

PCI Bus 8-Axis Motion Control Board with circular/linear interpolation

MC8581P is a PCI-bus compliant board equipped with 2 pcs of 4-axis motion control IC, "MCX514" with interpolation function. It can independently control 8-axis of either stepper motor or pulse type servo motor for position and speed controls. Enlarge interpolation function, MC8581P can perform such as up to 8 axes linear interpolation, CW/CCW circular interpolation, 2/3/4 axes bit pattern interpolation (bit-data interpolation from CPU) and CW/CCW helical interpolation. Furthermore, two sets of interpolation drives can be performed at the same time.

Linear interpolation up to 8 axes

It can perform linear interpolation up to 8 axes that selects any axes by multichip interpolation function of MCX514. This function is very suitable for the application that needs the multi-axis control.



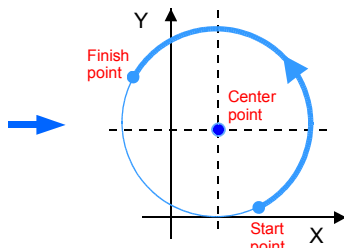
Linear interpolation up to 8 axes can be performed selecting any axes.

Perform two sets of interpolation drives simultaneously

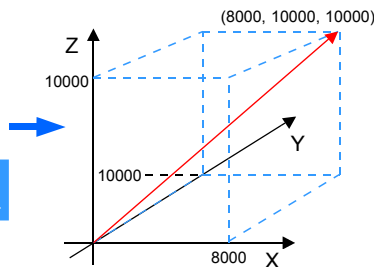
2 pieces of MCX514 mounted on MC8581P can independently interpolation drive. For example, one MCX514 performs circular interpolation, and another MCX514 performs 3-axis linear interpolation.



One MCX514 performs circular interpolation drive...



Another MCX514 performs 3-axis linear interpolation drive...



Helical interpolation

MC8581P can perform helical interpolation that moves another axis synchronizing with circular interpolation drive on XY plane. Fig.1 shows the example to move Z-axis in + direction corresponding to circular interpolation on XY plane. Fig.2 shows the example of normal vector control. An object such as a camera or nozzle is directed to the center of circular interpolation on a pan head which performs circular interpolation on XY plane while synchronizing with Z-axis rotation.

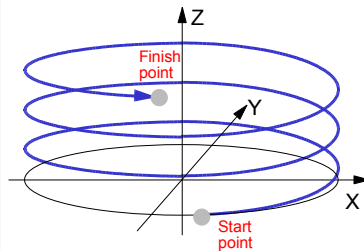
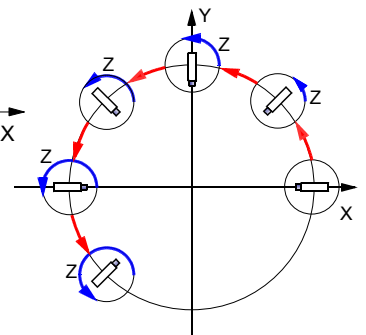


Fig.1 Example of helical interpolation

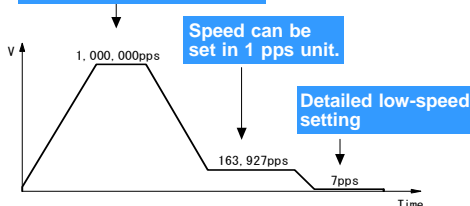
Fig.2 Example of normal line control



Speed Range-Free

MC8581P has no multiple of speed. This enables users to set drive speed by 1pps unit. Even though during driving, it can directly change the speed from low-speed such as 1 or 2 pps to high-speed such as 1 Mpps.

High-speed driving without speed range setting.



Speed can be set in 1 pps unit.

Detailed low-speed setting

Since there is no need to set multiples of speed (Range Setting), the user can set a drive speed of output pulses as a speed parameter (at CLK = 16MHz).

~~$$\text{Drive speed(pps)} = V \times \frac{8,000,000}{R}$$

$$\text{Acceleration(pps/sec)} = A \times 125 \times \frac{8,000,000}{R}$$

$$\text{Jerk(pps/sec}^2) = \frac{62.5 \times 10^6}{K} \times \frac{8,000,000}{R}$$~~

$$\text{Drive speed(pps)} = DV$$

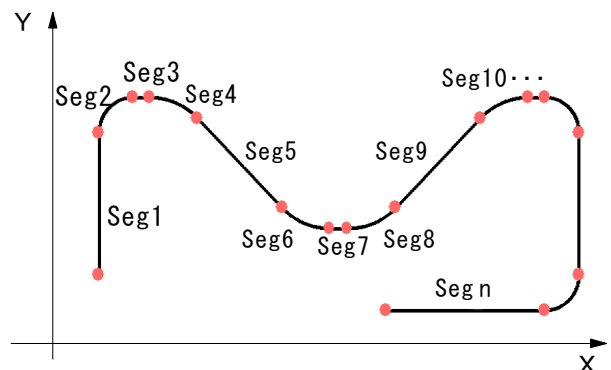
$$\text{Acceleration(pps/sec)} = AC$$

$$\text{Jerk(pps/sec}^2) = JK$$

Speed can be used as parameter.  
 → No need to calculate parameters.

8 Stages of Pre-Buffer for Continuous Interpolation

Equipped with 8 stages of pre-buffer register that stores finish point data (and others) in each segment, in order to handle continuous interpolation driving at high-speed. When there is a short segment such as Seg3 in below, if the average driving time of 8 segments including Seg3 is longer than setting time of position data for next segment, continuous interpolation can be performed.



## Specification

- **Control Axis** 1 ~ 8 axes (Each axis can be controlled independently.)
- **Interface** PCI bus interface
- **Data Bit Width** 16 Bit (Data bus of MCX514)
- **Occupied I/O Address** Depend on Plug and Play function.
- **Interrupt** Depend on Plug and Play function.

## Interpolation Functions

- **Interpolation Types**  
2~8 axes linear interpolation, CW/CCW circular interpolation, 2~4 axes bit pattern interpolation, CW/CCW helical interpolation
- **Interpolation Range**  
Each axis -2,147,483,646 ~ +2,147,483,646 drive pulse
- **Interpolation Speed**  
1 pps ~ 8 Mpps \*1
- **Interpolation Accuracy**  
±0.5LSB or less(linear interpolation), ±1LSB or less(circular interpolation)
- **Other Functions**  
Selectable any axis, short axis pulse equalization mode, 2-axis high accuracy constant vector speed mode, continuous interpolation, data control by 8 stages of pre-buffer register

## Common Specification of Each Axis

- **Drive Pulse Output**
  - Pulse Output Circuit: Differential line-drive (AM26C31) output
  - Pulse Output Speed: 1 pps ~ 8 Mpps
  - Initial Speed Range: 1 pps ~ 8 Mpps
  - Pulse Output Speed Accuracy: ±0.1% or less(according to the setting speed)
  - Acceleration Range: 1 pps/sec ~ 536,870,911 pps/sec
  - Jerk: 1 pps/sec<sup>2</sup> ~ 1,073,741,823 pps/sec<sup>2</sup> \*2
  - Output Pulse Range: -2,147,483,646 ~ +2,147,483,646 drive pulse (Relative / absolute position drive)
  - Speed Curve: Constant speed, symmetrical / non-symmetrical linear, symmetrical / non-symmetrical parabolic S-curve drive
  - Position Drive Deceleration Stop Mode: Auto / manual deceleration stop
  - Override: Output pulse number and drive speed are changeable during driving.
  - Driving Commands: Relative / absolute position driving, +/-direction continuous driving
  - Triangle Form Prevention: Can be used both in linear and S-curve acceleration / deceleration.
  - Drive Pulse Output Type: Independent 2-pulse, 1-pulse 1-direction, quadrature pulse and quad edge evaluation, quadrature pulse and double edge evaluation are selectable.
  - Drive Pulse Output Logic: Positive / negative logical level is selectable.
  - Drive Pulse Output Pin: Possible to pin inversion.
- **Encoder A / B phase input**
  - Input circuit: High speed photo coupler input. Connectable with differential line driver.
  - Input Pulse Input Type: Quadrature pulses input and quad edge evaluation, quadrature pulses input and double edge evaluation, quadrature pulses input and single edge evaluation, up / down pulse input are selectable.
  - Input Pulse Pin: Possible to pin inversion.
- **Automatic Home Search**
  - Automatic of execution of Step1(high-speed near home search)→Step2(low-speed home search)→Step3(low-speed encoder Z-phase search)→Step4(high-speed offset drive).
  - Setting: Enable / Disable each step and search direction are selectable.
  - Timer between Steps: Selectable from 1msec ~ 1,000msec
- **Position Counter**
  - Logical Position Counter: -2,147,483,648 ~ +2,147,483,647 drive pulse (For output pulse)
  - Real Position Counter: -2,147,483,648 ~ +2,147,483,647 pulse(For input pulse)
  - Variable Ring: Possible to set the count maximum value of each counter.
- **Software Limit**
  - Setting Range: -2,147,483,648 ~ +2,147,483,647 pulse
  - Stop Mode: Decelerating / instant stop is selectable.
- **Multi-Purpose Register**
  - Bit Length, Number of Registers: 32-bit length, 4 registers per axis
  - Uses: Compare and save the value of position / speed / timer and load the data of position / speed.
- **Timer**
  - Number of timers: 1 per axis
  - Setting Range: 1 ~ 2,147,483,647 μsec

- **Interrupt**
  - Number of Signals: 1(Including interrupts for each axis and continuous interpolation driving.)
  - Enable / Disable: Enable / disable each interrupt factor is selectable.
  - Interrupt Occurrence Factor: Start / terminate constant speed during acceleration / deceleration driving, driving terminates and so on.
- **Synchronous Action**
  - Number of Sets: 4 sets per axis
  - Activation Factor: Passing the specified position, start / terminate driving, expiring of an internal timer and so on.
  - Action: Start / stop driving, save position counter value to registers and so on.
  - Other Set Activation: Activation of other 3 sets actions of own axis can be set.
  - Other Axes Set0 Activation: Activation of set0 action of other axes can be set.
  - Repeat: Synchronous action can be operated once / repeatedly.
- **External Signal for Driving**
  - Signals: Relative position / continuous driving by EXOP+, EXOP- signals
  - Manual pulsar: Encoder input : quadrature pulses input and single edge evaluation
  - Input circuit: Photocoupler and built-in integral filter
- **External Stop Signal**
  - Number of Signals: 3 signals (STOP0 ~ 2) per axis
  - Enable / Disable: Enable / Disable stop signal function is selectable. Also can be used as near home, home, encoder z-phase input and general input signal.
  - Logical Level: Low / High active is selectable.
  - Stop Mode: When it is active, decelerating stop. (When driving below initial speed, instant stop)
  - Input circuit: Photocoupler and built-in integral filter
- **Servo Motor Input Signal**
  - Signal Types: ALARM and INPOS (In-position)
  - Enable / Disable: Enable / Disable stop signal function is selectable.
  - Logical Level: Low / High active is selectable.
  - Input circuit: Photocoupler and built-in integral filter
- **General Output Signal**
  - Number of Signals: 4 signals (OUT0 ~ 3) per axis
  - Output circuit: OUT0 shares the pin with DCC output. DTC023 output (Open collector output, output voltage : 30V max. output current : 60mA max.)
- **Overrun Limit Signal Input**
  - Number of Signals: 2 signals (+ / - direction each 1 signal) per axis
  - Enable / Disable: Enable / Disable limit function is selectable.
  - Logical Level: Low / High active is selectable.
  - Stop Mode: When it is active, instant / decelerating stop is selectable.
  - Input pulse pin: Possible to pin inversion.
  - Input circuit: Photocoupler and built-in integral filter
- **Emergency Stop Signal Input**
  - Number of Signals: EMGN 1 signal for all axes, instantly stops drive pulse of all axes.
  - Logical Level: Logical level is selectable by the jumpers on the board.
  - Input Circuit: Photocoupler and built-in integral filter
- **Built-in integral filter**
  - Input Signal Filter: Equipped with integral filters in the input column of each input signal.
  - Time Constant: Selectable from 16 types (500nsec ~ 16msec).
  - Enable / Disable: Enable / Disable integral filter function is selectable.

## Software

- **For Windows7, 8.1**
    - Device driver for MC8581P
    - Evaluation tool
    - VC/VB sample program (It will sequentially be supported to VB.)
- Software and user's manual are not attached to MC8581P. Please contact us or our distributor directly when you need. You can also download them on our website.  
[http://www.novaelec.co.jp/eng/index\\_e.html](http://www.novaelec.co.jp/eng/index_e.html)

## Other Characteristics

- Operating Temperature: 0 ~ +45°C(No condensation)
- Power Voltage: +5V ±5%(Consumption current:1000mA max.)
- External Power Voltage: +24V
- Board Dimensions: 174.6×106.7 mm(Connectors and brackets excluded)
- I/O Connector Type: CN2: FX2B-100PA-1.27DS(HIROSE)  
CN2: HIF3FC-50PA-2.54DS(HIROSE)  
CN3: HIF3FC-30PA-2.54DS(HIROSE)  
FX2B-100SA-1.27R (HIROSE) with 1.2m cable  
CN2: HIF3BB-50D-2.54R(HIROSE)  
CN3: HIF3BA-50D-2.54R(HIROSE)
- Accessories:

\*1 Bit pattern interpolation and continuous interpolation are 4Mpps or less, helical interpolation is 2Mpps or less.

\*2 Parameter that is used in S-curve acceleration / deceleration driving.

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The Specifications are subject to change without notice due to the technical development. 2016.4

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