# NOVA electronics

# MC8541P

## PCI Bus 4-Axis Motion Control Board with circular/linear interpolation

MC8541P is a PCI-bus compliant board equipped with a 4-axis motion control IC, “MCX514" with interpolation function. It can independently control 4-axis of either stepper motor or pulse type servo motor for position and speed controls.


### ● Speed range-free

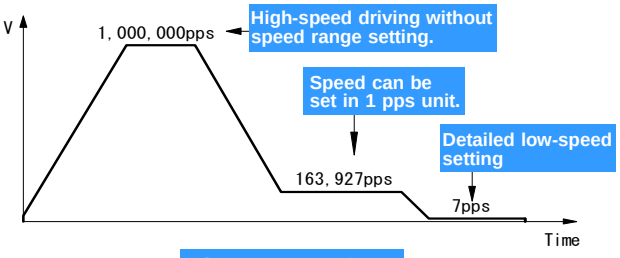
MC8541P has no multiple of speed. This enables users to set drive speed by 1pps unit. Also since there is no need to set speed multiple, the user can set a drive speed of output pulses as a speed parameter.

### ● 8 Stages of Pre-Buffer for Continuous Interpolation

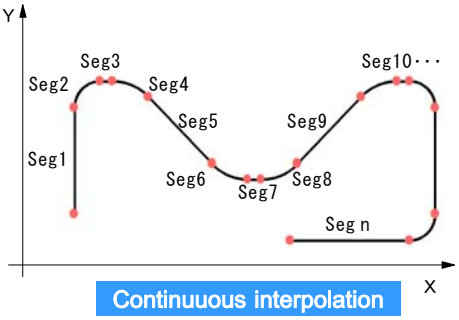
Equipped with 8 stages of pre-buffer register that stores finish point data (and others) in each segment, in order to handle continuous interpolation driving at high-speed.
When there is a short segment such as Seg3 in the lower center figure, if the average driving time of 8 segments including Seg3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

### ● Various Interpolation

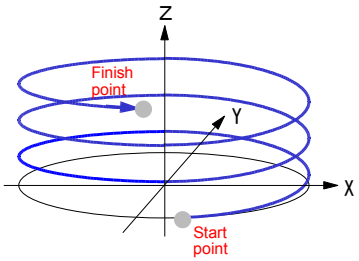
MC8541P can perform 2~4 axes linear interpolation, CW/CCW circular interpolation, 2~4 axes bit pattern interpolation (interpolation by bit data from CPU) and CW/CCW helical interpolation. Helical interpolation is an operation that moves another axis synchronizing with circular interpolation drive on XY plane (orthogonal coordinates). The figure in lower right shows the example to move Z-axis in the + direction corresponding to circular interpolation on XY plane.




Speed range-free

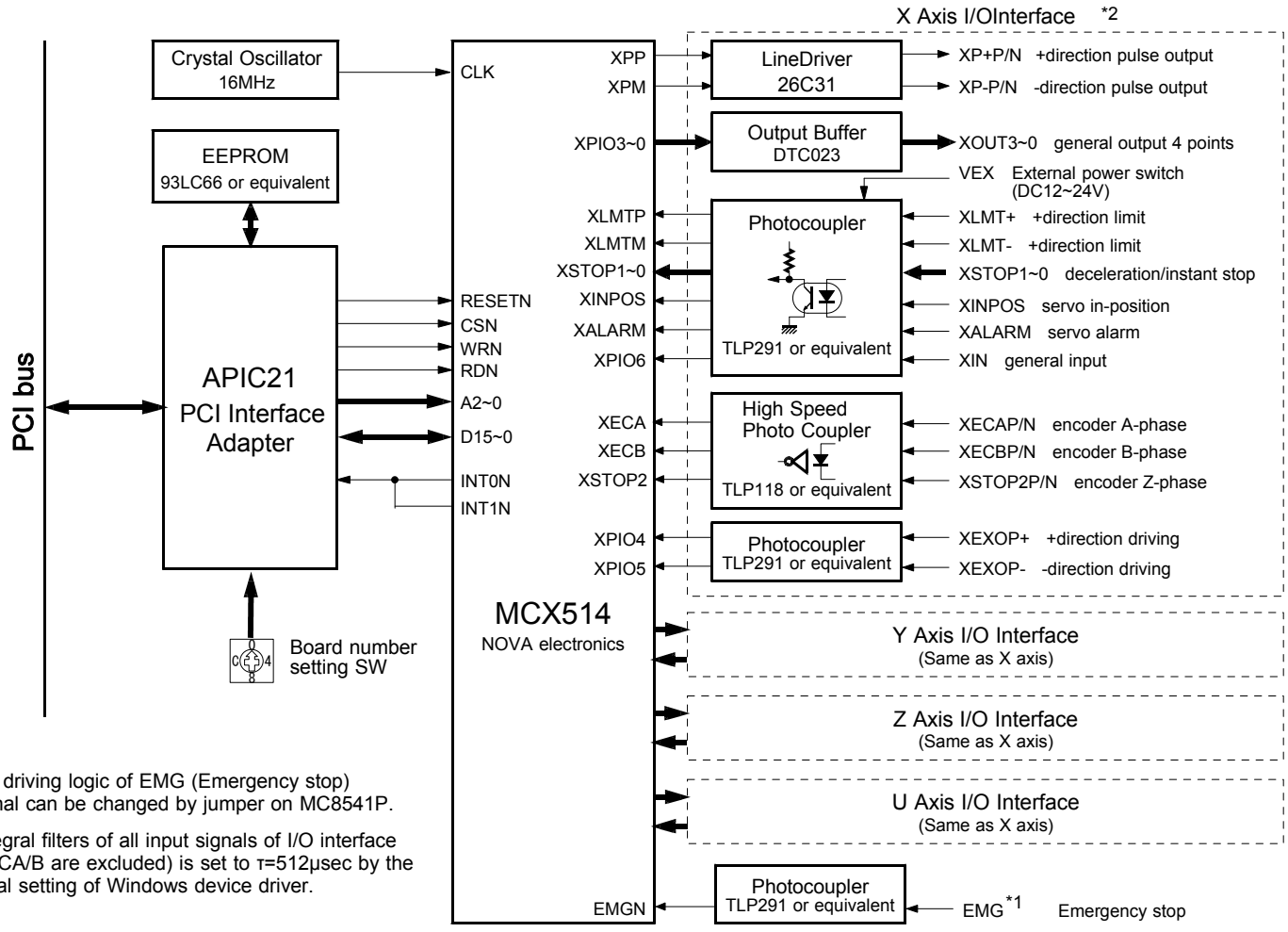



Continuuous interpolation




Helical interpolation

## Circuit Block Diagram and I/O Signal




*1 The driving logic of EMG (Emergency stop) signal can be changed by jumper on MC8541P.

*2 Integral filters of all input signals of I/O interface (nECA/B are excluded) is set to τ=512μsec by the initial setting of Windows device driver.

## Specification

- **Control Axis** 1 ~ 4 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**
  2~4 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$^2$ ~ 1,073,741,823 pps/sec$^2$ *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 OUT0 shares the pin with DCC output.
  - Output circuit: 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 MC8541P
  - Evaluation tool
  - VC/VB sample program

Software and user's manual are not attached to MC8541P.
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**

## Other Characteristics

- Operating Temperature: 0 ~ +45℃(No condensation)
- Power Voltage: +5V ±5%(Consumption current:700mA max.)
- External Power Voltage: +12~24V
- Board Dimensions: 174.6×106.7 mm(Connectors and brackets excluded)
- I/O Connector Type: FX2B-100PA-1.27DS(HIROSE)
- Accessories: FX2B-100SA-1.27R (HIROSE) with 1.2m cable

*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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