

R1-EC-9144

User Guide

操作手冊

User Information

Be sure to store this guide at a safe place.

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Chapter 1 Preface

1.1 Inspection

Please inspect the following items carefully.

1. Package: Check if the package is complete.
2. Bubble wrap: It can protect the product. Please make sure the sticker is firmly stuck on it.
3. R1-EC9144: Please make sure no damage is shown on its appearance and the accessories are all attached.
4. Installation Guide: Check if there is an installation guide

1.2 Model Explanation

R 1 - EC 9 1 4 4
(1) (2) (3) (4) (5) (6) (7)

(1) Product Type	R : Remote
(2) Product Category	1 : Type 1 - Slim
(3) Product Name	ESC : EtherCAT Slave Component
(4) Module Type	9 : Gateway DAC Module
(5) Module Resolution	1 : 16-bit
(6) Module Sampling Rate	4 : All Type Voltage : $\pm 10\text{ V}$ / $\pm 5\text{ V}$ / $0 \sim 5\text{ V}$ / $0 \sim 10\text{ V}$ Current : $0 \sim 20\text{ mA}$ / $4 \sim 24\text{ mA}$ / $0 \sim 24\text{ mA}$
(7) Channels	4 : 4 Channels

1.3 Using R1-EC9144

This product has to be used with R1-EC5500 of Delta Electronics.

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Chapter 2 Specifications

2.1 Product Figure



Figure 2.1 Front View

2.2 Specifications and Dimensions

2.2.1 Electrical Specifications

Item	R1-EC9144
Number of Inputs	4 (Single-Ended)
Power Supply	via E-bus
Signal Voltage	$\pm 10\text{ V} / \pm 5\text{ V} / 0 \sim 5\text{ V} / 0 \sim 10\text{ V}$
Signal Current	$0 \sim 20\text{ mA} / 4 \sim 24\text{ mA} / 0 \sim 24\text{ mA}$
Load	$> 1\text{K}\Omega$ (Short-Circuit-Proof)
Resolution	16 bit
Conversion Time	$\sim 80\text{ }\mu\text{s}$
Measurement Error	$< \pm 0.2\%$ (Full-Scale)
Electrical Isolation	1000 Vrms (E-bus / Signal Voltage)
E-bus Current Loss	$< 500\text{ mA}$
Bit Width during Mapping	Output: 4 x 16 Byte Data, (4 x16-bit Analogue Output)
Vibration / Shock Resistance	Conforms to EN 60068-2-6 / EN 60068-2-27/29
Noise Immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8 KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2 KV, Communication I/O: 1 KV RS (IEC 61131-2, IEC 61000-4-3: 8 MHz \sim 1 GHz, 10 V/m
Ambient Temperature	Operating: $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$; Storage: $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$

2.2.2 Dimensions

Dimensions: 100 mm x 73.2 mm x 17.5 mm

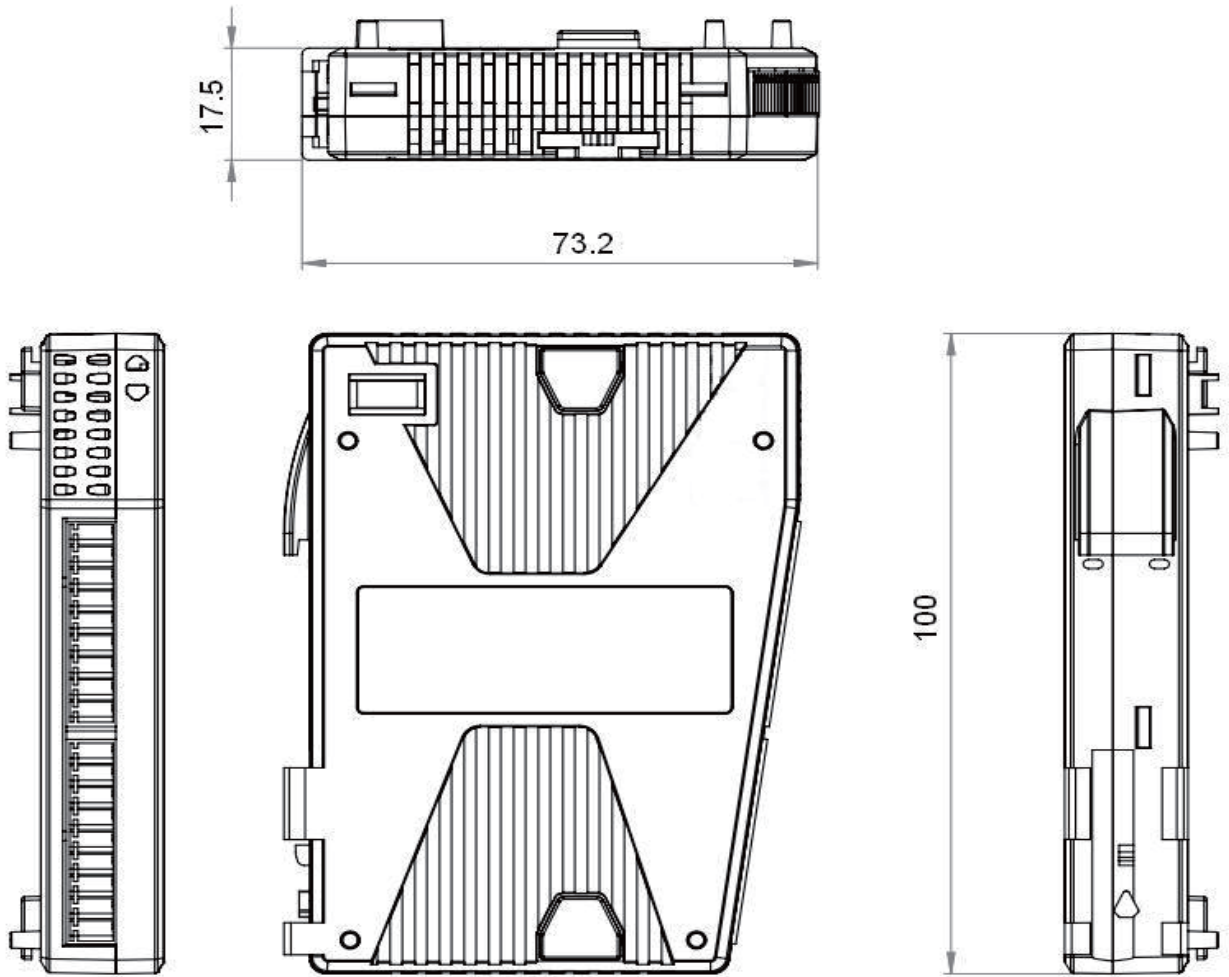


Figure 2.2 R1-EC9144 Module Dimensions

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Chapter 3 Product Description

3.1 Description of Each Part

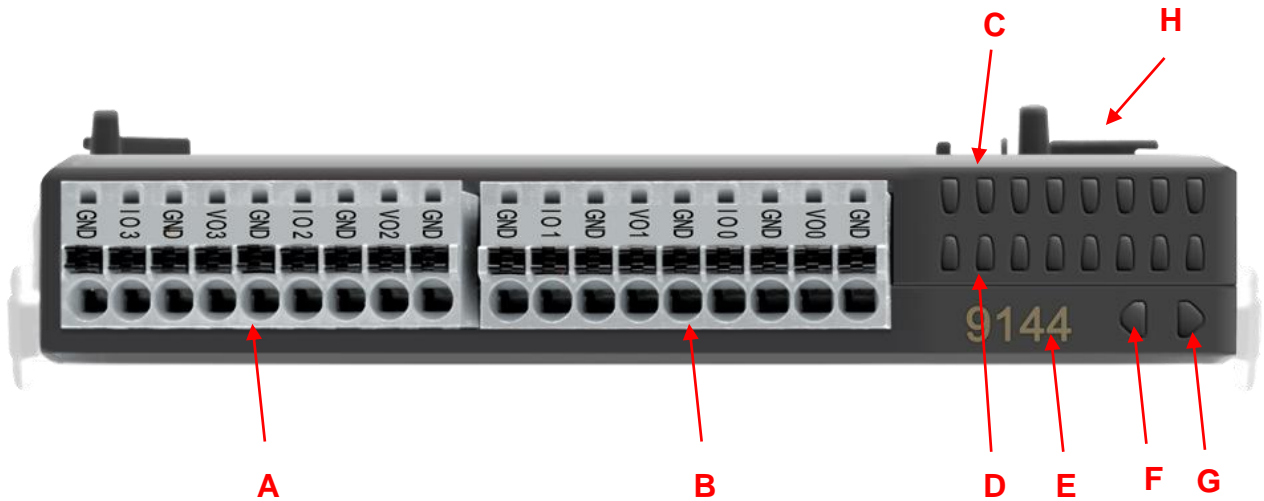


Figure 3.1 Identification of Each Part

No.	Description
A	Ch.2/Ch.3 Signal Port
B	Ch.0/Ch.1 Signal Port
C	(Part B) Ch.0 / Ch.1 Signal Display
D	(Part A) Ch.2 / Ch.3 Signal Display
E	Product ID Number
F	Status Indicator
G	Power Indicator
H	E-BUS Input Port

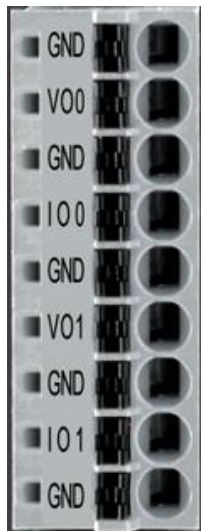


Figure 3.2 Pin Definition of Part B

Label	Description
GND	Analogue Ground
VO0	Ch.0 Voltage Output
GND	Analogue Ground
IO0	Ch.0 Current Output
GND	Analogue Ground
VO1	Ch.1 Voltage Output
GND	Analogue Ground
IO1	Ch.1 Current Output
GND	Analogue Ground

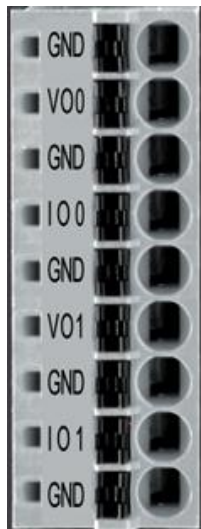


Figure 3.3 Pin Definition of Part A

Label	Description
GND	Analogue Ground
VO2	Ch.2 Voltage Output
GND	Analogue Ground
IO2	Ch.2 Current Output
GND	Analogue Ground
VO3	Ch.3 Voltage Output
GND	Analogue Ground
IO3	Ch.3 Current Output
GND	Analogue Ground



Figure 3.4 Indicator Definition

Label	Description	Label	Description
1	Ch.0 OUT Enable	9	Ch.2 OUT Enable
2	Ch.0 V Mode	10	Ch.2 V Mode
3	Ch.0 I Mode	11	Ch.2 I Mode
4	Ch.0 Error	12	Ch.2 Error
5	Ch.1 OUT Enable	13	Ch.3 OUT Enable
6	Ch.1 V Mode	14	Ch.3 V Mode
7	Ch.1 I Mode	15	Ch.3 I Mode
8	Ch.1 Error	16	Ch.3 Error

Chapter 4 Wiring

4.1 Wiring of R1-EC9144 Output Point

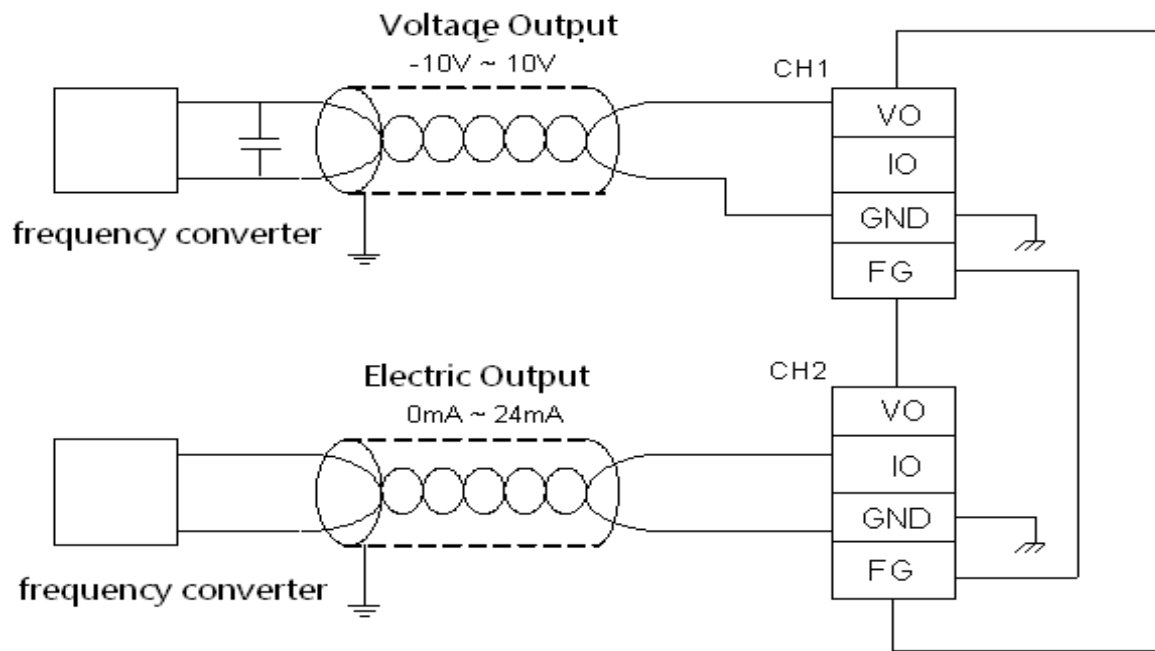


Figure 4.1 Wiring Example of Output Point

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Chapter 5 CiA401 Device Profile

5.1 Analogue Output Module

Users may use Range mode selection (2000h) and Write analogue output (6411h) to output voltage or current after the channel is enabled. If any error occurs, it will be shown via the object of Analogue output error value integer (6444h).

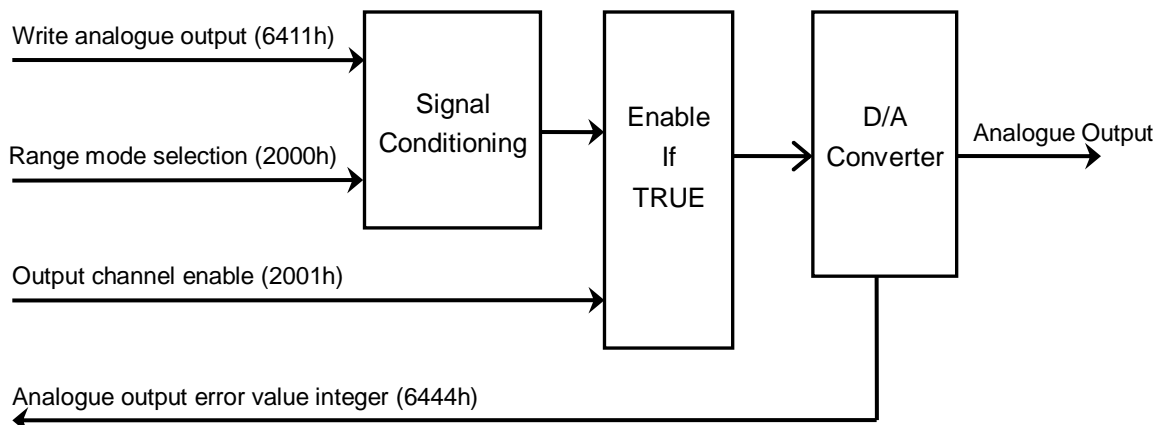


Figure 5.1 Object Block Diagram

Related Object

Index	Sub Index	Name	Data Type	Access	PDO Mapping	EEPROM
2000h	-	Range mode selection	-	-	-	-
	1	Ch.0 range mode select	UINT	RW	NO	NO
	2	Ch.1 range mode select	UINT	RW	NO	NO
	3	Ch.2 range mode select	UINT	RW	NO	NO
	4	Ch.3 range mode select	UINT	RW	NO	NO
2001h	-	Output channel enable	-	-	-	-
	1	Ch.0 output	UINT	RW	NO	NO
	2	Ch.1 output	UINT	RW	NO	NO
	3	Ch.2 output	UINT	RW	NO	NO
	4	Ch.3 output	UINT	RW	NO	NO
6411h	-	Write analogue output	-	-	-	-
	1	Ch.0 output value	UINT	RW	YES	NO
	2	Ch.1 output value	UINT	RW	YES	NO
	3	Ch.2 output value	UINT	RW	YES	NO
	4	Ch.3 output value	UINT	RW	YES	NO
6444h	-	Analogue output error value integer	UINT	RO	NO	NO

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Chapter 6 Object Dictionary

6.1 Command List

Object Dictionary	
Manufacturer Specific Objects	Output range selection (2000h)
	Output channel enable (2001h)
Device Control	Write analogue output (6411h)
	Analogue output error value integer (6444h)

6.2 General Objects

6.2.1 Device Type (1000h)

This object describes the type of device and functionality.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1000h	0	Device type	UDINT	RO	No	0x00080191	NO

Additional information (bit16 ~ 31): 0008 (Analogue output)

General information (bit0 ~ 15): 0191 (DS401)

6.2.2 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 Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1001h	0	Error register	USINT	RO	No	0x00	NO

6.2.3 Manufacturer Device Name (1008h)

This object shall acquire the device name of R1-EC9144.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1008h	0	Device name	STRING	RO	No	R1-EC9144	NO

6.2.4 Manufacturer Software Version (100Ah)

This object shall acquire information about the software version of R1-EC9144.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
100Ah	0	Software version	STRING	RO	No	1.10	NO

6.2.5 Identity Object (1018h)

This object shall acquire basic information about the device.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1018h	0	Number of entries	USINT	RO	No	4	NO
	1	Vendor ID	UDINT	RO	No	0x00001A05	NO
	2	Product code	UDINT	RO	No	0x00009144	NO
	3	Revision	UDINT	RO	No	0x00100000	NO
	4	Serial number	UDINT	RO	No	0x00000000	NO

6.3 PDO Mapping Objects

EtherCAT in CANopen protocol allows users to map objects to process data objects (PDO) and use these PDOs to conduct data transmission.

6.3.1 RxPDO-Map Outputs (1601h)

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1601h	0	Number of objects in this PDO	USINT	RW	No	4	YES
	1	Mapping entry 1	UDINT	RW	No	0x64110110	YES
	2	Mapping entry 2	UDINT	RW	No	0x64110210	YES
	3	Mapping entry 3	UDINT	RW	No	0x64110310	YES
	4	Mapping entry 4	UDINT	RW	No	0x64110410	YES

6.4 Sync Manager Communication Objects

6.4.1 Sync Manager Communication Type (1C00h)

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

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

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
1C12h	0	Number of assigned PDOs	USINT	RO	No	1	YES
	1	PDO Mapping object index of assigned RxPDO 1	UINT	RO	No	1601h	YES
1C13h	0	Number of assigned PDOs	USINT	RO	No	1	YES
	1	PDO Mapping object index of assigned TxPDO 1	UINT	RO	No	1A00h	YES

6.5 Manufacturer Specific Objects

6.5.1 Output Range Selection (2000h)

This object shall select the voltage mode output / current mode output and output range.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
2000h	0	Output Range Selection	USINT	RW	NO	4	NO
	1	Ch.0 Range Mode Selection	UINT	RW	NO	0 : 0V ~ 5V 1 : 0V ~ 10V 2 : -5V ~ 5V 3 : -10V ~ 10V 4 : 4mA ~ 20mA 5 : 0mA ~ 20mA 6 : 0mA ~ 24mA	NO
	2	Ch.1 Range Mode Selection	UINT	RW	NO		NO
	3	Ch.2 Range Mode Selection	UINT	RW	NO		NO
	4	Ch.3 Range Mode Selection	UINT	RW	NO		NO
					NO		

6.5.2 Output Channel Enable (2001h)

This object shall enable output channel.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM						
2001h	0	Number of channels	USINT	RO	NO	4	NO						
	1	Channel 0 output	UINT	RW	NO	<table border="1"> <thead> <tr> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disable</td> </tr> <tr> <td>1</td> <td>Enable</td> </tr> </tbody> </table>	Value	Description	0	Disable	1	Enable	NO
	Value	Description											
	0	Disable											
	1	Enable											
	2	Channel 1 output	UINT	RW	NO		NO						
3	Channel 2 output	UINT	RW	NO	NO								
4	Channel 3 output	UINT	RW	NO	NO								

6.6 Analogue Output

6.6.1 Write Analogue Output 16-bit (6411h)

This object shall write value 0~65535 to the output channel so as to select the output volume of voltage or current.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEPROM
6411h	0	Number of channel output	USINT	RO	NO	4	NO
	1	Ch.0 output value	UINT	RO	YES	0 to 65535	NO
	2	Ch.1 output value	UINT	RO	YES		NO
	3	Ch.2 output value	UINT	RO	YES		NO
	4	Ch.3 output value	UINT	RO	YES		NO

6.6.2 Analogue Output Error Value Integer (6444h)

This object shall read the error status of each channel.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Value	EEP-ROM
6444h	0	Analogue Output Error Value Integer	UDINT	RW	NO	0 to 0xFFFF	NO

Bit	Description
0	lout_3 error: If current output Ch.3 is in error, this bit value is 1.
1	lout_2 error: If current output Ch.2 is in error, this bit value is 1.
2	lout_1 error: If current output Ch.1 is in error, this bit value is 1.
3	lout_0 error: If current output Ch.0 is in error, this bit value is 1.
4	Vout_3 error: If voltage output Ch. 3 is in error, this bit value is 1.
5	Vout_2 error: If voltage output Ch. 2 is in error, this bit value is 1.
6	Vout_1 error: If voltage output Ch. 1 is in error, this bit value is 1.
7	Vout_0 error: If voltage output Ch. 0 is in error, this bit value is 1.
8	Temperature too high: If core temperature exceeds 150 °C, this bit value is 1.
9	Ramp active: If any one of the output channel is slewing, this bit value is 1.
10	PEC error: If the data-word received over the SPI interface contains PEC error, this bit value is 1.
11	User toggle: This bit shall be used to inspect data communications.
12	DC-DC3: In current output mode, if DC-to-DC converter of ch.3 cannot maintain compliance (it may be reaching its V_{MAX} voltage), this bit is 1. In this case, value of lout_3 error is 1. In Voltage mode, if DC-to-DC converter of ch.3 is unable to regulate to 15 V as expected, this bit value is 1.
13	DC-DC2: In Current mode, if DC-to-DC converter of ch.2 cannot maintain compliance (it may be reaching its V_{MAX} voltage), this bit is 1. In this condition, value of lout_2 error is 1. In Voltage mode, if DC-to-DC converter of ch.2 is unable to regulate to 15 V as expected, this bit value is 1.
14	DC-DC1: In Current mode, if DC-to-DC converter of ch.1 cannot maintain compliance (it may be reaching its V_{MAX} voltage), this bit is 1. In this condition, value of lout_1 error is 1. In Voltage mode, if DC-to-DC converter of ch.1 is unable to regulate to 15 V as expected, this bit value is 1.
15	DC-DC0: In Current mode, if DC-to-DC converter of ch.0 cannot maintain compliance (it may be reaching its V_{MAX} voltage), this bit is 1. In this condition, value of lout_0 error is 1. In Voltage mode, if DC-to-DC converter of ch.0 is unable to regulate to 15 V as expected, this bit value is 1.

Chapter 7 SDO Error Message Abort Codes

7.1 SDO Error Message Abort Codes

The following table lists the SDO error message abort codes.

Abort Code	Description
0x05 03 00 00	Toggle bit not alternated.
0x05 04 00 00	SDO protocol timeout.
0x05 04 00 01	Client/server command specifier not valid or unknown.
0x05 04 00 05	Out of 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 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 does not match; length of service parameter does not match.
0x06 07 00 12	Data type does not match; length of service parameter too high.
0x06 07 00 13	Data type does not match; length of service parameter too low.
0x06 09 00 11	Sub-index does not exist.
0x06 09 00 30	Value range of parameter exceeded (only for write access).
0x06 09 00 31	Value of parameter written too high.
0x06 09 00 32	Value of parameter written too low.
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 in the application.
0x08 00 00 21	Data cannot be transferred or stored in the application because of local control.
0x08 00 00 22	Data cannot be transferred or stored in the application because of present device state.
0x08 00 00 23	Object dictionary dynamic generation fails or no object dictionary is present.

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