



## I-8196F / I-9196F

High-speed, DSP-based,  
6-axis Motion Control Module  
with FRnet Master

### Introduction

The **I-8196F** and **I-9196F** are 6-axis stepping/pulse-type servo motor control modules. Both modules are expansion units for the programmable automation controller (PAC) series provided by ICP DAS. The I-8196F module is an expansion card for the XP-8000 and WP-8000 series. The I-9196F module is a plug-in card for the XP-9000 and WP-9000 series.

A digital signal processor (DSP) calculates the commanded move trajectory and manages supervisory control by monitoring the limits and emergency stops to ensure safe operation. I/O control output (e.g. latch, compare, encoder counter etc.) is realized in a Field Programmable Gate Array (FPGA).

The motion controller is suitable for general-purpose motion control applications. In addition to its wide speed range, this intelligent motion controller also has a variety of built-in motion control functions, such as 2- to 6-axis linear interpolation, 2- and 3-axis circular interpolation, helical interpolation, T/S-curve acceleration/ deceleration, and automatic home search, etc.

The motion controller uses FRnet as a communication protocol to control distributed remote I/O modules. In an FRnet network the motion controller acts as a master and can control up to 128 digital outputs and 128 digital inputs. The FRnet scan interval is 0.72 ms. FRnet is a two-wire serial bus and is specifically designed for easy and cost effective wiring. ICP DAS provides a large range of FRnet I/O terminal boards and modules.

Libraries and DLL are provided for the following operation systems: Windows embedded, WinCE 5.0 and 6.0. A software utility enables the user to initialize the motion controller and execute motion commands.

### Specifications

| Model                          | I-8196F  | I-9196F |
|--------------------------------|--|---------|
| <b>General</b>                 |  |         |
| Number of Axes                 | 6  |         |
| Pulse Output Rate              | 4 MHz (Max.)                                       |         |
| Command Type                   | Pulse command                                      |         |
| Pulse Output Mode              | CW/CCW, PULSE/DIR, A/B pulse                       |         |
| Linear Interpolation           | Any 2- to 6-axis                                   |         |
| Circular/Helical Interpolation | Any 2- or 3-axis                                   |         |
| Speed Curve Profile            | T/S-curve  |         |
| Mechanical Switch Input        | Home, LMT+/-, NHOME, LTC, EMG                      |         |
| Servo I/O Interface            | Input: INP, ALM, RDY<br>Output: SVON, ALM_RST, ERC |         |
| Ring Counter Mode              | 32-bit   |         |
| Position Control Mode          | Relative and absolute position                     |         |
| Position Compare Trigger       | 4 MHz  |         |

### Features

- Expansion card for ICP DAS programmable automation controller (PAC)
- DSP-based motion control module
- Pulse Output Rate: 4 MHz (Max.)
- Maximum Encoder input frequency: 12 MHz
- Independent 6-axis motion control
- 2- to 6-axis linear/ 2- to 3-axis circular/ helical interpolation function
- Continuous interpolation
- 4-step home mode with auto-searching
- Synchronized start motion
- Programmable T/S-curve acceleration and deceleration
- Software limit protection
- Software FIFO for arbitrary curve motion
- High-speed position latch
- High-speed compare trigger and auto-increment compare mode
- Expandable remote I/O: 128 DI and 128 DO via a two-wire FRnet interface.

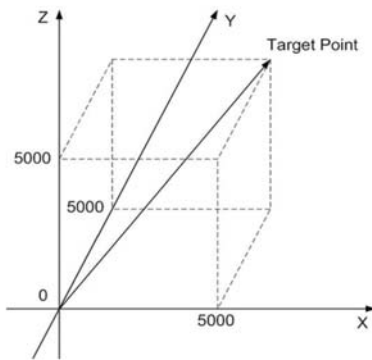


### Software Support

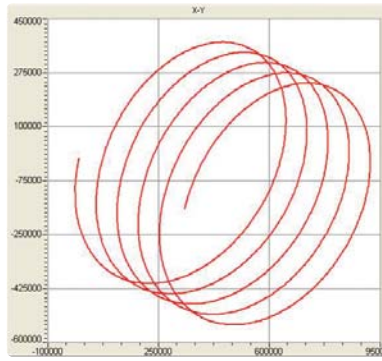
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|--------------|--|
| WES<br>WinCE | 32 bit:<br>Visual C++ lib/DLL<br>C#, VB.Net<br>LabVIEW<br>Configuration utility<br>Demo programs |
|--------------|--|

| Model                        | I-8196F                                   | I-9196F |
|------------------------------|---|---------|
| Encoder Interface            | A/B pulse, Up/Down                        |         |
| Encoder Counter              | 32-bit                                    |         |
| Encoder Counting Rate        | 12 MHz (Max.)                             |         |
| Digital Input Channels       | Local: 12 DI<br>Expandable: 128 DI        |         |
| Digital Output Channels      | Local: 3 DO<br>Expandable: 128 DO         |         |
| I/O Isolation (with DN-8368) | 2500 Vrms optical isolation               |         |
| Connector                    | 68-pin VHDCI connector and 20-pin SCSI-II |         |
| Power Consumption            | +5 V @ 500 mA                             |         |
| <b>Environmental</b>         |   |         |
| Operating Temperature        | 0 ~ +60 °C                                |         |
| Storage Temperature          | -20 ~ +80 °C                              |         |
| Ambient Relative Humidity    | 5 ~ 90 % RH, non-condensing               |         |

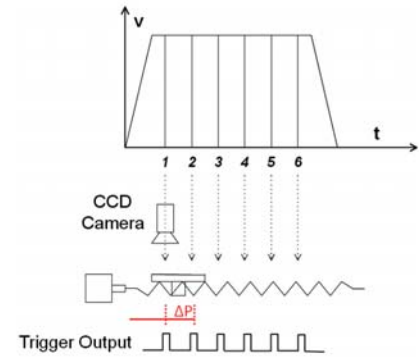
## Features of Motion Function



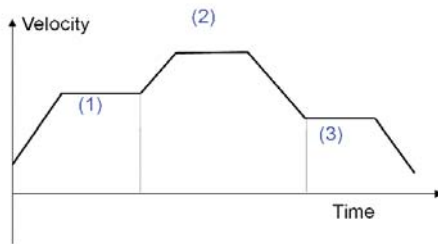
2 to 6-Axis Linear Interpolation



3-Axis Circular or Helical Interpolation



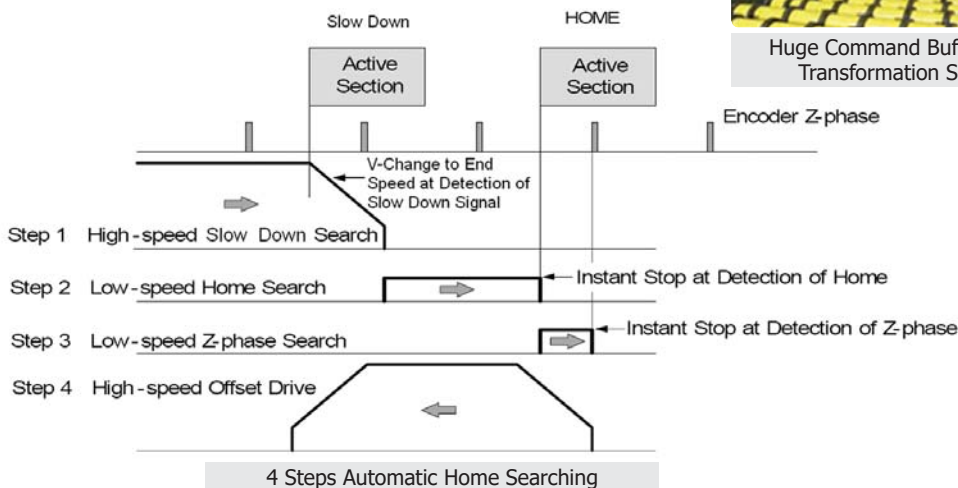
High Speed Position Compare



Multi-Axis Continuous Interpolation  
(With Acc. and Dec.)



Huge Command Buffer and Real Time Coordinate Transformation Suitable for Robotic Control



4 Steps Automatic Home Searching

## Ordering Information

|                |   |
|----------------|---|
| <b>I-8196F</b> | High-Speed 6-axis Motion Control Module with FRnet Master (For XP-8000/WP-8000 PAC) |
| <b>I-9196F</b> | High-Speed 6-axis Motion Control Module with FRnet Master (For XP-9000/WP-9000 PAC) |

## Accessories

|                        |   |
|------------------------|---|
| DN-8368UB              | Photo-isolated Universal Snap-on wiring terminal board  |
| DN-8368GB              | Photo-isolated General-purpose wiring terminal board  |
| DN-8368MB              | Photo-isolated Snap-on wiring terminal board for Mitsubishi MELSERVO-J2 servo amplifier                 |
| DN-20M                 | General purpose digital input and remote digital I/O (FRnet) extension board                            |
| CA-MINI68-15           | 68-pin VHDCI to SCSI-II Connector Cable, Length 1.5 M   |
| CA-SCSI20-M1/ M3/ M5   | 20-pin SCSI-II Male connector cable (for Mitsubishi J2 series motor), Length 1 M / 3 M / 5 M.           |
| CA-26-MJ3-15/30/50(B)  | 26-pin HD D-Sub Male Cable for Mitsubishi Servo Amplifier, 1.5/3/5 M. (for MELSERVO-J3/J4 Series)       |
| CA-26-PA4-15/30/50(B)  | 26-pin HD D-Sub Male Cable for Panasonic Servo Amplifier, 1.5/3/5 M. (for MINAS A4/A5 Series)           |
| CA-26-YSV-15/30/50(B)  | 26-pin HD D-Sub Male Cable for Yaskawa Servo Amplifier, 1.5/3/5 M. ( for Sigma II/III/V Series)         |
| CA-26-DAA2-15/30/50(B) | 26-pin HD D-Sub Male Cable for Delta A2 Servo Amplifier, 1.5/3/5 M. (for ASDA-A2 Series)                |
| CA-26-DAB2-15/30/50(B) | 26-pin HD D-Sub Male Cable for Delta B2 Servo Amplifier, 1.5/3/5 M. (for ASDA-B2 Series)                |
| CA-26-FFW-15/30/50     | 26-pin HD D-Sub Male Cable for Fuji Servo Amplifier, 1.5/3/5 M. ( for FALDIC-W and ALPHA5 Smart Series) |
| CA-26-TTA-15/30/50     | 26-pin HD D-Sub Male Cable for Teco Servo Amplifier, 1.5/3/5 M. (for TSTA-A/A+ Series)                  |