



DELTA R2-ECx004 EtherCAT Remote I O Module User Manual

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Delta EtherCAT Remote I/O Module
R2-ECx004 User Manual

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R2-ECx004 EtherCAT Remote I O Module



Preface

Thank you for purchasing this product. This user manual provides information about the R2-ECx004 EtherCAT remote control digital I/O expansion module.

This manual includes:

- Product inspection and model explanation
- Specifications and product interface
- Wiring and installation
- CiA 401 Device Profile
- Object Dictionary
- SDO abort codes

Product features of the EtherCAT remote control expansion module:

The R2-ECx004 distributed I/O module supports the EtherCAT (Ethernet Control Automation Technology) communication protocol, which makes this module a high-performance remote I/O bus system.

The digital input port(s) of this module supports reading the status of the NPN type and PNP type loads, and the digital output port(s) supports NPN type loads.

The module can read and control the remote digital signal status of the master and acquire the load status (within 1 ms) of multiple slave modules through the EtherCAT communication.

The EtherCAT series product line consists of modules of various functions and features, which meet different remote automation control requirements. This product is the optimal integration platform for multi-point I/O control. It is easy to assemble with better stability and scalability. This is the one and only choice for industrial upgrading.

How to use this user manual:

Use this user manual as a reference when installing, setting up, using, and maintaining the R2-ECx004 EtherCAT remote control digital I/O expansion module.

Delta technical services:

Please consult your DELTA equipment distributors or DELTA Customer Service Center if you encounter any problems.

Safety Precautions

1. Perform wiring in accordance with the descriptions of connection ports and ensure to properly ground the system.
2. When applying power to the module, do not disassemble the module, change the wiring, or touch the power supply to prevent electric shock.

Pay special attention to the following safety precautions at all times during installation, wiring, and operation of the product.

The symbols of “DANGER”, “WARNING”, and “STOP” indicate:



Danger. May cause severe or fatal injuries to personnel if the instructions are not followed.



WARNING Warning. May cause moderate injury to personnel, or lead to severe damage or even malfunction of the product if the instructions are not followed.



STOP Absolutely prohibited activities. May cause serious damage or even malfunction of the product if the instructions are not followed.

Installation



It is recommended that you install this module in a suitable electrical control panel and make sure the ambient temperature is lower than 60°C (140°F).

Do not place the product in an environment containing oil mist, salt mist, and dust.

Do not use the product in an environment containing flammable and explosive gases.

The electric arc generated when you switch the relay On or Off might ignite the gases.

Wiring



The wires used for wiring should be UL-compliant with the following specification.

Wire gauge: 26 – 18 AWG; temperature rating: > 105°C (221°F); material: copper.

To prevent electric shock, make sure to cut off the power to the module and the common input / output points before removing the module or the connected wires.

This product uses DC power only. Do not use AC power for the product.

Operation



This product is for industrial automation and other related applications. For your safety, the instructions for installation and operation in this manual should be observed.

Wipe clean with dry cloth to keep the product from humidity.

Use the power adapters that comply with the power supply requirements of UL 61010-1, UL 61010-2-201, or UL 62368-1 for this product.

The power for the module and the common input / output points should be two independent power supplies and within the rated voltage. If you are uncertain of the voltage in your area, contact local electrical technicians.

Do not attempt to disassemble or repair the module yourself if a malfunction occurs. Contact Delta or the distributor for technical support.

Product Inspection and Model Explanation

This chapter includes the product inspection and model explanation of the R2-ECx004 series products. Read this chapter first to get an overall understanding of the products before use.

1.1 Product inspection

Check the following after you receive the product.

1. Packaging: check if the shipping carton is intact.
2. Bubble wrap: the bubble wrap is used to protect the product from collision. Check if the stickers are securely attached to the bubble wrap.
3. R2-ECx004: check if the product appearance is intact.
4. Instruction sheet: check if an instruction sheet is included.

1.2 Model explanation

R 2 - E C - x0 04
(1)(2) (3) (4) (5)

No.	Item	Description	
(1)	Product type	R	Remote I/O series
(2)	Product category	2	Board type (distributed I/O system)
(3)	Bus type	EC	EtherCAT
(4)	Module type	00	Mixed I/O module
		10	Input module
		20	Output module
(5)	Module subtype	04	24 VDC / 32-CH

Specifications and Product Interface

This chapter introduces the specifications of the R2-ECx004 series products, including electrical specifications, product diagram, dimensional drawings, and definitions of the connection ports and indicators.

2.1 Electrical specifications

Item	R2-EC <u>0</u> 004		R2-EC <u>1</u> 004	R2-EC <u>2</u> 004
Power	24 VDC, -15% to +20%			
Module input current	< 1A			
Digital input / output	Digital input	Digital output	Digital input	Digital output
Isolation type	Optical coupling	Optical coupling	Optical coupling	Optical coupling
Signal type	Sink / Source	Sink	Sink / Source	Sink
Number of I/O points	16-CH	16-CH	32-CH	32-CH
I/O maximum operating power	24 VDC @ 5.1 mA	200 mA per CH	24 VDC @ 5.1 mA	200 mA per CH
I/O rated input power	24 VDC	24 VDC	24 VDC	24 VDC
Operating frequency	≤ 1 kHz	≤ 1 kHz	≤ 1 kHz	≤ 1 kHz
Operation time (OFF > ON)	300 μs	85 μs	300 μs	85 μs
Release time (ON > OFF)	300 μs	110 μs	300 μs	110 μs
Outer dimensions	52.5 x 74.8 x 88.0 mm (W x H x D)			
Weight	0.25 kg (0.55 lbs)			
Permissible atmospheric pressure	Operation: 1,013 to 795 hPa (approx. 0 m to 2,000 m / 0 ft. to 6,560 ft. above sea level) Storage: 1,013 to 660 hPa (approx. 0 m to 3,500 m / 0 ft. to 11,400 ft. above sea level)			
Operating environment	Operating temperature: -20°C to +60°C (-4°F to +140°F) Storage temperature: -40°C to +70°C (-40°F to +158°F)			
Mounting type	DIN rail mounting			
Vibration resistance / Shock resistance	Conforms to EN 60068-2-6 / EN 60068-2-27/29			
Electromagnetic compatibility / Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2) EFT (IEC 61131-2, IEC 61000-4-4) RS (IEC 61131-2, IEC 61000-4-3)			
IP rating	IP20			
Approvals				

2.2 Product diagram and dimensions

The R2-ECx004 series products are digital input and digital output modules. The input modules support DC sink /

source output devices. The output modules use NPN transistor circuits, supporting connection to 24 VDC loads.

2.2.1 Product diagram

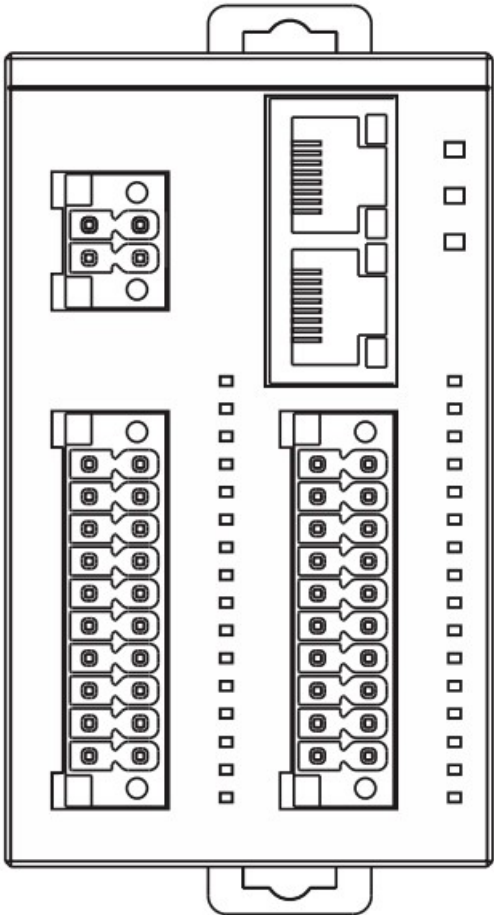
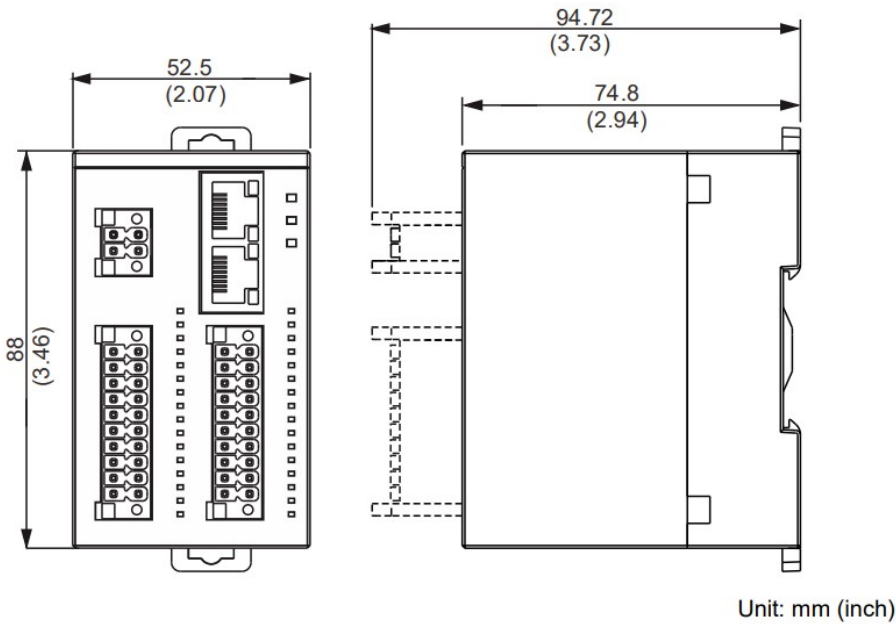


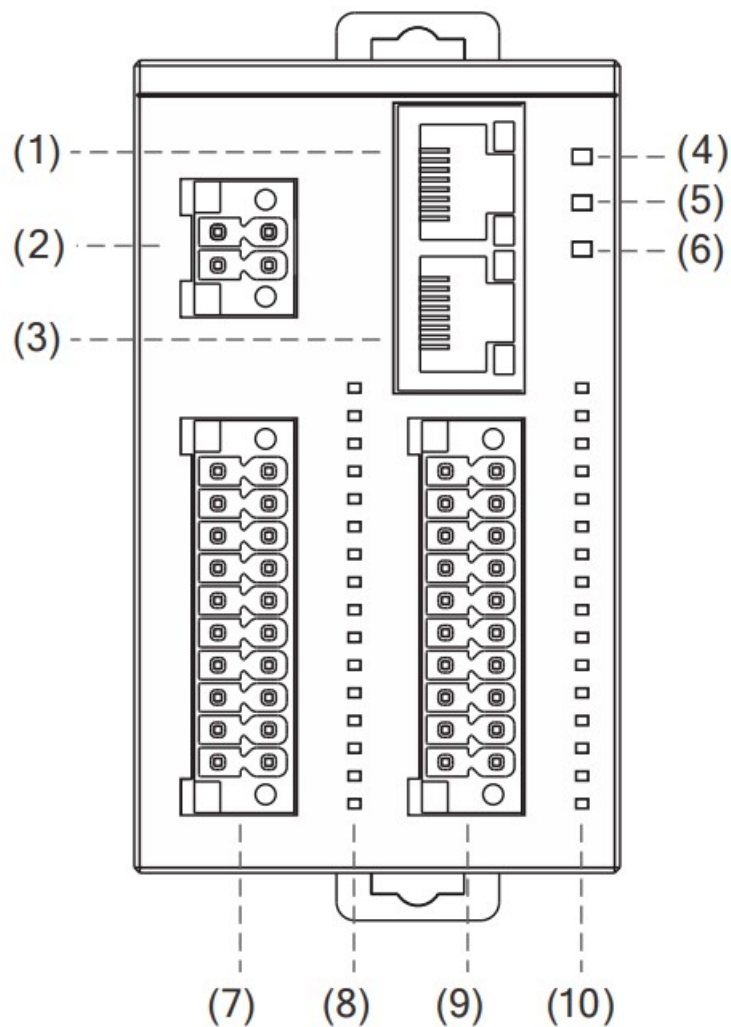
Figure 2.2.1.1 Front view of R2-ECx004

2.2.2 Outer dimensions



2.3 Description and illustration of product interface

The following describes the product interface of the R2-ECx004 series models.

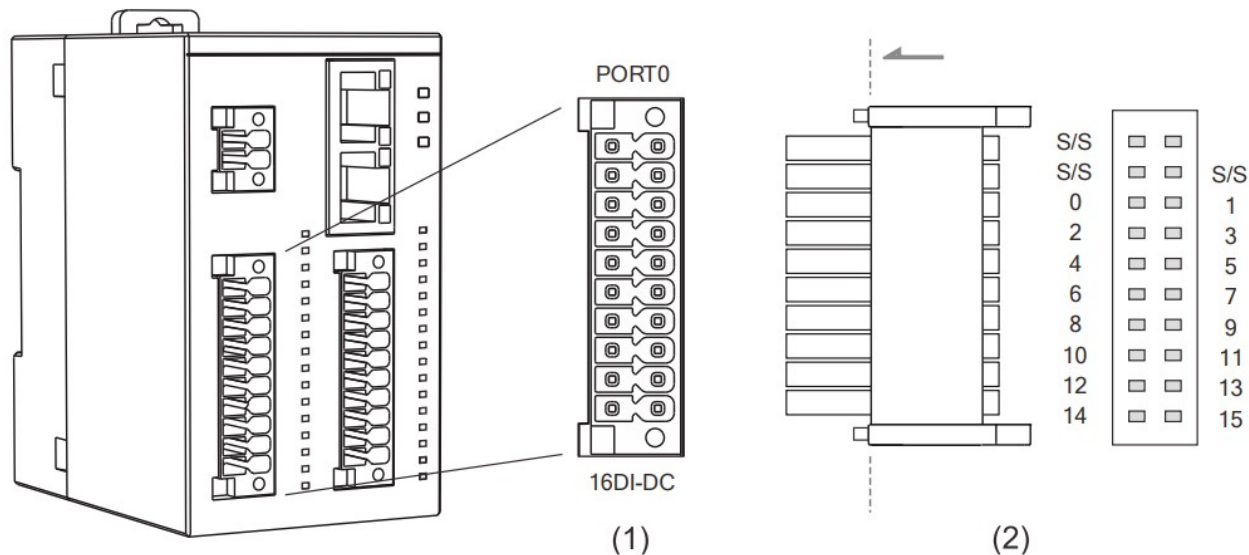


No.	Description		
(1)	EtherCAT input port (connection status indicator included)		
(2)	Module power port		
(3)	EtherCAT output port (connection status indicator included)		
(4)	Module power indicator (PWR)		
(5)	Module communication indicator (RUN)		
(6)	Module error indicator (ERR)		
(7)	GPIO Port 0	Input port	R2-EC0004, R2-EC1004
		Output port	R2-EC2004
(8)	GPIO Port 0 status indicators		
(9)	GPIO Port 1	Input port	R2-EC1004
		Output port	R2-EC0004, R2-EC2004
(10)	GPIO Port 1 status indicators		

2.4 Description of connection ports and indicators

2.4.1 R2-ECx004 IO Port 0

Definitions of Port 0 for R2-EC0004 and R2-EC1004 models are as follows.



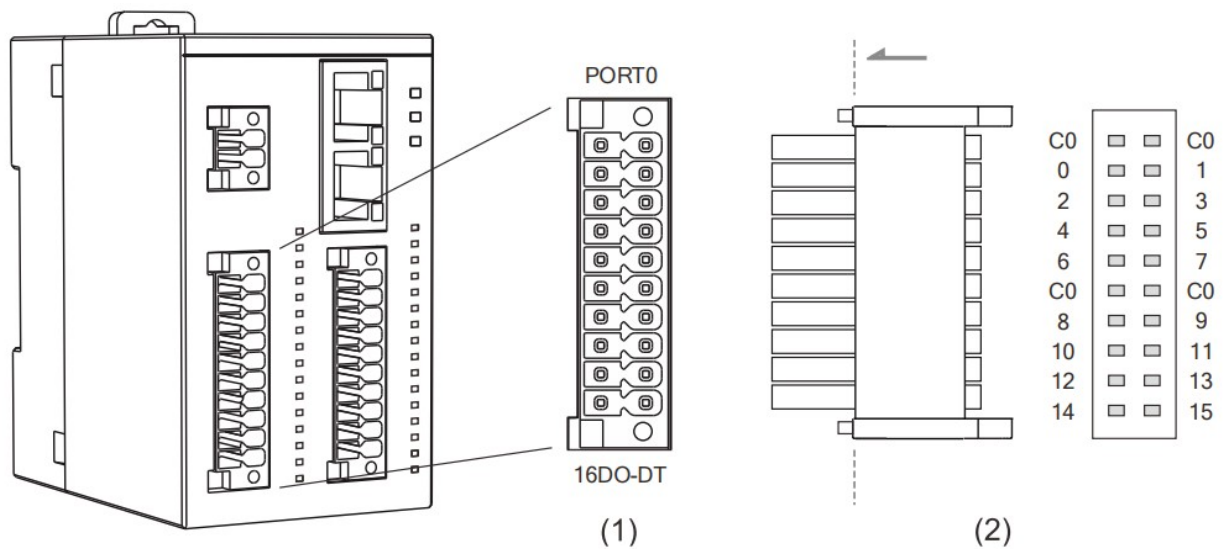
Pin	Description	Pin	Description
S/S*	Common input point	–	Reserved (no connection)
S/S*	Common input point	S/S*	Common input point
0	1st input of Port 0	1	2nd input of Port 0
2	3rd input of Port 0	3	4th input of Port 0
4	5 th input of Port 0	5	6 th input of Port 0
6	7th input of Port 0	7	8th input of Port 0
8	9th input of Port 0	9	10th input of Port 0
10	11th input of Port 0	11	12th input of Port 0
12	13th input of Port 0	13	14th input of Port 0
14	15th input of Port 0	15	16th input of Port 0

Note: S/S is the common input point for connecting the NPN type or PNP type load. When an NPN type load is connected, S/S functions as Vcc. When a PNP type load is connected, S/S functions as GND.



WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points to ensure proper operation.
- Use 26 – 18 AWG wires for wiring.
- Definitions of Port 0 for R2-EC2004 models are as follows.



Pin	Description	Pin	Description
C0	Common output point	C0	Common output point
0	1st output of Port 0	1	2nd output of Port 0
2	3rd output of Port 0	3	4th output of Port 0
4	5th output of Port 0	5	6th output of Port 0
6	7th output of Port 0	7	8th output of Port 0
C0	Common output point	C0	Common output point
8	9th output of Port 0	9	10th output of Port 0
10	11th output of Port 0	11	12th output of Port 0
12	13th output of Port 0	13	14th output of Port 0
14	15th output of Port 0	15	16th output of Port 0

Note: C0 is the common output point for connecting the NPN type load. When an NPN type load is connected, C0 functions as GND.

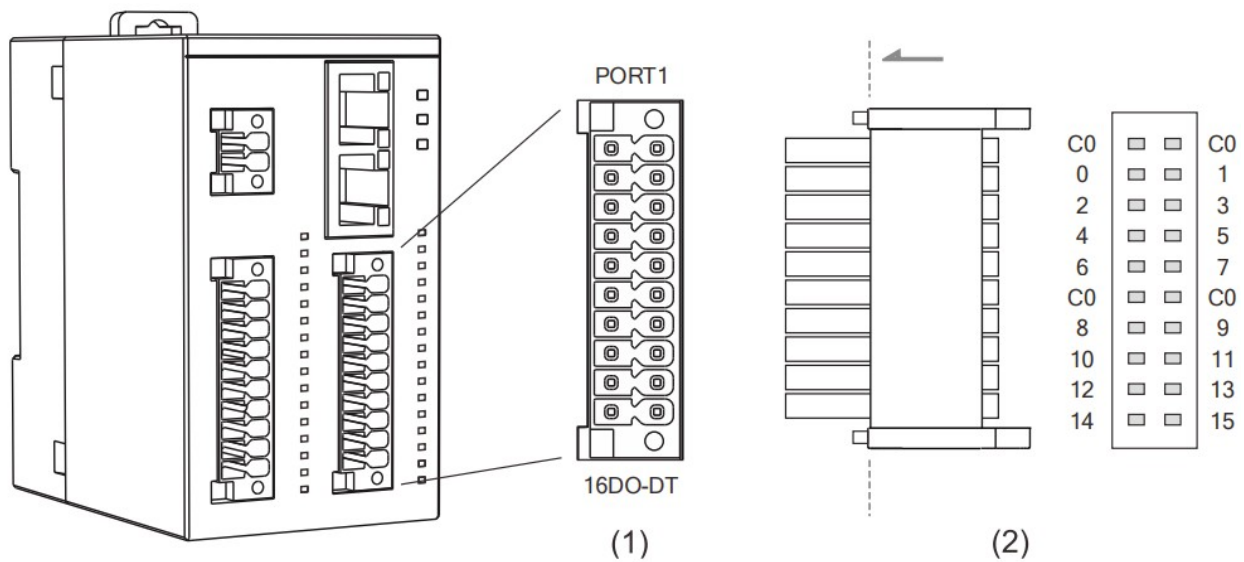


WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points to ensure proper operation.
- Use 26 – 18 AWG wires for wiring.

2.4.2 R2-ECx004 IO Port 1

- Definitions of Port 1 for R2-EC0004 and R2-EC2004 models are as follows.



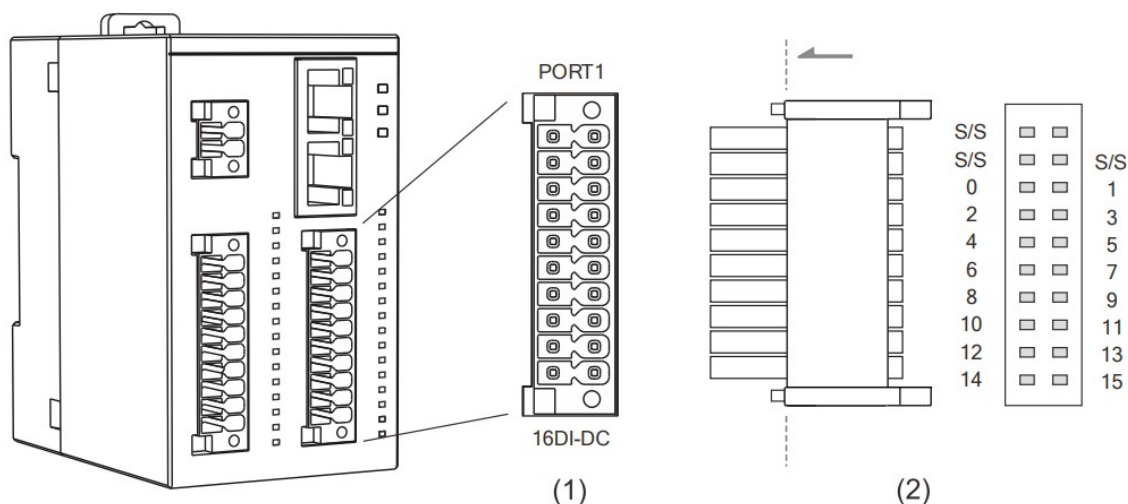
Pin	Description	Pin	Description
C0	Common output point	C0	Common output point
0	1st output of Port 1	1	2nd output of Port 1
2	3rd output of Port 1	3	4th output of Port 1
4	5th output of Port 1	5	6th output of Port 1
6	7th output of Port 1	7	8th output of Port 1
C0	Common output point	C0	Common output point
8	9th output of Port 1	9	10th output of Port 1
10	11th output of Port 1	11	12th output of Port 1
12	13th output of Port 1	13	14th output of Port 1
14	15th output of Port 1	15	16th output of Port 1

Note: C0 is the common output point for connecting the NPN type load. When an NPN type load is connected, C0 functions as GND.



WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points for proper operation.
- Use 26 – 18 AWG wires for wiring.
- Definitions of Port 1 for R2-EC1004 models are as follows.



Pin	Description	Pin	Description
S/S*	Common input point	–	Reserved (no connection)
S/S*	Common input point	S/S*	Common input point
0	1st input of Port 1	1	2nd input of Port 1
2	3rd input of Port 1	3	4th input of Port 1
4	5th input of Port 1	5	6th input of Port 1
6	7th input of Port 1	7	8th input of Port 1
8	9th input of Port 1	9	10th input of Port 1
10	11th input of Port 1	11	12th input of Port 1
12	13th input of Port 1	13	14th input of Port 1
14	15th input of Port 1	15	16th input of Port 1

Note: S/S is the common input point for connecting to the NPN type or PNP type load. When an NPN type load is connected, S/S functions as Vcc. When a PNP type load is connected, S/S functions as GND.

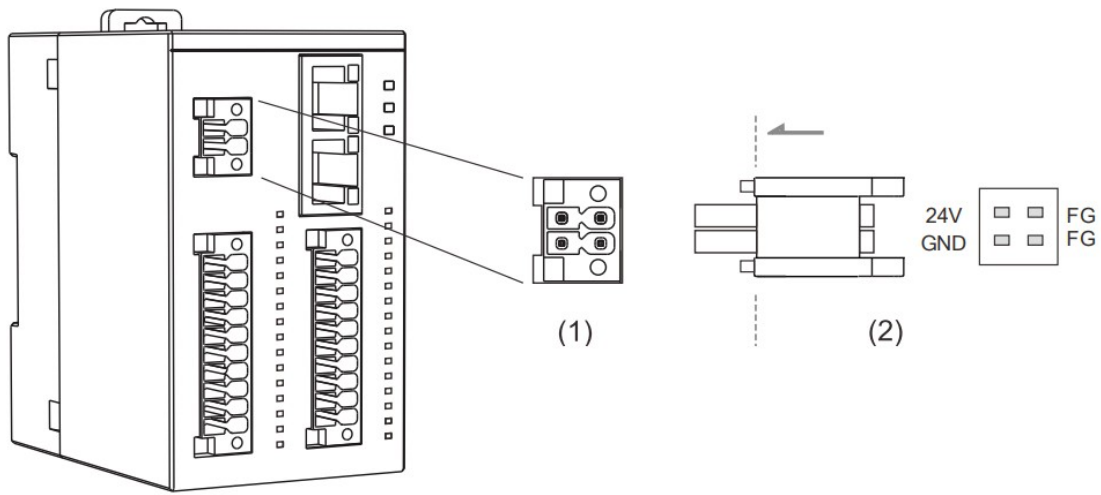


WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points for proper operation.
- Use 26 – 18 AWG wires for wiring.

2.4.3 R2-ECx004 power port

Definitions of the power port for the R2-ECx004 series models are as follows.



Pin	Description	Note
24V	Module external power of 24 VDC	Range of error: -15% to +20%
GND	Ground for module external power	—
FG	Functional ground	—

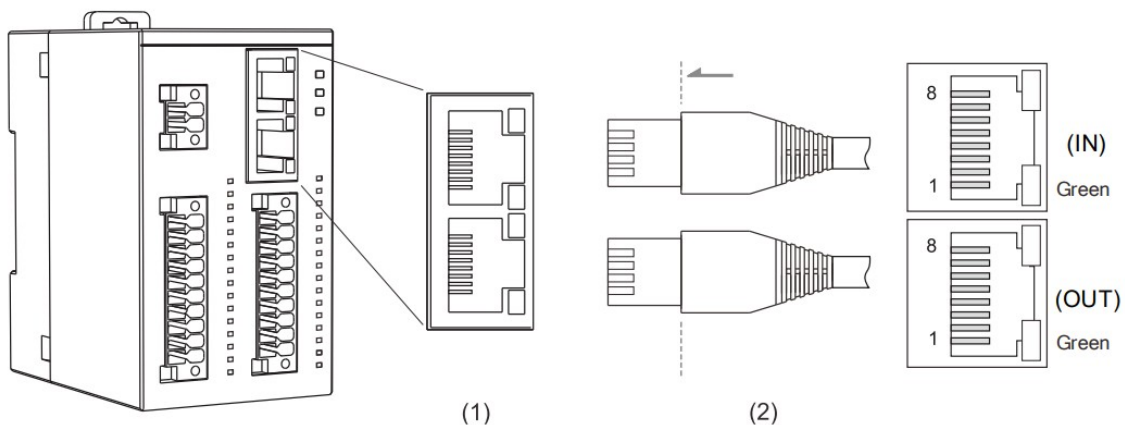


WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points for proper operation.
- Use 26 – 18 AWG wires for wiring.

2.4.4 EtherCAT communication ports and indicators

Definitions of the communication ports and LED indicators for the R2-ECx004 series models are as follows.



The LED indicators for the communication ports (RJ-45) are green, which indicate the EtherCAT communication connection status.

Indicator status	Description	Note
OFF	EtherCAT connection is not established.	Off
ON	EtherCAT connection is established but no data transmission.	Solid on
Blinking	EtherCAT connection is established and data is in transmission.	Flashing

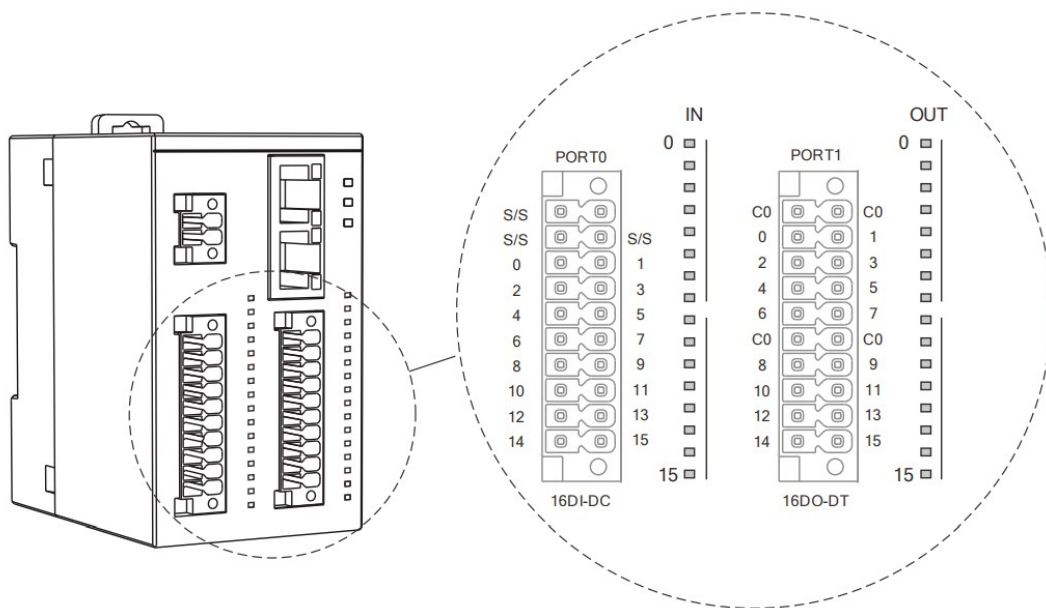


WARNING Follow the instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points for proper operation.
- Use 26 – 18 AWG wires for wiring.

2.4.5 R2-ECx004 IO indicators

- Definitions of the LED indicators for Port 0 and Port 1 of the R2-EC0004 series models are as follows.

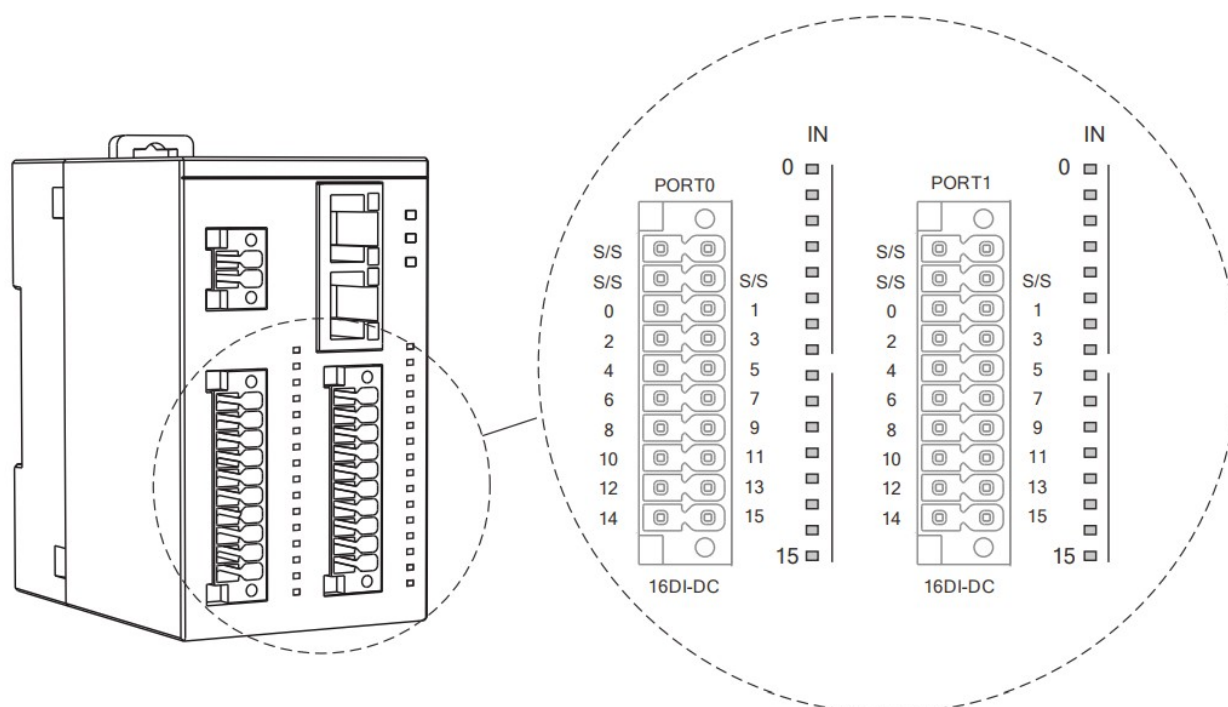


The LED indicators show the status of the GPIO signals. When the input / output signal is on, the corresponding indicator shows green (solid on).

IN Port 0		OUT Port 1	
Indicator No.	Corresponding IO port	Indicator No.	Corresponding IO port
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

Note: the LED indicator turns on when the controller activates the inputs / outputs. If the actual signal is not on, check for the wiring.

■ Definitions of the LED indicators for Port 0 and Port 1 of the R2-EC1004 series models are as follows.

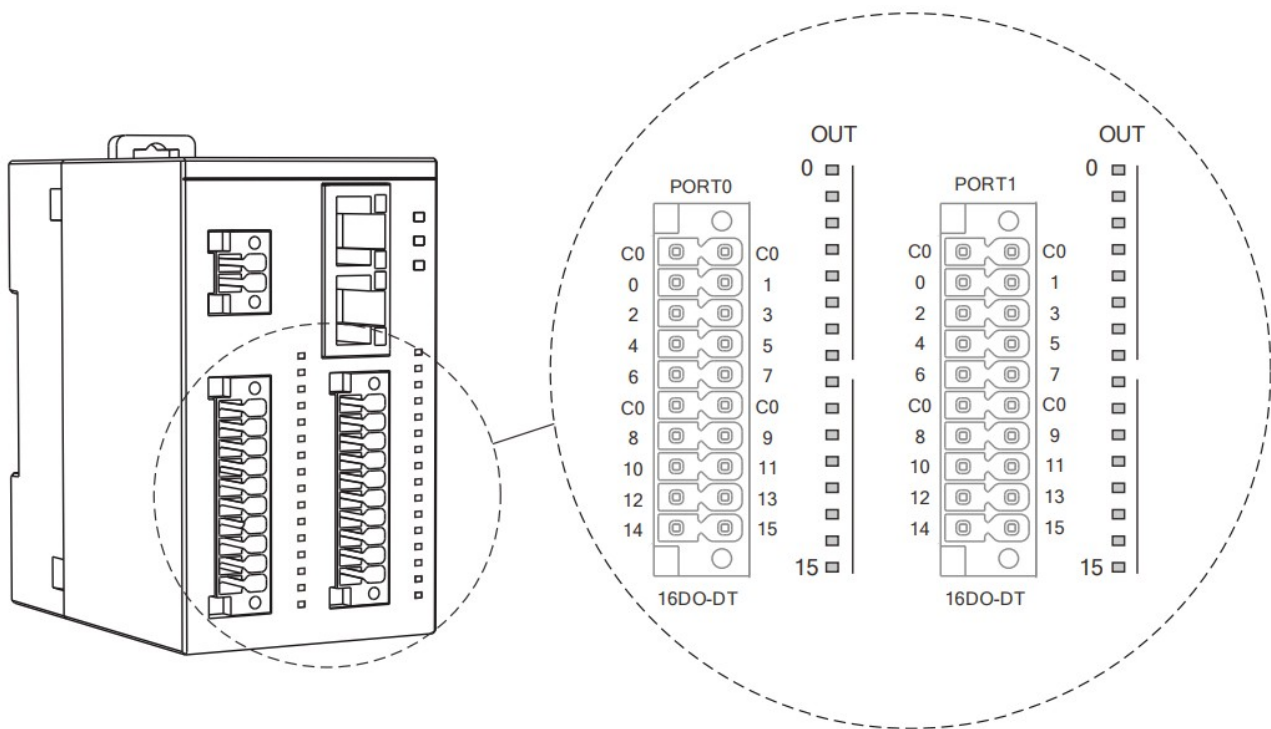


The LED indicators show the status of the GPIO signals. When the input / output signal is on, the corresponding indicator shows green (solid on).

IN Port 0		IN Port 1	
Indicator No.	Corresponding IO port	Indicator No.	Corresponding IO port
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

Note: the LED indicator turns on when the controller activates the inputs / outputs. If the actual signal is not on, check for the wiring.

■ Definitions of the LED indicators for Port 0 and Port 1 of the R2-EC2004 series models are as follows.



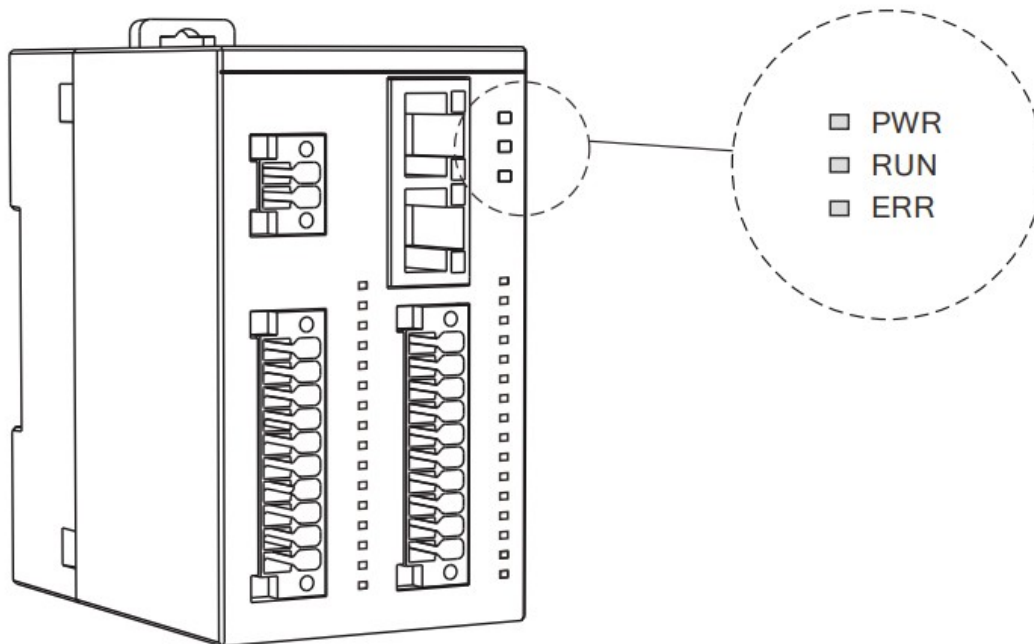
The LED indicators show the status of the GPIO signals. When the input / output signal is on, the corresponding indicator shows green (solid on).

OUT Port 0		OUT Port 1	
Indicator No.	Corresponding IO port	Indicator No.	Corresponding IO port
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15

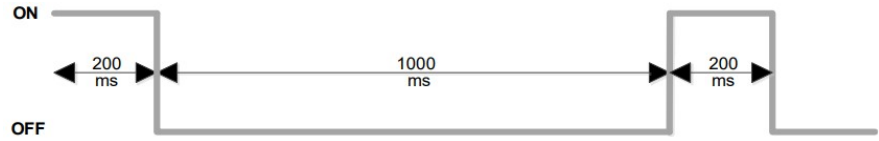
Note: the LED indicator turns on when the controller activates the inputs / outputs. If the actual signal is not on, check for the wiring.

2.4.6 R2-ECx004 module status indicators

Definitions of the LED indicators for the module status of the R2-ECx004 series models are as follows.



The module status indicators include module power indicator (PWR), module communication status indicator (RUN), and module error indicator (ERR).

Indicator name	Indicator status	Description
PWR (green light)	ON	The external power of 24 VDC is supplied.
	OFF	No voltage input or voltage error.
RUN (green light)	OFF	Init state (initialization)
	Continuous flashing	Safe-operational state. The flashing frequency is shown as follows. 
	Single flashing	Pre-operational state. The flashing frequency is shown as follows. 
	ON	Operation state (normal operation)
ERR (red light)	Double flashing	Disconnection or connection is in error. The flashing frequency is shown as follows. 
	OFF	No error occurs.

Wiring and Installation

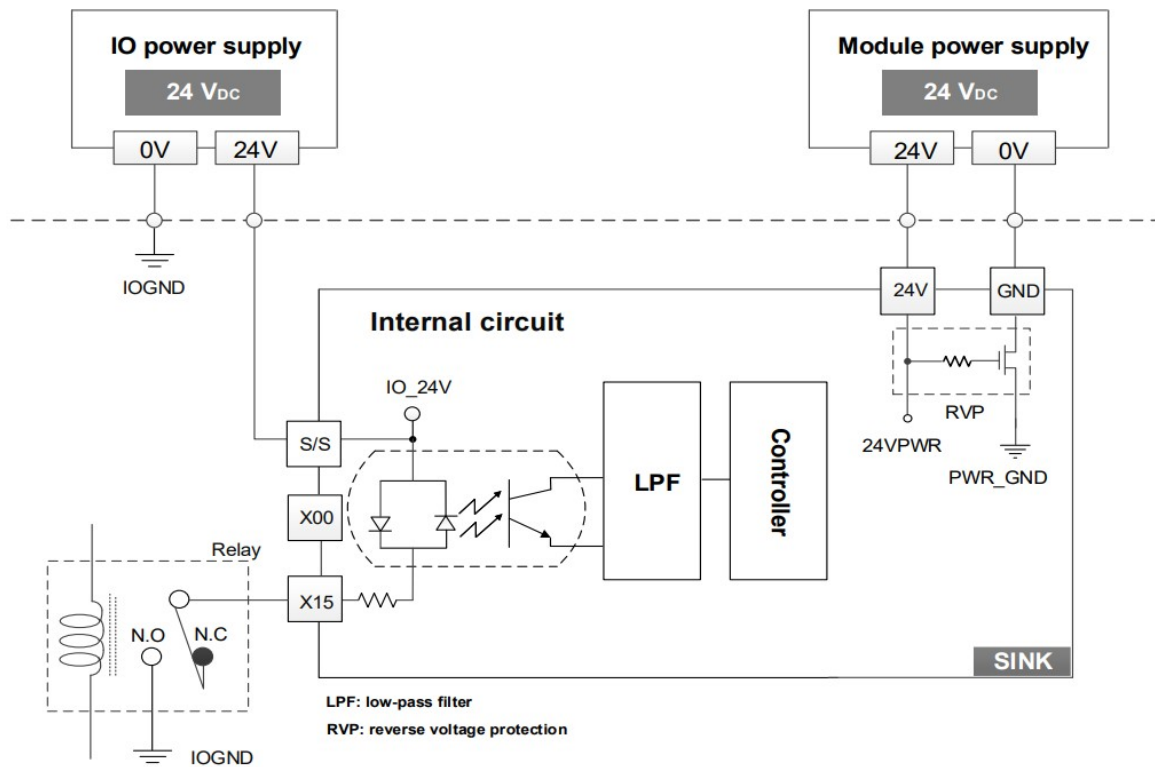
This chapter introduces the wiring examples of input and output ports, system structure example, and installation for the R2-ECx004 products.

3.1 Input port wiring example

Connect NPN (SINK) type load to R2-ECx004 input ports

The IO power (IO_24V / IOGND) and module power (24VPWR / PWR_GND) should be two independent power circuits.

The following figure illustrates a single input point (X15). The structure is the same for the other 15 input points (X01 – X14). The rated voltage is 24 VDC for the input port and module power port. Do not use a power supply exceeding 28.8 VDC or an AC power supply to avoid damaging the module circuit.



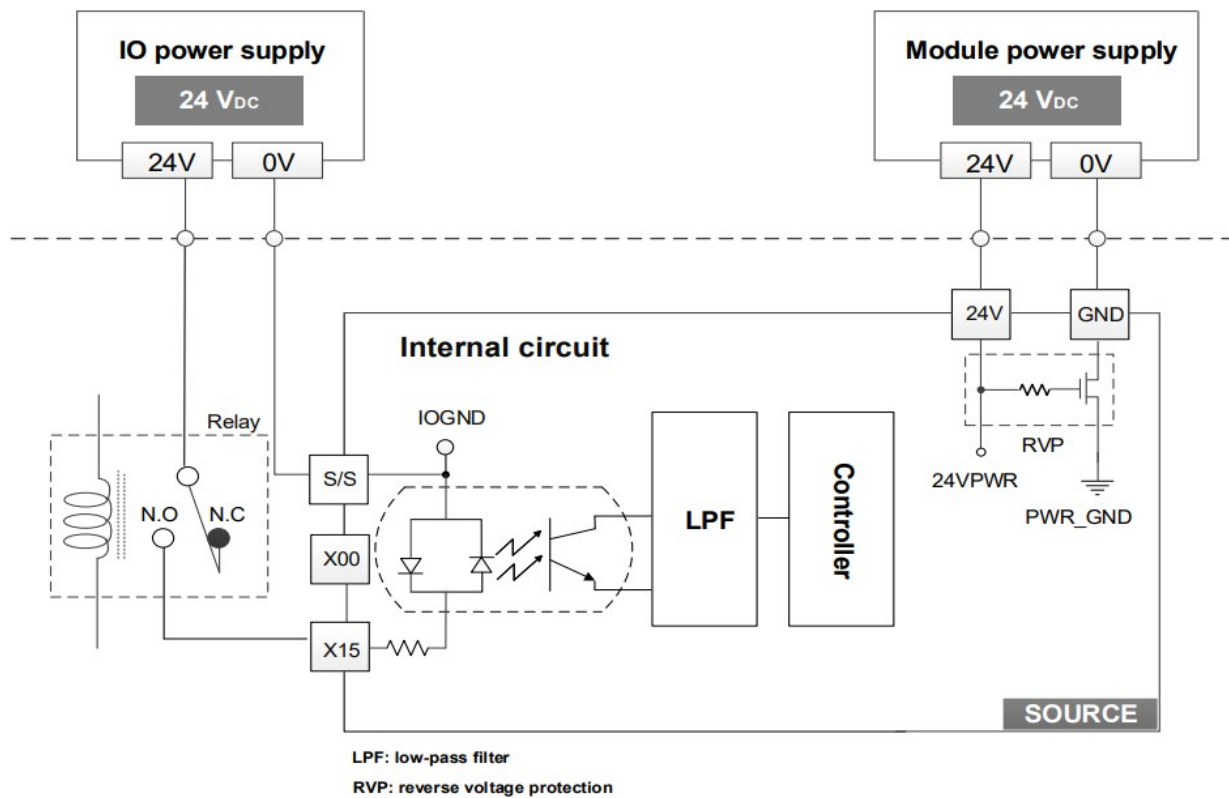
WARNING

Follow these instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points to ensure proper operation.
- Use 26 – 18 AWG wires for wiring.
- Connect PNP (SOURCE) type load to R2-ECx004 input ports

The IO power (IO_24V / IOGND) and module power (24VPWR / PWR_GND) should be two independent power circuits.

The following figure illustrates a single input point (X15). The structure is the same for the other 15 input points (X01 – X14). The rated voltage is 24 VDC for the input port and module power port. Do not use a power supply exceeding 28.8 VDC or an AC power supply to avoid damaging the module circuit.



WARNING

Follow these instructions for power supply and wiring to prevent any danger.

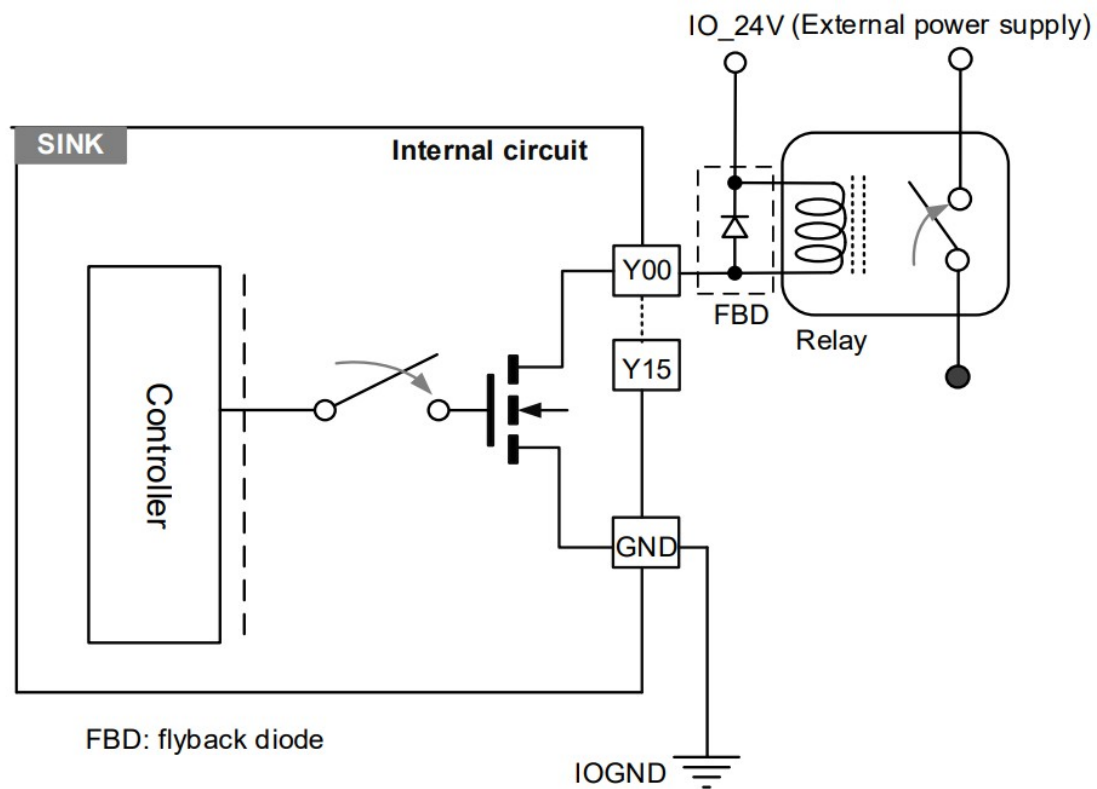
- Use two independent 24 VDC power supplies for the module and the common input / output points to ensure proper operation.
- Use 26 – 18 AWG wires for wiring.

3.2 Output port wiring example

Connect NPN (SINK) type load to R2-ECx004 output ports

The IO power (IO_24V / IOGND) and module power (24VPWR / PWR_GND) should be two independent power circuits.

The following figure illustrates a single output point (Y00). The structure is the same for the other 15 output points (Y01 – Y15). Connect the GND of the output port to IOGND to avoid output status error. If an inductive load is connected, ensure to connect a flyback diode to both sides of the inductive load in parallel to protect the output circuit.

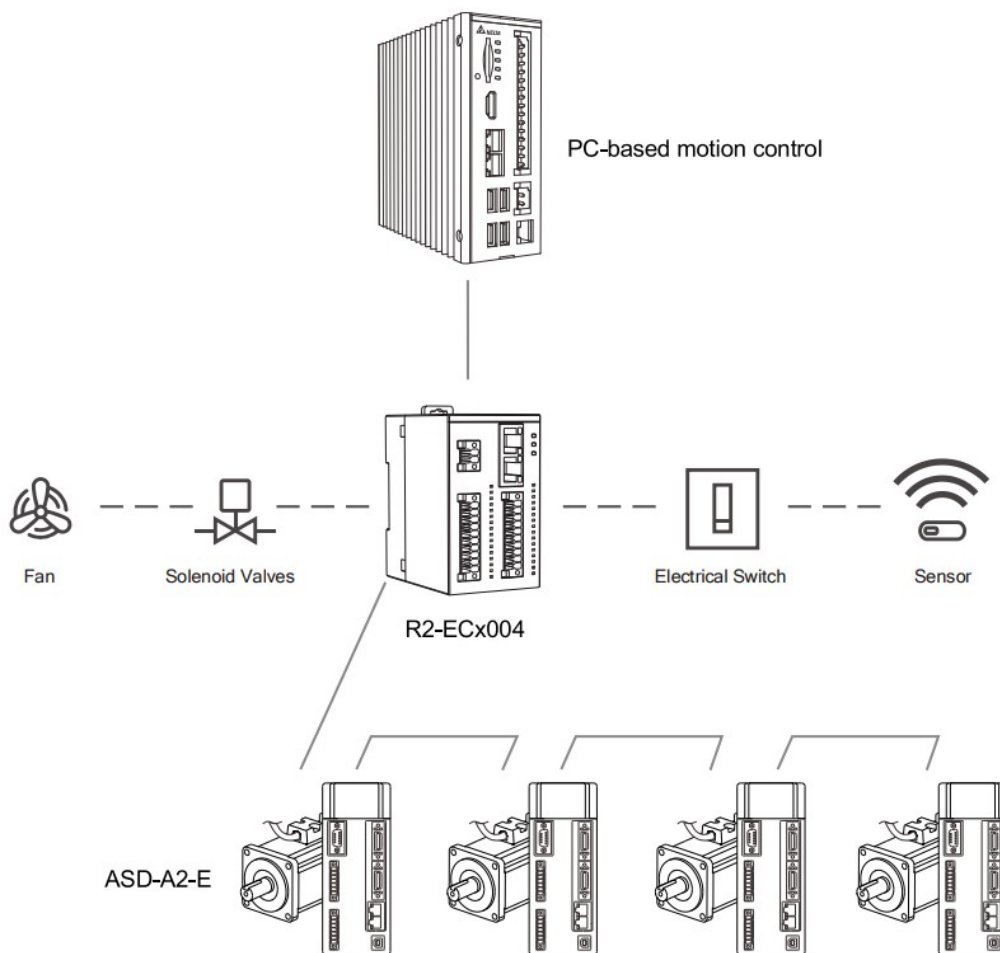


Follow these instructions for power supply and wiring to prevent any danger.

- Use two independent 24 VDC power supplies for the module and the common input / output points to ensure proper operation.
- Use 26 – 18 AWG wires for wiring.

3.3 System structure example

The controller connects to the EtherCAT device (R2-ECx004) through Ethernet (RJ-45) to communicate with the slave modules (such as ASD-A2-E), accessing and controlling the status of the slaves.



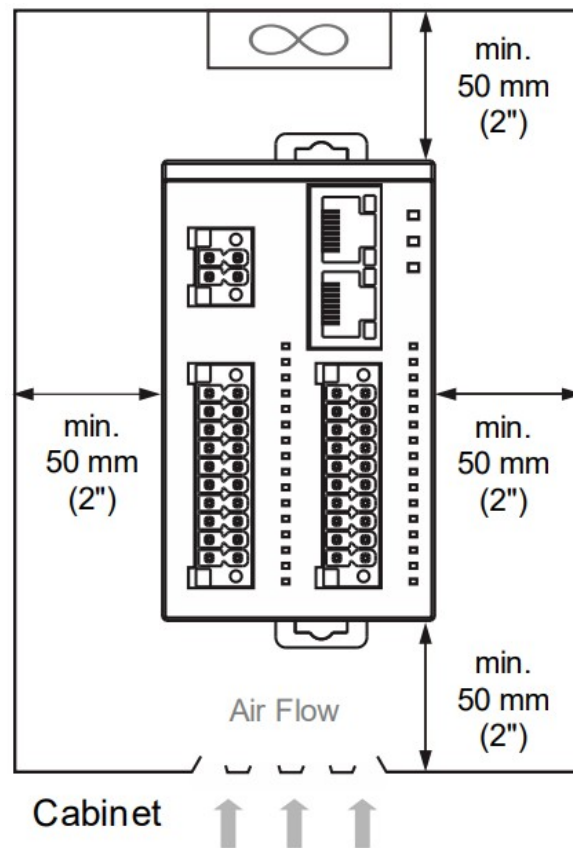
3.4 Installation

3.4.1 Installation in the electrical control panel

Follow these precautions when installation. If you do not follow the precautions specified in the manual, the protection provided by the control module may be reduced.

Mounting space

Install the R2-ECx004 series module in an enclosed electrical control panel and allow a clearance of 50 mm (2") between the module and the walls for ventilation, as shown in the following figure.



Environment requirements in the electrical control panel

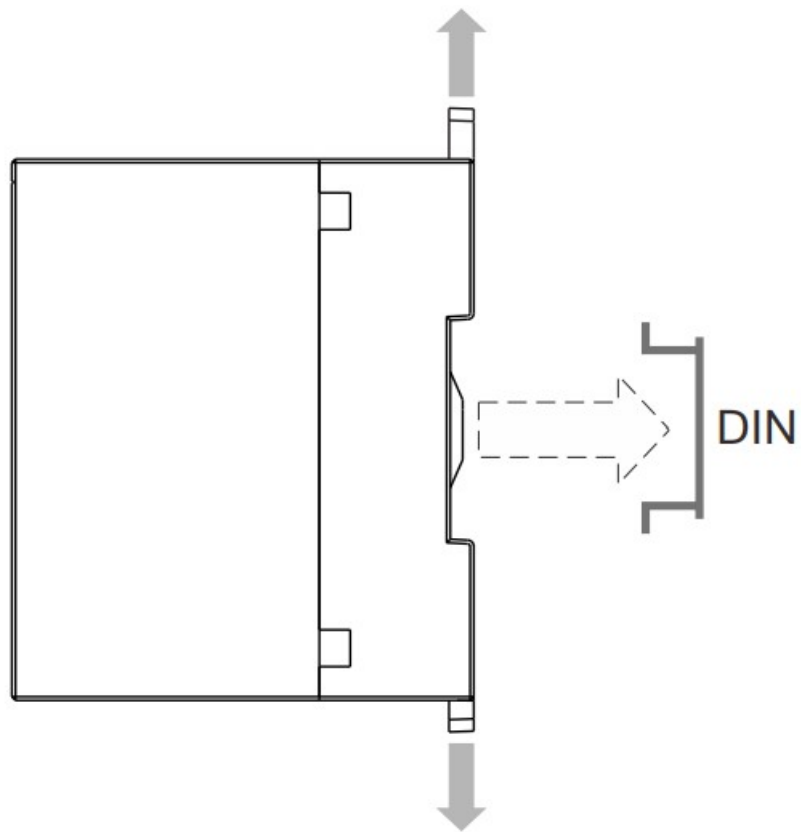
- Ambient temperature: -20 to +60°C (-4 to +140°F)
- Ambient humidity: 5 to 95%
- Avoid installing the product near high-temperature or inflammable devices.
- Allow sufficient ventilation space.
- Install a fan or air conditioning if the ambient temperature is higher than 60°C.
- This product is for indoor use only.
- When installing the module in the electrical control panel, allow a clearance of 1 to 2 m (3.3 to 6.6 ft) under the bottom of the module for easy installation and operation.
- Keep the product away from high voltage and power devices when installation.
- The circuit in the electrical control panel must be cut off before you install the control module. Do not install the module when the power is on.

Measures for increasing immunity to interference

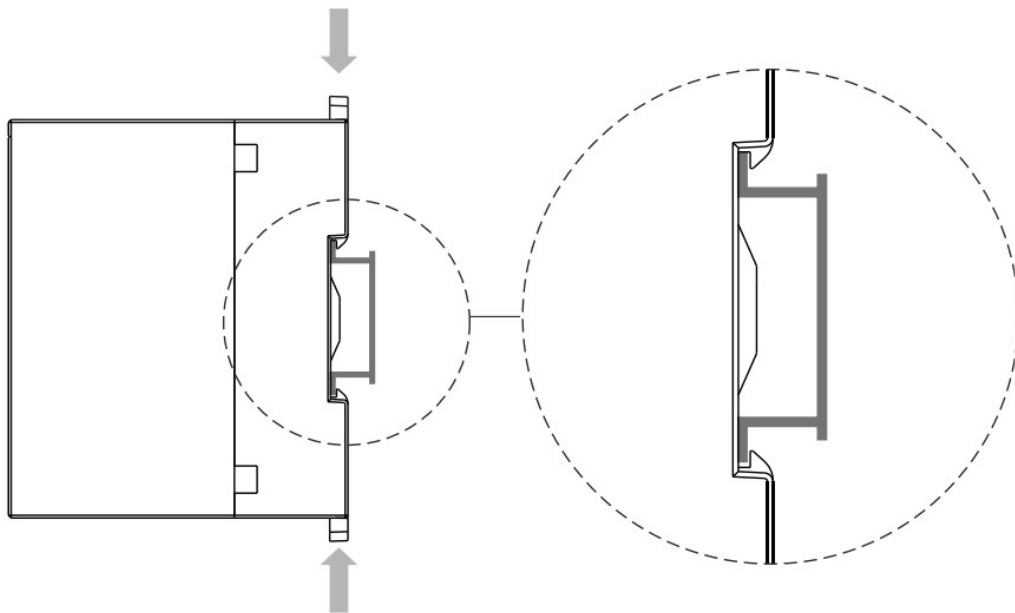
- No high voltage devices in the electrical control panel.
- Isolate the power cable from the control module with the distance of at least 200 mm (7.87").
- Ground the electrical control panel.

DIN rail installation

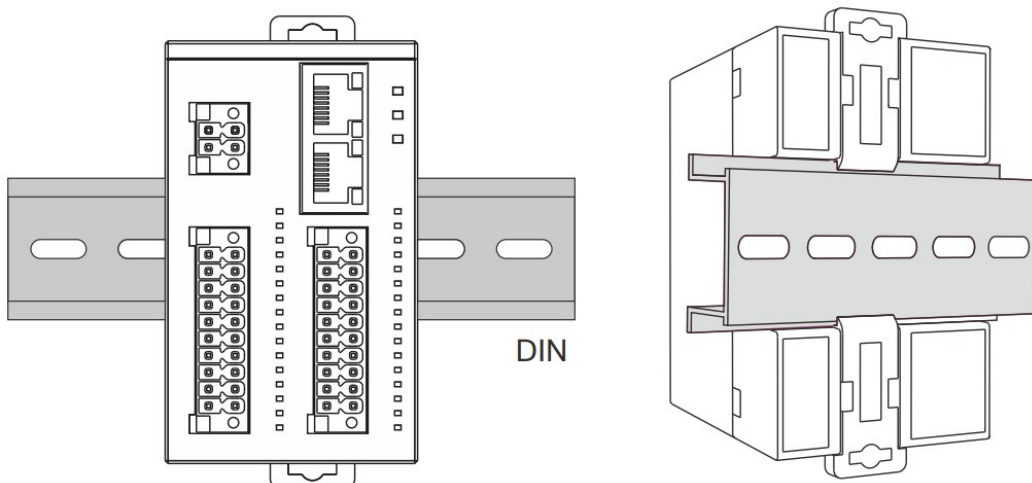
1. Pull out the DIN-rail clips and mount the module to the DIN rail in the electrical control panel.



2. Push the DIN-rail clips back and the module is secured in the electrical control panel.

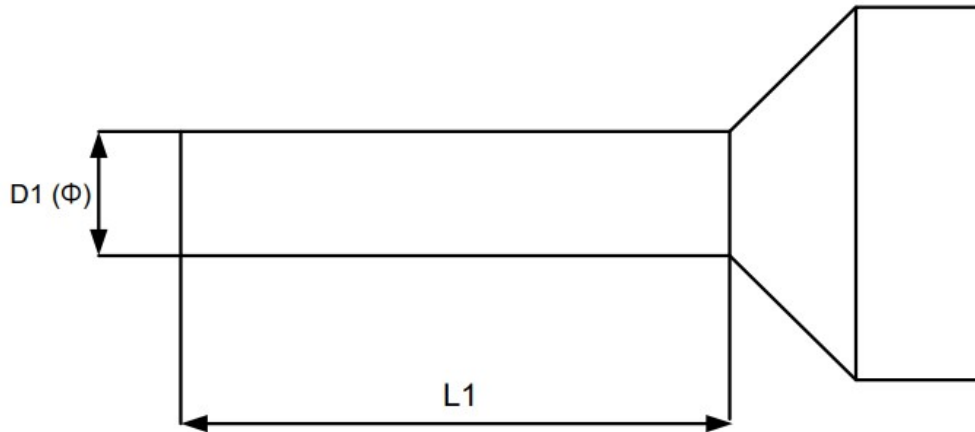


3. The installation is complete.



3.4.2 Wiring requirements

1. The recommended wire gauge for wiring with the housing connector or terminal block is 26 to 18 AWG.
2. The recommended length for exposed wire is 8 mm to 9 mm (0.31" to 0.35").
3. Pay attention to the following when wiring with wire ferrules.
 - Use a correct crimping tool (such as Dinkle DNT13-0101).
 - The recommended length for L1 is 8 mm to 10 mm (0.31" to 0.39").
 - The recommended diameter (D1) is 0.75 mm to 1.4 mm (0.03" to 0.06").

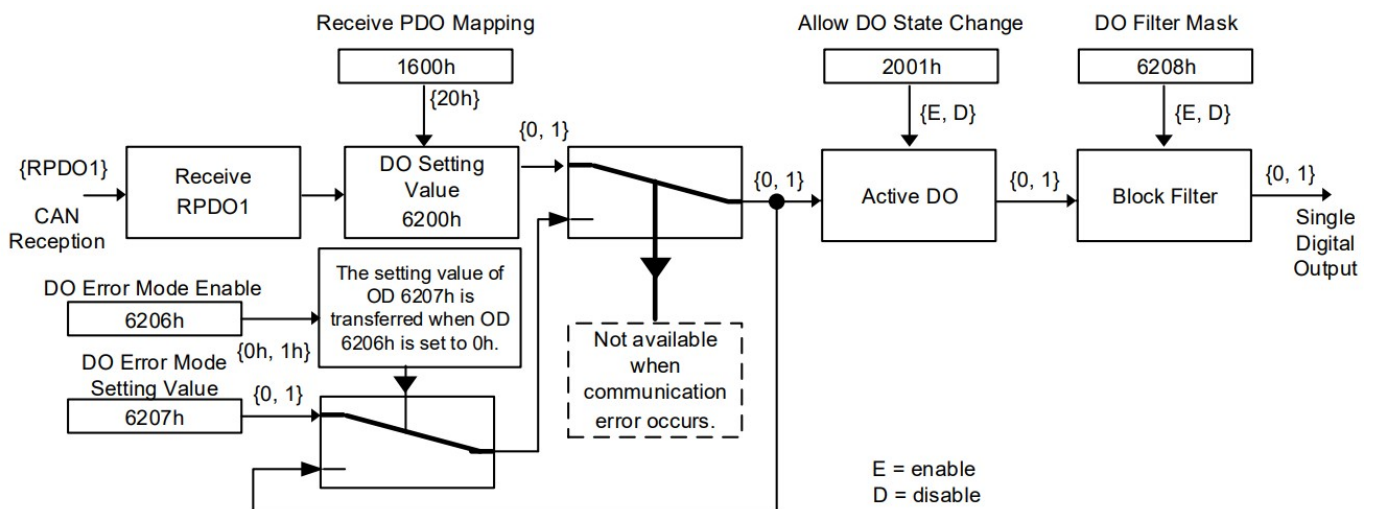


CiA 401 Device Profile

This chapter introduces the operation method and related objects for the digital output module according to the CiA 401 profile which R2-ECx004 conforms to.

4.1 DO operation method

You can control the digital output status at present with DO Setting Value (6200h) and Allow DO State Change (2001h), limit the output channels with DO Filter Mask (6208h), and determine the output status at present when a connection error occurs with DO Error Mode Enable (6206h) and DO Error Mode Setting Value (6207h). The following is the control flowchart.



4.1.1 Related objects

The following lists the names and setting properties of the objects related to R2-EC0004.

Index	Sub- index	Name	Access	PDO mapping	Unit	Data type
2000h	0	Read DO Actual Value	RO	NO	–	USINT
	1	Read Port 1 DO CH0 – 7 Actual Value	RO	NO	–	USINT
	2	Read Port 1 DO CH8 – 15 Actual Value	RO	NO	–	USINT
2001h	0	Allow DO State Change	RO	NO	–	USINT
	1	Allow Port 1 DO CH0 – 7 State Change	RW	NO	–	USINT
	2	Allow Port 1 DO CH8 – 15 State Change	RW	NO	–	USINT
6200h	0	DO Setting Value	RO	NO	–	USINT
	1	Port 1 DO CH0 – 7 Setting Value	RW	YES	–	USINT
	2	Port 1 DO CH8 – 15 Setting Value	RW	YES	–	USINT
6206h	0	DO Error Mode Enable	RO	NO	–	USINT
	1	Port 1 DO CH0 – 7 Error Mode Enable	RW	NO	–	USINT
	2	Port 1 DO CH8 – 15 Error Mode Enable	RW	NO	–	USINT
6207h	0	DO Error Mode Setting Value	RO	NO	–	USINT
	1	Port 1 DO CH0 – 7 Error Mode Setting Value	RW	NO	–	USINT
	2	Port 1 DO CH8 – 15 Error Mode Setting Value	RW	NO	–	USINT
6208h	0	DO Filter Mask	RO	NO	–	USINT
	1	Port 1 DO CH0 – 7 Filter Mask	RW	NO	–	USINT
	2	Port 1 DO CH8 – 15 Filter Mask	RW	NO	–	USINT

2000h	0	Read DO Actual Value	RO	NO	–	USINT
	1	Read Port 0 DO CH0 – 7 Actual Value	RO	NO	–	USINT
	2	Read Port 0 DO CH8 – 15 Actual Value	RO	NO	–	USINT
	3	Read Port 1 DO CH0 – 7 Actual Value	RO	NO	–	USINT
	4	Read Port 1 DO CH8 – 15 Actual Value	RO	NO	–	USINT

2001h	0	Allow DO State Change	RO	NO	–	USINT
	1	Allow Port 0 DO CH0 – 7 State Change	RW	NO	–	USINT
	2	Allow Port 0 DO CH8 – 15 State Change	RW	NO	–	USINT
	3	Allow Port 1 DO CH0 – 7 State Change	RW	NO	–	USINT
	4	Allow Port 1 DO CH8 – 15 State Change	RW	NO	–	USINT
6200h	0	DO Setting Value	RO	NO	–	USINT
	1	Port 0 DO CH0 – 7 Setting Value	RW	YES	–	USINT
	2	Port 0 DO CH8 – 15 Setting Value	RW	YES	–	USINT
	3	Port 1 DO CH0 – 7 Setting Value	RW	YES	–	USINT
	4	Port 1 DO CH8 – 15 Setting Value	RW	YES	–	USINT
6206h	0	DO Error Mode Enable	RO	NO	–	USINT
	1	Port 0 DO CH0 – 7 Error Mode Enable	RW	NO	–	USINT
	2	Port 0 DO CH8 – 15 Error Mode Enable	RW	NO	–	USINT
	3	Port 1 DO CH0 – 7 Error Mode Enable	RW	NO	–	USINT
	4	Port 1 DO CH8 – 15 Error Mode Enable	RW	NO	–	USINT
6207h	0	DO Error Mode Setting Value	RO	NO	–	USINT
	1	Port 0 DO CH0 – 7 Error Mode Setting Value	RW	NO	–	USINT
	2	Port 0 DO CH8 – 15 Error Mode Setting Value	RW	NO	–	USINT
	3	Port 1 DO CH0 – 7 Error Mode Setting Value	RW	NO	–	USINT
	4	Port 1 DO CH8 – 15 Error Mode Setting Value	RW	NO	–	USINT

6208h	0	DO Filter Mask	RO	NO	–	USINT
	1	Port 0 DO CH0 – 7 Filter Mask	RW	NO	–	USINT
	2	Port 0 DO CH8 – 15 Filter Mask	RW	NO	–	USINT
	3	Port 1 DO CH0 – 7 Filter Mask	RW	NO	–	USINT
	4	Port 1 DO CH8 – 15 Filter Mask	RW	NO	–	USINT

Object Dictionary

This chapter introduces the objects, including the descriptions and applications, supported by R2-ECx004.

5.1 Object list

Object Dictionary		Section
General Objects	Device Type (1000h)	5.2.1
	Error Register (1001h)	5.2.2
	Manufacturer Device Name (1008h)	5.2.3
	Manufacturer Software Version (100Ah)	5.2.4
	Identity Object (1018h)	5.2.5
PDO Mapping Objects	Receive PDO Mapping (1600h)	5.3.1
	Receive PDO Mapping 2 (1601h)	5.3.2
	Transmit PDO Mapping (1A00h)	5.3.3
	Transmit PDO Mapping 2 (1A01h)	5.3.4
Sync Manager Communication Objects	Sync Manager Communication Type (1C00h)	5.4.1
	Sync Manager PDO Assignment (1C12h, 1C13h)	5.4.2
	Sync Manager Synchronization (1C32h, 1C33h)	5.4.3
Manufacturer Specific Objects	Read DO Actual Value (2000h)	5.5.1
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	DI Filter Range (2002h)	5.5.3
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	Clear Input Event (2011h)	5.5.5
	Input Event Value (2012h)	5.5.6
	Timestamp Initial Time Setting (2020h)	5.5.7
	Timestamp Enable (2021h)	5.5.8
	Clear Timestamp Value (2022h)	5.5.9
	DI Timestamp Counter and Pass Time FIFO (2030h – 204Fh)	5.5.10
	DO Timestamp Counter and Pass Time FIFO (2050h – 206Fh)	5.5.11
	DI Input Bounce Counter and Pass Time FIFO (2070h – 208Fh)	5.5.12
Device Control	Read Input (8-bit) (6000h)	5.6.1
	DO Setting Value (6200h)	5.6.2
	DO Error Mode Enable (6206h)	5.6.3
	DO Error Mode Setting Value (6207h)	5.6.4
	DO Filter Mask (6208h)	5.6.5

5.2 General Objects

5.2.1 Device Type (1000h)

This object describes the type and function of each device.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1000h	0	Device Type	UDINT	RO	NO	0x00030191

R2-EC1004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1000h	0	Device Type	UDINT	RO	NO	0x00010191

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1000h	0	Device Type	UDINT	RO	NO	0x00020191

Data description:

Bit	Meaning	Description
0 – 15	General information	0x0191: the Device Profile Number is 401.
16 – 31	Additional information	When Bit 16 = 1, the digital input function is implemented; when Bit 17 = 1, the digital output function is implemented. 0x0003: digital input + digital output (R2-EC0004) 0x0001: digital input (R2-EC1004) 0x0002: digital output (R2-EC2004)

5.2.2 Error Register (1001h)

This object is the error register of R2-ECx004 for recording error messages.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1001h	0	Error Register	USINT	RO	NO	0x00

Data description:

Bit	Meaning
0	Generic error
1	Current
2	Voltage
3	Temperature
4	Communication error (overrun, error state)
5	Device profile specific
6	Reserved (always 0)
7	Manufacturer-specific

5.2.3 Manufacturer Device Name (1008h)

This object acquires the device name of R2-ECx004.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1008h	0	Manufacturer Device Name	STRING	RO	NO	R2-EC0004

R2-EC1004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1008h	0	Manufacturer Device Name	STRING	RO	NO	R2-EC1004

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1008h	0	Manufacturer Device Name	STRING	RO	NO	R2-EC2004

5.2.4 Manufacturer Software Version (100Ah)

This object acquires the software version of R2-ECx004.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
100Ah	0	Manufacturer Software Version	STRING	RO	NO	–

5.2.5 Identity Object (1018h)

This object acquires the general information of R2-ECx004.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1018h	0	Number of entries	USINT	RO	NO	4
	1	Vendor ID	UDINT	RO	NO	0x000001DD
	2	Product code	UDINT	RO	NO	0x00000004
	3	Revision number	UDINT	RO	NO	0x00100000
	4	Serial number	UDINT	RO	NO	0x00000000

R2-EC1004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1018h	0	Number of entries	USINT	RO	NO	4
	1	Vendor ID	UDINT	RO	NO	0x000001DD
	2	Product code	UDINT	RO	NO	0x00001004
	3	Revision number	UDINT	RO	NO	0x00100000
	4	Serial number	UDINT	RO	NO	0x00000000

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1018h	0	Number of entries	USINT	RO	NO	4
	1	Vendor ID	UDINT	RO	NO	0x000001DD
	7	Product code	UDINT	RO	NO	0x00002004
	3	Revision number	UDINT	RO	NO	0x00100000
	4	Serial number	UDINT	RO	NO	0x00000000

5.3 PDO Mapping Objects

In EtherCAT communication, you can set the PDO mapping objects to update data periodically. OD 1601h and 1A01h are optional objects.

5.3.1 Receive PDO Mapping (1600h)

This object receives data periodically.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1600h	0	Number of objects in this PDO	USINT	RO	NO	4
	1	Mapping entry 1	UDINT	RW	NO	0x62000108
	2	Mapping entry 2	UDINT	RW	NO	0x62000208
	3	Mapping entry 3	UDINT	RW	NO	0x20110108
	4	Mapping entry 4	UDINT	RW	NO	0x20110208

R2-EC1004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1600h	0	Number of objects in this PDO	USINT	RO	NO	4
	1	Mapping entry 1	UDINT	RW	NO	0x20110108
	2	Mapping entry 2	UDINT	RW	NO	0x20110208
	3	Mapping entry 3	UDINT	RW	NO	0x20110308
	4	Mapping entry 4	UDINT	RW	NO	0x20110408

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1600h	0	Number of objects in this PDO	USINT	RO	NO	4
	1	Mapping entry 1	UDINT	RW	NO	0x62000108
	2	Mapping entry 2	UDINT	RW	NO	0x62000208
	3	Mapping entry 3	UDINT	RW	NO	0x62000308
	4	Mapping entry 4	UDINT	RW	NO	0x62000408

5.3.2 Receive PDO Mapping 2 (1601h)

This object is optional and receives data periodically.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1601h	0	Number of objects in this PDO	USINT	RO	NO	3
	1	Mapping entry 1	UDINT	RW	NO	0x24000008
	2	Mapping entry 2	UDINT	RW	NO	0x24010008
	3	Mapping entry 3	UDINT	RW	NO	0x24020040

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1601h	0	Number of objects in this PDO	USINT	RO	NO	3
	1	Mapping entry 1	UDINT	RW	NO	0x24000008
	2	Mapping entry 2	UDINT	RW	NO	0x24010008
	3	Mapping entry 3	UDINT	RW	NO	0x24020040

5.3.3 Transmit PDO Mapping (1A00h)

This object transmits data periodically.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1A00h	0	Number of objects in this PDO	USINT	RO	NO	4
	1	Mapping entry 1	UDINT	RW	NO	0x60000108
	2	Mapping entry 2	UDINT	RW	NO	0x60000208
	3	Mapping entry 3	UDINT	RW	NO	0x20120108
	4	Mapping entry 4	UDINT	RW	NO	0x20120208

R2-EC1004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1A00h	0	Number of objects in this PDO	USINT	RO	NO	8
	1	Mapping entry 1	UDINT	RW	NO	0x60000108
	2	Mapping entry 2	UDINT	RW	NO	0x60000208
	3	Mapping entry 3	UDINT	RW	NO	0x60000308
	4	Mapping entry 4	UDINT	RW	NO	0x60000408
	5	Mapping entry 5	UDINT	RW	NO	0x20120108
	6	Mapping entry 6	UDINT	RW	NO	0x20120208
	7	Mapping entry 7	UDINT	RW	NO	0x20120308
	8	Mapping entry 8	UDINT	RW	NO	0x20120408

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1A00h	0	Number of objects in this PDO	USINT	RO	NO	1
	1	Mapping entry 1	UDINT	RW	NO	0x10F80040

5.3.4 Transmit PDO Mapping 2 (1A01h)

This object is optional and transmits data periodically.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1A01h	0	Number of objects in this PDO	USINT	RO	NO	1
	1	Mapping entry 1	UDINT	RW	NO	0x10F80040

5.4 Sync Manager Communication Objects

5.4.1 Sync Manager Communication Type (1C00h)

In EtherCAT communication, this object sets the communication type of the sync managers.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1C00h	0	Number of used Sync Manager channels	USINT	RO	NO	4
	1	Communication type sync manager 0	USINT	RO	NO	1: mailbox receive (Master to slave)
	2	Communication type sync manager 1	USINT	RO	NO	2: mailbox send (Slave to master)
	3	Communication type sync manager 2	USINT	RO	NO	3: process data output (Master to slave)
	4	Communication type sync manager 3	USINT	RO	NO	4: process data input (Slave to master)

5.4.2 Sync Manager PDO Assignment (1C12h, 1C13h)

In EtherCAT communication, this object assigns the sync manager PDOs. OD 1C12h Sub-index 2 and OD 1C13h Sub-index 2 are optional objects.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1C12h	0	Number of assigned RxPDOs	USINT	RW	NO	1 or 2
	1	PDO Mapping object index of assigned RxPDO 1	UINT	RW	NO	1600h
	2	PDO Mapping object index of assigned RxPDO 2	UINT	RW	NO	1601h
1C13h	0	Number of assigned TxPDOs	USINT	RW	NO	1 or 2
	1	PDO Mapping object index of assigned TxPDO 1	UINT	RW	NO	1A00h
	2	PDO Mapping object index of assigned TxPDO 2	UINT	RW	NO	1A01h

5.4.3 Sync Manager Synchronization (1C32h, 1C33h)

In EtherCAT communication, this object synchronizes the input and output parameters of the sync managers.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
1C32h	0	Number of SM Output Parameter	USINT	RO	NO	32
	1	Synchronization Type	UINT	RW	NO	0x0001
	2	Cycle Time	UDINT	RW	NO	0
	4	Synchronization Type Supported	UINT	RO	NO	0x0005
	5	Minimum Cycle Time	UDINT	RO	NO	0x0001E848
	6	Calc and Copy Time	UDINT	RO	NO	0
	8	Get Cycle Time	UDINT	RW	NO	0x0001
	9	Delay Time	UDINT	RO	NO	0
	10	Sync0 Cycle Time	UDINT	RW	NO	0
	11	SM-Event Missed	UDINT	RO	NO	0
	12	Cycle Time Too Small	UDINT	RO	NO	0
	13 – 31	Reserved	–	–	–	–
	32	Sync Error	BOOL	RO	NO	FALSE
1C33h	0	Number of SM Input Parameter	USINT	RO	NO	32
	1	Synchronization Type	UINT	RW	NO	0x0022
	2	Cycle Time	UDINT	RW	NO	0
	4	Synchronization Type Supported	UINT	RO	NO	0x0005
	5	Minimum Cycle Time	UDINT	RO	NO	0x0001E848
	6	Calc and Copy Time	UDINT	RO	NO	0
	8	Get Cycle Time	UDINT	RW	NO	0
	9	Delay Time	UDINT	RO	NO	0
	10	Sync0 Cycle Time	UDINT	RW	NO	0
	11	SM-Event Missed	UDINT	RO	NO	0
	12	Cycle Time Too Small	UDINT	RO	NO	0
	13 – 31	Reserved	–	–	–	–
	32	Sync Error	BOOL	RO	NO	FALSE

5.5 Manufacturer Specific Objects

5.5.1 Read DO Actual Value (2000h)

This object reads the actual output values of R2-EC0004 and R2-EC2004 (8 output channels as a set).

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2000h	0	Read DO Actual Value	USINT	RO	NO	2
	1	Read Port 1 DO CH0 – 7 Actual Value	USINT	RO	NO	0 to 255
	2	Read Port 1 DO CH8 – 15 Actual Value	USINT	RO	NO	0 to 255

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2000h	0	Read DO Actual Value	USINT	RO	NO	4
	1	Read Port 0 DO CH0 – 7 Actual Value	USINT	RO	NO	0 to 255
	2	Read Port 0 DO CH8 – 15 Actual Value	USINT	RO	NO	0 to 255
	3	Read Port 1 DO CH0 – 7 Actual Value	USINT	RO	NO	0 to 255
	4	Read Port 1 DO CH8 – 15 Actual Value	USINT	RO	NO	0 to 255

5.5.2 Allow DO State Change (2001h)

This object sets whether the states of the output channels of R2-EC0004 and R2-EC2004 can be changed (8 channels as a set). Take OD 2001h Sub-index 1 for example. To disallow CH0 – 5 from changing the states and allow CH6 – 7 to change the states, set the value of Sub-index 1 to the binary value of 11000000 (192 in decimal). (0 indicates state change is not allowed and 1 indicates state change is allowed)

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2001h	0	Allow DO State Change	USINT	RO	NO	2
	1	Allow Port 1 DO CH0 – 7 State Change	USINT	RW	NO	0 to 255
	2	Allow Port 1 DO CH8 – 15 State Change	USINT	RW	NO	0 to 255

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2001h	0	Allow DO State Change	USINT	RO	NO	4
	1	Allow Port 0 DO CH0 – 7 State Change	USINT	RW	NO	0 to 255
	2	Allow Port 0 DO CH8 – 15 State Change	USINT	RW	NO	0 to 255
	3	Allow Port 1 DO CH0 – 7 State Change	USINT	RW	NO	0 to 255
	4	Allow Port 1 DO CH8 – 15 State Change	USINT	RW	NO	0 to 255

5.5.3 DI Filter Range (2002h)

This object sets the filter time of the digital inputs (DIs) of R2-EC0004 and R2-EC1004. The signals are filtered by the software filter function of the module with the minimum filter time of 100 μ s. When the DI filter time is set to 1 ms, the actual filter time can be up to 1100 μ s (1 ms + 100 μ s). This filter time setting is available only when the DI event recording function (2010h) is enabled. When the DI signal is detected (i.e. the time duration of signal change exceeds the set filter time), the DI event is recorded in Input Event Value (2012h).

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2002h	0	DI Filter Range	USINT	RW	NO	0 to 4

Data description:

Value	Meaning
0	If the DI filter time is not set, the hardware filter time of 100 μ s is applied. (Default)
1	DI filter time is 1 ms.
2	DI filter time is 2 ms.
3	DI filter time is 3 ms.
4	DI filter time is 4 ms.

5.5.4 Input Event Enable (2010h)

This object enables the DI event recording function of R2-EC0004 and R2-EC1004.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2010h	0	Input Event Enable	USINT	RW	NO	0 to 1

Data description:

Value	Meaning
0	Disable the DI event recording function. (Default)
1	Enable the DI event recording function.

5.5.5 Clear Input Event (2011h)

This object clears the DI event records of R2-EC0004 and R2-EC1004.

Index	Sub-index	Name	Data type	Access	PDO mapping	Value
2011h	0	Clear Input Event	USINT	RW	YES	0 to 255

Data description:

Value	Meaning
–	When the value of OD 2011h changes, the value of OD 2012h is cleared to 0 immediately.

5.5.6 Input Event Value (2012h)

This object shows the DI event records of R2-EC0004 and R2-EC1004.

R2-EC0004

Index	Sub-index	Name	Data type	Access	PDO mapping	Value
2012h	0	Input Event Value	USINT	RO	NO	2
	1	Read Port 0 CH0 – 7 Input Event Value	USINT	RO	YES	0 to 255
	2	Read Port 0 CH8 – 15 Input Event Value	USINT	RO	YES	0 to 255

R2-EC1004

Index	Sub-index	Name	Data type	Access	PDO mapping	Value
2012h	0	Input Event Value	USINT	RO	NO	4
	1	Read Port 0 CH0 – 7 Input Event Value	USINT	RO	YES	0 to 255
	2	Read Port 0 CH8 – 15 Input Event Value	USINT	RO	YES	0 to 255
	3	Read Port 1 CH0 – 7 Input Event Value	USINT	RO	YES	0 to 255
	4	Read Port 1 CH8 – 15 Input Event Value	USINT	RO	YES	0 to 255

Data description: the following takes Sub-index 1 of OD 2012h for example.

Bit	Meaning
0	Records whether the DI signal of Port 0 Input CH0 has changed.
1	Records whether the DI signal of Port 0 Input CH1 has changed.
2	Records whether the DI signal of Port 0 Input CH2 has changed.
3	Records whether the DI signal of Port 0 Input CH3 has changed.
4	Records whether the DI signal of Port 0 Input CH4 has changed.
5	Records whether the DI signal of Port 0 Input CH5 has changed.
6	Records whether the DI signal of Port 0 Input CH6 has changed.
7	Records whether the DI signal of Port 0 Input CH7 has changed.

5.5.7 Timestamp Initial Time Setting (2020h)

This is a user-defined object. By Delta's default setting, it sets the initial time of the R2-ECx004 timestamp. You can set the initial time of the timestamp with Sub-index 1 and Sub-index 2. For example, setting Sub-index 1 to 0x20200107 and Sub-index 2 to 0x00093030 means the initial time is 9:30:30, January 7th, 2020. After the initial time is set, R2-ECx004 provides the pass time as a reference of how long the event takes.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2020h	0	Timestamp Initial Time Setting	USINT	RO	NO	2
	1	Year:Month:Day	UDINT	RW	NO	0x0 to 0xFFFFFFFF F Default: 0
	2	Hour:Min:Sec	UDINT	RW	NO	0x0 to 0xFFFFFFFF F Default: 0

5.5.8 Timestamp Enable (2021h)

This object sets whether to enable the timestamp recording function of R2-ECx004. The values of OD 2030h to OD 208Fh are valid only when this function is enabled.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2021h	0	Timestamp Enable	USINT	RW	NO	0 to 1

Data description:

Value	Meaning
0	Disable the timestamp recording function. (Default)
1	Enable the timestamp recording function.

5.5.9 Clear Timestamp Value (2022h)

This object clears the timestamp records of R2-ECx004.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2022h	0	Clear Timestamp Value	USINT	RW	NO	0 to 1

Data description:

Value	Meaning
–	When the value of OD 2022h switches from 0 to 1, the timestamp records are cleared.

5.5.10 DI Timestamp Counter and Pass Time FIFO (2030h to 204Fh)

These objects record the count of DI changes of R2-EC0004 and R2-EC1004 after the timestamp function is enabled and record the pass time based on the initial time (2020h).

The available DI points of R2-EC0004 are DI 0 to DI 15 of Port 0; 16 points in total.

The available DI points of R2-EC1004 are DI 0 to DI 15 of Port 0 and DI 0 to DI 15 of Port 1; 32 points in total.

The correspondence between the DI point and OD index is as follows: DI 0 of Port 0 is 2030h, DI 1 of Port 0 is 2031h, and then DI 0 of Port 1 is 2040h and DI 1 of Port 1 is 2041h, and soon. Sub-index 1 records the count of DI changes after the timestamp function is enabled. Each time the DI switches from On to Off or from Off to On, the count increments by 1. Sub-indexes 2 to 9 record the pass time with 4 layers of FIFO. When the 4 FIFO layers are full, new data is written to overwrite the old data starting from FIFO 0. The pass time is in units of 100 μ s. For example, when the pass time of FIFO 0 is 100000, it means that 10 seconds ($100000 \times 100 \mu\text{s} = 1000 \text{ ms} = 10 \text{ s}$) has passed since the initial time.

Index	Sub-index	Name	Data type	Access	PDO mapping	Value
2030h	0	Port 0 DI 0 Timestamp Counter and Pass Time FIFO	USINT	RO	NO	9
	1	Timestamp Counter	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	2	FIFO 0 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	3	FIFO 0 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	4	FIFO 1 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	5	FIFO 1 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	6	FIFO 2 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	7	FIFO 2 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	8	FIFO 3 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	9	FIFO 3 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0

5.5.11 DO Timestamp Counter and Pass Time FIFO (2050h to 206Fh)

These objects record the count of DO changes of R2-EC0004 and R2-EC2004 after the timestamp function is enabled and record the pass time based on the initial time (2020h).

The available DO points of R2-EC0004 are DO 0 to DO 15 of Port 0; 16 points in total.

The available DO points of R2-EC2004 are DO 0 to DO 15 of Port 0 and DO 0 to DO 15 of Port 1; 32 points in total.

The correspondence between the DO point and OD index is as follows: DO 0 of Port 0 is 2050h, DO 1 of Port 0 is 2051h, and then DO 0 of Port 1 is 2060h and DO 1 of Port 1 is 2061h, and so on.

Sub-index 1 records the count of DO changes after the timestamp function is enabled. Each time the DO switches from On to Off or from Off to On, the count increments by 1. Sub-indexes 2 to 9 record the pass time with 4 layers of FIFO. When the 4 FIFO layers are full, new data is written to overwrite the old data starting from FIFO 0. The pass time is in units of 100 μ s. For example, when the pass time of FIFO 0 is 100000, it means that 10 seconds (100000*100 μ s = 10000 ms = 10 s) has passed since the initial time.

Index	Sub-index	Name	Data type	Access	PDO mapping	Value
2050h	0	Port 1 DO 0 Timestamp Counter and Pass Time FIFO	USINT	RO	NO	9
	1	Timestamp Counter	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	2	FIFO 0 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	3	FIFO 0 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	4	FIFO 1 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	5	FIFO 1 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	6	FIFO 2 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	7	FIFO 2 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	8	FIFO 3 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	9	FIFO 3 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0

5.5.12 DI Input Bounce Counter and Pass Time FIFO (2070h to 208Fh)

These objects record the count of signal bounce of R2-EC0004 and R2-EC1004 after the timestamp function is enabled and record the pass time based on the initial time (2020h).

The available DI points of R2-EC0004 are DI 0 to DI 15 of Port 0; 16 points in total.

The available DI points of R2-EC1004 are DI 0 to DI 15 of Port 0 and DI 0 to DI 15 of Port 1; 32 points in total.

The correspondence between the DI point and OD index is as follows: DI 0 of Port 0 is 2070h, DI 1 of Port 0 is 2071h, and then DI 0 of Port 1 is 2080h and DI 1 of Port 1 is 2081h, and so on.

Sub-index 1 records the count of signal bounce after the timestamp function is enabled. Each time the DI signal changes but with the time duration shorter than the set filter time (2002h), the bounce count increments by 1. Sub-indexes 2 to 9 record the pass time with 4 layers of FIFO.

When the 4 FIFO layers are full, new data is written to overwrite the old data starting from FIFO 0. The pass time is in units of 100 μ s. For example, when the pass time of FIFO 0 is 100000, it means that signal bounce occurs 10 seconds ($100000 \times 100 \mu\text{s} = 10000 \text{ ms} = 10 \text{ s}$) after the initial time.

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
2070h	0	Port 0 DI 0 Input Bounce Counter and Pass Time FIFO	USINT	RO	NO	9
	1	Bounce Counter	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	2	FIFO 0 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	3	FIFO 0 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	4	FIFO 1 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	5	FIFO 1 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	6	FIFO 2 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	7	FIFO 2 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	8	FIFO 3 Pass Time L Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0
	9	FIFO 3 Pass Time H Word	UDINT	RO	NO	0x0 to 0xFFFFFFFF Default: 0

5.6 Device Control

5.6.1 Read Input (8-bit) (6000h)

This object reads the status of the DI channels of R2-EC0004 and R2-EC1004 (8 input channels as a set).

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6000h	0	Read Input (8-bit)	USINT	RO	NO	2
	1	Read Port 0 Input CH0 – 7 (8-bit)	USINT	RO	YES	0 to 255
	2	Read Port 0 Input CH8 – 15 (8-bit)	USINT	RO	YES	0 to 255

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6000h	0	Read Input (8-bit)	USINT	RO	NO	4
	1	Read Port 0 Input CH0 – 7 (8-bit)	USINT	RO	YES	0 to 255
	2	Read Port 0 Input CH8 – 15 (8-bit)	USINT	RO	YES	0 to 255
	3	Read Port 1 Input CH0 – 7 (8-bit)	USINT	RO	YES	0 to 255
	4	Read Port 1 Input CH8 – 15 (8-bit)	USINT	RO	YES	0 to 255

5.6.2 DO Setting Value (6200h)

This object sets the values of the DO channels of R2-EC0004 and R2-EC2004 (8 output channels as a set).

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6200h	0	DO Setting Value	USINT	RO	NO	2
	1	Port 1 DO CH0 – 7 Setting Value	USINT	RW	YES	0 to 255 Default: 0
	2	Port 1 DO CH8 – 15 Setting Value	USINT	RW	YES	0 to 255 Default: 0

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6200h	0	DO Setting Value	USINT	RO	NO	4
	1	Port 0 DO CH0 – 7 Setting Value	USINT	RW	YES	0 to 255 Default: 0
	2	Port 0 DO CH8 – 15 Setting Value	USINT	RW	YES	0 to 255 Default: 0
	3	Port 1 DO CH0 – 7 Setting Value	USINT	RW	YES	0 to 255 Default: 0
	4	Port 1 DO CH8 – 15 Setting Value	USINT	RW	YES	0 to 255 Default: 0

5.6.3 DO Error Mode Enable (6206h)

This object sets whether to enable the DO error mode for R2-EC0004 and R2-EC2004 (8 output channels as a set). For example, when the value of the sub-index is 00000000, the DO error mode is not enabled, and the value of the output channel set remains the same when an error occurs. When the value of the sub-index is 11111111, the DO error mode is enabled, and the value of the output channel set is the value set in DO Error Mode Setting Value (6207h) when an error occurs.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6206h	0	DO Error Mode Enable	USINT	RO	NO	2
	1	Port 1 DO CH0 – 7 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	2	Port 1 DO CH8 – 15 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6206h	0	DO Error Mode Enable	USINT	RO	NO	4
	1	Port 0 DO CH0 – 7 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	2	Port 0 DO CH8 – 15 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	3	Port 1 DO CH0 – 7 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	4	Port 1 DO CH8 – 15 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255

5.6.4 DO Error Mode Setting Value (6207h)

This object sets the DO Error Mode Setting Value for R2-EC0004 and R2-EC2004 (8 output channels as a set).

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6207h	0	DO Error Mode Setting Value	USINT	RO	NO	2
	1	Port 1 DO CH0 – 7 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	2	Port 1 DO CH8 – 15 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6207h	0	DO Error Mode Setting Value	USINT	RO	NO	4
	1	Port 0 DO CH0 – 7 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	2	Port 0 DO CH8 – 15 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	3	Port 1 DO CH0 – 7 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	4	Port 1 DO CH8 – 15 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0

5.6.5 DO Filter Mask (6208h)

This object sets the DO Filter Mask for R2-EC0004 and R2-EC2004 (8 output channels as a set). For example, when the value of the sub-index is 00000000, it means the Filter Mask of the output channel set is disabled, and the value of the output channel set remains the same. When the value of the sub-index is 11111111, the value of the output channel set is the value set in OD 6200h.

R2-EC0004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6208h	0	DO Filter Mask	USINT	RO	NO	2
	1	Port 1 DO CH0 – 7 Filter Mask	USINT	RW	NO	0 to 255 Default: 255
	2	Port 1 DO CH8 – 15 Filter Mask	USINT	RW	NO	0 to 255 Default: 255

R2-EC2004

Index	Sub- index	Name	Data type	Access	PDO mapping	Value
6208h	0	DO Filter Mask	USINT	RO	NO	4
	1	Port 0 DO CH0 – 7 Filter Mask	USINT	RW	NO	0 to 255 Default: 255
	2	Port 0 DO CH8 – 15 Filter Mask	USINT	RW	NO	0 to 255 Default: 255
	3	Port 1 DO CH0 – 7 Filter Mask	USINT	RW	NO	0 to 255 Default: 255
	4	Port 1 DO CH8 – 15 Filter Mask	USINT	RW	NO	0 to 255 Default: 255

SDO Abort Codes

This chapter introduces the SDO abort codes for R2-ECx004.

6.1 SDO abort codes

The following lists the abort codes for SDO communication error.

Code	Description
0x05 03 00 00	Toggle bit not changed.
0x05 04 00 00	SDO protocol timeout.
0x05 04 00 01	SDO command specifier invalid or unknown.
0x05 04 00 05	Out of memory.
0x06 01 00 00	Unsupported access to an object.
0x06 02 00 00	The object is not found in the object dictionary.
0x06 03 00 02	Attempt to write a read-only object.
0x06 04 00 41	The object cannot be mapped to the PDO.
0x06 04 00 42	The number and length of the objects to be mapped would exceed the PDO length.
0x06 04 00 43	General parameter incompatibility.
0x06 04 00 47	General internal incompatibility in the device.
0x06 06 00 00	Access failed due to a hardware error.
0x06 07 00 10	Data type or length of service parameter does not match.
0x06 07 00 12	Data type does not match, length of service parameter too long.
0x06 07 00 13	Data type does not match, length of service parameter too short.
0x06 09 00 11	Sub-index does not exist.
0x06 09 00 30	Value range of parameter exceeded (for write access).
0x06 09 00 31	Value range error: written parameter value too big.
0x06 09 00 32	Value range error: written parameter value too small.
0x06 09 00 36	Maximum value is smaller than minimum value.
0x08 00 00 00	General error.
0x08 00 00 20	Data cannot be transferred or stored in the application.
0x08 00 00 21	Data cannot be transferred or stored in the application due to local control.
0x08 00 00 22	Data cannot be transferred or stored in the application due to current device status.
0x08 00 00 23	Object dictionary dynamic generation fails or no object dictionary is present.

Revision History

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Documents / Resources



[DELTA R2-ECx004 EtherCAT Remote I O Module](#) [pdf] User Manual
R2-ECx004 EtherCAT Remote I O Module, R2-ECx004, EtherCAT Remote I O Module, Remote I O Module, O Module, Module

References

- [User Manual](#)