Smarter. Greener. Together.

Industrial Automation Headquarters

Delta Electronics, Inc.
Taoyuan Technology Center
No.18, Xinglong Rd., Taoyuan District,
Taoyuan City 33068, Taiwan
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Shanghai) Co., Ltd.
No.182 Minyu Rd., Pudong Shanghai, P.R.C.
Post code : 201209
TEL: 86-21-6872-3988 / FAX: 86-21-6872-3996
Customer Service: 400-820-9595

Delta Electronics (Japan), Inc.
Tokyo Office
Industrial Automation Sales Department
2-1-14 Shibadaimon, Minato-ku
Tokyo, Japan 105-0012
TEL: 81-3-5733-1155 / FAX: 81-3-5733-1255

Delta Electronics (Korea), Inc.
Seoul Office
1511, 219, Gasan Digital 1-Ro., Geumcheon-gu,
Seoul, 08501 South Korea
TEL: 82-2-515-5305 / FAX: 82-2-515-5302

Delta Energy Systems (Singapore) Pte Ltd.
4 Kaki Bukit Avenue 1, #05-04, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.
Plot No.43, Sector 35, HSIIDC Gurgaon,
PIN 122001, Haryana, India
TEL: 91-124-4874900 / FAX : 91-124-4874945

Delta Electronics (Thailand) PCL.
909 Soi 9, Moo 4, Bangpoo Industrial Estate (E.P.Z),
Pattana 1 Rd., T.Phraksa, A.Muang,
Samutprakarn 10280, Thailand
TEL: 66-2709-2800 / FAX : 662-709-2827

Delta Electronics (Australia) Pty Ltd.
Unit 20-21/45 Normanby Rd., Notting Hill Vic 3168, Australia
TEL: 61-3-9543-3720

Americas

Delta Electronics (Americas) Ltd.
Raleigh Office
P.O. Box 12173, 5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3813 / FAX: 1-919-767-3969

Delta Electronics Brazil
São Paulo Sales Office
Rua Itapeva, 26 - 3°, andar Edificio Itapeva,
One - Bela Vista 01332-000 - São Paulo - SP - Brazil
TEL: 55-12-3932-2300 / FAX: 55-12-3932-237

Delta Electronics International Mexico S.A. de C.V.
Mexico Office
Gustavo Baz No. 309 Edificio E PB 103
Colonia La Loma, CP 54060
Tlalnepantla, Estado de México
TEL: 52-55-3603-9200

EMEA

Headquarters: Delta Electronics (Netherlands) B.V.
Sales: Sales.IA.EMEA@deltaww.com
Marketing: Marketing.IA.EMEA@deltaww.com
Technical Support: iatechnicalsupport@deltaww.com
Customer Support: Customer-Support@deltaww.com
Service: Service.IA.emea@deltaww.com
TEL: +31(0)40 800 3900

BENELUX: Delta Electronics (Netherlands) B.V.
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
Mail: Sales.IA.Benelux@deltaww.com
TEL: +31(0)40 800 3900

DACH: Delta Electronics (Netherlands) B.V.
Coesterweg 45, D-59494 Soest, Germany
Mail: Sales.IA.DACH@deltaww.com
TEL: +49(0)2921 987 0

France: Delta Electronics (France) S.A.
ZI du bois Challand 2, 15 rue des Pyrénées,
Lisses, 91090 Evry Cedex, France
Mail: Sales.IA.FR@deltaww.com
TEL: +33(0)1 69 77 82 60

Iberia: Delta Electronics Solutions (Spain) S.L.U
Ctra. De Villaverde a Vallecas, 265 1° Dcha Ed.
Hormigueras – P.I. de Vallecas 28031 Madrid
TEL: +34(0)91 223 74 20

Carrer Llacuna 166, 08018 Barcelona, Spain
Mail: Sales.IA.Iberia@deltaww.com

Italy: Delta Electronics (Italy) S.r.l.
Via Meda 2–22060 Novedrate(CO)
Piazza Grazioli 18 00186 Roma Italy
Mail: Sales.IA.Italy@deltaww.com
TEL: +39 039 8900365

Russia: Delta Energy System LLC
Vereyskaya Plaza II, office 112 Vereyskaya str.
17 121357 Moscow Russia
Mail: Sales.IA.RU@deltaww.com
TEL: +7 495 644 3240

Turkey: Delta Greentech Elektronik San. Ltd. Sti. (Turkey)
Şerifali Mah. Hendem Cad. Kule Sok. No:16-A
34775 Ümraniye – İstanbul
Mail: Sales.IA.Turkey@deltaww.com
TEL: + 90 216 499 9910

GCC: Delta Energy Systems AG (Dubai BR)
P.O. Box 185668, Gate 7, 3rd Floor, Hamarain Centre
Dubai, United Arab Emirates
Mail: Sales.IA.MEA@deltaww.com
TEL: +971(0)4 2690148

Egypt + North Africa: Delta Electronics
Unit 318, 3rd Floor, Trivium Business Complex, North 90 street,
New Cairo, Cairo, Egypt
Mail: Sales.IA.MEA@deltaww.com

Delta EtherCAT Remote I/O Module R2-EC0902 User Manual

Smarter. Greener. Together.

www.deltaww.com

Preface

Thank you for purchasing this product. This user guide provides information about the R1-EC0902 EtherCAT remote control 32-channel DI / 32-channel DO (relay) expansion module.

This user guide includes:

- ■ Product inspection and model explanation
- ■ Specifications and product interface
- ■ Wiring
- ■ CiA401 Drive Profile
- ■ Object Dictionary
- ■ SDO Error Message Abort Code

Product features of the EtherCAT remote control expansion module

R2-EC0902 distributed DI/DO mixed module supports the EtherCAT (Ethernet Control Automation Technology) protocol, which makes this module a high-performance remote I/O bus system.

For digital input, this module provides the status reading interface for NPN and PNP load types. For digital output, this module uses a relay as an isolated output switch, which can meet the needs for applications that require controlling large current load.

This integrated type module can read the status and control the remote digital signal of the EtherCAT master, which can instantly acquire the data (within 1 ms) of the load status for multiple sets of slave modules.

The EtherCAT series products have a number of modules with different functions and features to meet different remote automation control requirements. This product is the optimal integration platform for reading the multi-point load status. 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 guide

Use this user guide as a reference for installing, setting up, using, and maintaining the R2-EC0902 EtherCAT remote control 32-channel DI / 32-channel DO (relay) expansion module.

Delta technical services

Consult your Delta equipment distributors or Delta Customer Service Center if you encounter any problems.

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

(This page is intentionally left blank.)

Table of Contents

5 Object Dictionary

6 SDO Error Message Abort Code

Product Inspection and Model Explanation

1

This chapter includes the product inspection, model explanation, and instructions for the R2-EC0902 extension module. Read this chapter before using the product.

1.1   Product inspection

Check the following items after receiving the product:

1. Packaging: make sure the product's packaging is not damaged.

2. Bubble wrap: for protection of the product. Make sure the stickers are firmly attached to the bubble wrap.

3. R2-EC0902: check the product for damage.

4. Product installation instructions: make sure there is an instruction sheet.

1.2   Model explanation

$$\underset{(1)}{\underline{R}}\ \underset{(2)}{\underline{2}} - \underset{(3)}{\underline{EC}}\ \underset{(4)}{\underline{09}}\ \underset{(5)}{\underline{02}}$$

No.	Item	Description
(1)	Product type	R: remote I/O series
(2)	Product type	2: board type
(3)	Bus type	EC: EtherCAT
(4)	Module type	09: distributed DI/DO mixed module (remote module)
(5)	Module subtype	02: 32-CH input, 24 V_{DC} / 32-CH output, relay type, 2A

1.3   Product instructions

■ Use separate power supplies for the module and common I/O port.

■ Do not place or use this product in environments containing oil mist, salt mist, and dust.

■ Do not use relays in environments containing inflammable or explosive gas. The electric arc may ignite the inflammable or explosive gas when switching on and off.

Specifications and Product Interface

2

This chapter introduces the product specifications of the R2-EC0902 product, including electrical specifications, product diagram, dimensional specifications, and definitions of the ports and indicators.

2.1 Electrical specifications

Item	R2-EC0902		
Power	24 V_{DC}, -15% to +20%		
Input current	< 1 A		
Digital input / output	Digital input		Digital output
Isolation type	Optical coupling isolation		Relay
Signal type	Sink / Source		A (N.O) (dry contact)
I/O points	32-CH		32-CH
Maximum operating power supply	30 V_{DC} @ 8 mA per CH		30 V_{DC} @ 2 A per CH 250 V_{AC} @ 2 A per CH
Rated input power	24 V_{DC} @ 5.1 mA		-
Operating frequency	1 kHz		1 Hz
Operation time (OFF > ON)	300 µs		10 ms
Release time (ON > OFF)	300 µs		5 ms
Relay operation times	-		Inductive load
	-		100,000 times, 30 V_{DC} / 250 V_{AC} @ 2A
	-		Resistive load
	-		150,000 times, 30 V_{DC} / 250 V_{AC} @ 2A
Outer dimensions	230 x 121.7 x 41.7 mm (W x H x D)		
Operating environment	Operating temperature: 0°C to 50°C (32°F to 122°F) Storage temperature: -20°C to +70°C (-4°F to +158°F)		
Mounting type	Rail type		
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)		
Protection rating	IP20		
Approvals	CE UL CERTIFIED SAFETY US-CA E206327 IND. CONT. EQ.		

2.2 Product diagram and dimensions

R2-EC0902 is a mixed input / output module. The input supports DC sink / source output devices. The output uses relays as the output drive circuit, supporting load devices at a maximum of 30V (DC) / 250V (AC). If the output port is using an inductive load, connect a spark quencher to both ends of the load in parallel to prevent the circuit from being damaged by the back electromotive force.

2.2.1 Product diagram

Front view of R2-EC0902 module panel
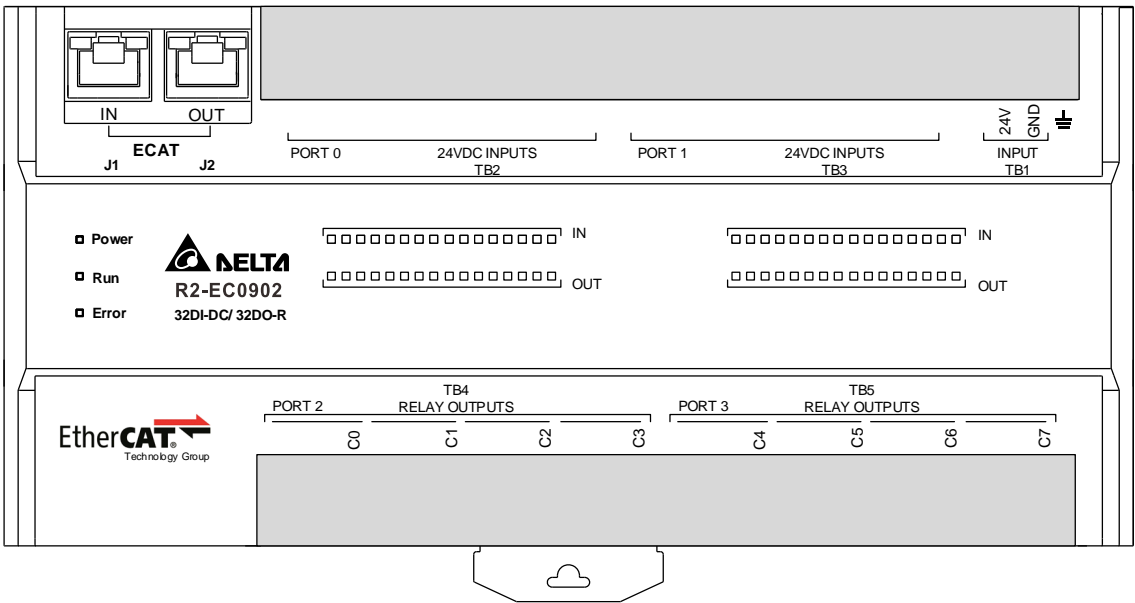
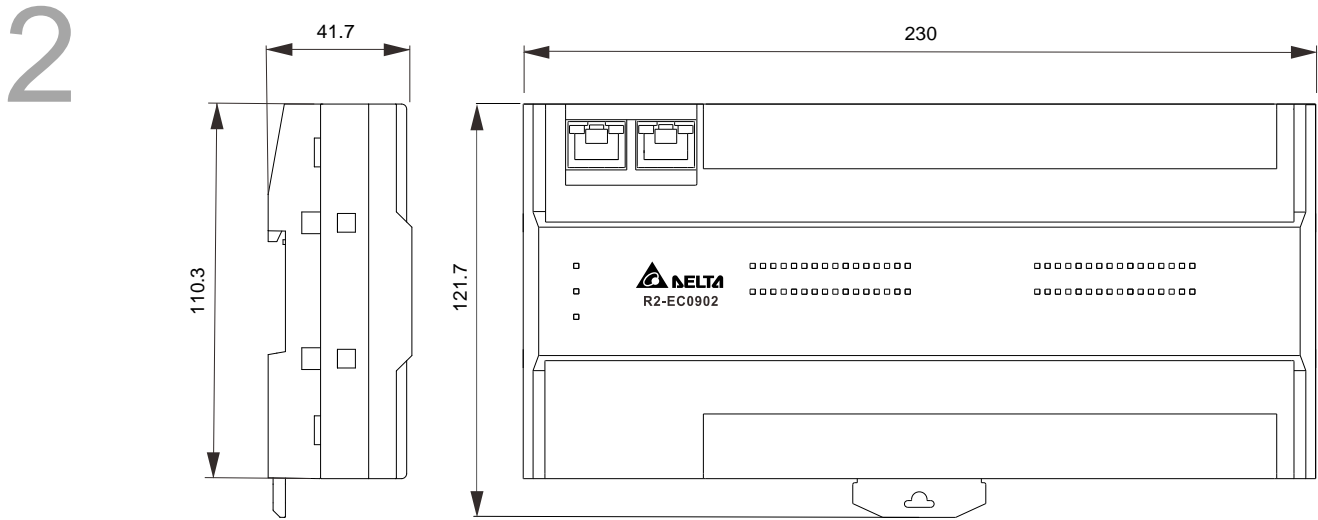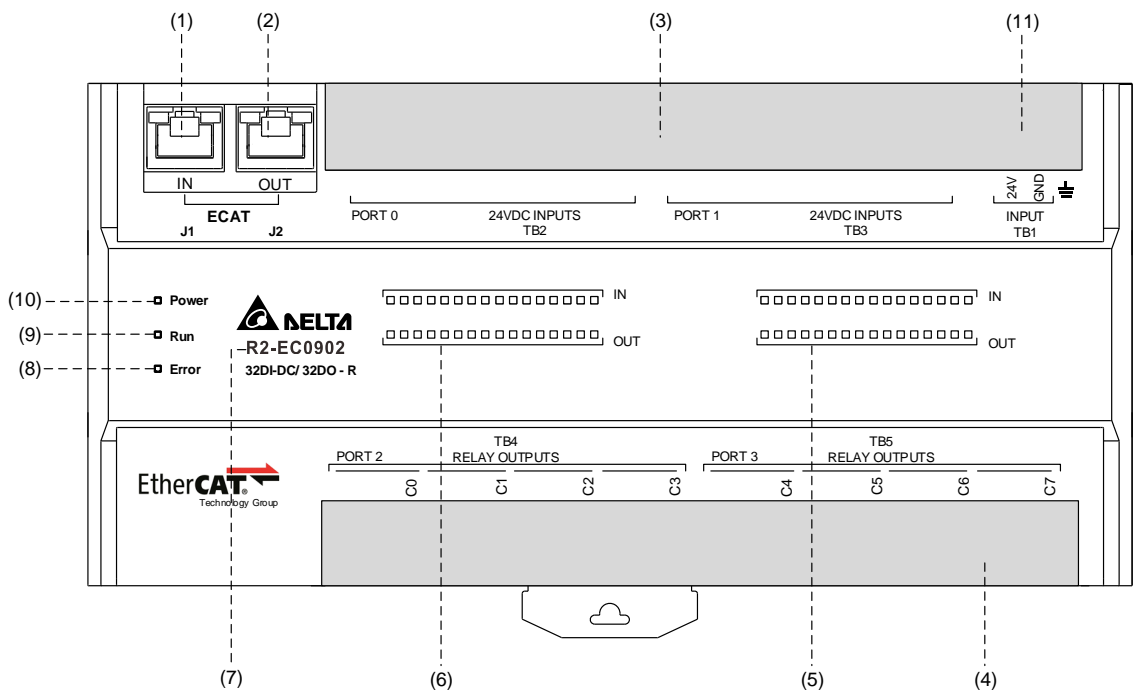## 2.2.2   Product dimensions

R2-EC0902 module dimensions: 230 x 121.7 x 41.7 mm (W x H x D)

2.3   Product interface description

The definitions and descriptions of the interface and configuration for the R2-EC0902 model are as follows.
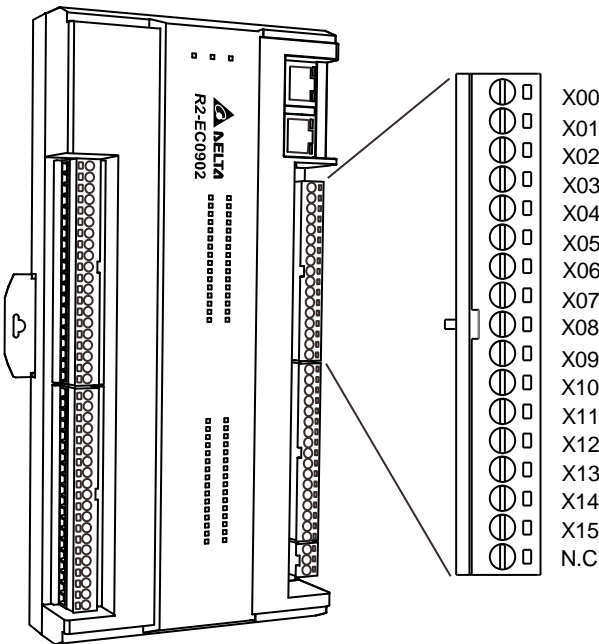

No.	Description
(1)	EtherCAT input port (connection status indicator included)
(2)	EtherCAT output port (connection status indicator included)
(3)	GPIO input ports (Port 0 and Port 1)
(4)	GPIO output ports (Port 2 and Port 3)
(5)	Status indicators for GPIO Port 1 (input) and Port 3 (output)
(6)	Status indicators for GPIO Port 0 (input) and Port 2 (output)
(7)	Model number
(8)	Error indicator
(9)	Communication indicator
(10)	Power indicator
(11)	External power port

2.4   Port description

2.4.1   IO Port 0

The pin definitions and descriptions of Port 0 for the R2-EC0902 model are as follows.

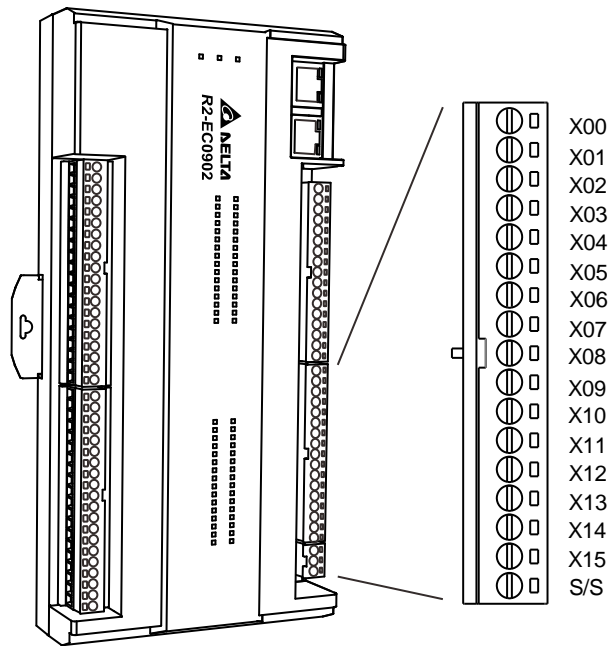| Pin	Description	Pin	Description
X00	1st set of input of Port 0	X09	10th set of input of Port 0
X01	2nd set of input of Port 0	X10	11th set of input of Port 0
X02	3rd set of input of Port 0	X11	12th set of input of Port 0
X03	4th set of input of Port 0	X12	13th set of input of Port 0
X04	5th set of input of Port 0	X13	14th set of input of Port 0
X05	6th set of input of Port 0	X14	15th set of input of Port 0
X06	7th set of input of Port 0	X15	16th set of input of Port 0
X07	8th set of input of Port 0	N.C	Reserved (no connection)
X08	9th set of input of Port 0	-	-

2.4.2   IO Port 1

The pin definitions and descriptions of Port 1 for the R2-EC0902 model are as follows.

Pin	Description	Pin	Description
X00	1st set of input of Port 1	X09	10th set of input of Port 1
X01	2nd set of input of Port 1	X10	11th set of input of Port 1
X02	3rd set of input of Port 1	X11	12th set of input of Port 1
X03	4th set of input of Port 1	X12	13th set of input of Port 1
X04	5th set of input of Port 1	X13	14th set of input of Port 1
X05	6th set of input of Port 1	X14	15th set of input of Port 1
X06	7th set of input of Port 1	X15	16th set of input of Port 1
X07	8th set of input of Port 1	S/S*	Setting for common input port (NPN, PNP)
X08	9th set of input of Port 1	-	-

Note: S/S: setting for common input port (NPN, PNP). (NPN = Vcc, PNP = GND)

2.4.3   IO Port 2

The pin definitions and descriptions of Port 2 for the R2-EC0902 model are as follows.
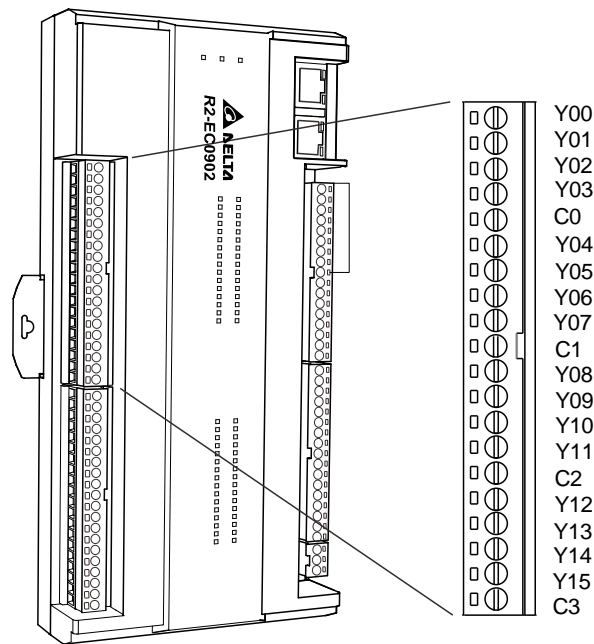
Pin	Description	Pin group
Y00	1st set of output of Port 2	C0*
Y01	2nd set of output of Port 2	
Y02	3rd set of output of Port 2	
Y03	4th set of output of Port 2	
Y04	5th set of output of Port 2	C1*
Y05	6th set of output of Port 2	
Y06	7th set of output of Port 2	
Y07	8th set of output of Port 2	
Y08	9th set of output of Port 2	C2*
Y09	10th set of output of Port 2	
Y10	11th set of output of Port 2	
Y11	12th set of output of Port 2	
Y12	13th set of output of Port 2	C3*
Y13	14th set of output of Port 2	
Y14	15th set of output of Port 2	
Y15	16th set of output of Port 2	

Note: C0: Group 0 of relay common output port; C1: Group 1 of relay common output port; C2: Group 2 of relay common output port; C3: Group 3 of relay common output port.

2.4.4 IO Port 3

The pin definitions and descriptions of Port 3 for the R2-EC0902 model are as follows.
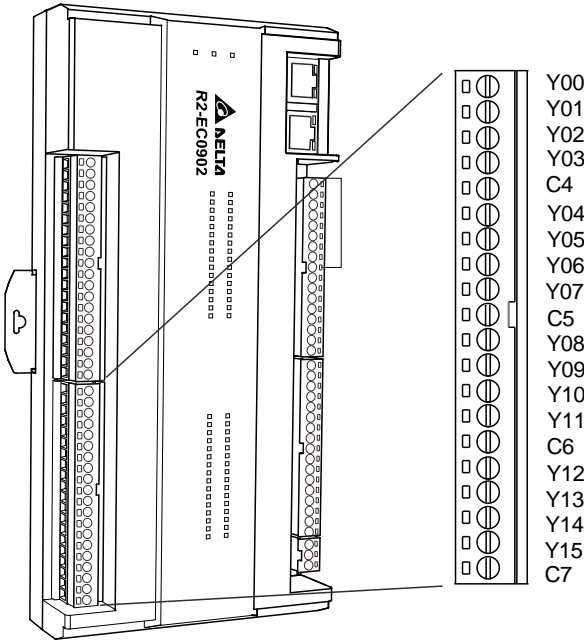
Pin	Description	Pin group
Y00	1st set of output of Port 3	C4*
Y01	2nd set of output of Port 3	
Y02	3rd set of output of Port 3	
Y03	4th set of output of Port 3	
Y04	5th set of output of Port 3	C5*
Y05	6th set of output of Port 3	
Y06	7th set of output of Port 3	
Y07	8th set of output of Port 3	
Y08	9th set of output of Port 3	C6*
Y09	10th set of output of Port 3	
Y10	11th set of output of Port 3	
Y11	12th set of output of Port 3	
Y12	13th set of output of Port 3	C7*
Y13	14th set of output of Port 3	
Y14	15th set of output of Port 3	
Y15	16th set of output of Port 3	

Note: C4: Group 4 of relay common output port; C5: Group 5 of relay common output port; C6: Group 6 of relay common output port; C7: Group 7 of relay common output port.

2.4.5 Power port

The pin definitions and descriptions of the power port for the R2-EC0902 model are as follows.
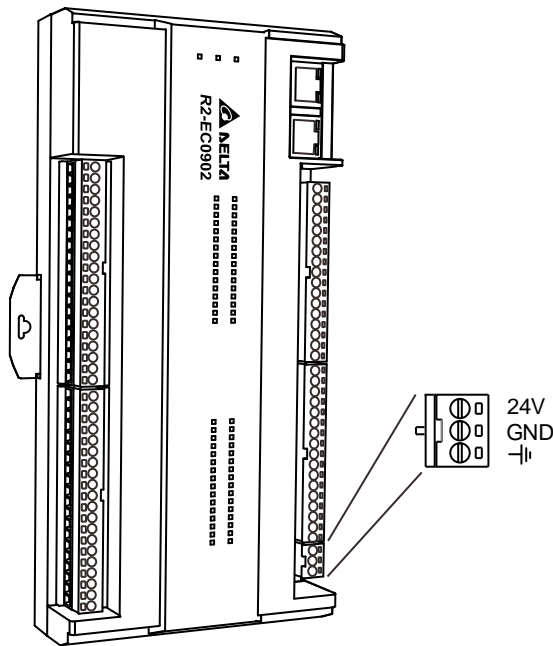
Pin	Description	Note
24V	External power supply 24 V_{DC} for the module	Error range: -15% to +20%
GND	External power ground for the module	-
FG ($\perp$)	Functional ground	-

2.4.6   EtherCAT communication port indicator

The description of the communication port indicators for the R2-EC0902 model are as follows.
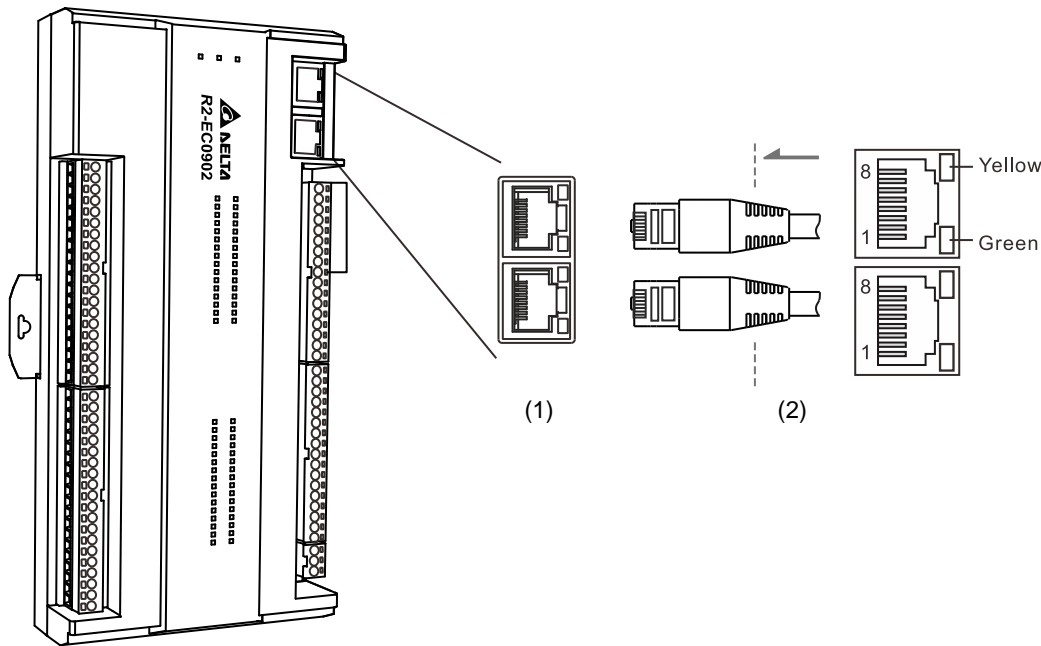
(1) Ethernet connectors (female); (2) Ethernet connectors (male)
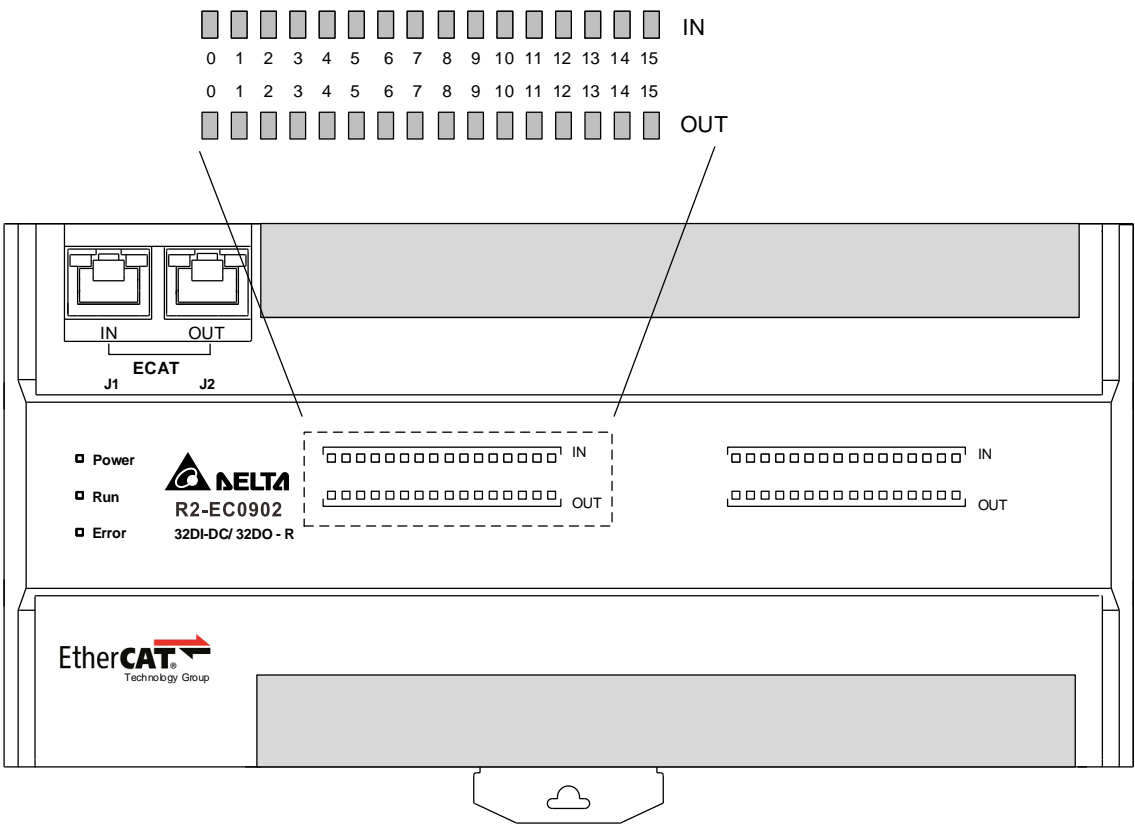
The communication port indicator (RJ-45 green light) shows the EtherCAT connection status.

Indicator status	Description	Note
Off	No connected device.	Steady off
On	The device is connected but not activated.	Steady green
Blinking	The device is connected and activated.	Flashing green

Note: RJ-45 yellow light: steady off (no function).

2.4.7 IO Indicator 1

The definitions of the IO Port 0 / Port 2 indicators for the R2-EC0902 model are as follows.

The indicator shows the status of the GPIO controller signal. A steady green light indicates the IO is activated.

IN		OUT	
Indicator pin	Corresponding IO port	Indicator pin	Corresponding IO port
0	X00	0	Y00
1	X01	1	Y01
2	X02	2	Y02
3	X03	3	Y03
4	X04	4	Y04
5	X05	5	Y05
6	X06	6	Y06
7	X07	7	Y07
8	X08	8	Y08
9	X09	9	Y09
10	X10	10	Y10
11	X11	11	Y11
12	X12	12	Y12
13	X13	13	Y13
14	X14	14	Y14
15	X15	15	Y15

Note: when the output indicator is On, it only means that the output is activated by the controller.

If the actual signal has no action, check whether the IO port is correctly connected.

2

2.4.8   IO Indicator 2

The definitions of the IO Port 1 / Port 3 indicators for the R2-EC0902 model are as follows.

The indicator shows the status of the GPIO controller signal. A steady green light indicates the IO is activated.

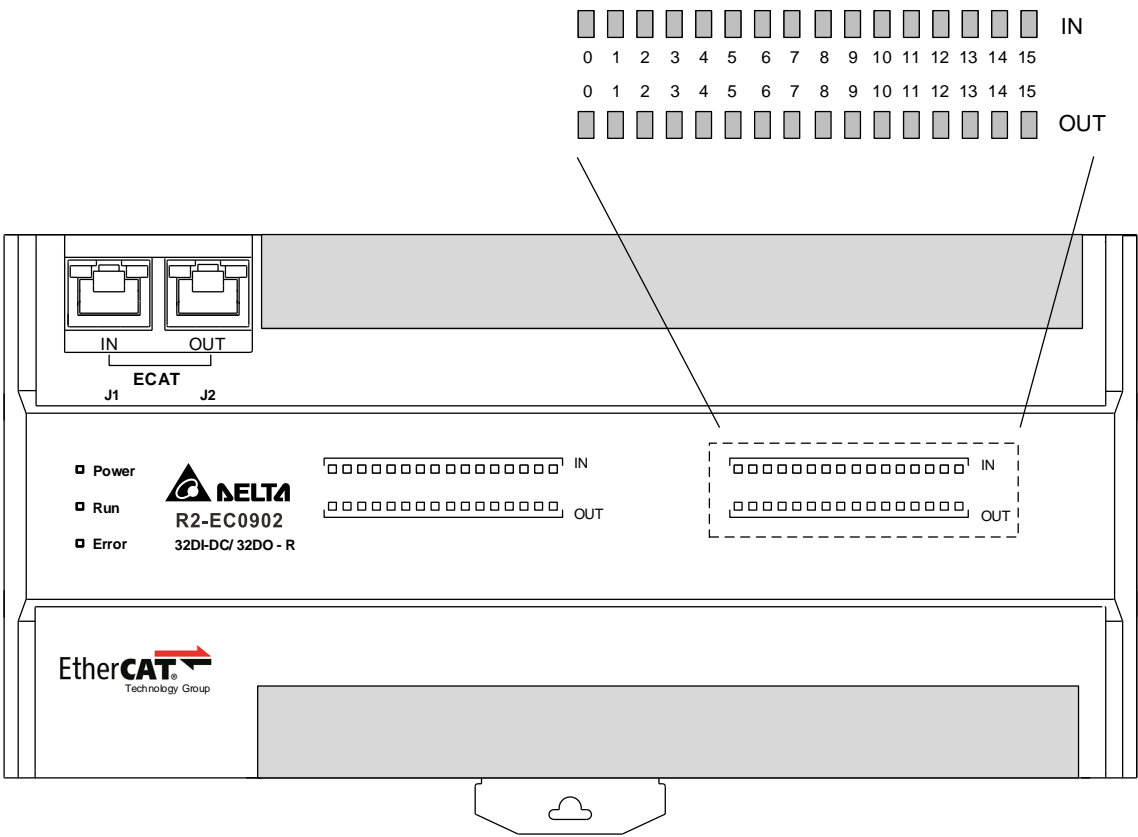| IN		OUT	
Indicator pin	Corresponding IO port	Indicator pin	Corresponding IO port
0	X00	0	Y00
1	X01	1	Y01
2	X02	2	Y02
3	X03	3	Y03
4	X04	4	Y04
5	X05	5	Y05
6	X06	6	Y06
7	X07	7	Y07
8	X08	8	Y08
9	X09	9	Y09
10	X10	10	Y10
11	X11	11	Y11
12	X12	12	Y12
13	X13	13	Y13
14	X14	14	Y14
15	X15	15	Y15

Note: when the output indicator is On, it only means that the output is activated by the controller.

If the actual signal has no action, check whether the IO port is correctly connected.

2

2.4.9 Module status indicator

The definitions of the module status indicators for the R2-EC0902 model are as follows.
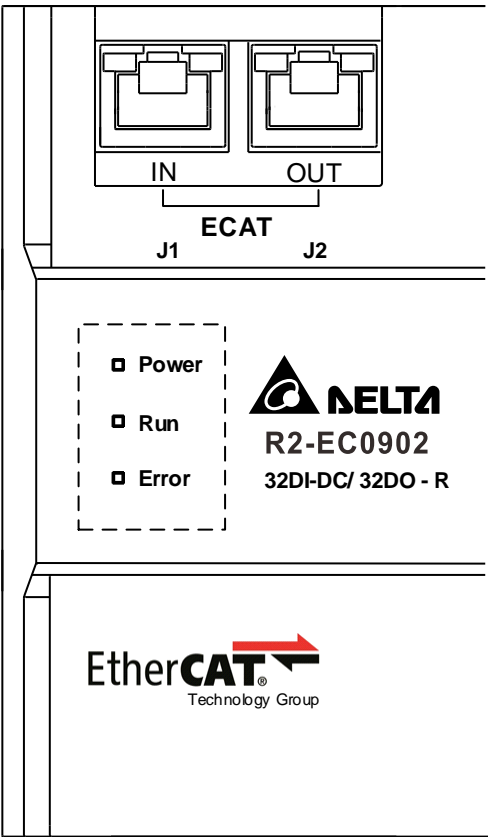
The module status indicators include the module power indicator (Power), the module communication indicator (Run), and the module error indicator (Error).

Indicator	Status	Description
Power	On	The external voltage 24 V_{DC} of the module is normal.
	Off	There is no voltage input or the voltage is abnormal.
Run	Off	Initialization status.
	Continuous flashing*	Safe Op mode.
	Single flashing*	Single flashing
	On	Normal operation mode.
Error	Double flashing*	The connection is disconnected or abnormal.
	Off	No error has occurred.

Note:

1. The Run indicator is a flashing green light.

    a. Continuous flashing: the flashing frequency is as shown in the following figure.
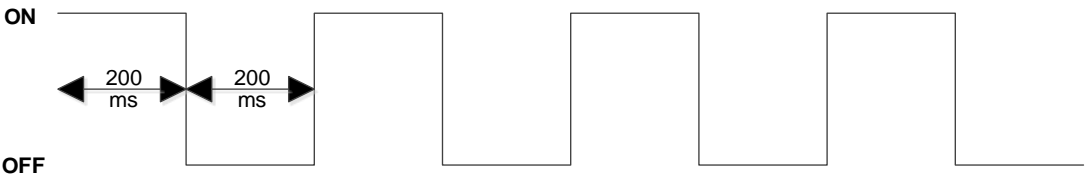
    b. Single flashing: the flashing frequency is as shown in the following figure.
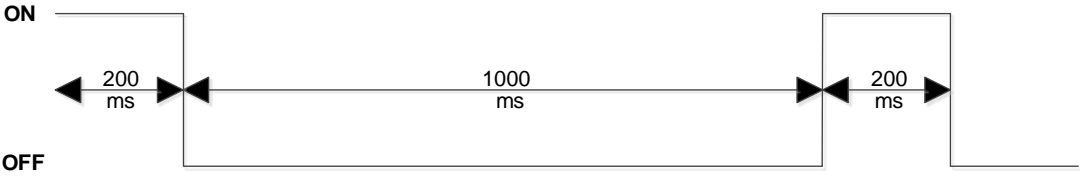
2. The Error indicator is a flashing red light.

    Double flashing: the flashing frequency is as shown in the following figure.

(This page is intentionally left blank.)

2

(This page is intentionally left blank.)

Wiring

3

This chapter provides wiring instructions for the R2-EC0902 product, including wiring examples of the input and output ports.

3.1   Input port wiring example

■   R2-EC0902 input port connected to NPN (SINK) type load

Isolate the IO power supply IO_24V / IOGND and module power supply 24V / GND circuits.

The following example shows a single point (X15) input diagram, and the other 15 sets (X00 - X14) have the same input structure. Port 0 (X00 - X15) / Port 1 (X00 - X15) are the same control types (NPN or PNP). The rated voltage of the IO input port is 24 V_{DC} @ 5.1 mA and the maximum operating power is 30 V_{DC}. Do not input power supply exceeding 30 V_{DC} or AC power to avoid damaging the module circuit.

LPF: low-pass filter

RVP: reverse voltage protect

3
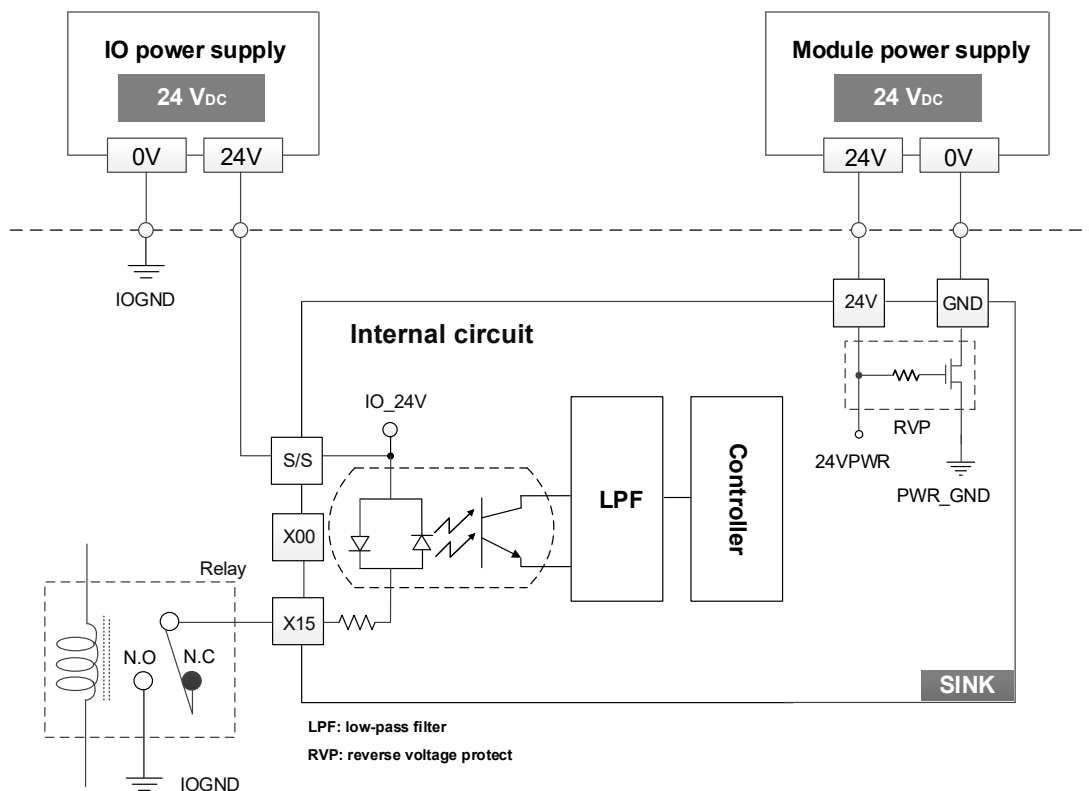
■   R2-EC0902 input port connected to PNP (SOURCE) type load

Isolate the IO power supply IO_24V / IOGND and module power supply 24V / GND circuits.

The following example shows a single point (X15) input diagram, and the other 15 sets (X00 - X14) have the same input structure. Port 0 (X00 - X15) / Port 1 (X00 - X15) are the same control types (NPN or PNP). The rated voltage of the IO input port is 24 V_{DC} @ 5.1 mA and the maximum operating power is 30 V_{DC}. Do not input power supply exceeding 30 V_{DC} or AC power to avoid damaging the module circuit.

LPF: low-pass filter

RVP: reverse voltage protect

3.2 Output port wiring example

■ R2-EC0902 relay output port connected to the load

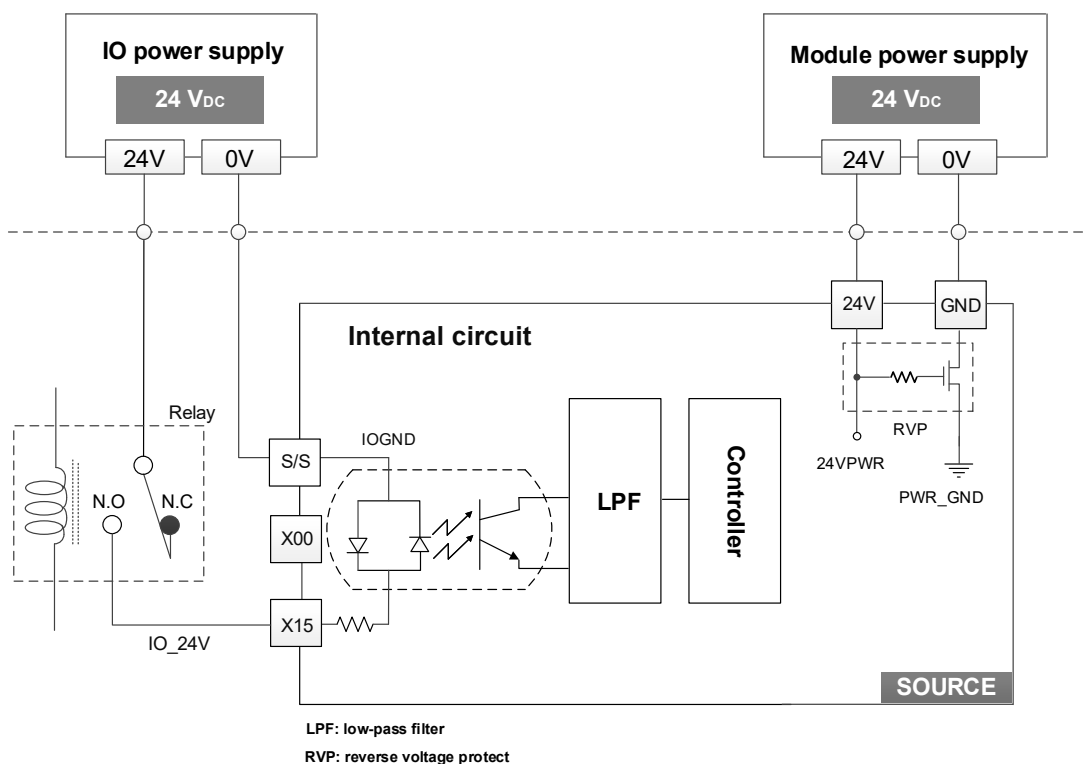Isolate the IO power supply IO_24V / IOGND and module power supply 24V / GND circuits.

When using a relay, connect a spark quencher (SPQ) in parallel according to the load requirements. This can prolong the life of the contacts and suppress contact sparks and surge voltage. When using an inductive load, the spark quencher can reduce the interference of the back electromotive force.
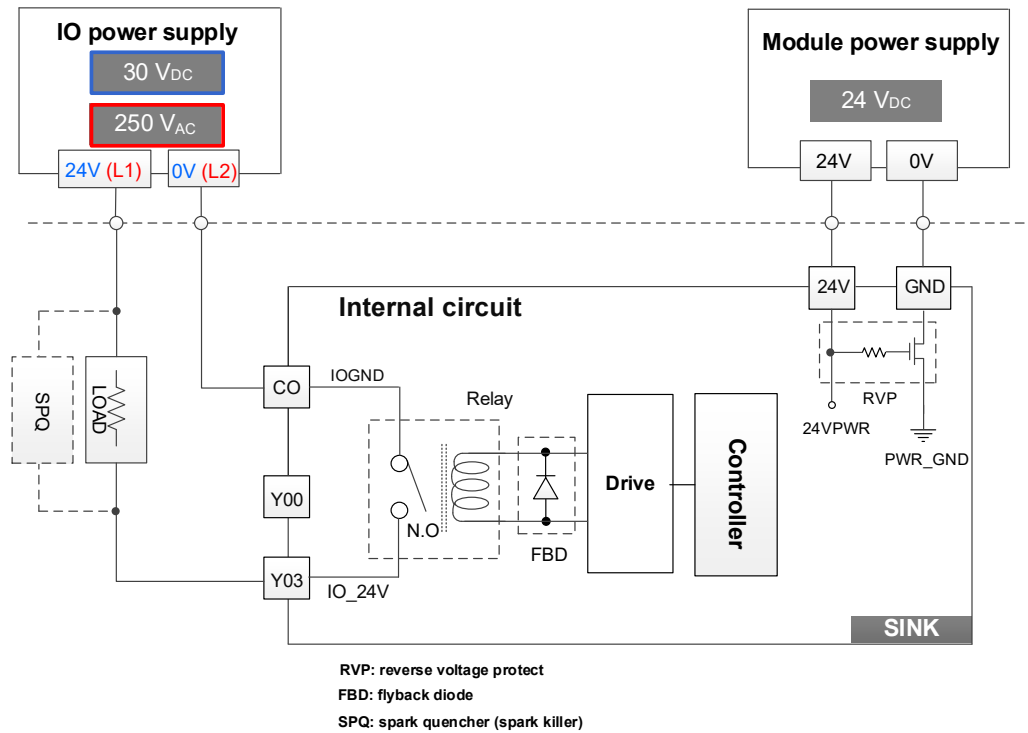
Note: use 24V & 0V wiring for V_{DC} IO power supply; use L1 & L2 wiring for V_{AC} IO power supply.

3.3   Relay

■   Precautions for using relay output:

When the relay output switches to on, bouncing occurs because it is a mechanical action, as shown in the following figure.

For the load application, add a debounce circuit to avoid misoperation. For the digital logic application, add a software filter to avoid misinterpretation.
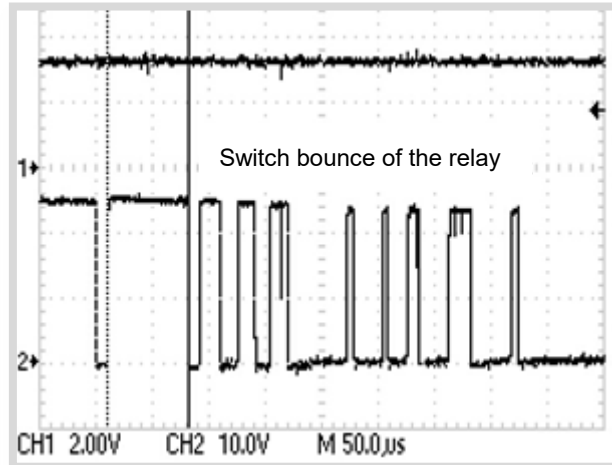
It is suggested to follow these items to avoid misoperation.

1.   Set the hardware or software filter time to > 100 μs.

2.   The hardware filter (debounce circuit) can use the external circuit to add an additional capacitor. The capacitance value is approximately 0.1 μF - 0.47 μF (calculated according to the current flowing through the load).

3.   Use the spark quencher to reduce surge voltage shock and prevent bouncing.

3
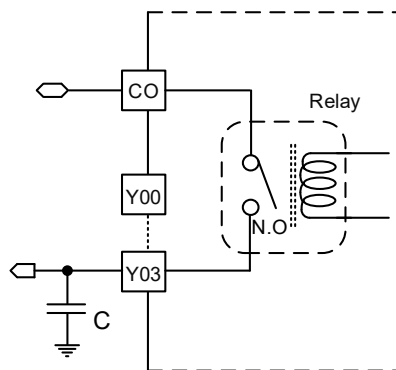
■   Use of relay spark quencher

The use of spark quencher prolongs the life of the contacts, suppresses contact sparks and surge voltage, reduces interference, and reduces carbon deposition caused by contact electric arc.

The following table shows application examples of the spark quenchers. You can use these as references for modifying the corresponding circuit design.
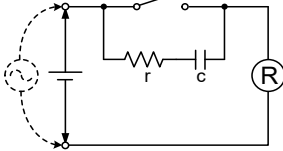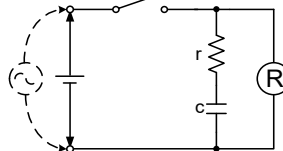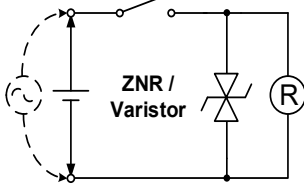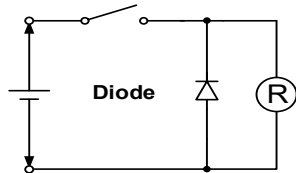
Simplified wiring diagram	Description
	This circuit is included in the module. (1) When in use, r should be greater than 10 ohm. (2) When applying AC voltage, the load impedance Ⓡ should be smaller than the r and C impedances of the spark quencher. r > 10 * Ⓡ r = 33 Kohm, 1/2 W
	Apply AC or DC power to the output port. (1) When r is in use, it should equal the load impedance Ⓡ. (2) When C is in use, its configuration should be 0.1 µF ~ 1 µF. Adjust the configuration value according to the load impedance.
	Apply AC or DC power to the output port. (1) When selecting a zener diode, it is suggested that the breakdown voltage is at least 2 times the applied voltage and the forward current value should be greater than the current flowing through the load impedance R. VR (DIODE)_Min > 2* IO_VCC (2) Or use a varistor to prevent high voltage from passing through the relay contact point from the application end. When selecting a varistor, the rating needs to be at least 1.5 times the application voltage.
	Apply DC power only to the output port. (1) When selecting a diode, it is suggested that the reverse withstand voltage is at least 10 times the applied voltage and the forward current value should be greater than the current flowing through the load impedance Ⓡ. VR (DIODE)_Min > 3* IO_VCC (2) If the applied voltage is 24V, the reverse withstand voltage of the diode should be above 75V.

When the spark quencher is installed, it delays the release time of the relay. Check if any abnormal operation has occurred to the connected load application.

3.4 Installation example

The controller communicates with the EtherCAT devices (ASD-A2-E) through Ethernet (RJ-45) and the extension module (R2-EC0902), accessing and controlling the status of the slaves.
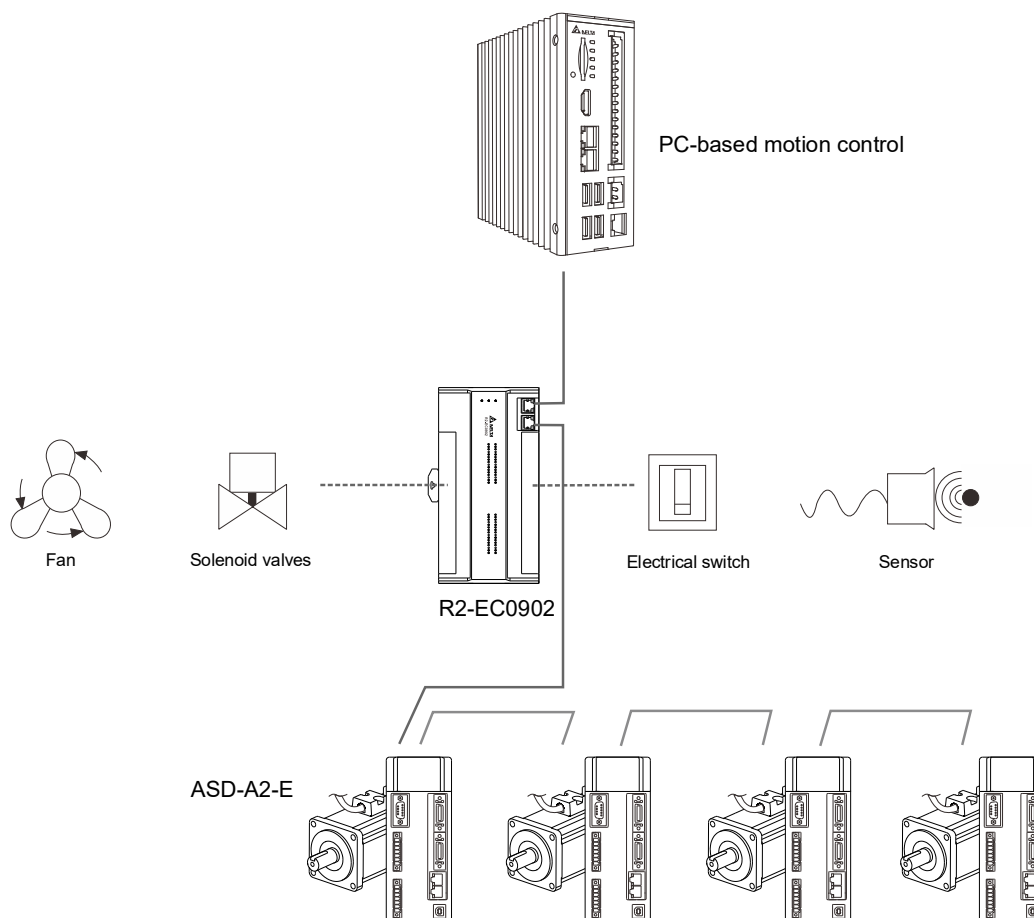
Considering the heat dissipation direction of the module, it is suggested that you mount the module vertically.
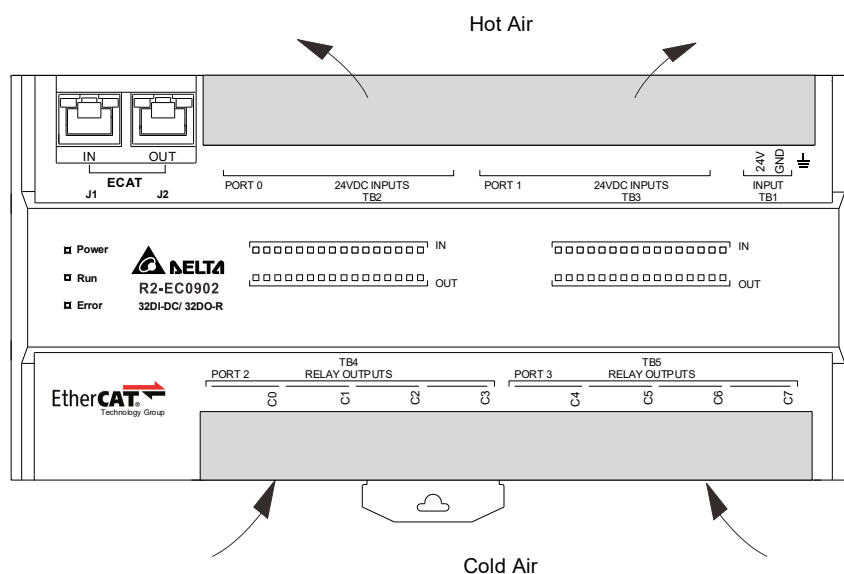
3.5   Connector assembly and disassembly steps

The assembly and disassembly steps for the R2-EC0902 connector are as follows.

■   Assembly steps

Step 1: place the plug with a tilt angle into the socket and align the pins of the plug and the
socket.

Step 2: press down the plug firmly until it snaps into place.

Step 3: make sure the plug is properly aligned with and fixed to the socket.
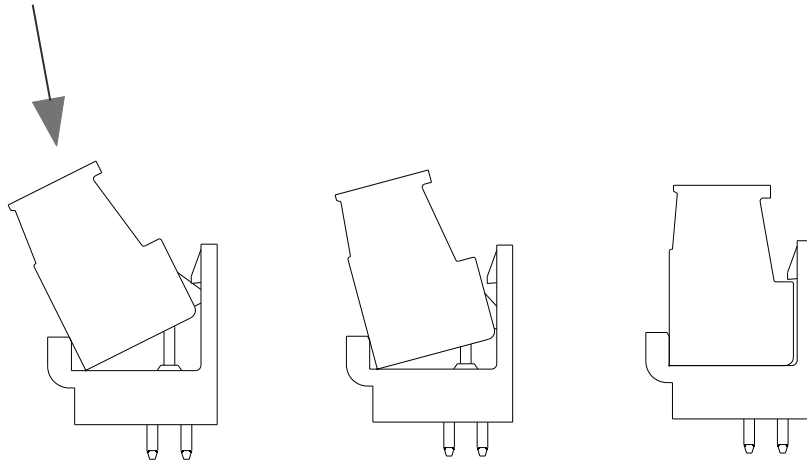
■   Disassembly steps

Step 1: find the slot on top of the connector.

Step 2: insert the tip of the screwdriver to the slot.

Step 3: pry the plug gently away from the socket and the plug will loosen.

Step 4: take the plug out of the socket.

CiA401 Drive Profile

4

This chapter introduces the operation and related objects of the output module according to the CiA401 protocol used by R2-EC0902.

4.1 Operation mode

You can use the objects DO Setting Value (6200h) and Active DO Enable (2001h) to control the digital output status or use DO Filter Mask (6208h) to designate the output channel. When there is a connection error, you can use the objects DO Error Mode Enable (6206h) and DO Error Mode Setting Value (6207h) to set the output status. Refer to the following control flowchart.
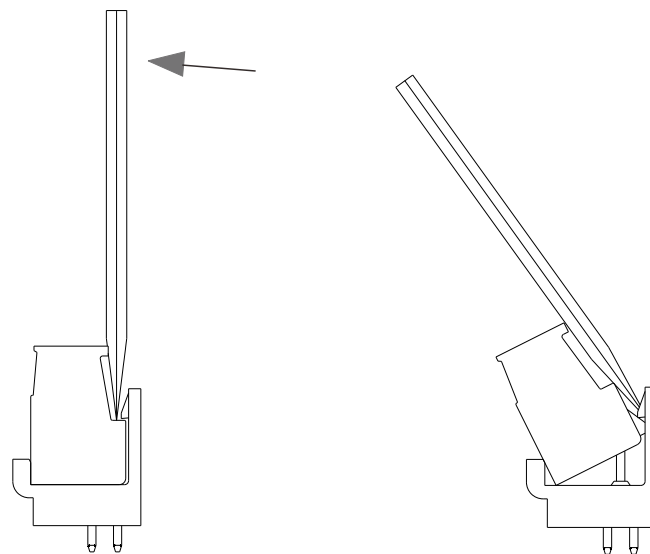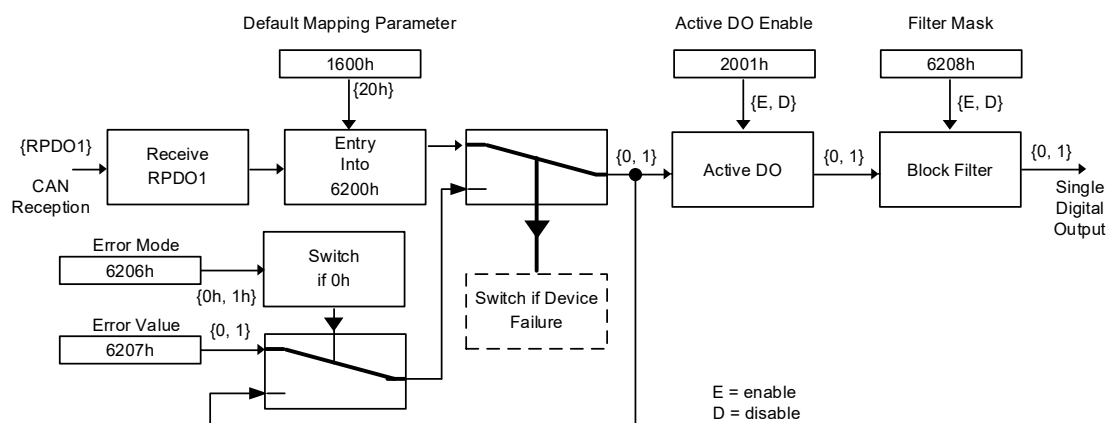

4.1.1 Related objects

This table provides the names and setting properties of the related objects.

Index	Sub	Name	Access	PDO Mapping	Unit	Type
2000h	-	Read DO Actual Value	-	-	-	-
	1	Read Port 2 DO CH0 - 7 Actual Value	RO	NO	-	USINT
	2	Read Port 2 DO CH8 - 15 Actual Value	RO	NO	-	USINT
	3	Read Port 3 DO CH0 - 7 Actual Value	RO	NO	-	USINT
	4	Read Port 3 DO CH8 - 15 Actual Value	RO	NO	-	USINT
2001h	-	Active DO Enable	-	-	-	-
	1	Active Port 2 DO CH0 - 7 Enable	RW	NO	-	USINT
	2	Active Port 2 DO CH8 - 15 Enable	RW	NO	-	USINT
	3	Active Port 3 DO CH0 - 7 Enable	RW	NO	-	USINT
	4	Active Port 3 DO CH8 - 15 Enable	RW	NO	-	USINT

Index	Sub	Name	Access	PDO Mapping	Unit	Type
6200h	-	DO Setting Value	-	-	-	-
	1	Port 2 DO CH0 - 7 Setting Value	RW	YES	-	USINT
	2	Port 2 DO CH8 - 15 Setting Value	RW	YES	-	USINT
	3	Port 3 DO CH0 - 7 Setting Value	RW	YES	-	USINT
	4	Port 3 DO CH8 - 15 Setting Value	RW	YES	-	USINT
6206h	-	DO Error Mode Enable	-	-	-	-
	1	Port 2 DO Ch0 - 7 Error Mode Enable	RW	NO	-	USINT
	2	Port 2 DO Ch8 - 15 Error Mode Enable	RW	NO	-	USINT
	3	Port 3 DO Ch0 - 7 Error Mode Enable	RW	NO	-	USINT
	4	Port 3 DO Ch8 - 15 Error Mode Enable	RW	NO	-	USINT
6207h	-	DO Error Mode Setting Value	-	-	-	-
	1	Port 2 DO CH0 - 7 Error Mode Setting Value	RW	NO	-	USINT
	2	Port 2 DO CH8 - 15 Error Mode Setting Value	RW	NO	-	USINT
	3	Port 3 DO CH0 - 7 Error Mode Setting Value	RW	NO	-	USINT
	4	Port 3 DO CH8 - 15 Error Mode Setting Value	RW	NO	-	USINT
6208h	-	DO Filter Mask	-	-	-	-
	1	Port 2 DO CH0 - 7 Filter Mask	RW	NO	-	USINT
	2	Port 2 DO CH8 - 15 Filter Mask	RW	NO	-	USINT
	3	Port 3 DO CH0 - 7 Filter Mask	RW	NO	-	USINT
	4	Port 3 DO CH8 - 15 Filter Mask	RW	NO	-	USINT

4

(This page is intentionally left blank.)

4

(This page is intentionally left blank.)

Object Dictionary

5

This chapter introduces the objects, including the descriptions and applications, for R2-EC0902.

5.1   Object list

Object dictionary		Reference
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, 1601h)	5.3.1
	Transmit PDO Mapping (1A00h, 1A01h)	5.3.2
Sync Manager Communication Objects	Sync Manager Communication Type (1C00h)	5.4.1
	Sync Manager PDO Assignment (1C12h, 1C13h)	5.4.2
	Sync Manager Synchronization parameter (1C32h, 1C33h)	5.4.3
Manufacturer Specific Objects	Read DO Actual Value (2000h)	5.5.1
	Active DO Enable (2001h)	5.5.2
	DI Filter Range (2002h)	5.5.3
	Input Event Enable (2010h)	5.5.4
	Clear Input Event (2011h)	5.5.5
	Input Event Value (2012h)	5.5.6
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 the device.

Index	Sub	Name	Type	Access	PDO Mapping	Value
1000h	0	Device Type	UDINT	RO	NO	0x00030191

General information (bit 0 - 15): 0191 (DS401)

Additional information (bit 16 - 31): 0003 (bit16 Digital input, bit17 Digital output)

5.2.2   Error Register (1001h)

This object is an error register for the device. The value of this object is stored in the emergency message.

Index	Sub	Name	Type	Access	PDO Mapping	Value
1001h	0	Error Register	USINT	RO	NO	0x00

Bit definition:

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

5.2.3   Manufacturer Device Name (1008h)

This object acquires the device name of R2-EC0902.

Index	Sub	Name	Type	Access	PDO Mapping	Value
1008h	0	Manufacturer Device Name	STRING	RO	NO	R2-EC0902

5.2.4   Manufacturer Software Version (100Ah)

This object acquires the information about the software version of R2-EC0902.

Index	Sub	Name	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 about the device.

Index	Sub	Name	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	0x0000090X
	3	Revision number	UDINT	RO	NO	0x00100000
	4	Serial number	UDINT	RO	NO	0x00000000

5

5.3   PDO mapping objects

In the EtherCAT protocol, PDO Mapping Objects can be set to have the data updated periodically.

5.3.1   Receive PDO Mapping (1600h to 1601h)

Index	Sub	Name	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
1601h	0	Number of objects in this PDO	USINT	RO	NO	2
	1	Mapping entry 1	UDINT	RW	NO	0x20110008
	2	Mapping entry 2	UDINT	RW	NO	0x00000018

5.3.2   Transmit PDO Mapping (1A00h to 1A01h)

Index	Sub	Name	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	0x60000308
	4	Mapping entry 4	UDINT	RW	NO	0x60000408
1A01h	0	Number of objects in this PDO	USINT	RO	NO	2
	1	Mapping entry 1	UDINT	RW	NO	0x20120008
	2	Mapping entry 2	UDINT	RW	NO	0x00000018

5.4   Sync Manager Communication Objects

5.4.1   Sync Manager Communication Type (1C00h)

Index	Sub	Name	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 to 1C13h)

Index	Sub	Name	Type	Access	PDO Mapping	Value
1C12h	0	Number of assigned PDOs	USINT	RW	NO	1
	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	0
1C13h	0	Number of assigned PDOs	USINT	RW	NO	1
	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	0

5.4.3 Sync Manager Synchronization (1C32h to 1C33h)

Index	Sub	Name	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
	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
	32	Sync Error	BOOL	RO	NO	FALSE

5

5.5   Manufacturer Specific Objects

5.5.1   Read DO Actual Value (2000h)

This object reads the actual output value (8 output channels as a set).

Index	Sub	Name	Type	Access	PDO Mapping	Value
2000h	0	Read DO Actual Value	USINT	RO	NO	4
	1	Read Port 2 DO CH0 - 7 Actual Value	USINT	RO	NO	0 to 255
	2	Read Port 2 DO CH8 - 15 Actual Value	USINT	RO	NO	0 to 255
	3	Read Port 3 DO CH0 - 7 Actual Value	USINT	RO	NO	0 to 255
	4	Read Port 3 DO CH8 - 15 Actual Value	USINT	RO	NO	0 to 255

5.5.2   Active DO Enable (2001h)

This object sets whether the output channel is allowed to change (8 output channels as a set).

0 = status change not allowed; 1 = status change allowed.

Index	Sub	Name	Type	Access	PDO Mapping	Value
2001h	0	Active DO Enable	USINT	RO	NO	4
	1	Active Port 2 DO CH0 - 7 Enable	USINT	RW	NO	0 to 255
	2	Active Port 2 DO CH8 - 15 Enable	USINT	RW	NO	0 to 255
	3	Active Port 3 DO CH0 - 7 Enable	USINT	RW	NO	0 to 255
	4	Active Port 3 DO CH8 - 15 Enable	USINT	RW	NO	0 to 255

5.5.3   DI Filter Range (2002h)

This object sets the time range for digital input filtering. This function is carried out by the software function. The smallest software filtering unit is 100 µs, so when the digital input filtering time is set to 100 µs, the actual filtering range may reach 200 µs (100 µs + 100 µs). When the digital input filtering time is set to 1 ms, the actual filtering range may reach 1100 µs (1 ms + 100 µs).
This function is used with the digital input event recording function. When the digital input signal value is detected, the digital input event will be recorded.

Index	Sub	Name	Type	Access	PDO Mapping	Value
2002h	0	DI Filter Range	USINT	RW	NO	0 to 4

Bit definition:

Value	Data description
0	The digital input filtering time is 100 µs. (Default)
1	The digital input filtering time is 1 ms.
2	The digital input filtering time is 2 ms.
3	The digital input filtering time is 3 ms.
4	The digital input filtering time is 4 ms.

5.5.4 Input Event Enable (2010h)

This object enables the digital input event recording function.

Index	Sub	Name	Type	Access	PDO Mapping	Value
2010h	0	Input Event Enable	USINT	RW	NO	0 to 1

Bit definition:

Value	Data description
0	Disables the digital input event recording function. (Default)
1	Enables the digital input event recording function.

5.5.5 Clear Input Event (2011h)

This object clears the digital input event value.

Index	Sub	Name	Type	Access	PDO Mapping	Value
2011h	0	Clear Input Event	USINT	RW	YES	0 to 255

Bit definition:

Value	Data description
-	When the value of 2011h changes, the value of 2012h is cleared to 0 immediately.

5.5.6   Input Event Value (2012h)

This object displays the digital input event value.

Index	Sub	Name	Type	Access	PDO Mapping	Value
2012h	0	Input Event Value	USINT	RO	YES	0 to 255

Bit definition:

Bit	Meaning
0	Records whether the digital input signal of Port 1 Input CH8 has changed.
1	Records whether the digital input signal of Port 1 Input CH9 has changed.
2	Records whether the digital input signal of Port 1 Input CH10 has changed.
3	Records whether the digital input signal of Port 1 Input CH11 has changed.
4	Records whether the digital input signal of Port 1 Input CH12 has changed.
5	Records whether the digital input signal of Port 1 Input CH13 has changed.
6	Records whether the digital input signal of Port 1 Input CH14 has changed.
7	Records whether the digital input signal of Port 1 Input CH15 has changed.

5.6 Device Control

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

This object reads the digital input channel status (8 input channels as a set).

Index	Sub	Name	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 controls the digital output channel status (8 output channels as a set).

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

5.6.3 DO Error Mode Enable (6206h)

This object sets the Error Mode parameters (8 output channels as a set). 0 = remain the original output values; 1 = refer to the setting values of DO Error Mode Setting Value (6207h).

Index	Sub	Name	Type	Access	PDO Mapping	Value
6206h	0	DO Error Mode Enable	USINT	RO	NO	4
	1	Port 2 DO CH0 - 7 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	2	Port 2 DO CH8 - 15 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	3	Port 3 DO CH0 - 7 Error Mode Enable	USINT	RW	NO	0 to 255 Default: 255
	4	Port 3 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 Error Mode Output Value parameters (8 output channels as a set).

Index	Sub	Name	Type	Access	PDO Mapping	Value
6207h	0	DO Error Mode Setting Value	USINT	RO	NO	4
	1	Port 2 DO CH0 - 7 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	2	Port 2 DO CH8 - 15 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	3	Port 3 DO CH0 - 7 Error Mode Setting Value	USINT	RW	NO	0 to 255 Default: 0
	4	Port 3 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 parameters (8 output channels as a set). 0 = ignore the received setting values and remain the original output status; 1 = the output status is set as the received setting values.

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

SDO Error Message Abort Code

6

This chapter introduces the SDO Error Message Abort Code of R2-EC0902.

6

6.1   SDO Error Message Abort Code

The following table lists the abort codes for SDO communication errors:

Code	Description
0x05 03 00 00	Toggle bit was not changed.
0x05 04 00 00	SDO protocol timeout.
0x05 04 00 01	Invalid or unknown SDO command.
0x05 04 00 05	Insufficient memory.
0x06 01 00 05	Unsupported access to an object.
0x06 01 00 00	Attempt to read an object.
0x06 03 00 02	Attempt to write a read-only object.
0x06 02 00 00	Object does not exist in the object dictionary.
0x06 04 00 41	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 error in 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	Parameter value out of range (for write access).
0x06 09 00 31	Value range error: parameter value too big.
0x06 09 00 32	Value range error: parameter value too small.
0x06 09 00 36	Maximum value is less than minimum value.
0x08 00 00 00	General error.
0x08 00 00 20	Data cannot be transferred or stored to the application.
0x08 00 00 21	Due to local control, data cannot be transferred or stored to the application.
0x08 00 00 22	Due to current device status, data cannot be transferred or stored to the application.
0x08 00 00 23	Dynamic creation error of the object dictionary or the object dictionary does not exist.

Revision History

Release date	Version	Chapter	Revision contents
May, 2021	V2.0 (Second edition)	CH2	The module dimensions are modified as 230 x 121.7 x 41.7 mm (W x H x D)
July, 2020	V1.0 (First edition)		

(This page is intentionally left blank.)