

RIO3-P02

User Manual



REVISION HISTORY				
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1.00		New Document	Oct 2020	(OPR), (PF)
1.00	17	Remove product list table and add a reference	Aug 2021	Faber
1.001	8, all	Pulse output frequency updated, typo and layout corrected	Nov 2022	Faber
1.02	12, 8; 6	Specification updated; wiring diagram updated	Feb 2025	Lankala

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1 Important Notes

Solid state equipment has operational characteristics differing from those of electromechanical equipment.

Safety Guidelines for the Application, Installation and Maintenance of Solid-State Controls describes some important differences between solid state equipment and hard-wired electromechanical devices.

Because of this difference, and because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will HITACHI be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any installation, HITACHI cannot assume responsibility or liability for actual use based on the examples and diagrams.

Warning!

- ✓ **If you don't follow the directions, it could cause a personal injury, damage to the equipment or explosion**
- ✓ Do not assemble the products and wire with power applied to the system. Else it may cause an electric arc, which can result into unexpected and potentially dangerous action by field devices. Arching is explosion risk in hazardous locations. Be sure that the area is non-hazardous or remove system power appropriately before assembling or wiring the modules.
- ✓ Do not touch any terminal blocks or IO modules when system is running. Else it may cause the unit to an electric shock or malfunction.
- ✓ Keep away from the strange metallic materials not related to the unit and wiring works should be controlled by the electric expert engineer. Else it may cause the unit to a fire, electric shock or malfunction.

Caution!

- ✓ **If you disobey the instructions, there may be possibility of personal injury, damage to equipment or explosion. Please follow below Instructions.**
- ✓ Check the rated voltage and terminal array before wiring. Avoid the circumstances over 50°C of temperature. Avoid placing it directly in the sunlight.
- ✓ Avoid the place under circumstances over 85% of humidity.
- ✓ Do not place Modules near by the inflammable material. Else it may cause a fire.
- ✓ Do not permit any vibration approaching it directly.
- ✓ Go through module specification carefully, ensure inputs, output connections are made with the specifications. Use standard cables for wiring.
- ✓ Use Product under pollution degree 2 environment.

1.1 Safety Instruction

1.1.1 Symbols

DANGER 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury, property damage, or economic loss. Attentions help you to identify a hazard, avoid a hazard, and recognize the consequences.

1.1.2 Safety Notes

DANGER 	The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, G-BUS Pin.
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1.1.3 Certification

UL Listed Industrial Control Equipment, certified for U.S.

See UL File E196687

CE Certificate

EN 61000-6-2; Industrial Immunity

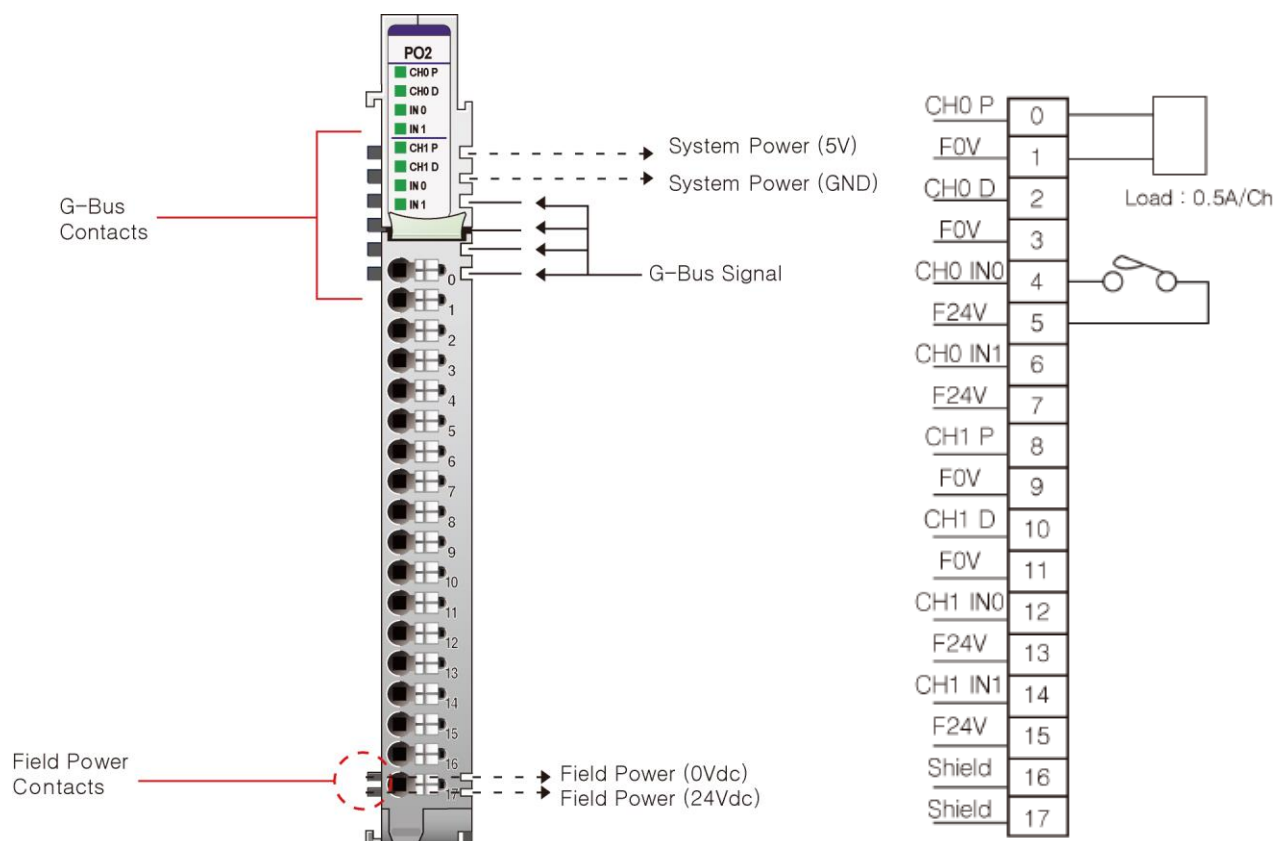
EN 61000-6-4; Industrial Emissions

Reach, RoHS (EU, CHINA), EAC

2 Specification

2.1 RIO3-PO2

2.1.1 Wiring Diagram

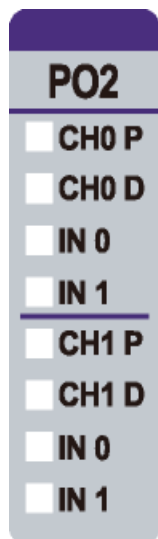


*Automatically switch current (sink/source) according to external load.

Pin No.	Signal Description
0	Pulse Output Channel #0
1	Field Power 0V, Common
2	Direction Output Channel #0
3	Field Power 0V, Common
4	Emergency Stop Input Channel #0
5	Field Power 24V, Common
6	Digital Input Channel #0
7	Field Power 24V, Common
8	Pulse Output Channel #1
9	Field Power 0V, Common
10	Direction Output Channel #1
11	Field Power 0V, Common
12	Emergency Stop Input Channel #1

13	Field Power 24V, Common
14	Digital Input Channel #1
15	Field Power 24V, Common
16	Shield
17	Shield

2.1.2 Indicator



LED No.	LED Function / Description	LED Color
0	Pulse Output Channel #0	Green
1	Direction Output Channel #0	Green
2	Emergency Stop Input #0	Green
3	Digital Input Channel #0	Green
4	Pulse Output Channel #1	Green
5	Direction Output Channel #1	Green
6	Emergency Stop Input #1	Green
7	Digital Input Channel #1	Green

2.1.3 Channel Status LED

Status	LED	Indicate
No Signal	Off	No Input / Output Signal
On Signal	Green	Input / Output Signal detected

2.1.4 Specification

Items	Specification
Pulse output specification	
Number of channels	2 channels
Number of outputs	2 outputs, push-pull type
Indicators	4 green LEDs - 2 Green Pulse LEDs - 2 Green Direction LEDs
Output voltage	24Vdc
Output current	0.5A per channel, 2.0A per Module *Automatically switch current (sink/source) according to external load. *Operating Temperature -40°C ~ 45°C: Max 0.5A per channel 45°C ~ 60°C: Max 0.3A per channel
Pulse output frequency	1Hz - 300kHz
Pulse output duty	About 50%
Pulse output quantity with one command	Continuous Pulse Output, Max. +1~ +2147483647(0x7FFFFFFF): Pulse direction output off. Max. -1~ -2147483647(0x80000000): Pulse direction output on.
Pulse output counter	Signed 32bit - wide
Function	Trapezoidal acceleration
Protection	Short circuit protection
Common type	4 common, field power 0V is common
Digital input specification	
Input per module	4 points sink type
Indicators	4 green terminal input status
Input on-state voltage	24Vdc nominal 15~30Vdc
Off-state voltage	8.3Vdc @ 25°C
On-state current	2.3mA @ 24Vdc 2.9mA @ 30Vdc
Input signal delay	OFF to ON : Max. 0.3ms @24Vdc ON to OFF : Max. 0.3ms @24Vdc
Nominal input impedance	10.2 kΩ typical
General specification	
Power dissipation	Max. 75mA @ 5Vdc
Isolation	I/O to Logic: photocoupler isolation Field power: non-isolation
UL field power	Supply voltage: 24Vdc nominal, Class 2
Field power	Supply voltage: 24Vdc nominal Voltage range: 15 ~ 30Vdc Power dissipation: Max. 45mA @ 24Vdc except load
Single Wiring	I/O Cable Max. 0.823mm ² (AWG18)
Weight	63g
Module size	12mm x 109mm x 70mm
Environment condition	Refer to 'Environment Specification'

2.1.5 Mapping data from the image table

Input Image Value - 10Byte

Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Pulse Output Counter CH#0 LL							
Byte 1	Pulse Output Counter CH#0 LH							
Byte 2	Pulse Output Counter CH#0 HL							
Byte 3	Pulse Output Counter CH#0 HH							
Byte 4	Pulse Output Counter CH#1 LL							
Byte 5	Pulse Output Counter CH#1 LH							
Byte 6	Pulse Output Counter CH#1 HL							
Byte 7	Pulse Output Counter CH#1 HH							
Byte 8	Emergency Stop Input CH#0				Digital Input CH#0			
Byte 9	Emergency Stop Input CH#1				Digital Input CH#1			

A Pulse Output Counter is a signed 32bit-wide data.

Emergency Stop Input 0,1: Stop the pulse output, when signal is detected on input channel.

Output Image Value - 14Byte

Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Frequency CH#0 Low Byte							
Byte 1	Frequency CH#0 High Byte							
Byte 2	Frequency CH#1 Low Byte							
Byte 3	Frequency CH#1 High Byte							
Byte 4	Pulse Output Qty CH#0 LL							
Byte 5	Pulse Output Qty CH#0 LH							
Byte 6	Pulse Output Qty CH#0 HL							
Byte 7	Pulse Output Qty CH#0 HH							
Byte 8	Pulse Output Qty CH#1 LL							
Byte 9	Pulse Output Qty CH#1 LH							
Byte 10	Pulse Output Qty CH#1 HL							
Byte 11	Pulse Output Qty CH#1 HH							
Byte 12	RUN0	ECP0	ACC0	CLR0	.	.	Multiple0	
Byte 13	RUN1	ECP1	ACC1	CLR1	.	.	Multiple1	

RUNx: Pulse Output Run

ECPx: (Enable Continuous Pulse): If this bit is '1' and Pulse Output Qty is not 0, pulse output always runs.

ACCx: Acceleration Function Enable. (It does not work when parameter value is 0 or frequency value is less than 3000.)

CLR x: Clear Real Pulse Output Counter

Frequency Multiple Selection

Value	Description
0 (B'00)	x1 Frequency Multiple
1 (B'01)	x10 Frequency Multiple
2 (B'10)	x100Frequency Multiple
3 (B'11)	x1000 Frequency Multiple

If Pulse Frequency = 123 and Frequency Multiple =2, Real Pulse Output is 12.3KHz (123*100).

2.1.6 Parameter Data

Valid Parameter length: 4 Bytes

Parameter Data

Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0	Acceleration Time CH#0 L							
Byte 1	Acceleration Time CH#0 H							
Byte 2	Acceleration Time CH#1 L							
Byte 3	Acceleration Time CH#1 H							

The unit is msec. if 1000, then Acceleration Time 1000msec.

The maximum is 10000. (10,000msec = 10sec)

2.1.7 Example

Example of Acceleration Function

* This Function is available when the frequency is over 3k and the Parameter value is not 0.

Setting for CH0 (same as CH1)

Frequency			
Byte0 (Low Byte)	0x14	Byte1 (High Byte)	0x00

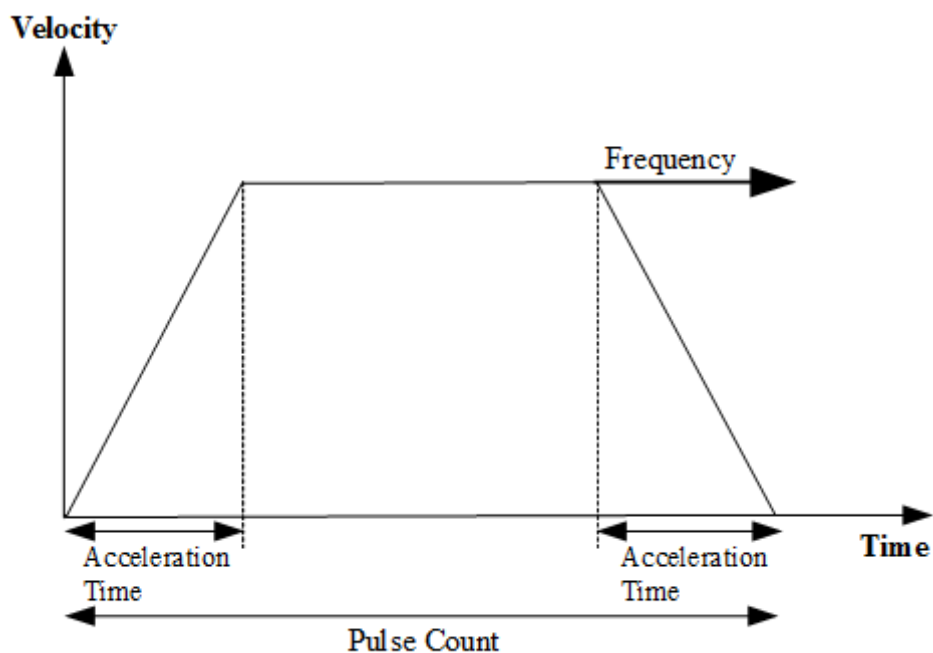
Pulse Output Qty							
Byte4 (LL)	0x50	Byte5 (LH)	0xC3	Byte6 (HL)	0x00	Byte7 (HH)	0x00

Control Byte (Byte 12) = 0xA3							
Bit7(RUN)	Bit6(ECP)	Bit5(ACC)	Bit4(CLR)	Bit3(None)	Bit2(None)	Bit1-0 (Multiple)	
1	0	1	0	.	.	0	3

Parameter (Acceleration Value)			
Byte0 (L)	0xE8	Byte1 (H)	0x03

=> Frequency = 25000 / Pulse Count = 50000 / Acceleration Time = 1,000msec

Result



※ If the counter value is not sufficient, the maximum velocity may not be reached.

3 Environment Specification

Environmental specification	
Operating Temperature	-40°C ~ 60°C
UL Temperature	-20°C ~ 60°C
Storage Temperature	-40°C ~ 85°C
Relative Humidity	5%~90% non-condensing
Mounting	DIN rail
General specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	Based on IEC 60068-2-6, 4g
Industrial Emissions	EN61000-6-4/A11: 2011
Industrial Immunity	EN61000-6-2: 2005
Installation Position	Vertical and horizontal installation is possible
Product Certifications	CE, UL

4.1 RIO3-PO2



5 Mounting

Caution!

Hot surface!

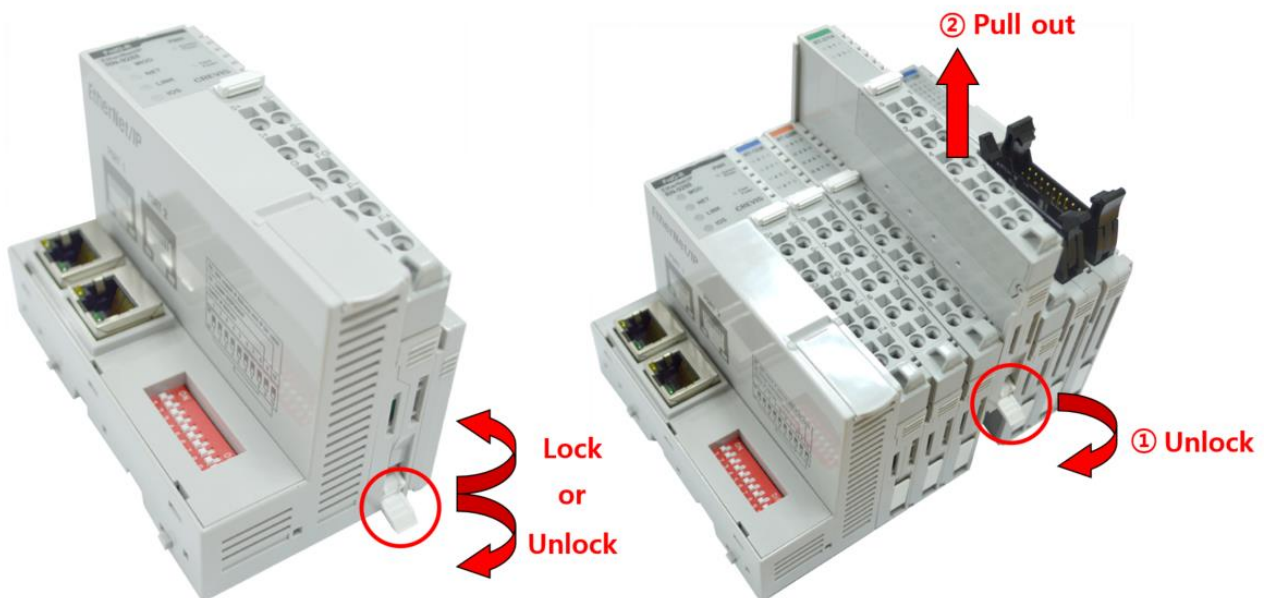
The surface of the housing can become hot during operation. If the device was operated at high ambient temperatures, allow it to cool off before touching it.

Notice!

Perform work on devices only if they are de-energized!

Working on energized devices can damage them. Therefore, turn off the power supply before working on the devices.

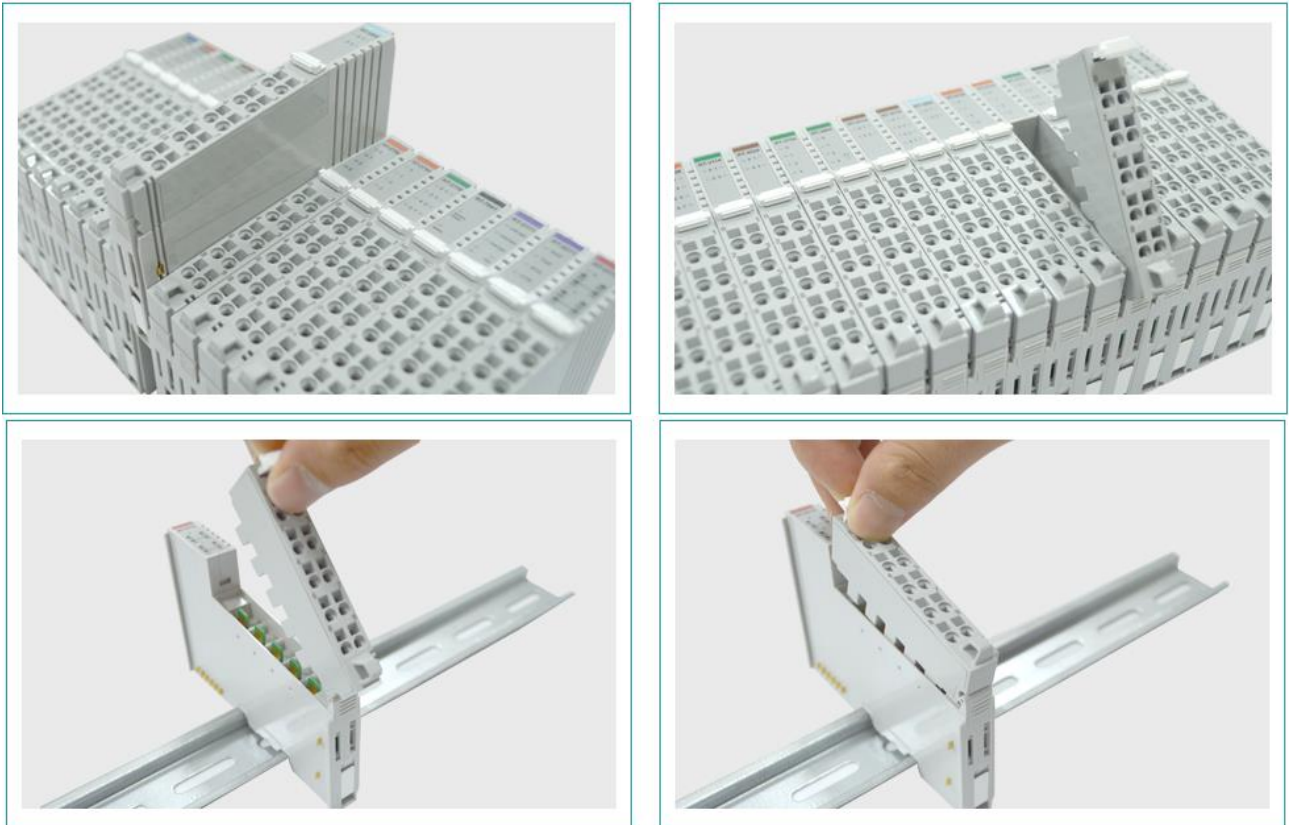
5.1 I/O Inserting and Removing Devices



As above figure in order to safeguard the RIO3-Module from jamming, it should be fixed onto the DIN rail with locking lever. To do so, fold on the upper of the locking lever.

To pull out the RIO3-Module, unfold the locking lever as below figure.

5.2 RTB (Removable Terminal Block)



Whole terminal block can be combined and removed for the convenience if its maintenance.

There is a locking switch on the RTB for the easy combination and easy removal.

Easy combination and easy removal for IO modules on the din rail through One Touch Locking Switch.

6 G-Bus Pin Description

Communication between the Network Adapter and the expansion module as well as system / field power supply of the bus modules is carried out via the internal bus. It is comprised of 6 data pin and 2 field power pin.



*Please refer to the table below regarding the pin description from P1 to P8.

No.	Description
P1	Field Power (VCC)
P2	Field Power (GND)
P3	GBUS CLK
P4	GBUS MISO
P5	GBUS MOSI
P6	GBUS Token
P7	System Power (GND)
P8	System Power (VCC)

DANGER



Do not touch data and field power pins in order to avoid soiling and damage by ESD noise.

APPENDIX A

A.1. Product List

Please refer the separate HX-RIO3 product list document

A.2. Glossary

System Power: The power for starting up CPU.

Field Power: The power for input and output line.

Terminator Resistor: Resistor for prevention reflected wave.

EDS: Electronic Data Sheet.

Sink: The method of in/output power supply if a device has no power source.

Source: The method of in/output power supply if a device has the power source.