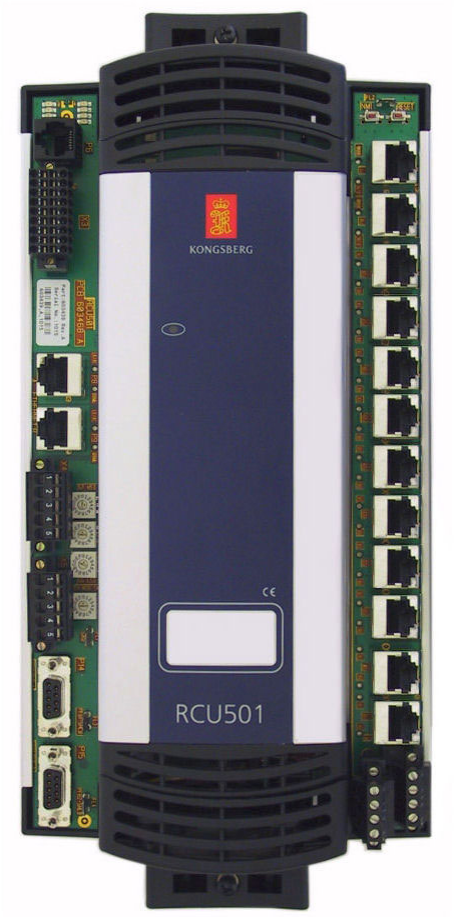
RCU501

Hardware Module Description

Kongsberg Maritime Part no.603439



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Note

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.
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Comments

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism.
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Glossary

Acronyms

BITE	Built-In Test Equipment
CAN	Controller Area Network
CPU	Central Processing Unit
DI	Digitial Input
DO	Digital Output
DSP	Digital Signal Processor
ESD	Electrostatic Discharge
GND	Module 0 V reference
HF	High Frequency
IE	Instrumentation Earth
I/O	Input/Output
KM	Kongsberg Maritime
LAN	Local Area Network
LED	Light Emitting Diode
MAC	Media Access Control
MTBF	Mean Time Between Failure
NMI	Non-Maskable Interrupt
PE	Protective Earth
RAM	Random Access Memory
RBUS	Remote I/O Bus that covers both communication link and power
RBUS Link	RIO communication link based on multi-drop 2 Mbps RS485 with Manchester encoding
RBUS Power	Electrical power supply to the RIO200 modules including field channels
RCU501	Remote Controller Unit series 501
RHUB200–5	RBUS hub module
RIO	Remote I/O
RIO200	Kongsberg Maritime Remote I/O 200 module family
RIO420	Kongsberg Maritime Remote I/O 420 module family
RMP	Remote Multi Purpose I/O module
RSER200–4	Serial line interface module
WD	Watchdog

Terms

Link Channel	Point to point serial line connection between RCU501 and RSER200-4
Process Net	Process Network A and B based on Ethernet 10BASE-T/100BASE-TX
PROFIBUS DP	PROFIBUS DP is a device level bus that supports both analog and discrete signals. PROFIBUS DP has widespread usage for such items as remote I/O systems, motor control centers, and variable speed drives. PROFIBUS DP communicates at speeds from 9.6 kbps to 12 Mbps over distances from 100 to 1,200 meters.
RedNet	Redundancy Network based on Ethernet 10BASE-T/100BASE-TX

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 RCU501 is a controller module for process control purposes. It is based on the PowerPC™ Host Processor MPC8245 running at 400 MHz and with RAM memory running at 133 MHz.

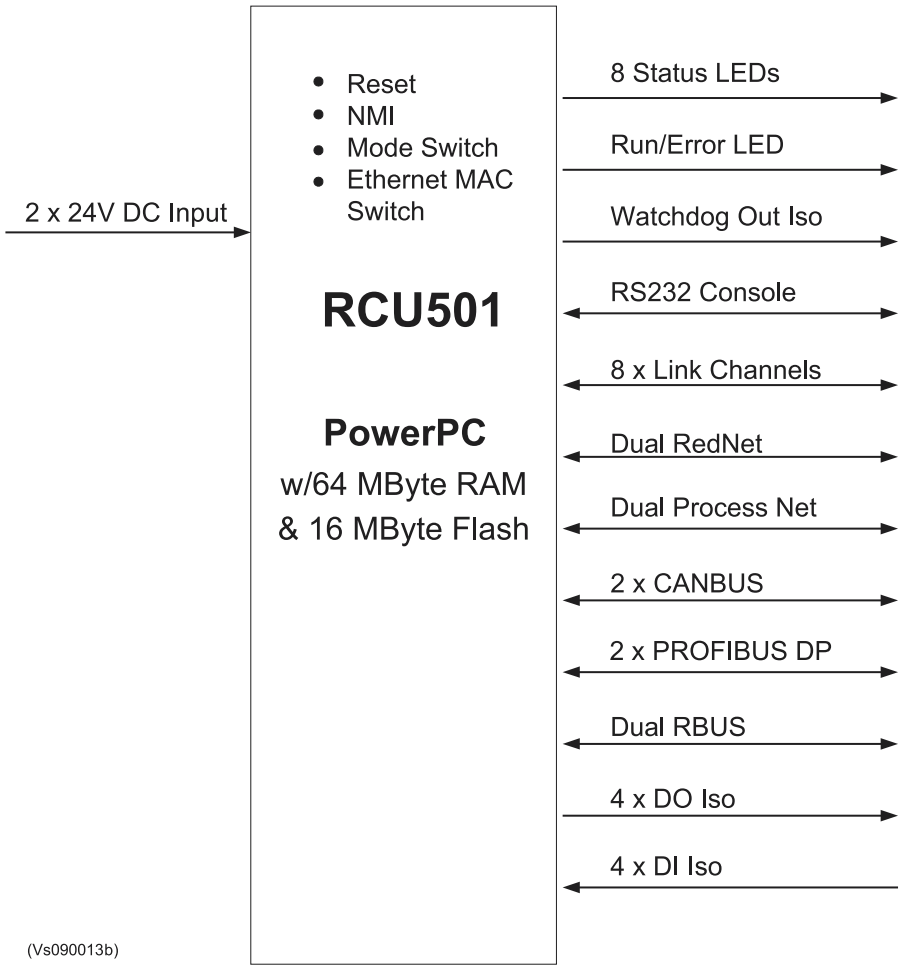
The main features of the RCU501 are:

- 32-bit CPU running at 400 MHz
- VxWorks real-time operating system
- 64 MByte RAM
- 16 MByte Flash memory
- 4 general-purpose opto-isolated digital input channels
- 4 general-purpose opto-isolated digital output channels
- 8 Link Channel interfaces dedicated for RSER200 modules
- Dual Process Net, Ethernet interfaces (10BASE-T/100BASE-TX) for interconnecting operator stations and controllers
- Dual RedNet, Ethernet interfaces (10BASE-T/100BASE-TX) for redundancy configurations
- Dual RBUS interface for connection to RIO200 and RIO420 modules
- 2 CAN interfaces
- 2 PROFIBUS DP interfaces
- Built-in real-time clock
- Watchdog status output
- Cooling fan alarm
- High temperature alarm
- Over/under-voltage power alarms
- Dual supply voltage (24 VDC)
- Low power consumption (typical 18 W)
- Built-in Test Equipment (BITE) for module monitoring during run-time
- Run/Error status LED
- Eight test status LEDs
- Compliant to standards IEC 60945 and IACS E10

2 FUNCTION

RCU501 is a Remote Controller Unit (RCU) based on a PowerPC™ and remote I/O-bus interfaces. It runs the application program of a process control system and interfaces to different bus systems. RCU501 is provided with network interfaces for redundancy configurations.

Figure 1 RCU501 interface block diagram



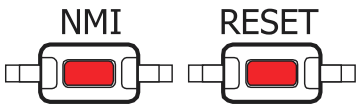
The RCU501 provides alarm functions such as:

- Fan alarm
- Temperature alarm
- Voltage alarm

2.1 Controls, indicators and system connector

The RCU501 is provided with the NMI and RESET function controls/buttons located in the upper right-hand corner of the module.

Figure 2 NMI and RESET buttons layout



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2.1.1 NMI push-button

Pressing the NMI function button stops the program execution momentary.

NMI (Non-Maskable Interrupt) is also generated when watchdog state is "watchdog_off".

2.1.2 RESET push-button

Pressing the RESET function button restarts the program execution and all parameter values are reset to initial values.

Reset will also be generated at power on and by software generated reset.

2.1.3 RCU condition monitoring

2.1.3.1 Fan and over-temperature status

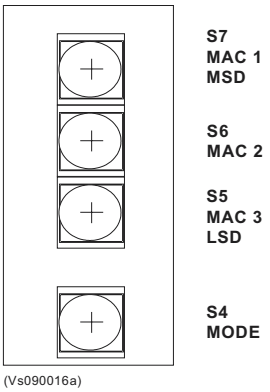
Two internal alarm signals are monitored by the module:

- Fan-not-running alarm
- High temperature alarm

2.1.4 Address switches (MAC 1, MAC 2, MAC 3)

The RCU501 has three hexadecimal switches MAC 1 (S7), MAC 2 (S6), MAC 3 (S5) by which you can set the MAC address for NET A and NET B.

Figure 3 Address switches and Mode switch



MAC address format for NET A is: 02:41:4C:42:1X:XX

MAC address format for NET B is: 02:41:4C:42:2X:XX

where X:XX is MAC 1:MAC 2 MAC 3.

2.1.4.1 Example of address setting

The hexadecimal switch settings:

MAC 1 = 1, MAC 2 = 2, MAC 3 = 3

give the MAC addresses:

NET A: 02:41:4C:42:11:23

NET B: 02:41:4C:42:21:23.

2.1.5 MODE switch

The RCU501 has a hexadecimal MODE switch (S4) (see Figure 3 on page 10), which is used to set operational mode. It is used for flashing resident application programs to the flash memory and for advanced servicing and debugging purposes.

Note

The switch has to be set to 0 (zero) for normal operation (default setting).

2.1.6 LED indicators

2.1.6.1 Run/Error LED

The Run/Error LED is located on the front cover. It can be red or green.

Table 1 LED indicator information

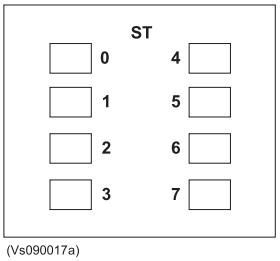
LED name	Colour	Function
Run/Error	Green	Green when the watchdog is enabled and is ON (see section 2.10.1 on page 14.
	Red	Red when the watchdog is disabled or is OFF

2.1.6.2 Eight status LEDs

The RCU501 has eight status LEDs used for signalling status conditions. The four LEDs ST0 to ST3 are used by the internal test programs. The four more LEDs, ST4 to ST7 can be used by the application programs or for debug purposes.

The eight LEDs are located in the upper left-hand corner of the module. See Figure 4 for LED layout.

Figure 4 Status LEDs layout



2.1.7 RS232 console connector (P6)

The P6 connector is used for interfacing a data terminal to the RCU501 CPU during advanced servicing and debugging. P6 is an eight-pin RJ45 type modular jack.

2.2 Power supply

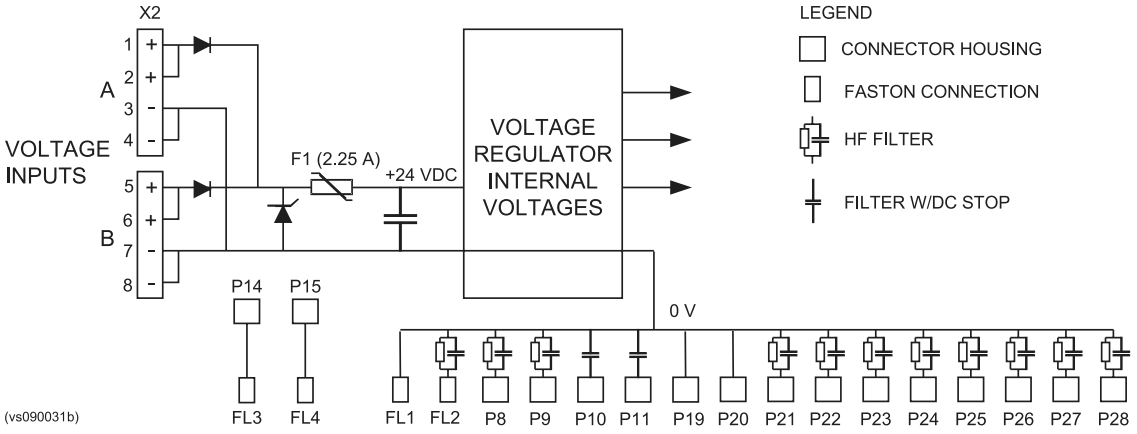
One or two power supplies (24 VDC) can be connected to RCU501 using the dual terminal block X2. Two independent power supplies (X2 A and B connection) are used when power supply redundancy is required.

To protect the voltage regulators against overvoltage, a tranzorber is mounted across the power terminals of X2. To protect the voltage regulators against overload, an automatic resetable fuse is implemented on the input side.

The internal voltages are monitored by the module.

The two connector headers of X2 are each provided with a uniquely positioned coding pin to avoid mixing up the two headers.

Figure 5 Power supply principles



2.3 Process Net interfaces

The Process Net interfaces, Net A and Net B, are available on P8 and P9 respectively. The physical interface complies with IEEE 802.3 10BASE-T/100BASE-TX.

2.4 Link Channel interfaces

The RCU501 is provided with eight proprietary Link Channel interfaces (SER1 to SER8). They are dedicated for connection to RSER200-4 modules.

- Each Link Channel is available on a RJ45 connector (P21 to P28).
- Each Link Channel connector has adjacent Tx and an Rx LEDs.
- Each Rx signal interface is galvanic isolated using an optocoupler.
- The bit rate is 1 Mbps.

2.5 RBUS Link interfaces

The RCU501 has two galvanic isolated RBUS Link interfaces (RBUS A and RBUS B) for single or redundant RBUS Link networks. RBUS runs a Kongsberg Maritime specific SW protocol. It facilitates communication between single or redundant controllers and I/O modules in the RIO200 and RIO420 systems. RBUS Link is based on multidrop RS485 serial lines.

The two RBUS Link interfaces are available on the P19 and P20 connectors respectively.

The RBUS Link cable segment can be maximum 200 m. Distance can be extended by using RHUB. The RBUS Link segment handles maximum three cable segments which means that maximum two RHUBs can be connected in series in one link segment.

2.6 CAN interfaces

The RCU501 is provided with two CAN ports (CANBUS 1 and CANBUS 2), which are available on the X4 and X5 connectors respectively. The CAN interfaces are designed according to the requirements of Device Net.

2.7 PROFIBUS DP interfaces

The RCU501 contains two PROFIBUS DP ports (PROFIBUS 1 and PROFIBUS 2), which are available on the P14 and P15 connectors. There are no internal termination resistors, consequently PROFIBUS plugs with resistors should be used.

2.8 DI and DO channels

The four onboard DI channels and the four onboard DO channels are all opto-isolated (see chapter 3 on page 16 for specification details and section 4.10 on page 26 for connection details). The channels are available on the X3 connector. After reset of the module the four DO channels are set to "0" i.e. no current in the optocouplers.

2.9 RedNet interfaces

RCU501 is provided with two Ethernet based ports RedNet Next (P10) and RedNet Previous (P11) for redundancy interconnection of the RCUs.

Two or three RCU501 can be interconnected in redundancy configurations.

Interconnecting cables used for RedNet must be provided with crossed RX and TX pairs.

Figure 6 Dual RCU redundancy

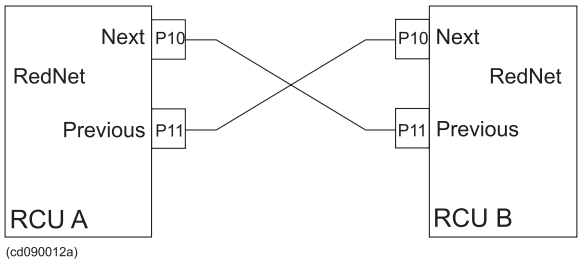
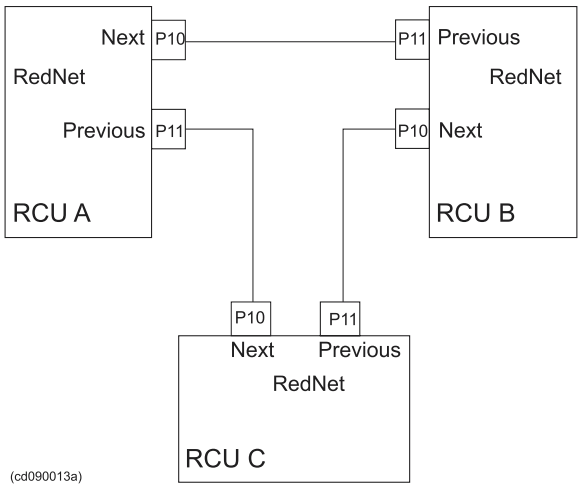


Figure 7 Triple RCU redundancy



2.10 Self diagnostics

Extensive self-diagnostics are built into the module to detect faults related to it.

2.10.1 Watchdog control

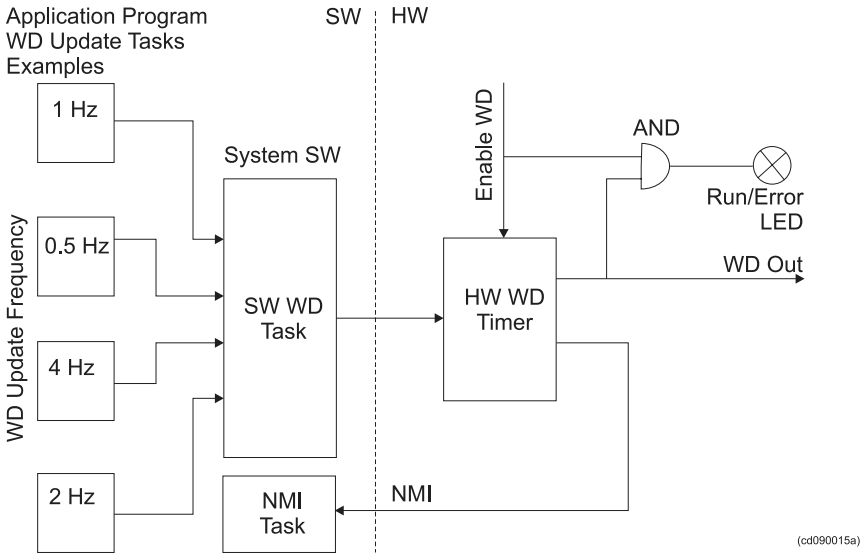
The RCU501 is provided with a SW and HW based watchdog (WD) system. The application programs running in the RCU501 is updating a SW WD task.

Provided the watchdog system is enabled and an application program fails for any reason, the SW WD task will not reset the HW WD timer, and the timer will then elapse and an NMI (a non-maskable interrupt) is created. The HW WD then stops the application program(s) and system tasks, switches the WD Out signal to OFF and the Status LED is then lit red.

If the HW WD is not enabled, the WD Out signal is OFF and the Status LED is lit red.

As long as the HW WD is enabled and the WD timer is regularly reset, the WD Out signal is ON and the Status LED is lit green.

Figure 8 Watchdog logic principles



3 TECHNICAL SPECIFICATION

Table 2 Technical specification

Power supply requirements	
Input voltage and current consumption	+24 VDC nominal (+18 - +32 VDC)
	Nominal current consumption: ≈ 0.8 A
	Maximum start-up current: 2.7 A (see also surge energy)
Power consumption	typical 18 W (no active interfaces)
Surge energy (inrush energy at power on of module)	0.6 J (joule) for 1 ms
Central processor and memory specifications:	
Processor type	PowerPC™ Host Processor MPC8245
Processor clock frequency	400 MHz
RAM size and speed	64 MByte at 133 MHz
PROM	16 MByte application Flash-file
Link Channel specifications	
Channels	P21 - P28: 8 x dedicated channels for RSER200–4, available on eight RJ45 connectors.
Bit rate	1 Mbps
Watchdog specifications	
Watchdog time-out	0.1748 s to 5.594 s, programmable
I/O channel specifications	
Digital output (DO)	Four general purpose digital outputs (opto-isolated with emitter and collector directly available)
Digital input (DI)	Four opto-isolated inputs (anode and cathode with 4.7 kohm serial resistor)
Network interface specifications	
Process Net interface	P8, P9: 2 x Ethernet IEEE 802.3 type 10BASE-T/100BASE-TX interface, available on two RJ45 connectors.
RedNet interface	P10, P11: 2 x Ethernet IEEE 802.3 type 10BASE-T/100BASE-TX interface, available on two RJ45 connectors.
Remote I/O interface specifications	
RBUS Link interface	P19, P20: 2 x RBUS Link interface, available on two RJ45 connectors.
Serial line type	RS485 multidrop
Signal code	Manchester encoded (self-clocked)
Power supply voltage	+18 - +32 VDC
Bit rate	2 Mbps
Isolation voltage	500 V
Fieldbus interface specifications	

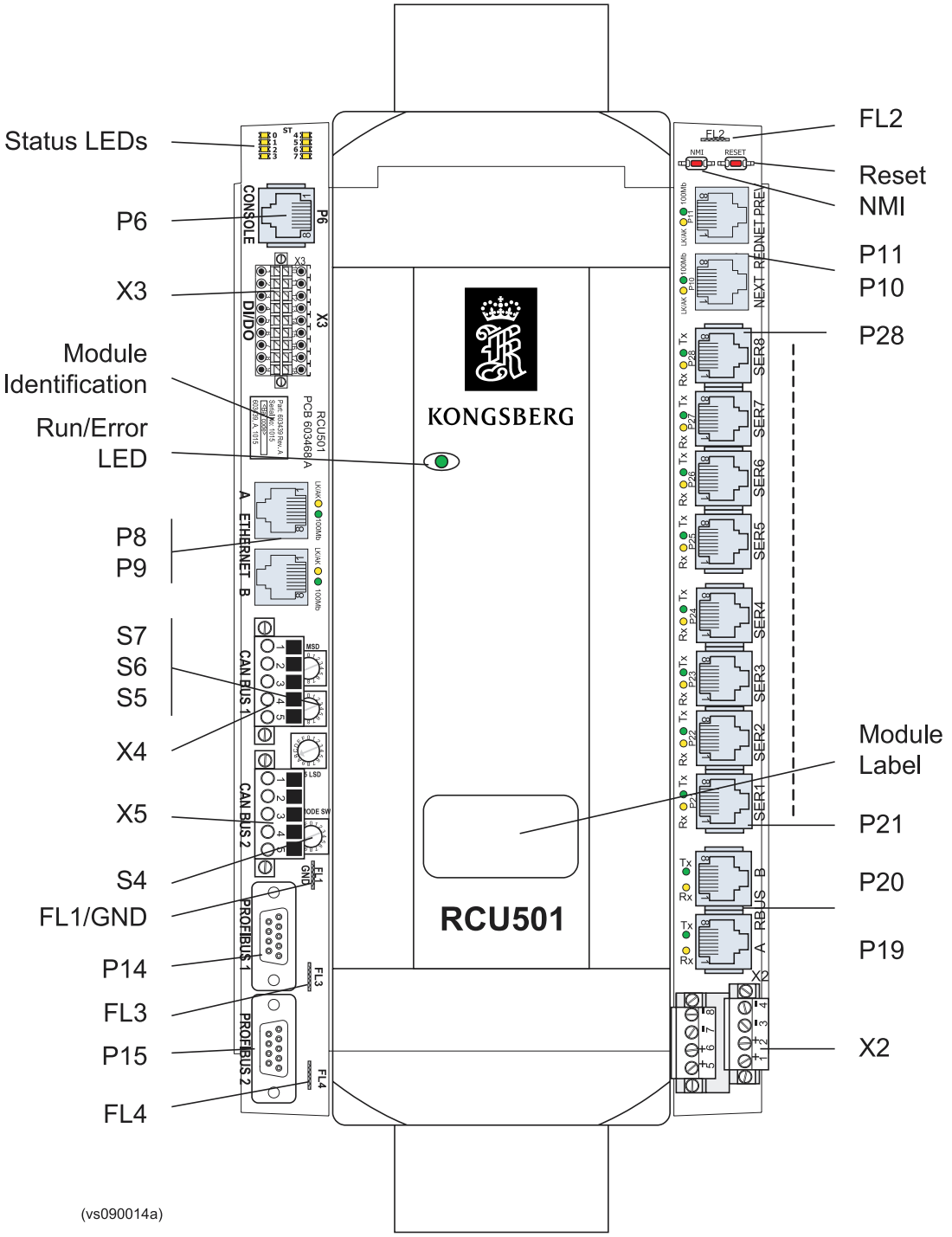
Table 2 Technical specification (cont'd.)

CAN interface	X4, X5: 2 x CANopen/DeviceNet capable interface available on two 5-pole terminal blocks with screw terminals handling 2.5 mm^2 wires
Bit rate	Maximum 1 Mbps. (DeviceNet not defined above 500 kbps)
PROFIBUS DP interface	P14, P15: 2 x Profibus interface, opto-isolated, available on two 9 pin female D-sub connectors.
Bit rate	Maximum 12 Mbps
Console interface specifications	
Connector type	RJ45 unshielded
Serial line type	RS232
Bit rate	9600 bps, 8 bit data, 1 stop bit, none parity
Fan specifications	
Fan noise	32 dB
Fan size	60 mm x 60 mm x 28 mm
Fan MTBF	50,000 hours
Mechanical specifications	
Module size (W x H x D)	158 x 355 x 87 mm
Weight	1.35 kg
Mounting	Screw locks on DIN-rail T35–15/7.5
Environmental requirements	
Temperature operational	-15 °C – +70 °C
Temperature storage	-25 °C – +70 °C
Vibration	Maximum 1.0 g
IP class	IP 20
Compliant to standards	IEC 60945 and IACS E10
Life cycle specifications	
MTBF calculated according to MIL-HDBK-217F (T = 25 ºC, environment = GB)	212 044 hours
MTBF calculated according to MIL-HDBK-217F (T = 35 ºC, environment = NS)	74 607 hours

4 CONFIGURATION

Figure 9 shows the layout of RCU501. Only direct accessible parts are shown (i.e. LEDs, switches, connectors, terminal blocks, FASTON terminals, label).

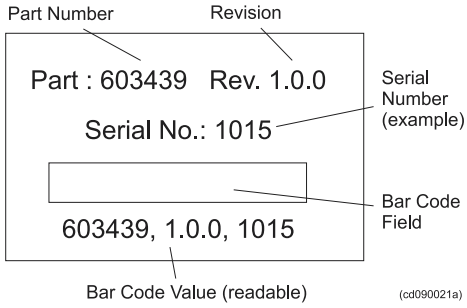
Figure 9 Layout of RCU501



4.1 Module identification

For any communication with Kongsberg Maritime on this module you should refer to the module name (RCU501) and information on the module identification label.

Figure 10 Module identification label (example)



4.2 P6 pin allocation (Console connection)

P6 is an 8-pin RJ45, unshielded female connector for RS232 serial line, console connection.

Figure 11 Front view of RJ45 with pin layout

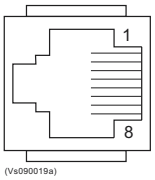


Table 3 P6 pin allocation

Pin no.	Signal name	Function
1	RE	Reference Earth
2		Not connected
3		
4	0 V	0 VDC reference for +24 VDC
5	CPU_RS232_TX	Transmit Data
6	CPU_RS232_RX	Receive Data
7		Not connected
8		

4.3 P8 and P9 (Process Net connection) pin allocation

P8 and P9 are RJ45, shielded female connectors that provide Process Net connections (Net A (P8) and Net B (P9)) to the module.

See Figure 11 on page 19 for connector pin layout.

Table 4 P8 and P9 pin allocation

Pin	Signal name	Function
1	TXP	Positive transmit line
2	TXN	Negative transmit line
3	RXP	Positive receive line
4		Not connected
5		
6	RXN	Negative receive line
7		Not connected
8		

Note

Each connector housing of P8 and P9 is connected via an HF filter to module 0 V within the module (see Figure 5 on page 12).

4.4 P10 and P11 (RedNet connection) pin allocation

RCU501 provides two ports, REDNET NEXT (P10) and REDNET PREV (P11), for redundancy connection between RCU modules. P10 and P11 are RJ45, shielded female connectors.

Interconnecting cables used for RedNet must be provided with crossed RX and TX pairs.

See Figure 11 on page 19 for connector pin layout.

Table 5 P10 and P11 pin allocation

Pin	Signal name	Function
1	TXP	Positive transmit line
2	TXN	Negative transmit line
3	RXP	Positive receive line
4		Not connected
5		
6	RXN	Negative receive line
7		Not connected
8		

Note

Each connector housing of P10 and P11 is connected via a capacitor to module 0 V within the module (see Figure 5 on page 12).

4.5 P14 and P15 pin allocation (PROFIBUS DP connection)

RCU501 provides two PROFIBUS DP ports (PROFIBUS 1 (P14) and PROFIBUS 2 (P15)). P14 and P15 are 9-pin, female, D-sub connectors.

Figure 12 P14 and P15 pin layout and allocation

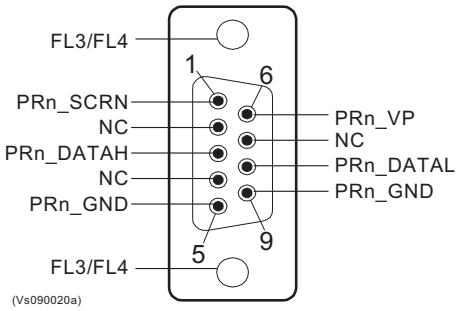


Table 6 P14 and P15 pin allocation

Pin no.	Signal name P14	Signal name P15	Function
1	PR0_SCRN	PR1_SCRN	For cable screen connection
2			Not connected
3	PR0_DATA_H	PR1_DATA_H	PROFIBUS Data, High terminal (RS485)
4			Not connected
5	PR0_GND	PR1_GND	PROFIBUS, signal reference
6	PR0_VP	PR1_VP	PROFIBUS, 5 VDC (isolated)
7			Not connected
8	PR0_DATA_L	PR1_DATA_L	PROFIBUS Data, Low terminal (RS485)
9	PR0_GND	PR1_GND	PROFIBUS, signal reference

Note

Connector housing of P14 is connected to FASTON FL3, and connector housing of P15 is connected to FASTON FL4 (see Figure 5 on page 12).

4.6 P19 and P20 pin allocation (RBUS Link connection)

RCU501 is provided with two RBUS Link connectors RBUS A (P19) and RBUS B (P20). P19 and P20 are RJ45, shielded female connectors.

See Figure 11 on page 19 for connector pin layout.

Table 7 P19 and P20 pin allocation

Pin no.	Signal name	Function
1	DATA_H	RS485 serial line high terminal
2	DATA_L	RS485 serial line low terminal
3		Not connected
4	0 VDC	0 VDC reference for +24 VDC
5		
6		Not connected
7	24 V	+24 VDC, interface input supply voltage
8	0 VDC	0 VDC reference for +24 VDC

Note

Each connector housing of P19 and P20 is direct connected to 0 V within the module (see Figure 5 on page 12).

4.7 P21 to P28 pin allocation (Link Channel connection)

RCU501 is provided with eight Link Channel connectors SER1 (P21) to SER 8 (P28). P21 to P28 are RJ45, shielded female connectors.

The Link Channel connection to RSER200-4 has to use a straight (not crossed) cable with all 8 pins in use.

See Figure 11 on page 19 for connector pin layout.

Table 8 P21 to P28 pin allocation

Pin no.	Signal name	Function
1	TXn-P	Link Channel #n Transmit, Positive terminal
2	TXn-N	Link Channel #n Transmit, Negative terminal
3	RXn_P	Link Channel #n Receive, Positive terminal
4	RTSn_P [1]	Link Channel #n Request To Send, Positive output terminal
5	RTSn_N[1]	Link Channel #n Request To Send, Negative output terminal
6	RXn_N	Link Channel #n Receive, Negative terminal
7		Not connected
8	0 V	0 V, signal reference terminal

where n = 1 for P21, 2 for P22, ..., 8 for P28

[1] – RTS is here an output signal used for flow control between RCU and RSER. It is signalling to the RSER that the RCU is ready to receive.

Note

Each connector housing of P21 to P28 is connected via an HF filter to 0 V within the module (see Figure 5 on page 12).

4.8 X1 (Fan connection)

X1 (Fan connection) is a 3 pin male connector located within the lower hatch-covered part of the module.

Table 9 X1 pin allocation

Pin no.	Pin name	Function
1	Pulse	Fan running feedback signal
2	0 VDC	Supply voltage 0V reference
3	+24 VDC	Fan supply voltage

4.9 X2 (Power connection)

X2 (Power connection) is an 8-pole dual terminal block with screw terminals. The connector is provided with two removable headers (terminal 1 to 4 and 5 to 8 respectively).

Figure 13 X2 terminal layout

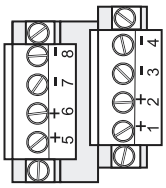


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Table 10 X2 terminal allocation

Terminal number	Terminal name	Function
1	+24 VDC	Supply voltage A, positive terminal
2		
3	0 VDC	Supply voltage A, 0 V terminal
4		
5	+24 VDC	Supply voltage B, positive terminal
6		
7	0 VDC	Supply voltage B, 0 V terminal
8		

4.10 X3 (DI, DO, WD)

X3 is a dual-row 18-pole terminal block with spring-lock terminals. It is provided with a removable header.

Figure 14 X3 terminal layout and allocation

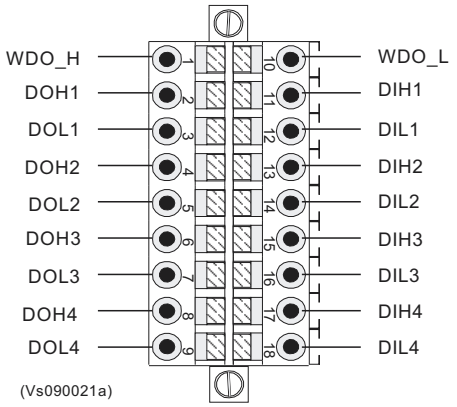

Table 11 X3 terminal allocation

Terminal number	Signal name	Function
1	WDO_H	Watchdog Out (opto collector)
2	DOH1	DO1 (opto collector)
3	DOL1	DO1 (opto emitter)
4	DOH2	DO2 (opto collector)
5	DOL2	DO2 (opto emitter)
6	DOH3	DO3 (opto collector)
7	DOL3	DO3 (opto emitter)
8	DOH4	DO4 (opto collector)
9	DOL4	DO4 (opto emitter)
10	WDO_L	Watchdog Out (opto emitter)
11	DIH1	DI1 (opto anode)
12	DIL1	DI1 (opto cathode)
13	DIH2	DI2 (opto anode)
14	DIL2	DI2 (opto cathode)
15	DIH3	DI3 (opto anode)
16	DIL3	DI3 ((opto cathode)
17	DIH4	DI4 (opto anode)
18	DIL4	DI4 (opto cathode)

4.11 X4 and X5 pin allocation (CAN connection)

RCU501 is provided with two CAN ports CANBUS 1 (X4) and CANBUS 2 (X5). X4 and X5 are 5-pole terminal blocks with spring loaded terminals. The terminal blocks have removable header.

Figure 15 X4 and X5 terminal layout

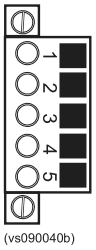

Table 12 X4 and X5 terminal allocation

Terminal number	Signal name X4	Signal name X5	Function
1	VNEG_C0	VNEG_C1	Bus power reference (0 V)
2	CANL_C0	CANL_C1	Bus low signal
3	SHIELD_C0	SHIELD_C1	Shield (AC termination)
4	CANH_C0	CANH_C1	Bus high signal
5			Not connected

4.12 FL1/GND (Module ground connection)

The FASTON terminal FL1/GND is ground reference (0 V) for the RCU501 module. The module is grounded by wiring this terminal to an earth bar.

4.13 FL2 (Floating module with HF ground connection)

The FASTON terminal FL2 is HF (high frequency) ground reference (0 V) for the RCU501 module. The module is HF grounded by wiring this terminal to an earth bar.

4.14 FL3 and FL4 (PROFIBUS cable shield connection)

FL3 and FL4 are FASTON terminals connected to the shield/housing terminal of the PROFIBUS connectors P14 and P15.

5 INSTALLATION

Caution

Electrostatic charges can damage components on the card. Always wear a correctly-connected earthing strap when handling unpacked cards or unprotected modules.

Note

The module is mounted vertically on a DIN rail with the fan in the lower end. The module's top and bottom can be mounted with no spacing to any cabinet top, bottom, DIN-rail modules etc.

1 Label the module.

2 Set correct MAC address to the module by rotating the three decimal switches to values as appropriate.

3 Verify that the MODE switch is set to **0**.

4 Fix the module to the rail by fasten the bolt at the top and the one at the bottom.

5 Connect the earth straps to the FASTON connectors FL1 through FL4 as appropriate.

6 Connect the power wires to the screw terminals on X2 connector as appropriate by using a screw driver.

7 Connect the DI, DO and Watchdog wires to X3 as appropriate by using a screw driver.

8 Connect the CAN-bus wires to X4 and X5 as appropriate by using a screw driver.

9 Connect all cable plugs to the connectors as appropriate.

10 Check that all cable plugs and screw terminal wires are properly fixed to avoid any loose connection.

11 Turn ON power.

12 Verify that the Run/Error LED shows red and later green after software program has been loaded and is running.

13 Verify by the system user interfaces that the module is working OK.

6 REPLACEMENT

6.1 Module replacement

Caution

Electrostatic charges can damage components on the card. Always wear a correctly-connected earthing strap when handling unpacked cards or unprotected modules.

1. Turn off the power to the module by using the corresponding circuit-breaker(s) or terminal block(s) with fuse.
2. Remove all cables attached to the module including the earth straps to the fast-ons (see Note).

   Note

   X2 to X5 can be split by firstly release the end bolts and then split the header from the connector body using a thin bladed screwdriver.

3. Remove the module from the rail by loosen one bolt at the module top and the one at the bottom.
4. Unpack the spare (new) RCU501.
5. From the new module remove all connector headers being in use.
6. Label the new module as the one being replaced.
7. Set correct MAC address to the module by rotating the three decimal switches to the same value as for the replaced.
8. Verify that the MODE switch is set to **0**.
9. Fix the module to the rail by fasten the bolt at the top and the one at the bottom.
10. Connect the earth straps to the FASTON connectors FL1 through FL4 as appropriate.
11. Refit the connector headers to X2 to X5 as appropriate by using a screwdriver.
12. Reconnect all cables to the module as appropriate.
13. Check that all cable plugs and screw terminal wires are properly fixed to avoid any loose connection.
14. Turn ON power.
15. Verify that the Run/Error LED shows red and later green after software program has been loaded and is running.
16. Verify by the system user interfaces that the module is working OK.

6.2 Fan replacement

6.2.1 Spareparts

Spare fan Kongsberg Maritime part no: 600686

6.2.2 Procedure

Caution

Electrostatic charges can damage components on the card. Always wear a correctly-connected earthing strap when handling unpacked cards or unprotected modules.

1 Turn off the power to the module by using the corresponding circuit breaker(s).

2 Remove the lower part of the hatch by loosen the fixing screw.

3 Grip the fan and gently pull it out (no hooks need to be bent).

4 Gently disconnect the fan plug from X1 connector by using a suitable screwdriver to help pulling it out.

5 Examine the new fan (see Note).

Note

The new fan body shall have a gasket located on the top side to avoid a loose assembly.

Be aware of determining correct fan orientation. Blowing direction must be into the module. See arrow marks on the fan for your guidance.

6 Insert the fan plug into the X1 connector.

7 Slide the spare fan into the guides. The wires should be to the left (seen from the module's lower end).

8 Refit the lower hatch part and fasten the screw.

9 Turn on the power circuit(s) to the module.

10 Verify that the fan is running in a proper way and that the air direction is correct (see Note above).

11 Verify that the Run/Error LED shows red and later green after software program has been loaded and is running.

12 Verify by the system user interfaces that the module is working OK.

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