RHUB200-5

Hardware Module Description

Kongsberg Maritime Part no.603442

Document history

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Glossary

DI	Digital Input
DO	Digital Output
ESD	Electrostatic Discharge
GND	Signal ground
IE	Instrumentation Earth
I/O	Input/Output
LED	Light Emitting Diode
MTBF	Mean Time Between Failure
PE	Protective Earth
RBUS	Remote I/O Bus that covers both communication link and power
RBUS Power	Electrical power supply to the RIO200 modules including field channels
RBUS Link	RIO communication link based on multi-drop 2 Mbps RS485 with Manchester encoding
RCU	Remote Controller Unit
RHUB200-5	RBUS Hub module
RIO200	Kongsberg Maritime Remote I/O 200 module family
RMP	Remote Multi Purpose I/O module
PSU	Power Supply Unit
USB	Universal Serial Bus

1 OVERVIEW

1.1 Document user

This document is intended to be used for HW engineering, hook-up and maintenance. Physical interfaces and capabilities are described.

1.2 Module

The RHUB200-5 is a module in the Kongsberg RIO200 module family. The modules in the RIO200 family provide functions such as I/O interface, network hub/repeater and serial line interface. They have the same shape and are mechanically mounted on a horizontal, dual-rail system.

The RHUB200-5 is a five channel hub dedicated for use in the Kongsberg RBUS system. It has three channels for controller connection (upstream) and five channels for RBUS dual-rail system connection (downstream).

Up to two RHUB200-5 modules can be connected in series (between an RCU501 and a module in the RIO200/420 family) to obtain more segregation of the RBUS network.

The RHUB200-5 is normally powered by the RBUS connectors, but it can also be powered from other power supplies via the terminal blocks X1 and X4.

The RHUB200-5 contains the following features:

- Five RBUS Downstream Link interfaces

- Isolated RBUS interface for each RBUS Downstream Link

- Run/error LED on front showing module status

- Blinking LEDs on front showing receive data activity for each Link

- Link connection LED for each RBUS Downstream Link

- Allow hot module replacement

- Comply to standards IEC 60945 and IACS E10

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2.2 Power and grounding principles

The RHUB200-5 is provided with galvanic isolated RBUS Link interfaces downstream (to e.g. RBUS sub-systems with RMPs) and with non-isolated RBUS Link interfaces upstream (to e.g. RCUs). The purpose of galvanic isolating one end of the RBUS Link cable segment is to avoid ground loops, which can introduce noise to the system (see illustration).

Figure 3   Power and grounding principles

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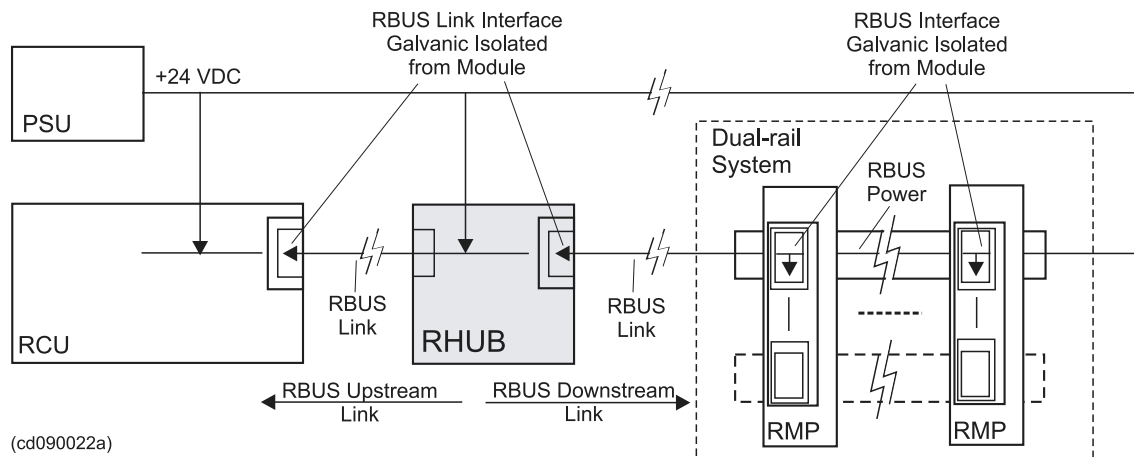
2.3 RBUS Upstream Link interfaces

Three identical RBUS Link interfaces A, B and C, dedicated for upstream use, are available on the RJ45 connectors P1, P2, and P3. The RBUS Upstream Link interface provides 24 VDC via the Link cable to the corresponding Link interface on the connected controller (RCU) modules or other RHUB200-5 module. The RBUS Upstream Link interface is built around an RS485 transceiver and is provided with termination network and over-voltage protection.

2.4 RBUS Downstream Link interfaces

Five isolated, identical, RBUS Link interfaces, dedicated for downstream use, are available on the connectors P5, P6, P7, P8 (RJ45s) and X3 (terminal row). The RBUS Downstream Link interface is powered with 24 VDC via the Link cable from the connected RBUS sub-system or other RHUB200-5 module. The RBUS Downstream Link interface is built around an RS485 transceiver and is provided with termination network and over-voltage protection.
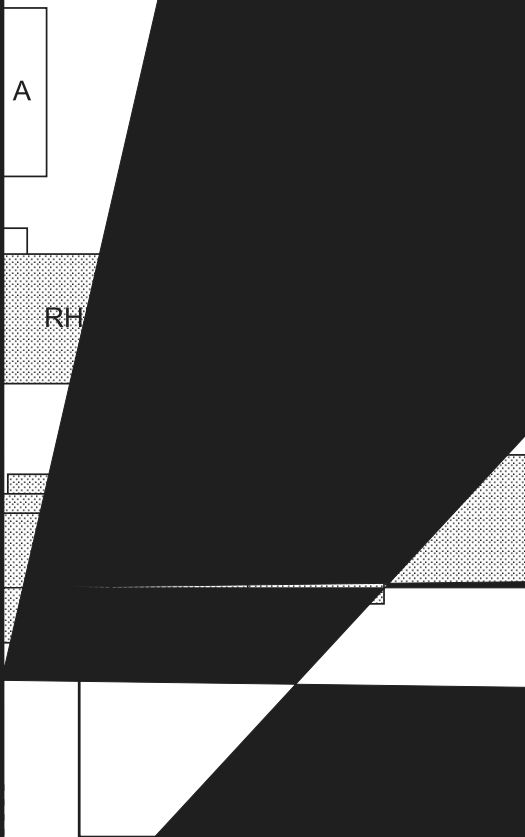
2.5 In   al RHUB200

can be interconnecte
ne controller (RCU
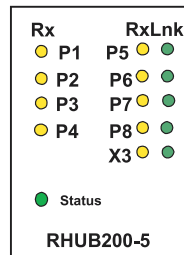tration).

200-5 modules c
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2.6 LED indicators

The module front is provided with 15 LED indicators. The LED layout is shown in the following illustration.

Figure 5   LED indicators layout

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Table 1   LED indicators on module front

LED name	Colour, state	Function
Status	Green, fixed	Normal operation. The module is OK and it has communication with at least one RCU
	Red, fixed	Serious HW or SW error condition occurred, watchdog activated
	Red, flashing	During boot
RX P1	Yellow, flashing	Receiving data on RBUS Upstream Link interface A (P1)
RX P2		Receiving data on RBUS Upstream Link interface B (P2)
RX P3		Receiving data on RBUS Upstream Link interface C (P3)
RX P4		Receiving data on USB console connection (P4)
RX P5		Receiving data on RBUS Downstream Link interface P5
RX P6		Receiving data on RBUS Downstream Link interface P6
RX P7		Receiving data on RBUS Downstream Link interface P7
RX P8		Receiving data on RBUS Downstream Link interface P8
RX X3		Receiving data on RBUS Downstream Link interface X3
LNK P5	Green, fixed	RBUS Downstream Link interface P5 is powered
LNK P6		RBUS Downstream Link interface P6 is powered
LNK P7		RBUS Downstream Link interface P7 is powered
LNK P8		RBUS Downstream Link interface P8 is powered
LNK X3		RBUS Downstream Link interface X3 is powered

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Note ───────────────────────────────

RHUB200-5s with serial number 1099 and below have been provided with swapped LED functions for P5 to P8 and X3 compared to the table above. This means that for these early modules the RX LEDs (P5 to P8 and X3) are the green flashing LEDs in the right column, and the LNK LEDs (P5 to P8 and X3) are the yellow fixed LEDs in the left column. Refer to section Module identification on page 14 on how to locate the module serial number.

2.7 USB interface

A USB port (USB 2.0) is included on the module for future use to facilitate direct communication with the module controller for test and service purposes. The interface uses a USB B type connector (P4) and is protected by a transient suppressor.

3 TECHNICAL SPECIFICATIONS

Table 2   Technical specifications

Power specifications	
Input voltage	+24 VDC nominal (+18 - +32 VDC)
Power on rise time	Maximum 20 ms/V monotonic
Current consumption	50 mA
Power ON inrush current	Maximum 0.5 A
Module short circuit current	Maximum 0.5 A for 50 ms
RBUS Link interface	
Serial line type	RS485 multidrop
Power supply voltage	+18 - +32 VDC
Bit rate	2 Mbps
Isolation voltage (downstream only)	500 V
Connections	
Power supplies	Terminal blocks for X1 and X4, and T-BUS™ connector for RBUS A and RBUS B
RBUS Upstream Link interfaces	RJ45 for P1 to P3
RBUS Downstream Link interfaces	RJ45 for P5 to P8, and terminal row for X3
USB port	Standard USB B connector (P4)
Watchdog	
Watchdog time-out	Maximum 1 sec.
Mechanical specification	
Size (WxHxD)	35 x 130 x 130 mm
Weight	0.30 kg
Environmental requirements	
Operating temperature	-15 °C - +70 °C
Storage temperature	-25 °C - +70 °C
Vibration	0.7 g
IP class	IP20
Compliant to standards	IEC 60945 and IACS E10
Life cycle specifications	
MTBF	Not available

4 CONFIGURATION

The illustration below shows the layout of the RHUB200-5.

Figure 6   Layout of RHUB200-5
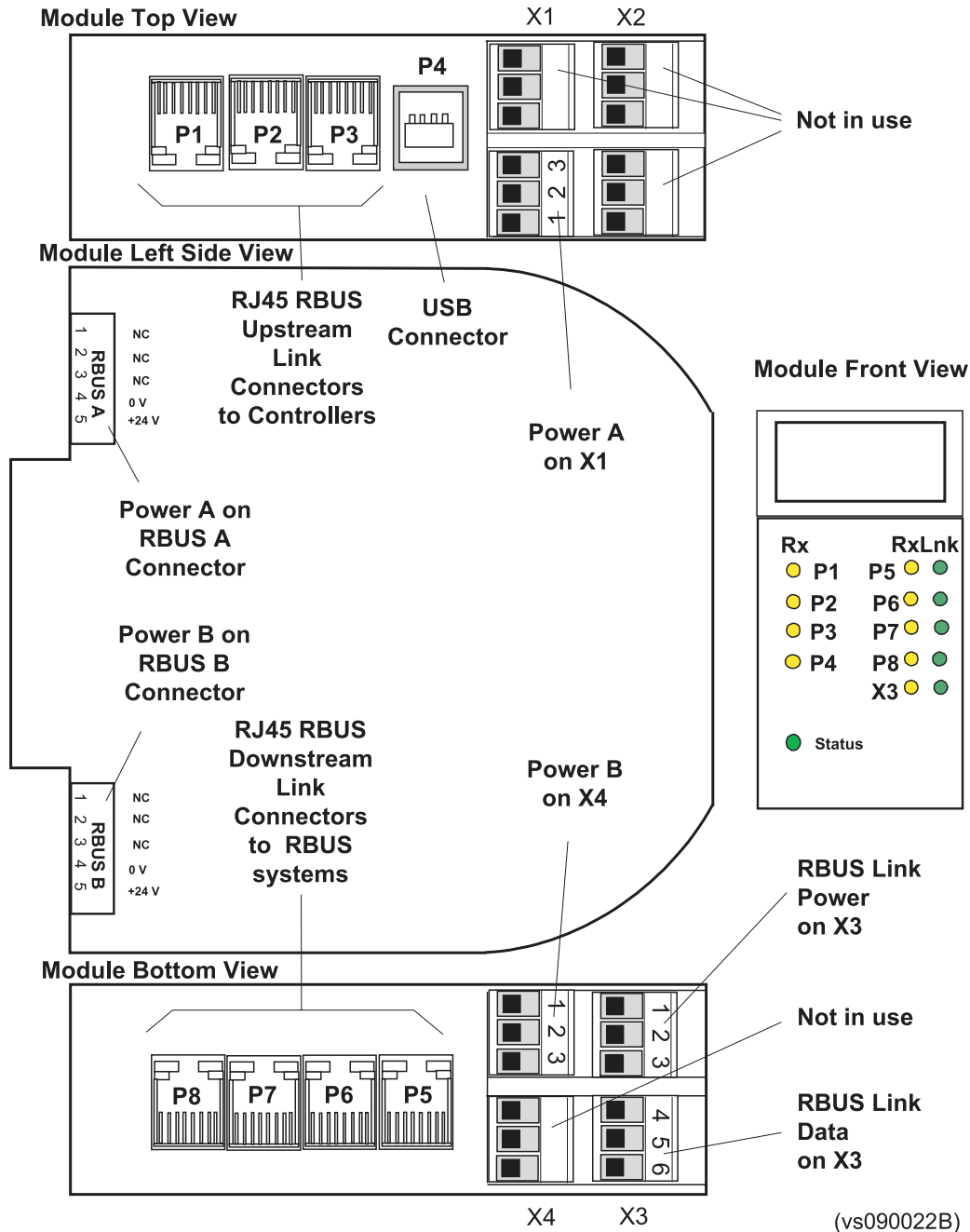
The following sections describe the module label layout, and the connectors' layout and pin allocation.

4.1 Module identification

There is a module identification label on each module. For any communication with Kongsberg Maritime on this module you should refer to the part number (Part#), revision (Rev.) and serial number (Serial#) (see figure below).

Figure 7   Module identification label
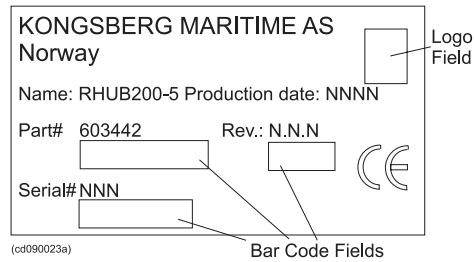
4.2 P1 to P3 – RBUS Upstream Link connectors

P1 to P3 are RJ45, 8 pin, unshielded, female connectors.

Figure 8   Front view of RJ45 with pin layout
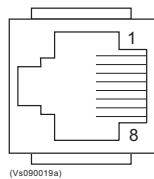
Table 3   P1 to P3 connectors (RJ45) pin allocation

Pin no.	Name	Function
1	DATA_x_H	RS485 Transceiver Data High for channel x
2	DATA_x_L	RS485 Transceiver Data Low for channel x
3	0 V	0 V supply voltage reference terminal
4		
5		
6		Not connected
7	24 VDC	+24 VDC supply voltage to upstream device
8		Not connected

where x = A for P1, B for P2, C for P3,

4.3 P4 - USB connector

This is an USB B, 6 pin, shielded, female connector.

Table 4   P4 connector pin allocation

Pin no.	Name	Function
1	VCC	From host +5 VDC
2	USB_D-	USB Transceiver Data Low
3	USB_D+	USB Transceiver Data High
4	0 V	Signal ground reference

Note

Connector housing of USB connector is terminated to 0 V via an HF capacitor within the module.

4.4 P5 to P8 – RBUS Downstream Link connectors

These are RJ45, 8 pin, unshielded, female connectors.

See Figure 8 on page 14 for connector pin layout.

Table 5   P5 to P8 connectors (RJ45) pin allocation

Pin no.	Name	Function
1	DATA_x_H	RS485 Transceiver Data High for channel x
2	DATA_x_L	RS485 Transceiver Data Low for channel x
3	0 VDC_x	0 V, reference terminal from sub-system x
4		
5		
6		Not connected
7	24 VDC_x	+24 VDC supply from RBUS system x
8		Not connected

where x = P5, P6, P7, P8

4.5 X1 – External power A terminal row

This is a terminal row with two terminal blocks. Each terminal block is provided with a removable header. Terminals 1 to 3 are used for power (see table below).
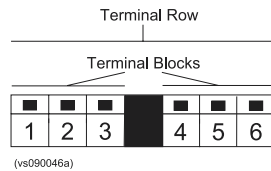
Figure 9   X1 terminal layout

Table 6   X1 terminal allocation

Terminal no.	Name	Function
1	+24 V PWR A	+24 VDC from external Power A connection
2	0 V PWR A	External Power A, 0 V reference
3		Not connected

4.6 X2 – Dummy terminal row

This terminal row is not in-use. It comprises two terminal blocks whereof each is provided with three screw terminals and removable headers.

4.7 X3 – RBUS Link connector downstream external

This is a terminal block with 6 screw terminals. It is provided with two removable headers (terminal 1 to 3 and 4 to 6).

See Figure 9 on page 16 for connector pin layout.

Table 7   X3 terminal allocation

Terminal no.	Name	Function
1	+24 V PWR	+24 VDC power voltage to interface
2	0 V PWR	0 V, power voltage reference terminal to interface
3		Not connected
4	DATA_H	RS485 Transceiver Data High
5	DATA_L	RS485 Transceiver Data Low
6	0 V DATA	0 V, signal ground reference

4.8 X4 – External power B terminal row

This is a terminal row with two terminal blocks. Each terminal block is provided with a removable header. Terminals 1 to 3 are used for power (see table below).

See Figure 9 on page 16 for connector pin layout.

Table 8   X4 terminal allocation

Terminal no.	Name	Function
1	+24 V PWR B	+24 VDC, power terminal for Power B
2	0 V PWR B	0 V, power terminal for Power B
3		Not connected

4.9 RBUS A and RBUS B connectors

The two RBUS A and RBUS B connectors are of type 5-pole Phoenix T-BUS™ connectors. They are located on the dual-rail and provides RBUS Power connections.

The module is provided with printed circuit board based connectors that fit to the T-BUS™ connectors.

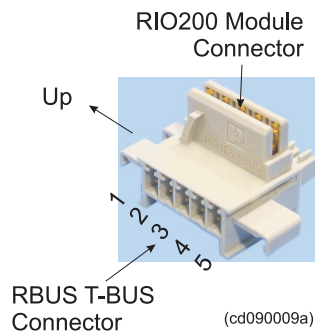*Figure 10   RBUS A and B T-BUS™ connector terminal layout*

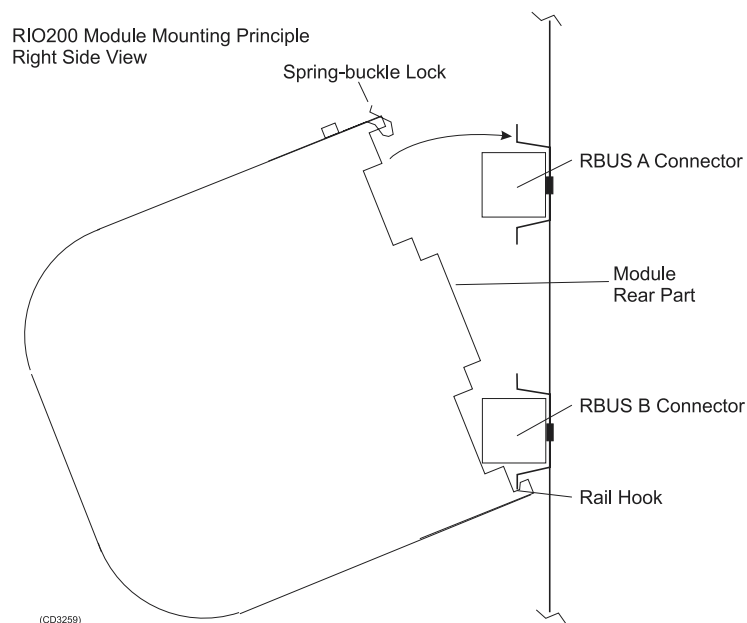*Table 9   RBUS A and RBUS B rail connector terminal allocation*

Pin no.	Name	Function
1		Not connected
2		
3		
4	0 VDC	0 VDC, power terminal
5	24 VDC	+24 VDC, power terminal

5 INSTALLATION

Caution

The module can be unpacked and handled without ESD protection, but electrostatic discharge can damage components on the module when terminating wires and cables to it. Therefore always wear a correctly-connected earthing strap when working on the module.

1 Label the module with the appropriate equipment name.

2 Hook the RHUB200-5 on to the lower DIN rail in a 30° angle and snap it to the RBUS connectors and upper DIN rail in one rotating movement.
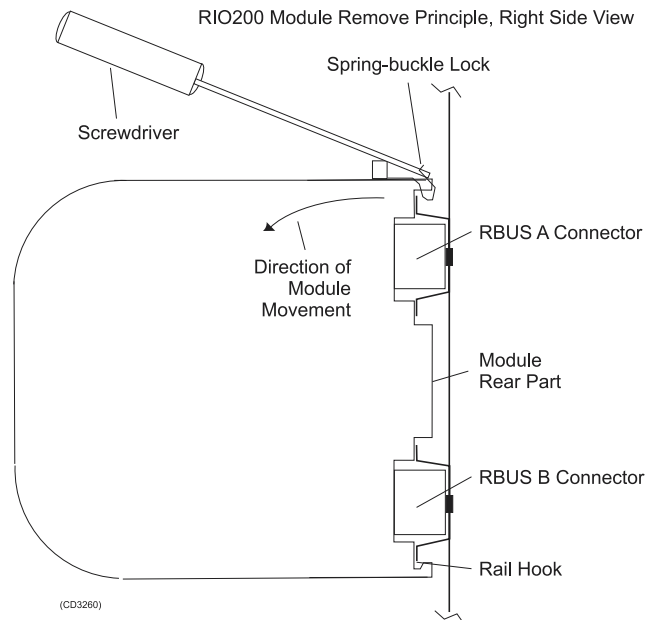
RIO200 Module Mounting Principle
Right Side View
Spring-buckle Lock
RBUS A Connector
Module Rear Part
RBUS B Connector
Rail Hook
(CD3259)

3 Connect the RBUS patch cables to connectors P1 to P3 and P5 to P8 as appropriate.

4 Connect the power and field cable wires to the terminal blocks on X1, X3 and X4 on the RHUB200-5 as appropriate. Use a flat-bit screwdriver to fasten the wires. The terminal blocks accept up to 2.5 mm^2 wire dimension.

5 Turn ON power. The module status LED will be lit red initially during start-up and turns to green when the module has started.

6 REPLACEMENT

1 Remove the terminal block headers on X1, X3 and X4 that are in use (the ones with wires attached). Use a flat-bladed screwdriver and jack the headers out in a vertical direction according to steps 1 to 4 in the following illustration.
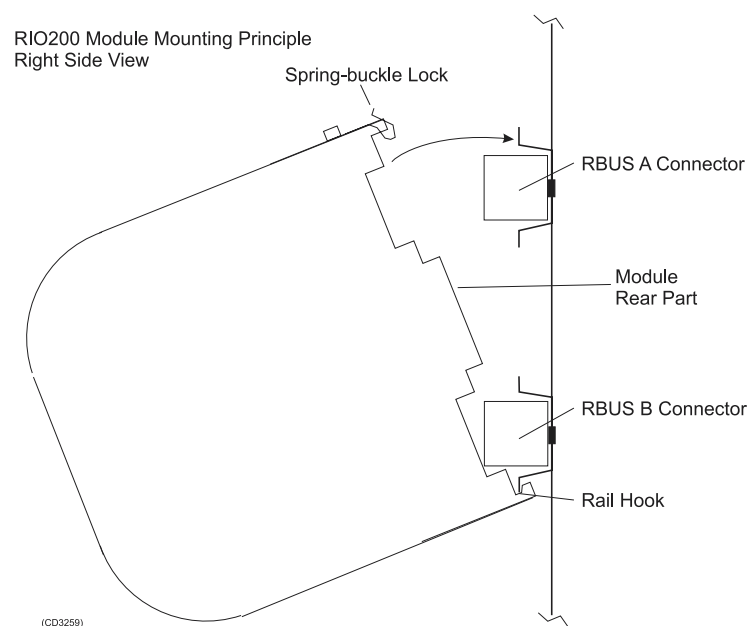

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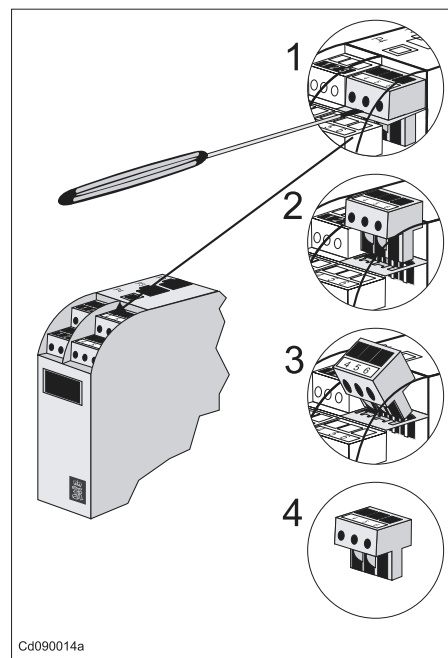
2 Unplug the RBUS patch cables connected to connectors P1 to P3 and P5 to P8.

3   Remove the RHUB200-5 module from the bus rails by using
     a screwdriver to unlock the spring buckle.

RIO200 Module Remove Principle, Right Side View

Spring-buckle Lock

Screwdriver

Direction of
Module
Movement

RBUS A Connector

Module
Rear Part

RBUS B Connector

Rail Hook

(CD3260)

4   Put the module aside and label it with its fault symptoms.

5   Label the new RHUB200-5 module.

6   On the new module remove the same terminal block
     headers as were removed from the other module, by using a
     flat-bladed screwdriver and jack them out, one by one.

7   Hook the RHUB200-5 on to the lower DIN rail in a 30°
     angle and snap it to the RBUS connectors and upper DIN
   rail in one rotating movement.

RIO200 Module Mounting Principle
Right Side View

Spring-buckle Lock

RBUS A Connector

Module
Rear Part

RBUS B Connector

Rail Hook

(CD3259)

8   Connect the RBUS patch cables to connectors P1 to P3 and P5 to P8 as appropriate.

9   Reconnect the terminal block headers X1, X3 and X4 on the RHUB200-5 as appropriate by pushing them into position (see note and illustration).

Note ───────────────────────

The terminal block headers are coded so there is only one way to enter all four headers on one side of the module.

The following illustration shows how to re-enter a terminal block header by performing the steps 1 to 4.

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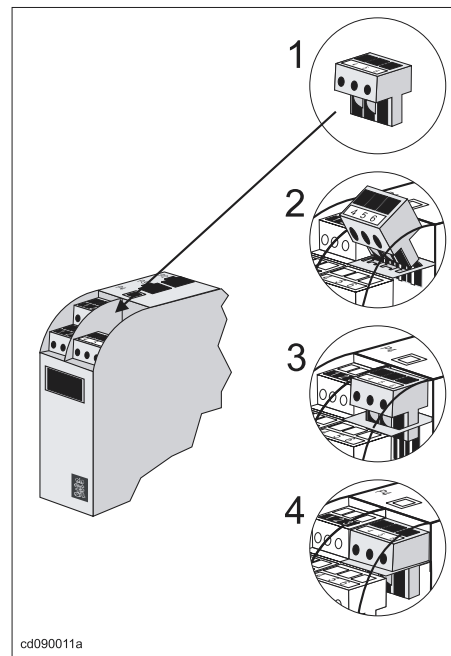
10   If power is OFF, turn ON power. The module status LED will be lit red initially during start-up and turns green when the module has started.

11   Check the RBUS Downstream Link LEDs. Check also the RBUS Downstream Link LEDs on the higher level devices (i.e. on RCU and RHUB) for the same link segment.

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