

## PCI 2 Axis Servo Card

**(Catalog Number 1784-PM02AE)**

This manual provides the instructions for installing the PCI 2 Axis Servo card (1784-PM02AE) in a PC computer using the NT operating system.

Before you install your card you should have a PC computer meeting the following minimum configuration:

| Category           | Requirement  |
|--------------------|--|
| Personal computer  | Pentium II 300MHz or Celeron 300A processor<br>Pentium III 450 MHz (or greater) recommended                                  |
| Operating System   | Microsoft Windows NT version 4.0 with Service Pack 5 (or greater) or Microsoft Windows 2000 with Service Pack 1 (or greater) |
| RAM                | 128 Mbytes of RAM minimum  |
| Hard Disk Space    | 50 Mbytes of free hard disk space  |
| Video Requirements | 256 - color, 800 X 600 video resolution minimum  |

- Open 32 bit Local PCI Bus slot
- Must be DMA capable and allow bus mastering on the PCI Bus.

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## Overview

The 1784-PM02AE motion card is a two axis closed-loop servo module used with the SoftLogix5800 when servo control is required. The 1784-PM02AE is compatible with 32 bit local PCI bus slots and supports a  $\pm 10V$  torque or velocity output and 4MHz quadrature encoder feedback input.

The 2 Axis Servo card is capable of supporting 2 axes sending cyclic position commands. It is designed to meet ASA System specifications and conforms to the common presentation format of communication cards.

## Important User Information

Due to the variety of uses for the product described in this publication, those responsible for the application and use of this card must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including all applicable laws, regulation codes, and standards.

The illustrations, charts, sample programs, and layout examples shown in this manual are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

The publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control* (available from your local Rockwell Automation office), describes some important differences between solid state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this documentation we use notes to make you aware of safety considerations:

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**ATTENTION**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

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Attention statements help to:

- Identify a hazard.
- Avoid a hazard.
- Recognize the consequences.

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**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

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## Technical Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

## Local Product Support

Contact your local Allen-Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

## Technical Product Assistance

If you need to contact Allen-Bradley for technical assistance, please review the information in this manual first. Then call your local Allen-Bradley representative. For the quickest possible response, we recommend that you have the catalog numbers of your products available when you call. See the *Related Documentation* section of this chapter for the publication numbers of other manuals that can help with this product.

The Rockwell Automation Technical Support number is:

**1-440-646-5800**

## On the Web

For information about Allen-Bradley, visit the following World Wide Web site:

**<http://www.ab.com/>**

## Compliance to the European Union Directive

If this product bears the CE marking, it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

### EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards:

- EN 50081-2EMC - Generic Emission Standard, Part 2 - Industrial Environment
- EN 50082-2EMC - Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

## Heavy Industrial Environment

The PCI Servo card is intended for use in a heavy industrial environment and is not to be used in a domestic or office environment. The card must be installed in a suitable industrial computer.

## Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 60204 Safety of machinery - Electrical equipment of machines.

For specific information required by EN 60204, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1
- Automation Systems Catalog, publication B111

This equipment is classified as open equipment and must be installed (mounted) in an enclosure during operation as a means of reducing user exposure to hazards.

## Preventing Electrostatic Discharge

### ATTENTION



This card is highly sensitive to electrostatic discharge (ESD). Electrostatic discharge may be present whenever you handle the card. When you handle the card without any ESD protection you can cause internal circuit damage that may not be apparent when you install or initially use the card.

Follow these guidelines when you handle the 2 Axis Servo card:

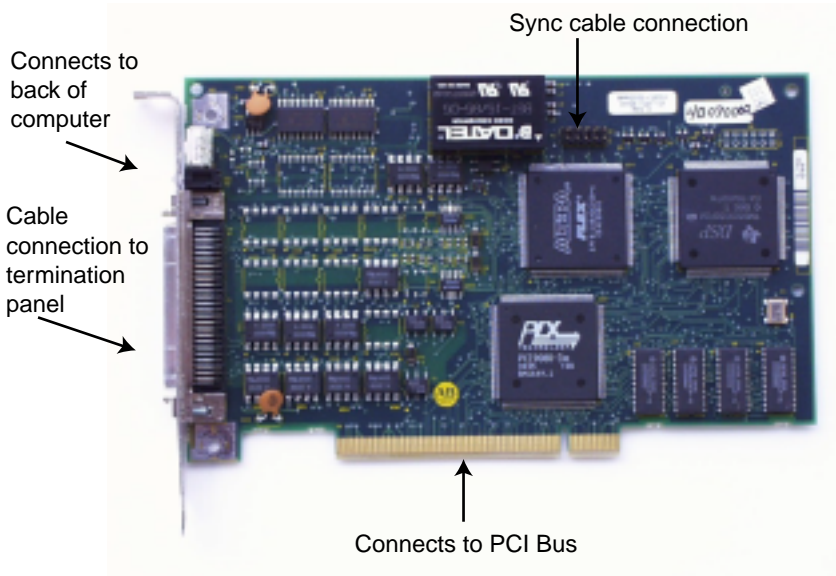
- Before you handle the card, touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.

- Do not touch the connector or connector pins on the 2 Axis Servo card.
- If the card is not in use, store it in the anti-static clamshell that the card was shipped in.

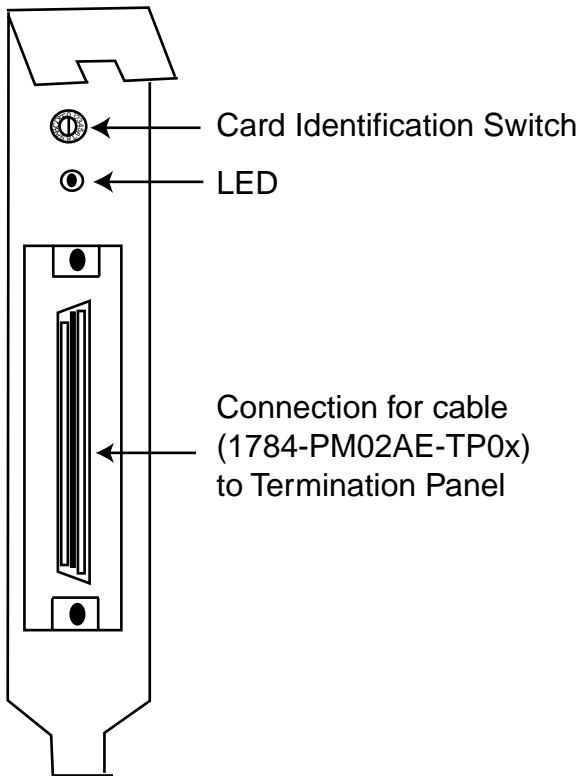
**IMPORTANT** Remember, a computer with AC power disconnected is *not* a grounded object.

## Identifying Card Components

The following diagrams provide two views of the 1784-PM02AE card. The first diagram is a side view which shows the orientation of the card and the connection to the PCI Bus. The second diagram is a front view which shows the position of the cable connection, the LED, and the Card Identification Switch.



**Figure 1 Side View of the 1784-PM02AE Card**



**Figure 2 Front View of the 1784-PM02AE Card**

### **Card Identification Switch**

The Card Identification Switch associates the 1784-PM02AE cards with slots in the virtual backplane. Each card has a specific slot identification which is listed by the backplane monitor. The virtual backplane monitor assigns installed 1784-PM02AE card(s) to virtual backplane slot(s). The switch setting defines the card/slot association. This facilitates replacement of a card. It is not necessary to reconfigure a new card as long as its switch setting matches that of the replaced card.

It is a slotted rotary switch with 16 switch positions – 0 through 9 and A through F. The switch is accessible by a flathead screwdriver through the PCI slot at the rear of the computer.

## LED

There is one bi-color LED to indicate the status of the Servo card. It is visible through the PCI slot at the rear of the computer.

At start up the LED goes through a sequence of color changes:

- At power up LED is Green.
- When SoftLogix driver starts the LED turns Red.
- At download of a valid program the LED is Green.

During regular operation the LED is GREEN when the Servo card is functioning normally and RED when a fault situation occurs.

## Servo Card to Termination Panel Connection

The connection on the back of the Servo card accepts a straight 68 way Mini D shielded plug with a spring latch.

## Installing the Card

Before you install the card, be certain you know how to:

- Install hardware in your computer.
- Configure the computer's options such as: disable cache memory, memory manager, and shadowing of memory, before you install the card.
- Enable bus mastering and DMA.

Consult your computer's documentation for specific information.

To install the card, you need:

- Access to the computer's expansion slots.
- Have either a Phillip-head or a flat-head screwdriver.
- Administration rights to NT.



## Access the Computer's PCI Local Bus Expansion Slots

To install the card, you must access the computer's PCI local bus expansion slots. Follow these general steps, or refer to your computer's user guide for instructions on how to:

1. Turn off the power to the host computer with the power switch.
2. Remove the computer's cover.
3. Select a vacant PCI local bus expansion slot. Make sure the vacant slot is on the main PCI Bus.
4. Remove the slot's expansion cover. Remove the screw on the back (rear bracket) of the computer.

## Insert the Card

To insert the card inside the computer:

1. Follow the card handling instructions on page 6.
2. Push the card's PCI connection into the PCI Bus.

If you have additional cards to install, repeat steps 1 and 2 for each card. After the cards (up to four) are installed, use the Sync cable (1784-PMCSY4) to connect all of the cards.

3. Replace and tighten the expansion slot screw.
4. Turn on the computer to make sure it comes up correctly.

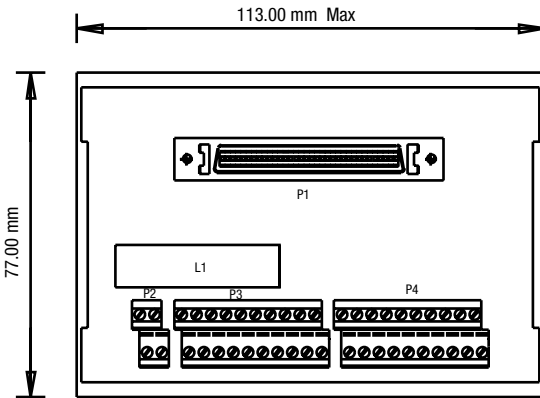
|                        |               |
|------------------------|---------------|
| <b>If the computer</b> | <b>then:</b>  |
| powers up              | go to step 5. |

| If the computer | then:   |
|-----------------|---|
| hangs up        | <ul style="list-style-type: none"> <li>• you probably have a memory or I/O conflict.</li> <li>• You should remove all other cards and try again.</li> </ul> <p>If you continue to experience difficulty, call Tech Support.</p> |

5. Replace the computer's cover (after computer boots up correctly).

### Termination Panel

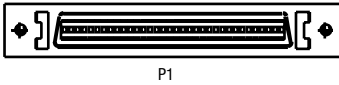
The termination panel is used in conjunction with the 1784-PM02AE card to facilitate the wiring of drives and encoders for use with the card. Because the card is installed inside the PC computer cabinet it would be difficult to access for wiring drives, encoders, etc. A termination panel, mounted separately from the card, allows for easier access to the two axis terminals.



**Figure 3 1784-PM02AE-TP0x Termination Panel**

**P1**

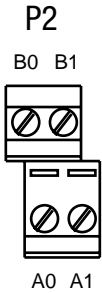
The connection marked P1 is for the cable from the PCI 2 Axis Servo card. It accepts a straight 68 way Mini D shielded plug with a spring latch. Through this connection the termination panel is connected to the PCI card by a 1 meter or 3 meter premade cable. The cable is shipped with the termination panel and shares its catalog number, 1784 - PM02AE-TP0x where x represents the length of the cable.



**Figure 4 1784-PM02AE-TP0x Cable Connection**

**P2**

The P2 connection is for wiring the encoder power. Those marked B0 and B1 are for the Encoder power and those marked A0 and A1 are the 0 volt connections.

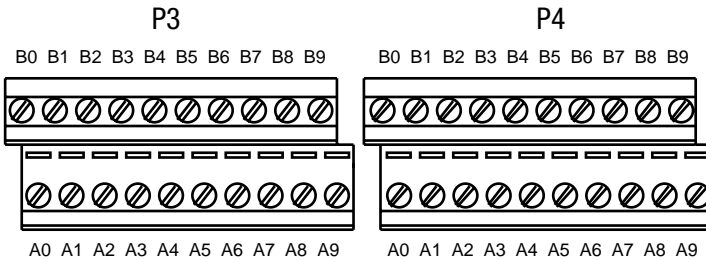


**Figure 5 P2 Connector**

| <b>P2</b> | <b>Function</b> | <b>P2</b> | <b>Function</b> |
|-----------|-----------------|-----------|-----------------|
| A0        | Encoder 0V      | B0        | Encoder Power   |
| A1        | Encoder 0V      | B1        | Encoder Power   |

### P3 and P4

The P3 and P4 receptacles are for wiring the axes. P3 is Axis 0 and P4 is Axis 1.

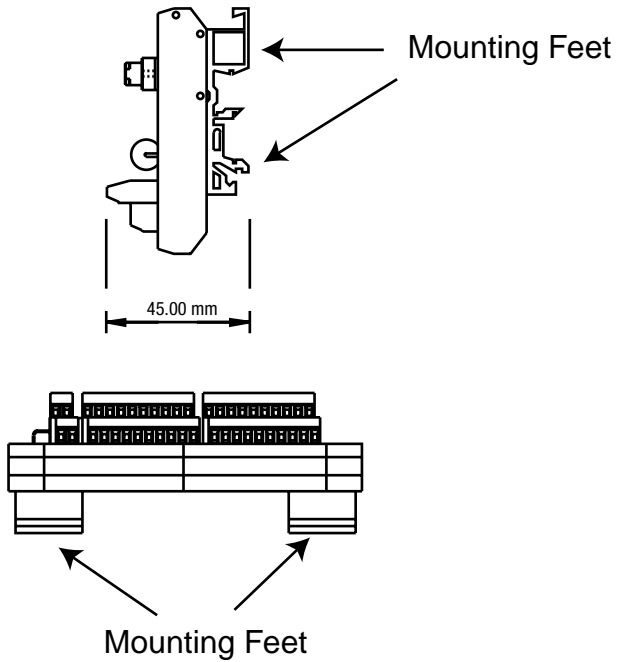


**Figure 6 P3 and P4 Connectors**

| <b>P3 &amp; P4</b> | <b>Function</b> | <b>P3 &amp; P4</b> | <b>Function</b> |
|--------------------|-----------------|--------------------|-----------------|
| A0                 | DRVFLT          | B0                 | +CHA            |
| A1                 | Home Area       | B1                 | -CHA            |
| A2                 | Reg 1           | B2                 | +CHB            |
| A3                 | Reg 2           | B3                 | -CHB            |
| A4                 | OK              | B4                 | +CHZ            |
| A5                 | IN_COM          | B5                 | -CHZ            |
| A6                 | Enable+         | B6                 | Shield          |
| A7                 | Enable-         | B7                 | +Out            |
| A8                 | Encoder 0V      | B8                 | -Out            |
| A9                 | Chassis         | B9                 | Encoder Pwr     |

## DIN Rail Assembly

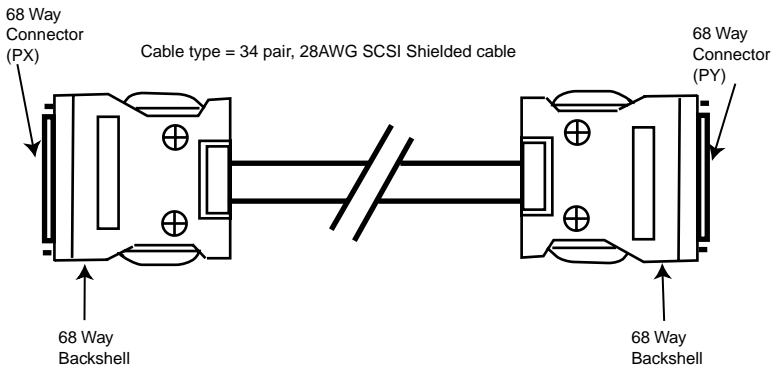
The termination panel mounts to a DIN rail using the mounting feet on the back of the panel.



**Figure 7 DIN Rail Assembly for Termination Panel**

## Cables

The 1784-PM02AE card is connected to the termination panel via a premade 34 pair, 28 AWG SCSI shielded cable. The cable is available in lengths of 1 meter and 3 meters.



**Figure 8 1784-PM02AE-TP0x Cable**

Catalog Numbers for premade Servo card to termination panel cables.

| Allen-Bradley Catalog Number | Length in meters |
|------------------------------|------------------|
| 1784-PM02AE-TP01             | 1m               |
| 1784-PM02AE-TP03             | 3m               |

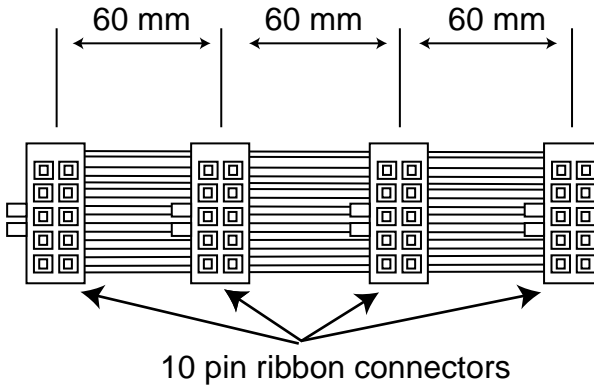
### Pinouts for Cable 1784-PM02AE-TP0x

| Pin (PX) | Pin Pair Number | Pin Description             | Pin (PY) |
|----------|-----------------|-----------------------------|----------|
| 1        | Pair 1          | +CH A Feedback Input Axis 0 | 1        |
| 35       |                 | -CH A Feedback Input Axis 0 | 35       |
| 2        | Pair 2          | +CH B Feedback Input Axis 0 | 2        |
| 36       |                 | -CH B Feedback Input Axis 0 | 36       |
| 3        | Pair 3          | +CH Z Feedback Input Axis 0 | 3        |
| 37       |                 | -CH Z Feedback Input Axis 0 | 37       |

| <b>Pin (PX)</b> | <b>Pin Pair Number</b> | <b>Pin Description</b>       | <b>Pin (PY)</b> |
|-----------------|------------------------|------------------------------|-----------------|
| 4               | Pair 4                 | +OUT, Axis 0                 | 4               |
| 38              |                        | -OUT, Axis 0                 | 38              |
| 5               | Pair 5                 | DRVFLT, Axis 0               | 5               |
| 49              |                        | HOME, Axis 0                 | 49              |
| 6               | Pair 6                 | REG1, Axis 0                 | 6               |
| 40              |                        | REG2, Axis 0                 | 40              |
| 7               | Pair 7                 | +ENABLE, Axis 0              | 7               |
| 41              |                        | -ENABLE, Axis 0              | 41              |
| 8               | Pair 8                 | OK 1                         | 8               |
| 42              |                        | IN_COM, Axis 0               | 42              |
| 9               | Pair 9                 | IN_COM, Axis 0               | 9               |
| 43              |                        | IN_COM, Axis 1               | 43              |
| 10              | Pair 10                | +CH A Feedback Input Axis 1  | 10              |
| 44              |                        | - CH A Feedback Input Axis 1 | 44              |
| 11              | Pair 11                | +CH B Feedback Input Axis 1  | 11              |
| 45              |                        | -CH B Feedback Input Axis 1  | 45              |
| 12              | Pair 12                | +CH Z Feedback Input Axis 1  | 12              |
| 46              |                        | -CH Z Feedback Input Axis 1  | 46              |
| 13              | Pair 13                | +OUT, Axis 1                 | 13              |
| 47              |                        | -OUT, Axis 1                 | 47              |
| 14              | Pair 14                | DRVFLT, Axis 1               | 14              |
| 48              |                        | HOME, Axis 1                 | 48              |
| 15              | Pair 15                | REG1, Axis 1                 | 15              |
| 49              |                        | REG2, Axis 1                 | 49              |
| 16              | Pair 16                | +ENABLE, Axis 1              | 16              |
| 50              |                        | -ENABLE, Axis 1              | 50              |
| 17              | Pair 17                | OK 2                         | 17              |
| 51              |                        | IN_COM, Axis 1               | 51              |

## Sync Cable

Up to four (4) 1784-PM02AE cards may be installed in a single computer provided there are enough PCI Bus slots available. A sync cable is required to keep the cards synchronized. This is a ribbon cable with four connectors that fit to the cards.



**Figure 9 1784-PMCSY4 Cable**



## Wiring Example

This is a general wiring example of the 1398 to the termination panel.

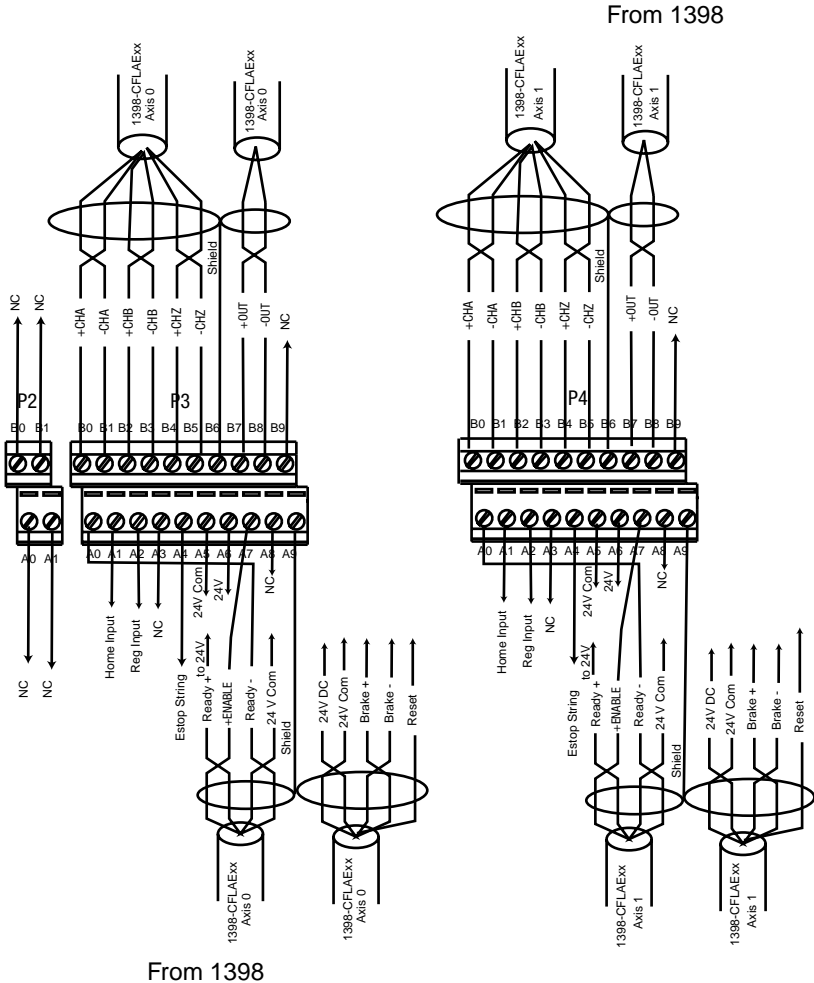




Figure 10 Wiring from a 1398 to the Termination Panel

## Card Specifications

|   |  |
|---|--|
| Number of Nodes   | 2 axes maximum   |
| Card location   | PCI Bus slot of PC   |
| Card keying   | Electronic   |
| Power dissipation   | 5W (1A @ 5V from PC)   |
| Encoder input<br>Type<br>Mode<br>Rate<br>Electrical interface<br>Voltage range<br>On state<br>Off state<br>Input impedance                                      | Incremental AB quadrature with marker<br>4X quadrature<br>4 MHz maximum<br>Optically isolated 5V differential<br>3.4V to 5.0V<br>0V to 1.8V<br>531 Ohms differential |
| Registration inputs<br>Type<br>24V input voltage<br>Maximum<br>Minimum on<br>Maximum off<br>Input impedance<br>24V input<br>Response time<br>(position latched) | Optically isolated, current sinking input<br>+24V dc nominal<br>26.4V<br>18.5V<br>3.5V<br>1.2 kOhms<br>1 $\mu$ s   |
| Drive Faults and Home Inputs<br>Type<br>Input voltage<br>Maximum<br>Minimum on<br>Maximum off<br>Input impedance  | Optically isolated, current sinking input<br>+24V dc nominal<br>26.4V<br>17.0V<br>8.5V<br>7.5 kOhms  |
| Servo output<br>Type<br>Isolation<br>Voltage range<br>Voltage resolution<br>Load<br>Maximum offset<br>Gain error  | Analog voltage<br>200 kOhms<br>$\pm$ 10V<br>16 bits<br>5.6 kOhms resistive minimum<br>25 mV<br>$\pm$ 4%  |

|   |   |
|---|---|
| <p>OK and Enable Outputs<br/>                 Type<br/>                 Operating voltage<br/>                     Maximum<br/>                 Operating current</p> | <p>Solid-state isolated relay contacts<br/>                 +24V dc nominal (Class 2 source)<br/>                 26.4V<br/>                 75 mA</p>  |
| <p>Environmental Specifications<br/>                 Operational Temperature<br/>                 Storage temperature<br/>                 Relative Humidity</p>      | <p>0 to 40° C (32 to 104° F)<br/>                 -40 to 85°C (-40 to 185°F)<br/>                 30 to 95%</p>   |
| <p>Shock<br/>                 Operating<br/>                 Non-operating</p>  | <p>10G<br/>                 30G</p>   |
| <p>Vibration<br/>                 Operating<br/>                 Non-operating</p>  | <p>1G, 5Hz - 500Hz<br/>                 2G, 5Hz - 500Hz</p>   |
| <p>Agency certification<br/>                 (when product or packaging is<br/>                 marked)</p>   | <p>UL508 – Industrial Control Equipment</p> <p> UL1604 – Class I, Division 2, Groups A, B, C<br/>                 D Hazardous location</p> <p> marked for all applicable directives</p> |

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**Power, Control and Information Solutions Headquarters**

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846