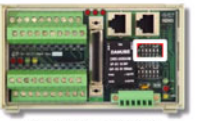
Slave ID Setting DIP Switch



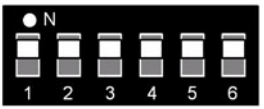
ADAM-3210

ADAM-3211/PMA

ADAM-3212/J2S



ADAM-3213/YS2



Pin	Label	ON	OFF
1	A5	1	0
2	A4	1	0
3	A3	1	0
4	A2	1	0
5	A1	1	0
6	A0	1	0

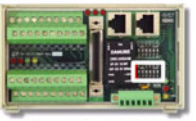
Note: Node Number=32xA5+16xA4+8xA3+4xA2+2xA1+A0

Configuration Setting

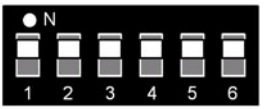
ADAM-3210

ADAM-3211/PMA

ADAM-3212/J2S



ADAM-3213/YS2



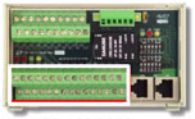
Pin	Label	ON	OFF
1	A5	1	0
2	A4	1	0
3	A3	1	0
4	A2	1	0
5	A1	1	0
6	A0	1	0

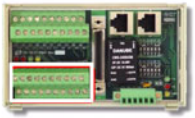
How to Use the Baud-Rate Setting

B0	B1	Baud-Rate Setting
OFF	OFF	1/4 System Clock
OFF	ON	1/8 System Clock
ON	OFF	1/16 System Clock
ON	ON	1/32 System Clock

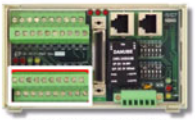
Note: default system clock = 80 MHz

CN1 Connector Pin Descriptions


ADAM-3210

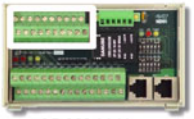

ADAM-3211/PMA


ADAM-3212/J2S


ADAM-3213/YS2

Label	General Description
24V	DC 24V Power Output
GND	Ground
PEL	End Limit Signal (+)
MEL	End Limit Signal (-)
ORG	Home Signal Input
SLD	Ramp-Down Signal Input
LTC+	Latch Signal Input (+)
LTC-	Latch Signal Input (-)
EMG+	Emergency Stop Input (+)
EMG-	Emergency Stop Input (-)
PCS	Position Change Signal Input
CLR	Clear Position Command Counter Signal Input
Label	**ADAM-3210 Description**
OUT+	Pulse Signal Output (+)
OUT-	Pulse Signal Output (-)
DIR+	Direction Signal Output(+)
DIR-	Direction Signal Output(-)
EA+	Encoder A Phase (+)
EA-	Encoder A Phase (-)
EB+	Encoder B Phase (+)
EB-	Encoder B Phase (-)
EZ+	Encoder Z Phase (+)
EZ-	Encoder Z Phase (-)

CN2 Connector Pin Descriptions


ADAM-3210


ADAM-3211/PMA

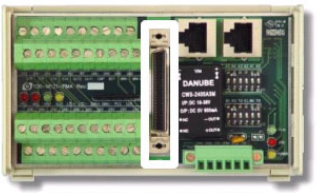

ADAM-3212/J2S


ADAM-3213/YS2

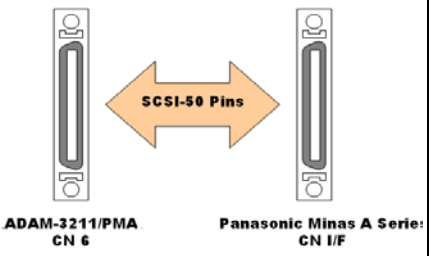
Label	General Description
24V	DC 24V Power Output
GND	Ground
STA	Simultaneous Start Input
STP	Simultaneous Stop Input
CMP	Position Compare Output
BSY	Motion Busy Signal Output
BRK	Machinery Break Signal Input (106-M131-J2S)
BRK+	Machinery Break Signal (+) Input
BRK-	Mechanical Brake Release Signal (-) Input
IN1	Digital Input Signal #1
IN2	Digital Input Signal #2
OUT1	Digital Output Signal #1
OUT2	Digital Output Signal #2
Label	**ADAM-3210 Description**
RDY	Servo Ready Signal input
SVON	Servo On Signal Output
ALM	Servo Alarm Signal Input
INP	In-Position Signal Input
ERC	Clear Servo Error Counter Signal Output
ALMC	Servo Alarm Clear Signal Output

4.3.5 1-to-1 Cable Information

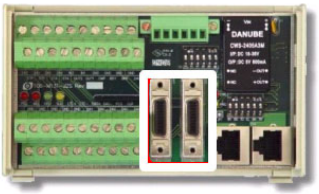
ADAM-3211/PMA



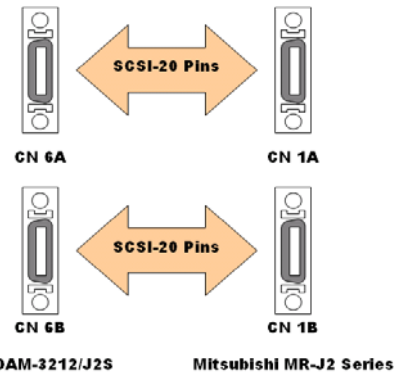
ADAM-3211/PMA



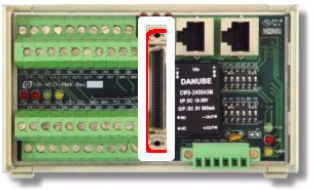
ADAM-3212/J2S



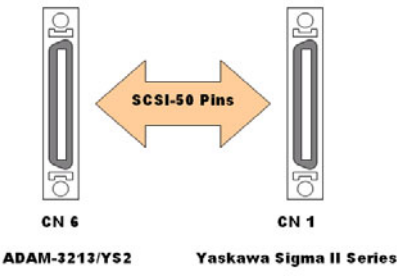
ADAM-3212/J2S



ADAM-3213/YS2



ADAM-3213/YS2



CHAPTER 5

Utility Software

Sections include:

- MotionNAVI
- EzLink

Chapter 5 Utility Software

5.1 MotionNAVI

MotionNAVI is a user-friendly utility for basic motion control of PCI-1247. It is designed to help in the testing of the different functions of the motion card that may be used to control a machine, without any complex programming. MotionNAVI can also be used to test the connection between motion cards and Driver/Motors, or to test the connection between motion cards and machines. You can save the relevant settings into a configuration file. This configuration file can be loaded into the application program for system initialization.

MotionNAVI reduces time and effort for system testing and debugging and also enhances the efficiency of project development. MotionNAVI is easy to use and learn, especially for beginners. Beginners can learn how to master motion control of machines with PCI-1247.

5.1.1 Minimum System Requirements

PC: IBM PC Compatible with at least x586 CPU

Memory: 128 MB RAM

OS: Windows 2000/XP

5.1.2 Description

Start-up

Figure 5.1 shows the menu that will be displayed on you PC after Motion-NAVI is activated. Menu selection is on top of the display. In the middle is an MDI operation menu. Multiple dialog boxes can be shown in this display.

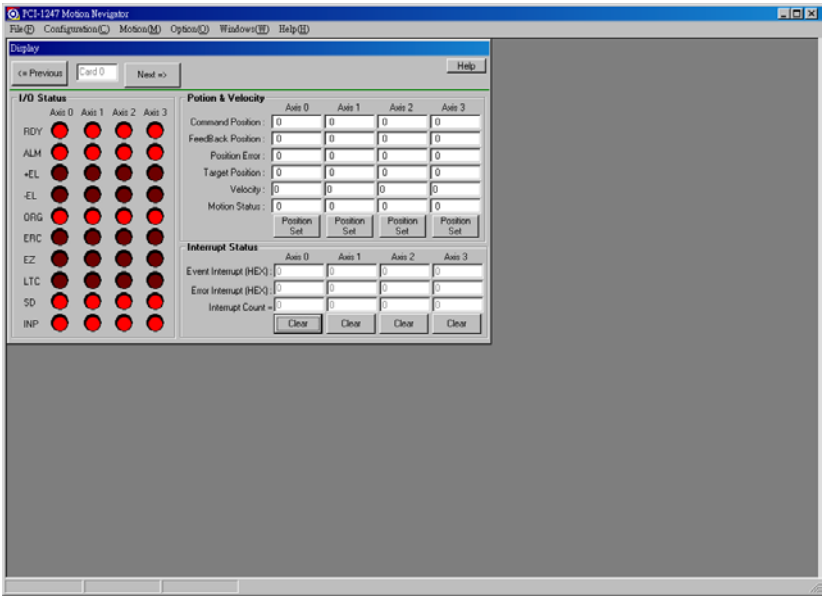


Figure 5.1: Start-up of MotionNAVI

5.1.3 File Management

Three functions are implemented in the File Management menu. They are "Save Configuration", "Load Configuration" and "Load Default Configuration". Save Configuration is shown in Figure 5.2.

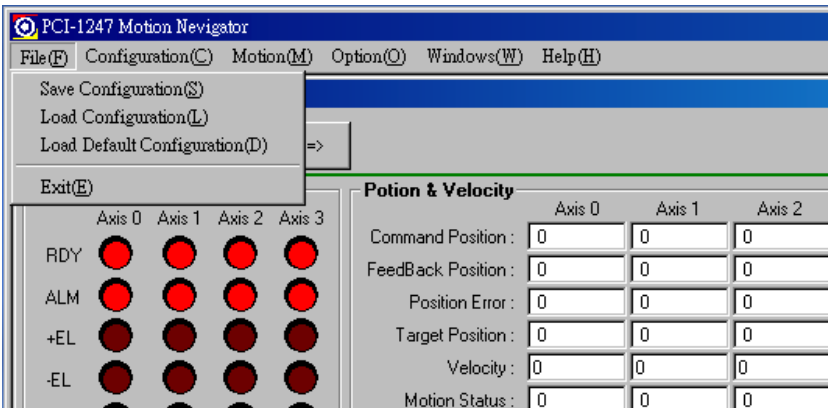


Figure 5.2: File Management

A dialog window will appear when you select this function, and configuration data can be saved into the selected directory with your specified file name.

You can load an assigned configuration file by clicking on the Load Configuration button as shown in figure 5.3.

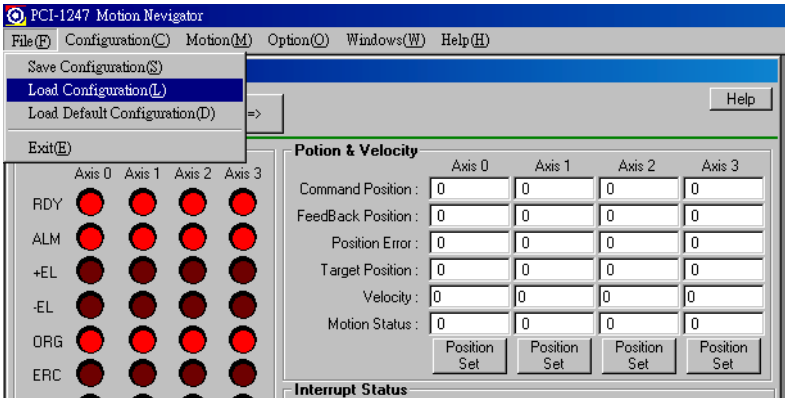


Figure 5.3: Load Configuration

You can also recover the setting by selecting “Load Default Configuration” as shown in figure 5.4

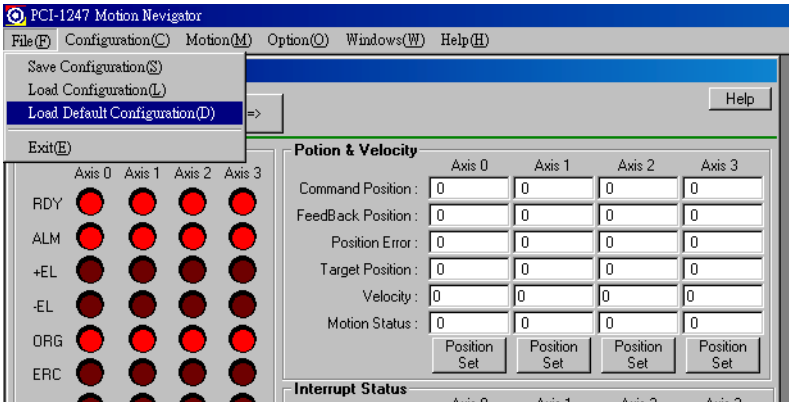


Figure 5.4: Load Default Configuration

You can leave MotionNAVI by clicking on the EXIT button. MotionNAVI will be terminated automatically afterwards.

5.1.4 Configuration Setting

There are three groups of settings in the configuration menu. They are "Interface I/O", "Interrupt" and "Pulse I/O". Please refer to figure 5.5 for how to select "Interface I/O".

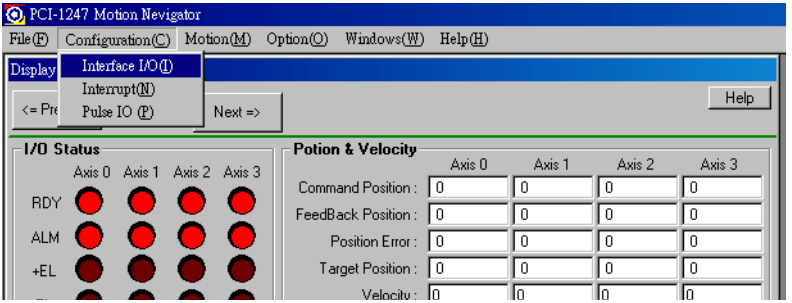


Figure 5.5: Interface I/O setting

Setting of Interface I/O

There are two main categories of parameter settings in this menu. One is for the Servo Driver/Motor Interface signal. The other is for Mechanical I/O Interface Signals. Please refer to figure 5.6.

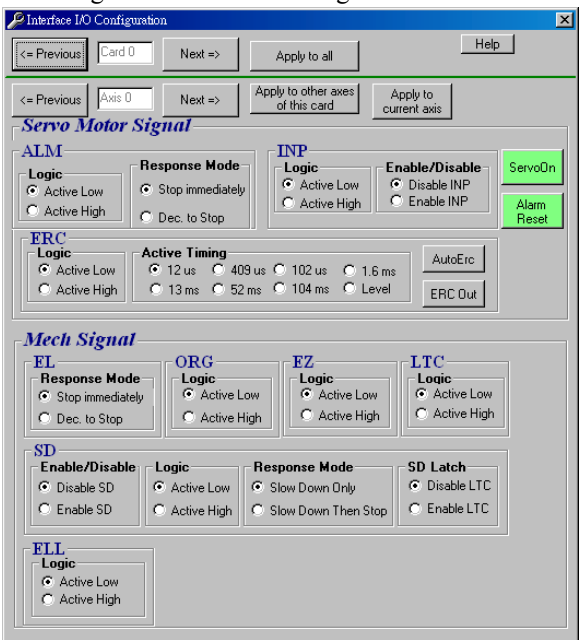


Figure 5.6: Interface I/O Setting

Servo Driver/Motor Settings

- ALM(Alarm) (From Driver to Control card)
  Logic Level Setting: Active High or Active Low
  Action Type: Stop Immediately or Dec. to Stop
- INP(In Position)
  Logic Level Setting : Active High or Active Low
  Action Type: Enable or Disable
- ERC(Error Rest Counter)
  Logic Level Setting: Active High or Active Low
  Active Timing: Duration of ERC Signal
- SVON
  Servo-On signal to Driver
- Alarm Rest
  Alarm Reset signal to Driver

Mechanical Interface I/O Setting

- EL(End Limit) and ELL (End Limit Logic)
  Logic Level Setting : Active High or Active Low
  Action Type: Stop Immediately or Dec. to Stop
- ORG (Origin)
  Logic Level Setting : Active High or Active Low
- LTC(Latch)
  Logic Level Setting : Active High or Active Low
- SD(Slow Down)
  Enable/Disable Setting : Enable or Disable the function of Slow Down
  Logic level Setting: Active High or Active Low
  Action Type: Stop Immediately or Dec. to Stop
- SD Latch (SD Latch)
  SD Signal Latch or Not

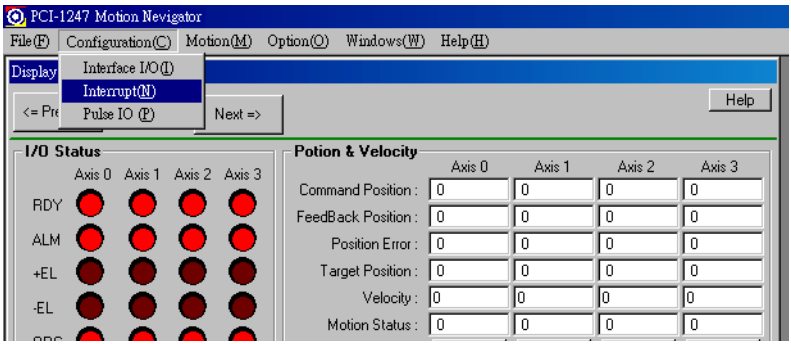


Figure 5.7: Interrupt I/O

Interrupt I/O Setting

You can set different Interrupt factor for each axis as shown in figure 5.8

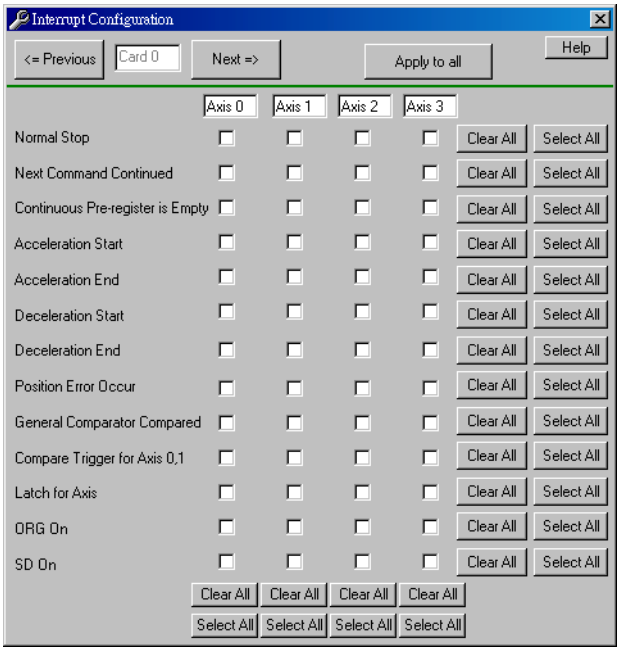


Figure 5.8: Dialog for Interrupt I/O Setting

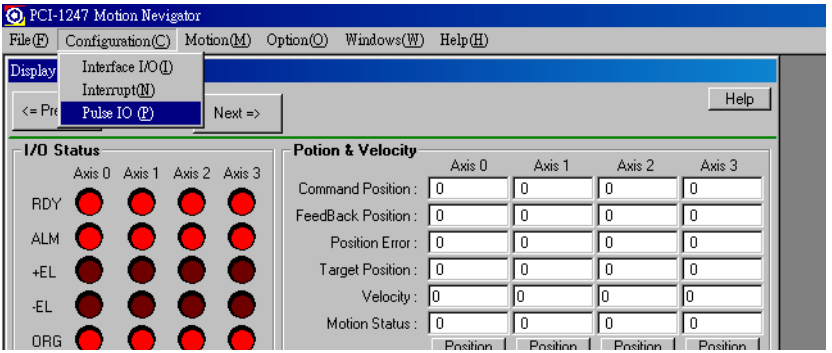


Figure 5.9: Pulse I/O

Pulse I/O Setting as shown in figure 5.10

Pulse Output Mode

You can set DIR/STP or CW/CCW pulse output type

Pulse Input (Feedback Counter)

Source: External or Internal (command pulse)

Logic: Inverse the Direction or Do Not Inverse Direction

Mode: 4 modes x1, x2, x4 A/B Phase or CW/CW

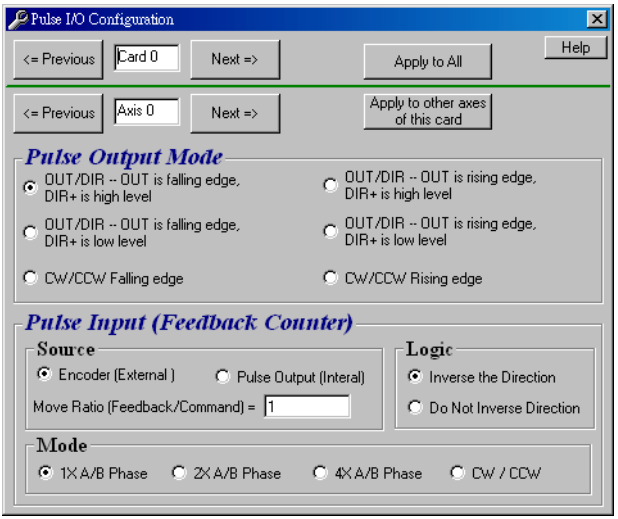


Figure 5.10: Pulse I/O Setting

5.1.5 Motion Menu

There are four groups of functions in the Motion menu. The first is Home Move, the second is Continuous Move, the third is P to P Move, and the last is MultiAxis Motion. Please refer to figure 5.11. Motion Menu

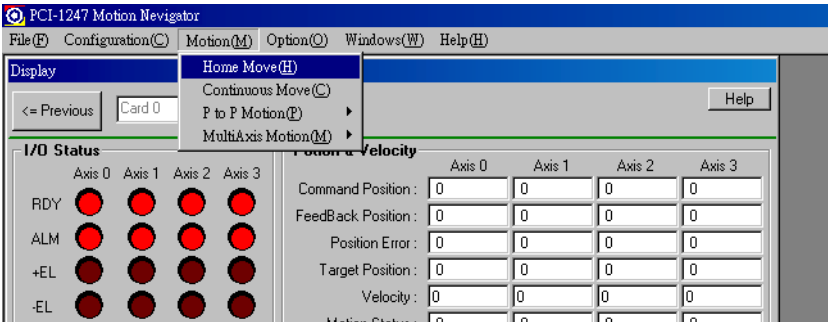


Figure 5.11: Motion Menu

In figure 5.12 you can see how different home modes can be set. There are 13 modes.

- Home Configuration
- Home Mode
- Set the home mode from 13 available modes
- ERC Output
- ERC output or not after homing is finished
- EZ Count
- Count of Encoder Z Phase

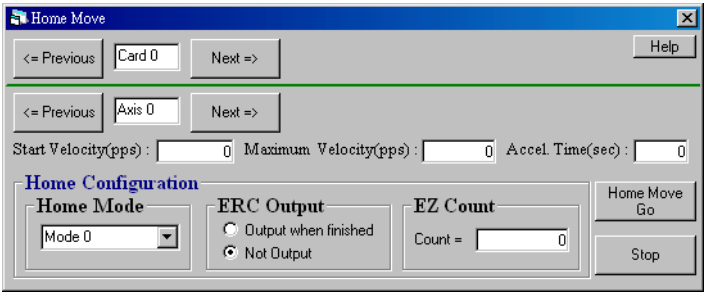


Figure 5.12: Dialog of HOME Move Menu

Continuous Move

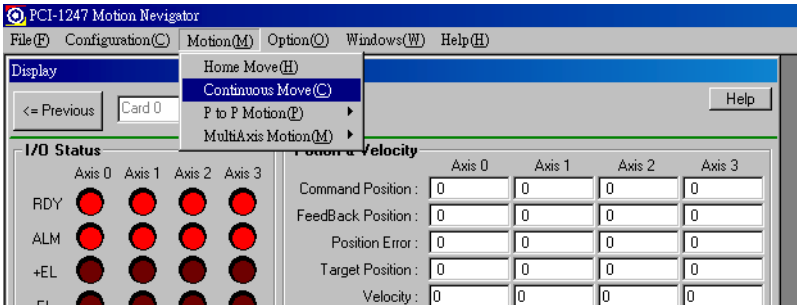


Figure 5.13: Continuous Move Menu

Select Continuous Move as shown in figure 5.13. In the Continuous Move Dialog box displayed in figure 5.14, you can set start velocity, maximum velocity, acceleration time and more. Click on the GO+ or GO- button to make the motion control card send pulse commands to the driver/motor. Click on the STOP button to stop the pulse command output of the motion card.

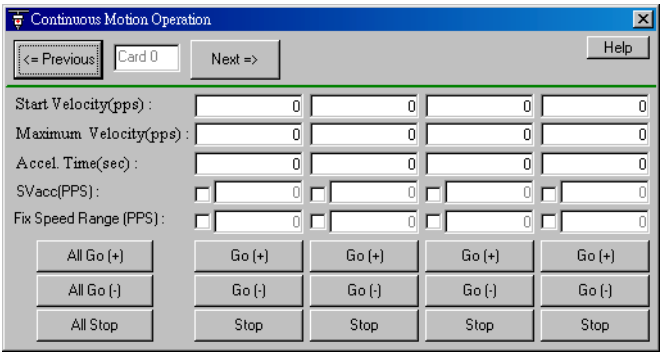


Figure 5.14: Continuous Move Dialog

Point-to-Point Move

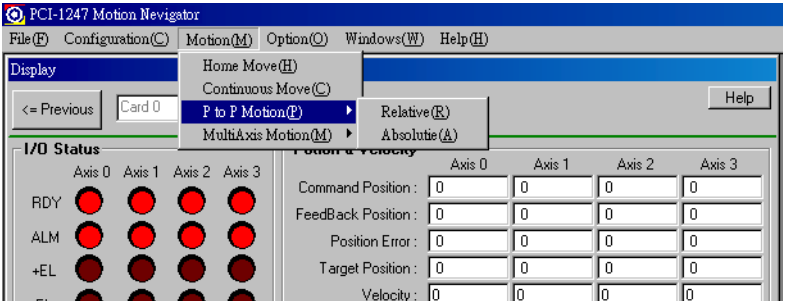


Figure 5.15: P to P Motion

Select P to P Motion as shown in figure 5.15 and the dialog window will pop up on as shown in figure 5.16 and 5.17. You can set relative or absolute coordinates in the dialog. After setting corresponding parameters in this menu, you can test the motion card easily.

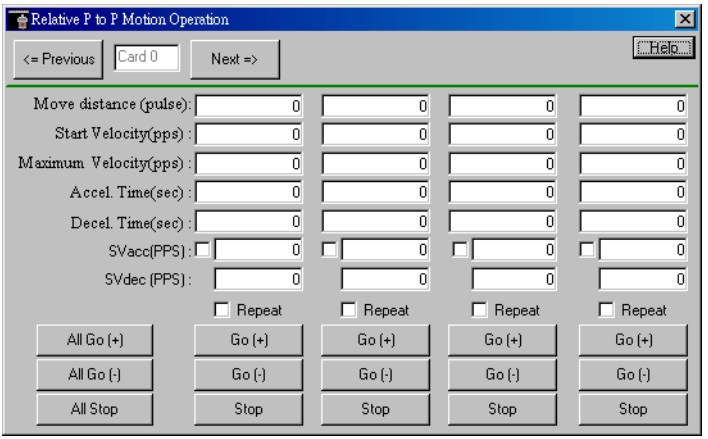


Figure 5.16: P to P Motion

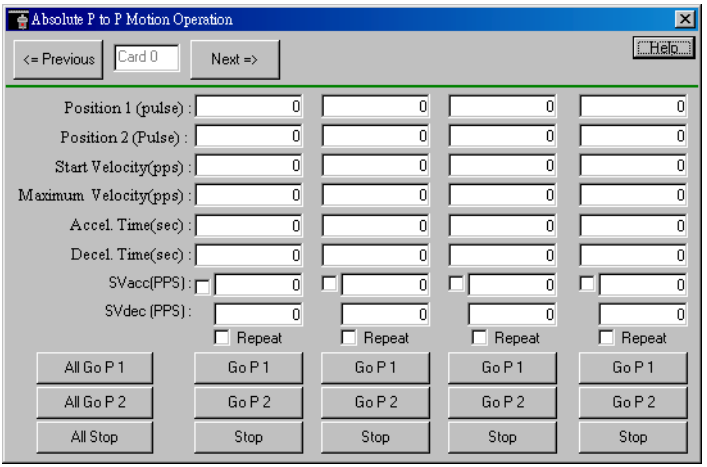


Figure 5.17: Absolute Coordinate P to P motion

MultiAxis Motion

Select MultiAxis from the Motion menu to do multiaxis motion.

Multiaxis motion is divided into 2 types, one is linear interpolation, and the other is circular interpolation.

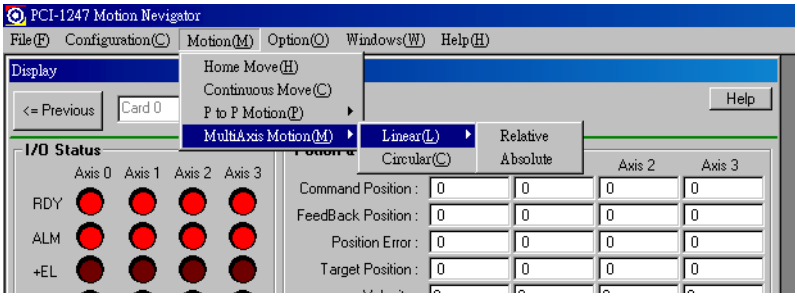


Figure 5.18: Multi-Axis Motion Select

In the linear Interpolation menu, you can test under relative or absolute coordinate motion. Please refer to figure 5.19 and 5.20. All you have to do is set corresponding parameters in the related menus.

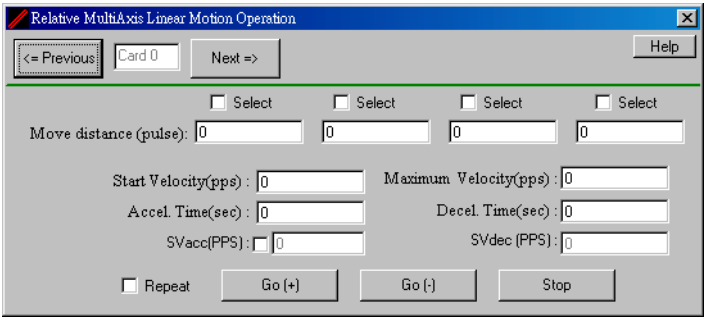


Figure 5.19: Linear Interpolation under Relative Coordinate

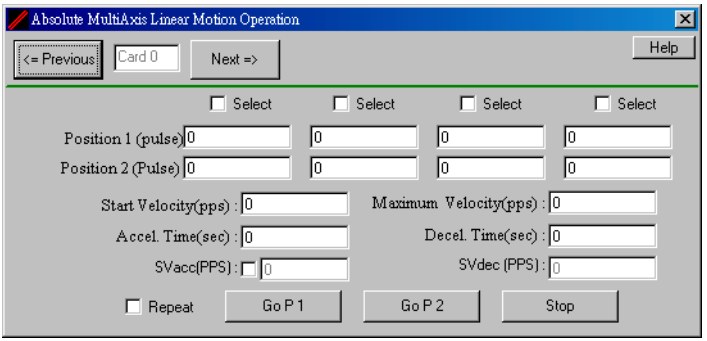


Figure 5.20: Linear Interpolation under absolute coordinate

You can test 2-axis circular interpolation by setting parameters in the corresponding menus as shown in the following pictures Fig. 5-21.

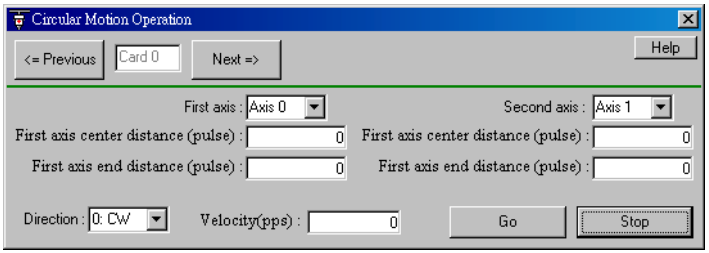


Figure 5.21: 2-axis Circular Interpolation

5.1.6 Options

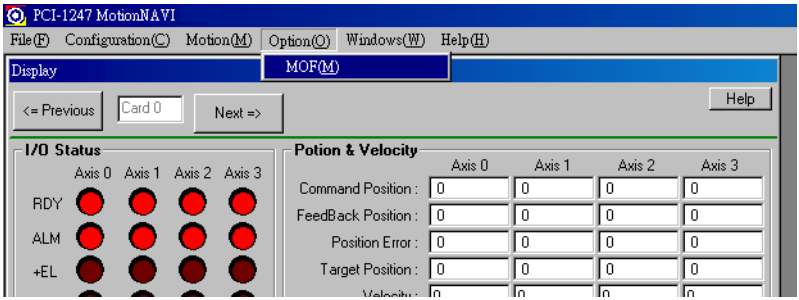


Figure 5.22: Option

In the Option menu shown in figure 5.22, MOF (Manual Operation Function) is supported.

Unlike most PC-based motion control cards, PCI-1247 supports powerful Manual Operation Functions. All MOF functions are completed by hardware on board. The response is fast, especially compared to traditional manual operations that are simulated by software.

There are functions under this MOF menu. First is MPG, Second is JOG, The last one is STEP as shown in figure 5.23. A specially designed Handy Pendant is used to demonstrate this function. Please refer to figure 5.24.

Figure 5.23: Handy Pendant

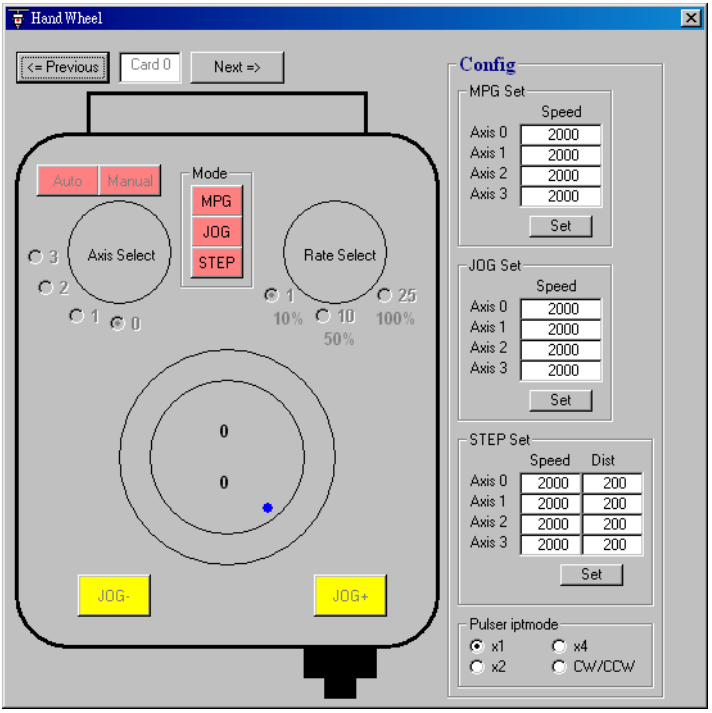


Figure 5.24: MOF Menu

Before you make use of MOF, you first have to switch from Auto mode to Manual mode. Hold the enable button and release the EMG button on the Pendant.

MPG Mode

Select the MPG function in Manual mode, and then select the axis and the rate factor. There are 3 rate factors, x1, x5 and x25. Set the corresponding velocity data by clicking on the SET button in the MPG set area. Then you can rotate the MPG to send command pulses to the PCI-1247 and control the driver/motor manually by the way of pulse commands.

JOG Mode

Select the JOG function in Manual Mode, and then select the axis and the feed rate factor. Set the corresponding velocity data by clicking on the SET button in the JOG set area. Then you can push the JOG button to control the command pulse output from the controller to the driver/motor. When you push on the button, pulses will be generated continuously, when you release the button, pulses will be terminated immediately.

STEP Mode

Select the STEP function in Manual Mode, and select the axis. Set the corresponding velocity and distance parameters by clicking on the SET button in the STEP set area. Every time you push the JOG button, the specified pulses will be generated and sent to the driver/motor automatically.

This is different from the MPG and JOG function.

5.1.7 Windows Display

You can switch to the desired menu display quickly by clicking on the sub-menu button as shown in figure 5.25.

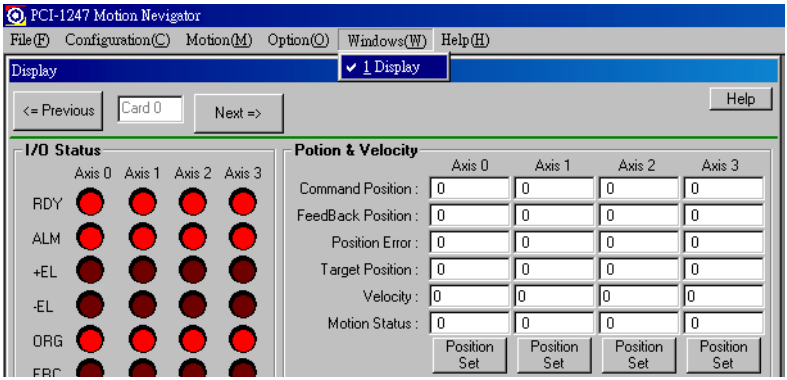


Figure 5.25: Window Display Switch

5.1.8 Help

In the HELP menu shown in figure 5.26, you can see the Information and About choices.

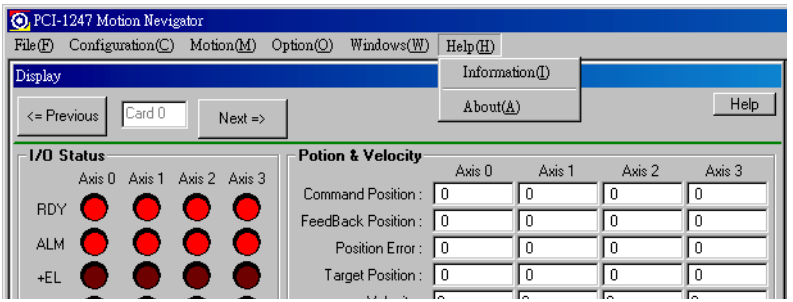


Figure 5.26: HELP menu

The Base Address and IRQ Level will be shown as shown in figure 5.27 when choosing “Product Information”.

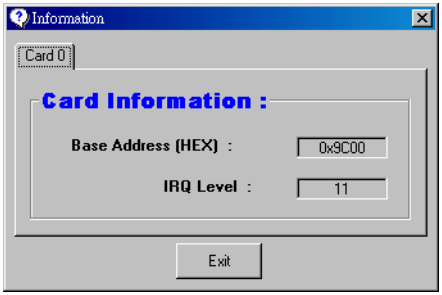


Figure 5.27: Product Information

Copyright and Version will be shown when choosing “About” in Fig. 5-28 in the following.

Figure 5.28: Product Version

5.2 EzLink

EzLink is a user-friendly utility for the purpose of testing and debugging MotionNet. EzLink supports two types of remote slaves: DIO slave modules, and 1-axis motion slave modules.

There are three main steps to make use of EzLink: First, you scan how many master cards are installed in the system. Then you can connect the master and slave devices. After that, you can scan how many slave modules are installed in each ring of the master. EzLink can identify the type of slaves as being DIO or Motion slave automatically and can test their functions.

EzLink is designed to assist in testing system configurations. This can reduce the communication effort between software programming engineers and hardware engineers. You do not have to do any coding during the system configuration testing with EzLink. It is a really helpful tool to both hardware and software engineers.

5.2.1 Minimum System Requirements

PC: IBM PC Compatible with at least x586 CPU

Memory: 128 MB RAM

OS: Windows 2000/XP

5.2.2 Description

Start-up of EzLink

The menu shown in figure 5.29 will be displayed when you start-up EzLink. The menu selection is on top of the display. In the middle is an SDI operation menu. Multiple dialog boxes can be shown in this display. On the top is the tool bar, which can be used to do basic operations. In the left window is an overview of the master card and slave modules that are currently connected. On the right is information about slave modules including slave ID. At the bottom, messages about the system such as communication status and detailed operation information are displayed.

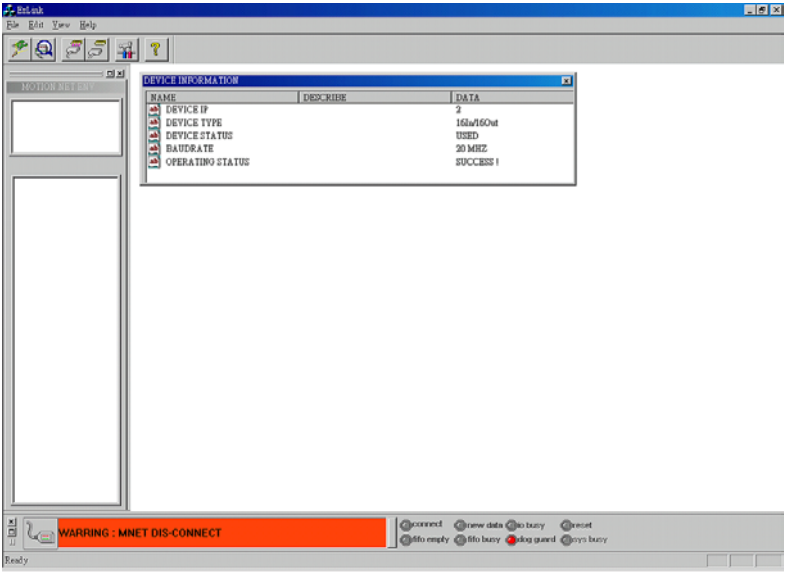


Figure 5.29: Start-up of EzLink

5.2.3 Scan Master Cards

Click on the first button on the tool bar to scan master cards in the system. All master cards will be identified after the scanning is completed as shown in figure 5.30 to 5.33, and all master cards will be listed in the menu.

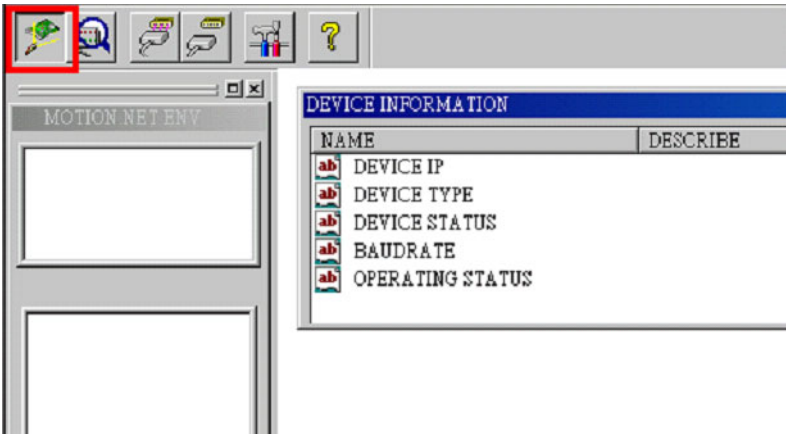


Figure 5.30: Scan Master Cards

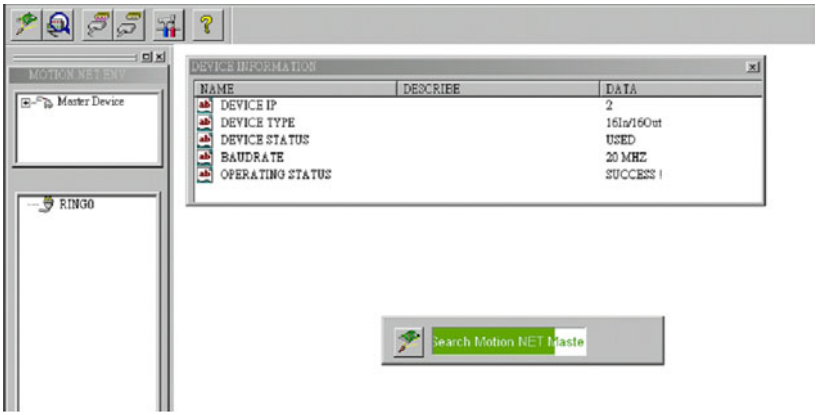


Figure 5.31: Scanning Master

Figure 5.32: Scan is Completed

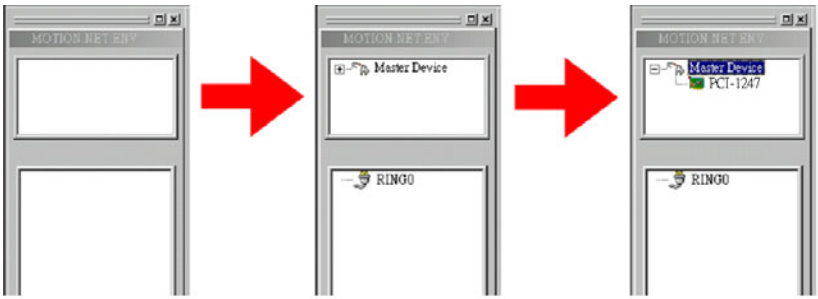


Figure 5.33: Scan Results

5.2.4 Remote Slave Module

After completely scanning the master cards, you can connect the master and remote slaves by clicking on the connect button on the tool bar as shown in figure 5.34 and figure 5.35. Whether the slave is connected or not connected with the master cards can be read from the bottom window that shows system status.

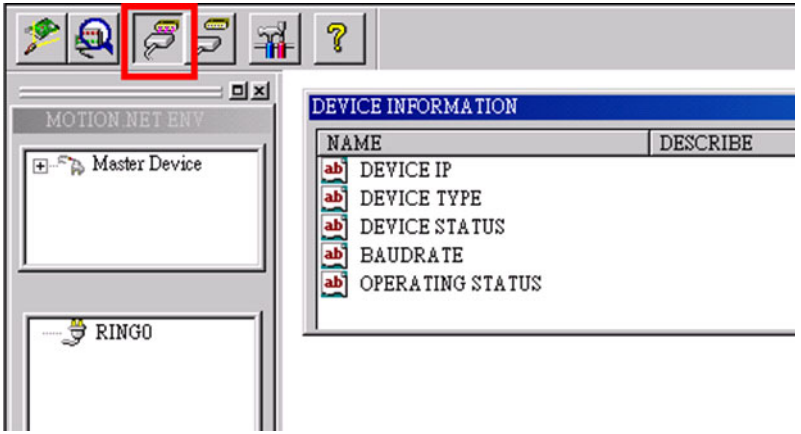


Figure 5.34: Remote Slave Module

Figure 5.35: Status for the Slave Connection

5.2.5 Scan Remote Slave Modules

After the connection between the master and slave has been set up successfully, you can scan the slave modules that are installed in this ring of the master card. Both the number and types of slave modules will be displayed on the left. The slave modules can be either DIO slave or 1-axis motion slave as shown in figure 5.36 to 5.38.

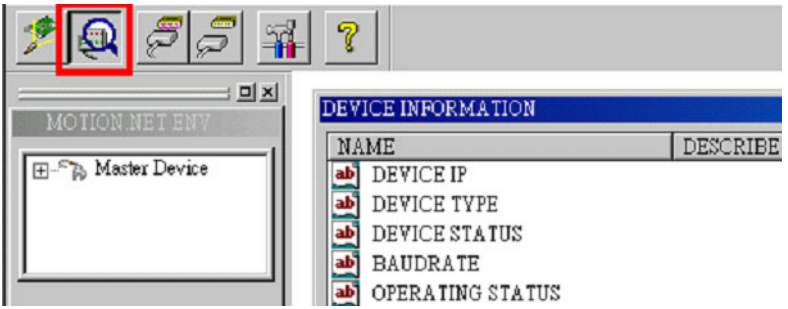


Figure 5.36: Scan Slave Modules

Figure 5.37: Scan Error

Figure 5.38: Successful Scan Result

5.2.6 Slave Module Status Display

All master cards and slave modules will be displayed on the left menu after you have successfully scanned the master, connected the master and slave, and scanned all slaves. Please refer to figure 5.39.

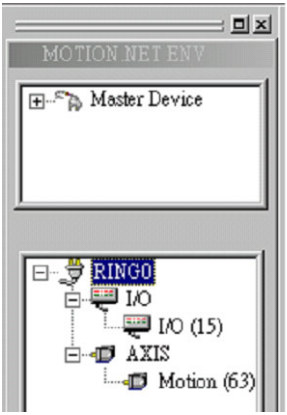


Figure 5.39: Scan Results

You can click on each individual slave module in the menu, the information about the selected slave module will be displayed on the right as shown in figure 5.40. In this dialog box , the ID and Type of the slave module will be displayed.

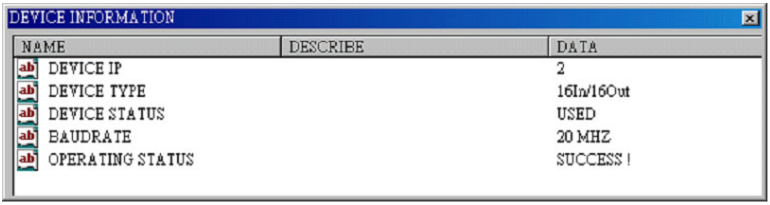


Figure 5.40: Message about the slave module

5.2.7 DIO Type Slave Module

2 types of icons are applied in the operation box of DIO type slave module. The green lamp is for input signal, the red button is for output signal. User can click on the red button and send output signals thereafter. User can read the input status from the green lamp. Please refer to the following pictures Fig.5-41 ~Fig.5-43

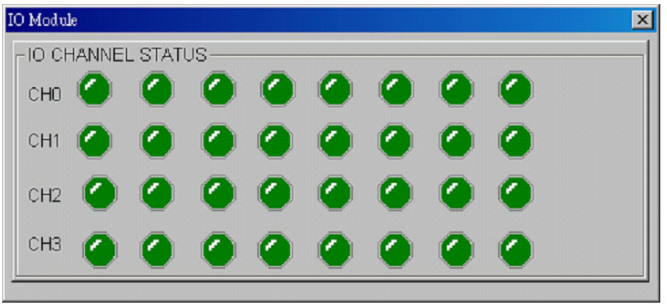


Figure 5.41: DI 32

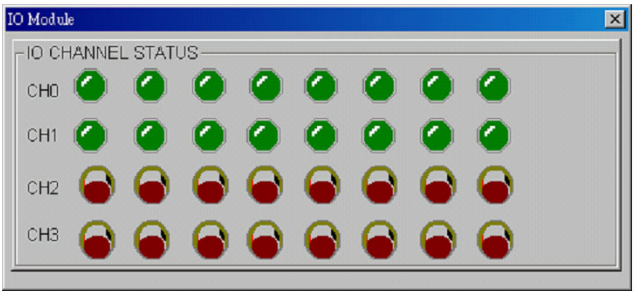


Figure 5.42: DI16DO16

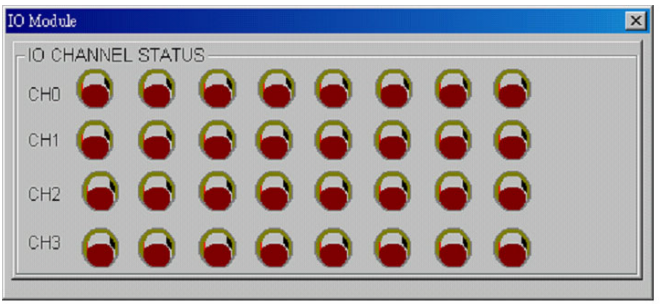


Figure 5.43: DO 32

5.2.8 1-axis Motion Slave

There are 2 menus for the 1-axis motion slave modules. One is for operation , the other is for configuration as shown in the following figures Fig.5-44 and Fig.5-45. Before proceed to the operation menu , please check the settings in the configuration menus first. Correct I/O configuration settings are necessary to successful operations.

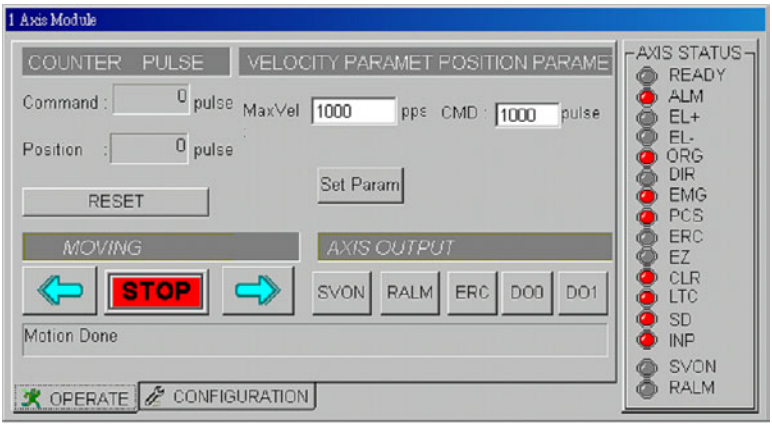


Figure 5.44: Operation of 1-axis Motion Slave

Please check the following settings including ALM, ERC, INP, ORG, LTC, SLD and especially the type of pulse output and encoder inputs. The status of these signals on this salve module will be displayed on the right-hand menu.

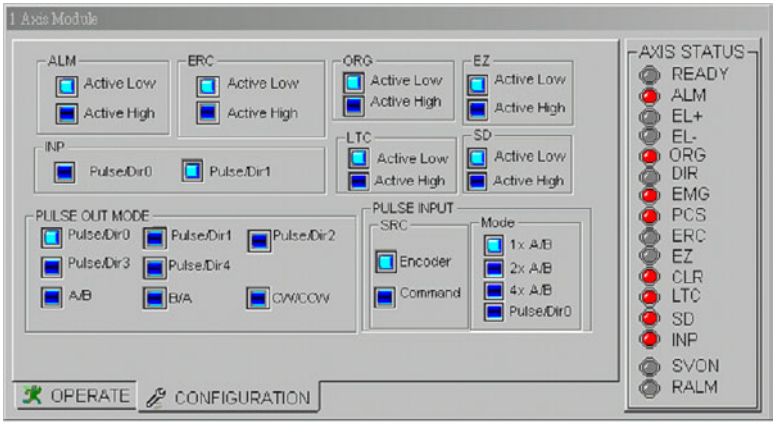


Figure 5.45: Configuration of 1-axis Motion Slave

5.2.9 Other

In the help menu the following about the EzLink version will be displayed as shown in Fig. 5-46.

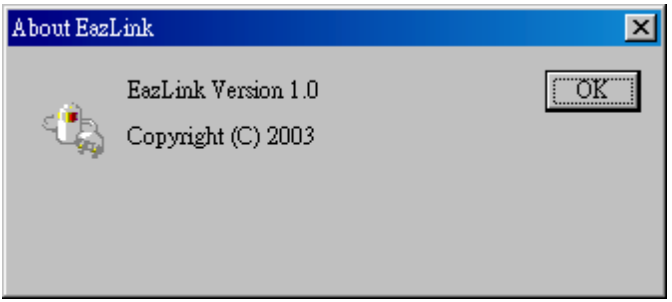


Figure 5.46: Version of EzLink

CHAPTER 6

Motion API

Sections include:

- 4-Axis ASIC Motion API
- MotionNet Extension API

Chapter 6 Motion API

6.1 4-Axis ASIC Motion API

6.1.1 System Initialization

Function Name	Description
_1247_Initial	initialize system resource
_1247_Close	release all resources
_1247_get_base_addr	Get base address of ASIC
_1247_ResetCard	Reset card to initial status

6.1.2 Card Configuration

Function Name	Description
_1247_set_pls_iptmode	Encoder feedback input
_1247_set_pls_outmode	Configure the pulse output mode
_1247_set_feedback_src	Set counter input source

6.1.3 Interrupt Handling

Function Name	Description
_1247_int_control	Set INT Resource
_1247_set_int_factor	Set INT factor
_1247_int_enable	Enable INT event
_1247_int_disable	Disable INT Event
_1247_get_int_status	Get INT Status
_1247_link_Int_CbkFunc	Link INT CALLBACK Function
_1247_link_Int_Event	Link INT Event

6.1.4 Homing

Function Name	Description
_1247_set_home_config	Set the home/index logic configuration
_1247_home_move	Begin a home return action

6.1.5 Motion

1. Point-To-Point

Function Name	Description
_1247_start_tr_move	Begin a relative trapezoidal profile move
_1247_start_ta_move	Begin an absolute trapezoidal profile move
_1247_start_sr_move	Begin a relative S-curve profile move
_1247_start_sa_move	Begin an absolute S-curve profile move
_1247_set_move_ratio	Set the ratio of command pulse and feedback pulse.
_1247_p_change	Change position on the fly
_1247_set_pcs_logic	Set the logic of PCS (Position Change Signal)
_1247_backlash_comp	Set backlash corrective pulse for compensation
_1247_suppress_vibration	Set vibration suppressing timing

2. Linear Interpolation

Function Name	Description
_1247_start_tr_move_xy	Begin a relative 2-axis linear interpolation for X & Y, with trapezoidal profile
_1247_start_ta_move_xy	Begin a absolute 2-axis linear interpolation for X & Y, with trapezoidal profile
_1247_start_sr_move_xy	Begin a relative 2-axis linear interpolation for X & Y, with S-curve profile
_1247_start_sa_move_xy	Begin a absolute 2-axis linear interpolation for X & Y, with S-curve profile
_1247_start_tr_move_zu	Begin a relative 2-axis linear interpolation for Z & U, with trapezoidal profile
_1247_start_ta_move_zu	Begin a absolute 2-axis linear interpolation for Z & U, with trapezoidal profile
_1247_start_sr_move_zu	Begin a relative 2-axis linear interpolation for Z & U, with S-curve profile
_1247_start_sa_move_zu	Begin a absolute 2-axis linear interpolation for Z & U, with S-curve profile
_1247_start_tr_line2	Begin a relative 2-axis linear interpolation for any 2 axes with trapezoidal profile
_1247_start_ta_line2	Begin a absolute 2-axis linear interpolation for any 2 axes with trapezoidal profile
_1247_start_sr_line2	Begin a relative 2-axis linear interpolation for any 2 axes, with S-curve profile
_1247_start_sa_line2	Begin a absolute 2-axis linear interpolation for any 2 axes, with S-curve profile
_1247_start_tr_line3	Begin a relative 3-axis linear interpolation with trapezoidal profile
_1247_start_ta_line3	Begin a absolute 3-axis linear interpolation with trapezoidal profile
_1247_start_sr_line3	Begin a relative 3-axis linear interpolation with S-curve profile
_1247_start_sa_line3	Begin a absolute 3-axis linear interpolation with trapezoidal profile
_1247_start_tr_line4	Begin a relative 4-axis linear interpolation with trapezoidal profile
_1247_start_ta_line4	Begin a absolute 4-axis linear interpolation with trapezoidal profile
_1247_start_sr_line4	Begin a relative 4-axis linear interpolation with S-curve profile
_1247_start_sa_line4	Begin a absolute 4-axis linear interpolation with S-curve profile,

3. Circular Interpolation

Function Name	Description
_1247_start_a_arc_xy	Begin a absolute circular interpolation for X & Y
_1247_start_r_arc_xy	Begin a relative circular interpolation for X & Y
_1247_start_a_arc_zu	Begin a absolute circular interpolation for Z & U
_1247_start_r_arc_zu	Begin a relative circular interpolation for Z & U
_1247_start_a_arc2	Begin a absolute circular interpolation for any 2 of the 4 axes
_1247_start_r_arc2	Begin a relative circular interpolation for any 2 of the 4 axes

4. Velocity Move

Function Name	Description
_1247_tv_move	Encoder feedback input
_1247_sv_move	Configure the pulse output mode
_1247_v_change	Set counter input source
_1247_sd_stop	Decelerate to stop
_1247_emg_stop	Immediately stop
_1247_fix_speed_range	Define the speed range
_1247_unfix_speed_range	Release the speed range constrain
_1247_get_current_speed	Get current speed

5. Position Latch and Position Compare

Function Name	Description
_1247_get_position	Get the value of feedback position counter
_1247_set_position	Set the feedback position counter
_1247_get_command	Get the value of command position counter
_1247_set_command	Set the command position counter
_1247_get_error_counter	Get the value of position error counter
_1247_reset_error_counter	Reset the position error counter
_1247_get_general_counter	Get the value of general counter
_1247_set_general_counter	Set the general counter
_1247_get_target_pos	Get the value of target position recorder
_1247_reset_target_pos	Reset target position recorder
_1247_get_rest_command	Get remain pulse till end of motion
_1247_check_rdp	Check the ramping down point data

6.1.6 Manual Operation

Function Name	Description
_1247_set_pulser_iptmode	Set pulser input mode
_1247_pulser_pmove	Start pulser p move
_1247_pulser_vmove	Start pulser v move
_1247_pulser_home_move	Start pulser home move

6.1.7 Continue Motion

Function Name	Description
_1247_set_continuous_move	Enable continuous motion for absolute motion
_1247_check_continuous_buffer	Check if the buffer is empty

6.1.8 Multiple Axes Simultaneous Operation

Function Name	Description
_1247_set_tr_move_all	Multi-axis simultaneous operation setup
_1247_start_move_all	Begin a multi-axis trapezoidal profile motion
_1247_stop_move_all	Simultaneously stop Multi-axis motion

6.1.9 Position Control and Counters

Function Name	Description
_1247_get_position	Get the value of feedback position counter
_1247_set_position	Set the feedback position counter
_1247_get_command	Get the value of command position counter
_1247_set_command	Set the command position counter
_1247_get_error_counter	Get the value of position error counter
_1247_reset_error_counter	Reset the position error counter
_1247_get_general_counter	Get the value of general counter
_1247_set_general_counter	Set the general counter
_1247_get_target_pos	Get the value of target position recorder
_1247_reset_target_pos	Reset target position recorder
_1247_get_rest_command	Get remain pulse till end of motion
_1247_check_rdp	Check the ramping down point data

6.1.10 General-purpose TTL output

Function Name	Description
_1247_d_output	Digital Output
_1247_get_dio_status	Get DO status

6.1.11 Motion I/O Monitoring

Function Name	Description
_1247_get_io_status	Get the motion I/O status of 1247

6.1.12 Interface I/O

Function Name	Description
_1247_set_ell_Logic	Set the ELL logic
_1247_set_alm	Set alarm logic and operating mode
_1247_set_el	Set EL logic and operating mode
_1247_set_inp	Set INP logic and operating mode
_1247_set_erc	Set ERC logic and timing
_1247_set_sd	Set SD logic and operating mode
_1247_set_servo	Set servo Driver logic
_1247_set_servoAlarm	Set servo alarm logic

6.2 MotionNet Extension API

6.2.1 System Initialization

Function Name	Description
_mnet_initial	initialize system resource
_mnet_get_hardware_info	get the hardware information
_mnet_close	Close MNET interface
_mnet_get_ring_address	Get the operating physical address

6.2.2 Communication Operation

Ring Status Function

Function Name	Description
_mnet_get_ring_status	Get the active ring status
_mnet_get_com_status	Get the target ring communication status
_mnet_set_ring_quality_param	Set the ring communication quality
_mnet_get_slave_info	Get the slave information

Ring Operation Function

Function Name	Description
_mnet_start_ring	Start ring communication
_mnet_stop_ring	Stop Ring communication
_mnet_reset_ring	Soft reset ring and recorder data
_mnet_get_ring_active_table	Get the active slave table
_mnet_enable_soft_watchdog	Enable watch dog

Slave Status Function

Function Name	Description
_mnet_set_slave_quality_param	Set the slave continue error Endurance
_mnet_get_error_slave	Get the first error slave device
_mnet_get_warning_slave	Get the first error slave device

6.2.3 DIO Slave Module Operation

IO Slave Operation

Function Name	Description
_mnet_io_output	output remote port
_mnet_io_input	input remote port

6.2.4 1-Axis Motion Slave Operation

Motion Slave Initial

Function Name	Description
_mnet_m1_initial	Initial the remote Axis resource

Motion Slave Configure

Function Name	Description
_mnet_m1_set_pls_iptmode	Set encoder input mode
_mnet_m1_set_pls_outmode	Set pulse command output mode
_mnet_m1_set_feedback_src	Set the counters input source

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_set_tmove_speed	Set a trapezoidal Velocity profile
_mnet_m1_set_smove_speed	Set a S-curve Velocity profile move
_mnet_m1_v_change	Speed change by comparator
_mnet_m1_fix_speed_range	immediately stop
_mnet_m1_unfix_speed_range	Release the speed range constrain

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_v_move	Accelerate an axis to a constant velocity with trapezoidal profile
_mnet_m1_start_rel_move	Begin an relative move
_mnet_m1_start_abs_move	Begin an absolute move
_mnet_m1_sd_stop	slow down to stop
_mnet_m1_emg_stop	immediately stop

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_set_home_config	Set the home/index logic configuration
_mnet_m1_start_home_move	Begin a home return action

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_motion_done	Return the motion status of Motiom.NET Motion Slave
_mnet_m1_set_alm	Set alarm logic and operating mode
_mnet_m1_set_erc	Set ERC logic and timing
_mnet_m1_set_erc_on	Force ERC output
_mnet_m1_set_sd	Set SD logic and operating mode
_mnet_m1_set_svon	Set servo Driver ON
_mnet_m1_set_ralm	Output servo Driver Alarm Reset
_mnet_m1_set_pcs	Set PCS logic

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_motion_done	Return the motion status of Motiom.NET Motion Slave
_mnet_m1_set_alm	Set alarm logic and operating mode
_mnet_m1_set_inp	Set INP logic and operating mode
_mnet_m1_set_erc	Set ERC logic and timing
_mnet_m1_set_erc_on	Force ERC output
_mnet_m1_set_sd	Set SD logic and operating mode
_mnet_m1_set_svon	Set servo Driver ON
_mnet_m1_set_ralm	Output servo Driver Alarm Reset
_mnet_m1_set_pcs	Set PCS logic

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_get_command	Get the Command Value
_mnet_m1_set_command	Set the Command Value
_mnet_m1_reset_command	Reset the Command Value to zero
_mnet_m1_get_position	Get the Command Value
_mnet_m1_set_position	Set the Command Value
_mnet_m1_reset_position	Reset the position Value to zero
_mnet_m1_get_error_counter	Get the Command Value
_mnet_m1_reset_error_counter	Reset the Error Counter to zero
_mnet_m1_get_current_speed	Get current speed

Motion Slave Position Compare and Latch

Function Name	Description
_1247g_set_ltc_logic	Set Latch Logic
_mnet_m1_get_latch_data	Get Latch data
_mnet_m1_set_soft_limit	Set Soft limit
_mnet_m1_enable_soft_limit	Enable limit
_mnet_m1_disable_soft_limit	Disable Limit
_mnet_m1_set_comparator_mode	Set general-purposed comparator
_mnet_m1_set_comparator_value	Check current comparator data
_mnet_m1_get_comparator_value	Set Trigger comparator Value
_mnet_m1_set_trigger_comparator	Set Trigger comparator
_mnet_m1_set_trigger_comparator_value	Set Trigger comparator Value

Motion Slave Velocity Mode

Function Name	Description
_mnet_m1_dio_output	Set TTL output status
_mnet_m1_dio_output	Set TTL output status
_mnet_m1_get_io_status	Get the motion I/O status of MNET AXIS Controller

APPENDIX A

Position Mode Servo Driver/Motor

Appendix A Position Mode Servo Driver/ Motor

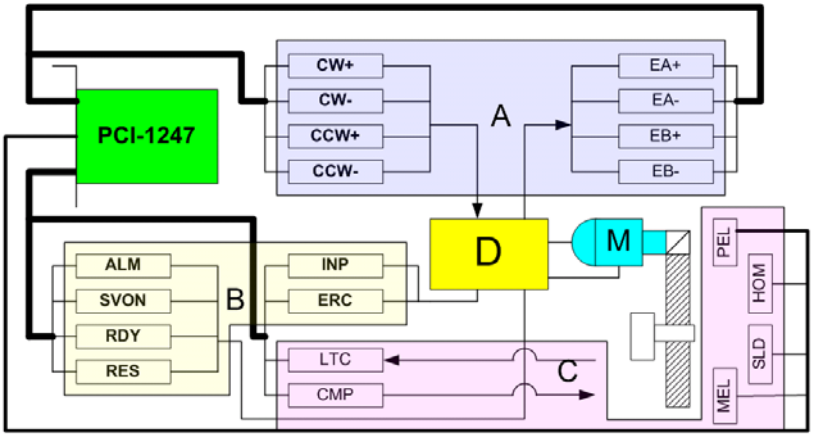


Figure A.1: Overview

There are three types of wiring between PCI-1247 and the Driver/Motor/ Machines.

Type A: Pulse I/O between PCI-1247 and Servo Driver

Type B: Digital I/O between PCI-1247 and Servo Driver

Type C: Digital I/O between PCI-1247 and Machines

Type A:

Pulse output from PCI-1247 to Servo Driver

named as CW+,CW-,CCW+,CCW- respectively

Pulse Input from Servo Driver to PCI-1247

Named as EA+, EA-, EB+, EB-, EZ+, EZ- respectively

Type B:

Digital output from PCI-1247 to Servo Driver

Named as SVON, RES, ERC

Digital input from Servo Driver to PCI-1247

Named as ALM, RDY, INP

Type C:

Digital output from PCI-1247 to Machine

Named as CMP

Digital inputs from Machine to PCI-1247

Named as PEL, MEL, SLD, ORG, LTC

The following picture and table is a summary of three Servo Driver/ Motor makers, including Panasonic Minas A, Mitsubishi J2-Super and Yaskawa Sigma II.

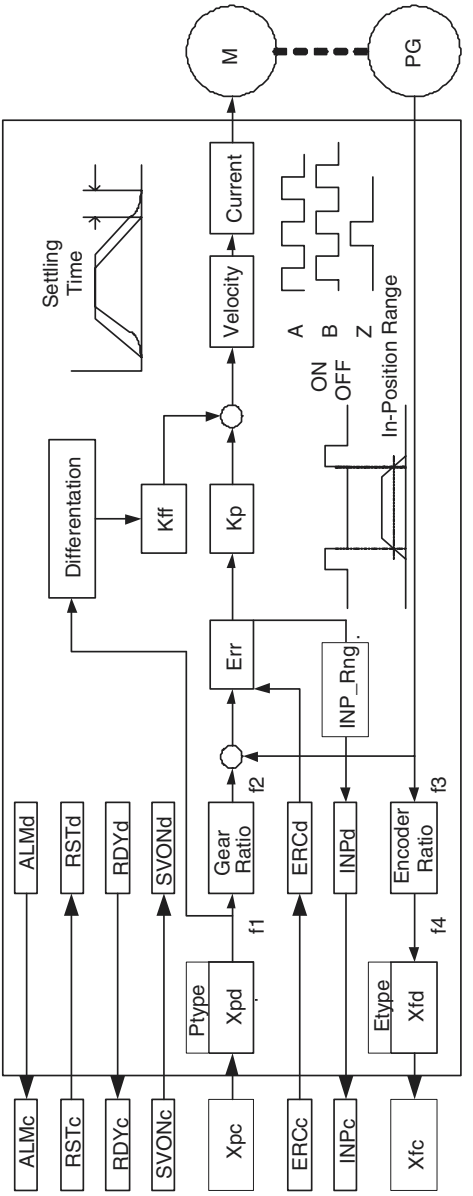


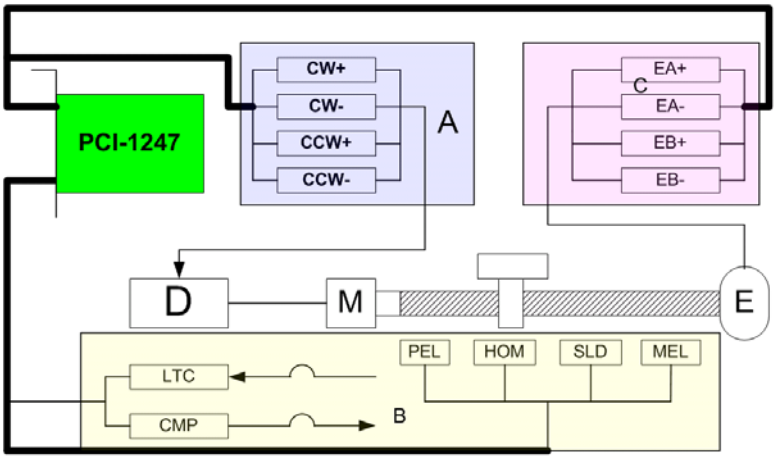
Figure A.2: Function Block Diagram of Position Mode Servo Driver/Motor

Table A.1: Variable Mapping Table to Three Types of Motor Drivers			
	Panasonic Minas A	**Yaskawa Sigma II**	**Mitsubishi J2-Super**
P type	PrNo.42	Pn200.0	P021
Xpd	CN_I/F pin3,4,5,6	CN1 pin7,8,11,12	CN1A pin3,13,2,12
Gear Ratio	PrNo.46~4B	Pn202/Pn203	P003/P004
ALMd	CN_I/F pin36,37	CN_I/F pin31,32	CN1B pin18
SVONd	CN_I/F pin29	CN_I/F pin40	CN1B pin5
RDYd	CN_I/F pin34,35	CN_I/F pin29,30	CN1A pin19
RSDd	CN_I/F pin31	CN_I/F pin44	CN1B pin14
ERCd	CN_I/F pin30	CN_I/F pin14	CN1A pin8
IPNd	CN_I/F pin38,39	CN_I/F pin25,26	CN1A pin18
INP Rng.	PrNo.60	Pn500	P005
Kp	PrNo.10 PrNo.18	Pn102,106	P006/P035
Encoder Ratio	PrNo.40,44	Pn201	P027
E type	Only AB phase	Only AB phase	Only AB phase
Xfd	CN_I/F pin21,22,48,49,23, 24	CN_I/F pin33,34,35,36,19, 20	CN1A pin6,16,7,17,5,15

Table A-1

A.1 Micro Stepping Step Driver/Motor

The wiring is simplified in the following diagram.



There are 3 groups of wirings between PCI-1247 and step driver/motor/ machine

Type A: Pulse output from PCI-1247 to Step driver/motor

Named as CW+, CW-, CCW+, CCW- respectively

Type B: Digital outputs from PCI-1247 to machine

Named as CMP, and DO

Digital inputs from machine to PCI-1247

Named as PEL, MEL, ORG, SLD, LTC

Type C: Pulse inputs from external encoder to PCI-1247

Named as EA+, EA-, EB+, EB-, EZ+, EZ- respectively