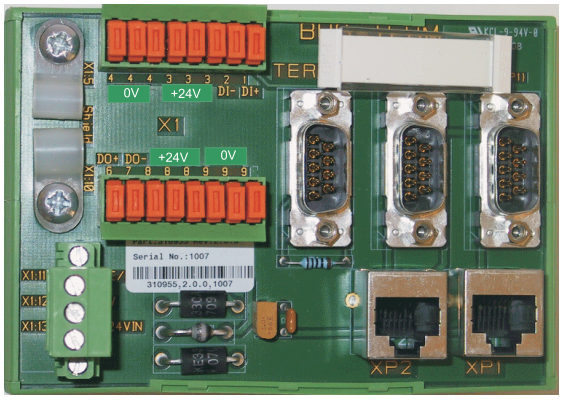
KONGSBERG

BUS-Term

Hardware Module Description

Kongsberg Maritime Part no. 310955



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311167/C

Document history

Document number: 311167		
Rev. A	April 2007	First version.
Rev. B	September 2008	Updated due to new field connectors and strain reliefs.
Rev. C	December 2010	New document review. Text and figures edited.

Note

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.
Kongsberg Maritime disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

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

BUS-TERM	BUS Termination
CE	Communauté Européenne
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
Ex	Explosion Approval
FS	Field Station
GND	Module 0 V reference
IDC	Insulated Displacement Connector
IE	Instrumentation Earth
I/O	Input/Output
IP	Ingress Protection/Enclosure Rating
KM	Kongsberg Maritime
LAN	Local Area Network
MTBF	Mean Time Between Failure
PE	Protective Earth
RBUS	Remote Process I/O Bus
RCU	Remote Controller Unit
RDIOR420	Remote I/O Relay module series 420
RIO	Remote I/O
RMP420	Remote MultiPurpose module series 420
SPBUS-Term	Serial Process I/O BUS Termination
STP	Shielded Twisted Pair

Overview

BUS-Term is a termination board for the Kongsberg RBUS (remote I/O bus) and SPBUS which is a serial process I/O bus interfacing the RCU (remote controller module, eg. RCU501, RCU502) and field I/O connected to RIO (remote I/O) modules (e.g. RMP420, RDIOR420).

This module is backward compatible with the prior SPBUS-Term (KM item number 600198). Thus, by utilizing this BUS-Term module with the two additional RJ45 connectors, the system topology is prepared to the state of the art RBUS line of delivery from KM.

One single BUS-Term module handle one single RBUS channel. Redundant RBUS channel topology require a corresponding number of BUS-Term modules.

24V DC communication bus supply power is to be connected to separate screw terminals on X1.

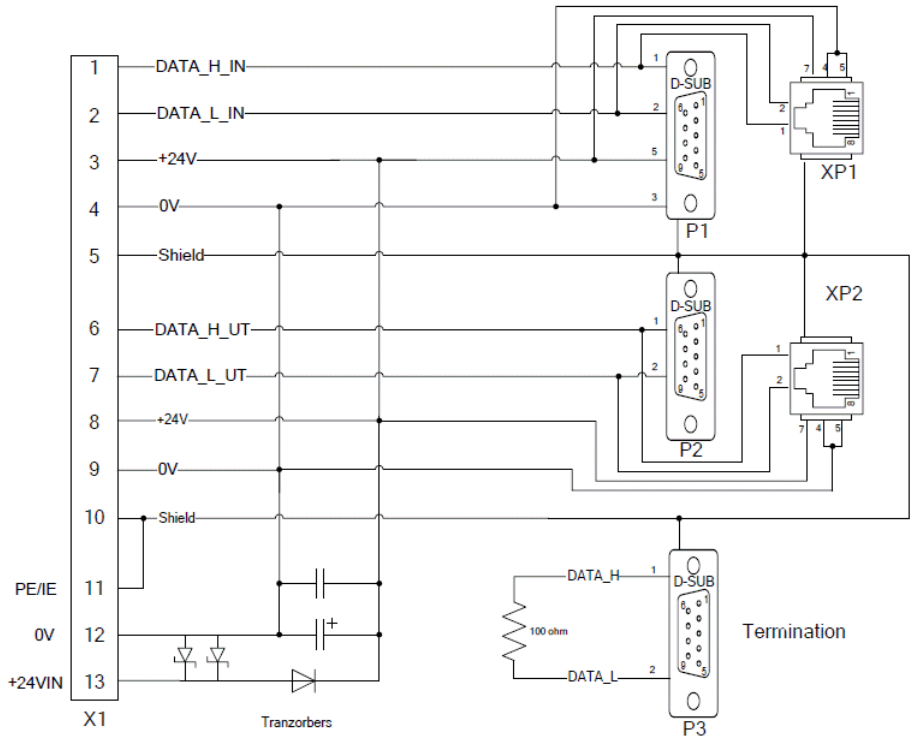
Recommended RBUS 24 VDC power supply is identical to host computer (RCU) power supply. One power supply feed per RBUS channel, as illustrated in figure 3 and 4.

IDC part of termination board X1 is for interfacing of external cabling (normally yard supply). BUS data termination is mainly designed for shielded twisted pair (STP) LAN cable. Termination is carried out with the time saving fast termination, punch down connection design: Insulation Displacement Connection. (IDC).

The module is approved for Ex Zone 2 applications.

Function

Figure 1 Electric schematics of the BUS-Term



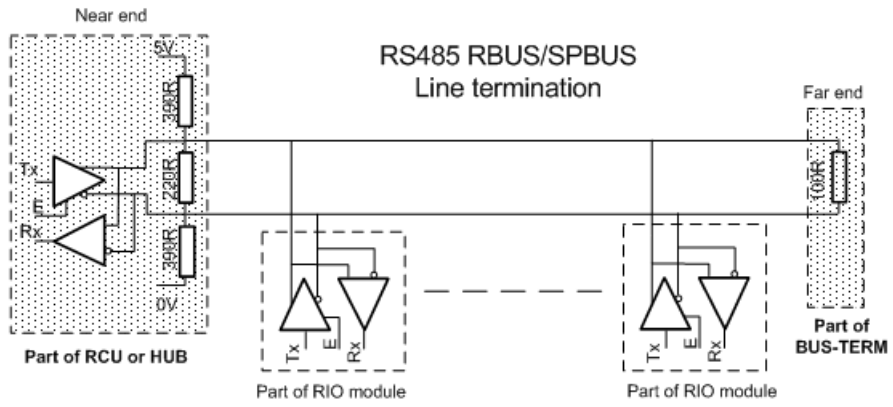
BUS wiring

The BUS is daisy chained between the RCU and the RIO modules as illustrated in figure 2. The connectors XP1 and XP2 are used for interfacing the RCU501/502 HUB to the module using STP patch cables (RJ45).

BUS termination

KM IO process bus physical layer is a standard RS485 daisy-chained multidrop bus-line. Figure 2 shows a standard fail-safe biased bus line, this is the standard method used in KM systems. Fail-safe biasing should be used in noisy environments in order to prevent false message detection. Without fail-safe biasing, the line can easily switch from 0 to 1 (or vice versa) and thereby generate a false start pulse. If this false pulse comes directly in front of a legal message – the message will then be corrupted and lost.

Figure 2 Fail-safe biasing RBUS line



The prefabricated internal RBUS cables (normally KM supply) have approx. 100 ohm impedance, therefore the BUS-Term impedance termination resistor R_T has the identical value.

BUS-Term power connection

The power supply interface on the BUS-Term module is provided with a diode which allows power to be entered at different BUS-Term modules along the communication RBUS. Redundant power supplies will keep the serial line powered if a cabinet node is turned off.

Grounding

When terminating / connecting the STP cable to the IDC part at X1 connector, cable shield shall be clamped by the metal based strain reliefs. Illustrated as X1:5 and X1:10 in Figure 5. Further, make sure that X1:11 is terminated to PE.

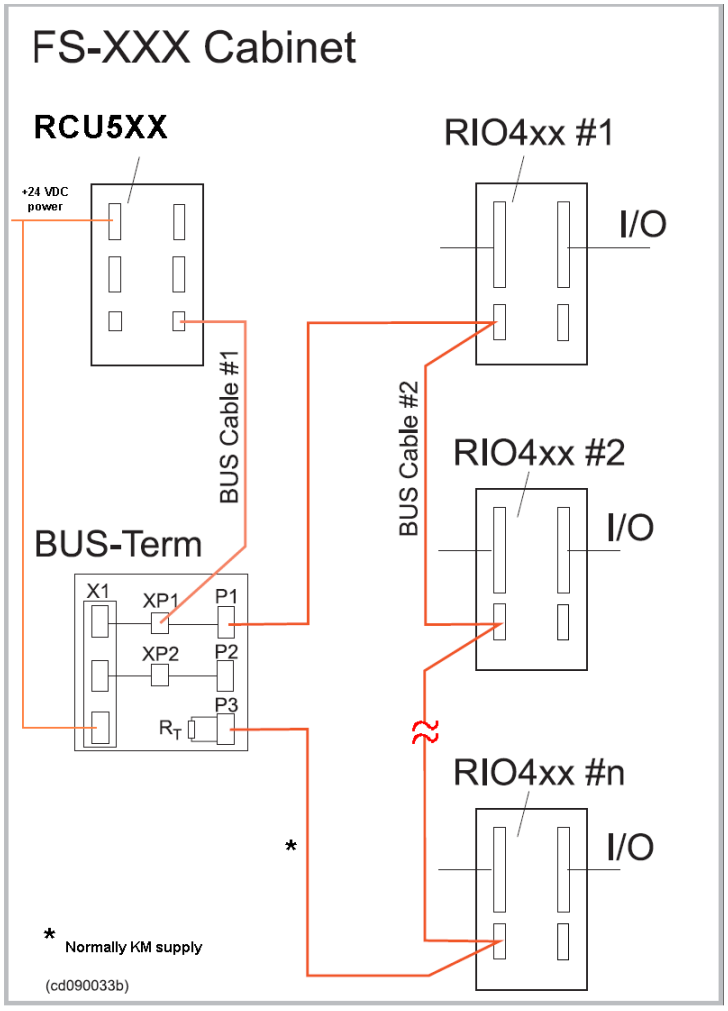
Examples of BUS-Term use

The following illustrations shows examples of how the communication BUS can be wired within field stations (FS) using the BUS-Term module.

Prefabricated RBUS cables for use inside cabinets are terminated at the D-sub connectors on the BUS-Term. The BUS-Term module and the interfaced RCU and RIO modules are normally interconnected in one I/O hub. Normally located inside one cabinet.

The BUS-Term is provided with a bus impedance termination resistor to which the last connector of the RBUS cable must be connected.

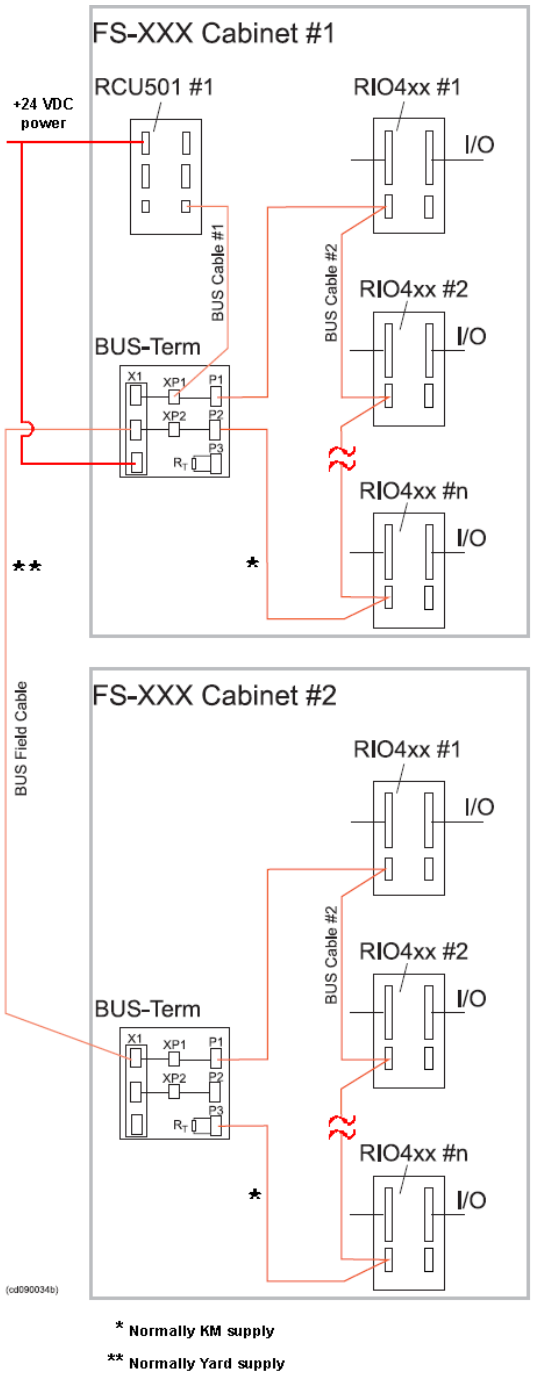
Figure 3 Example of BUS-Term used in a field station



When interfacing several cabinets or I/O nodes as illustrated in Figure 4, a shielded twisted pair (STP) LAN cable (normally yard supply) is to be connected to the Insulated Displacement Connector (IDC) part at terminal block X1. Inside the cabinet, P1, P2, and P3 D-sub connectors are prepared to daisy-chain interface the RIO modules to the

communication bus with standard prefabricated cables (normally KM supply). P3 is for impedance termination if the cabinet is the last one on the communication bus as illustrated in Figure 2, 3 and 4.

Figure 4 Example of BUS-Term used in two linked field stations



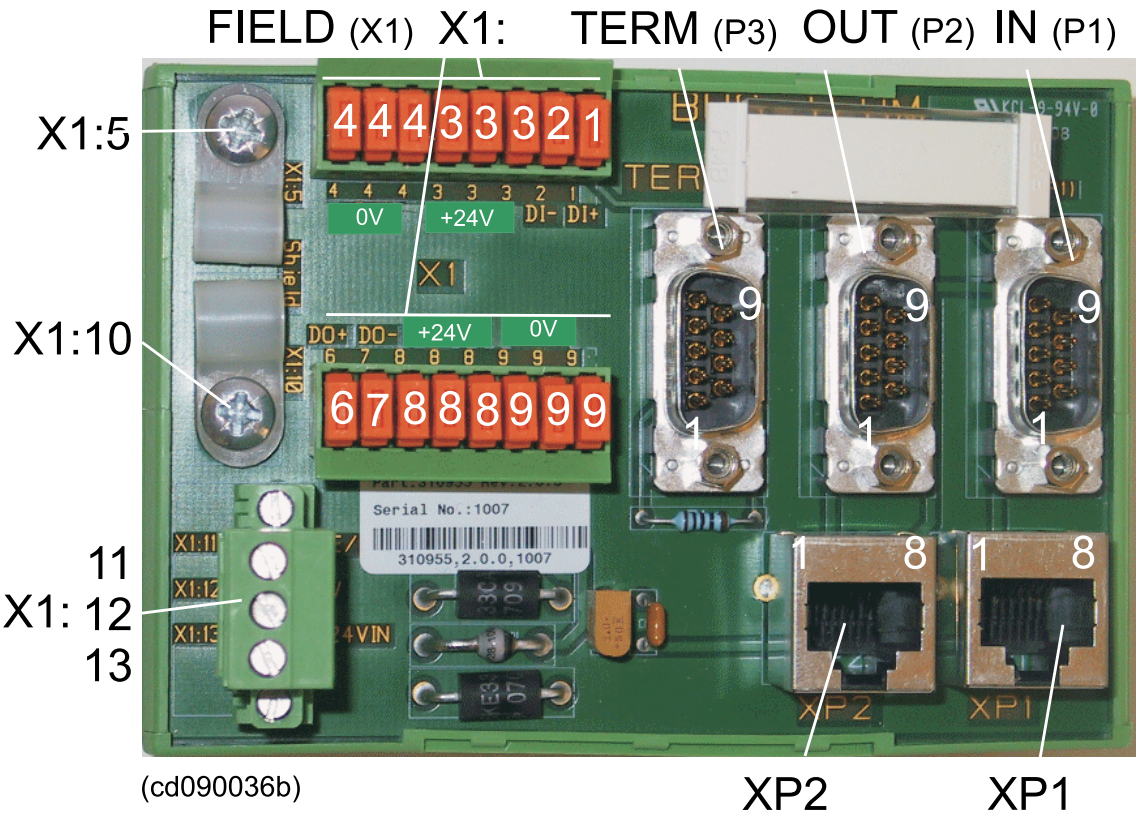
Technical Specifications

Table 1 Technical specification

Power supply requirements and specifications	
Supply voltage	+24 VDC +30% - 25%
Mechanical specifications	
Module size (W x H x D)	112 x 75 x 41 mm (included Phoenix Contact cassette)
Weight	0.12 kg
Mounting	Snap on to DIN-rail T35–15/7.5
Communication bus cable connection	IDC type
Cable cross section	Minimum 0.22 mm^2 (AWG 22/7) Maximum 0.34 mm^2 (AWG 26/7)
Power cable connection	Screw terminal slotted type
Cable cross section	2.5 mm^2
Environmental requirements	
IP class	IP 20
Life cycle specifications	
MTBF calculated according to MIL-HDBK-217E (T=35°C, env=NS)	150,700 hours
Capability	
CE mark compliant. Ex nAII T4	Conform to EMC directive 2004/108/EC. Conform to 94/9/EC (Atex directive)

Configuration

Figure 5 Component location



Connectors

Daisy-chain connector – P1/P2 (D-SUB)

Two BUS interfaces are available on P1 and P2, which is a 9-pole male D-SUB connector. The pins 10 and 11 represent the screw locks of the D-SUB.

Figure 6 P1 pin layout

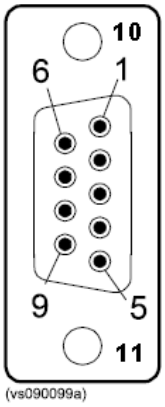


Table 2 P1 pin allocation

Pin	Name	Pin	Name
1	Data serial diff. BUS Positive	2	Data serial diff. BUS Negative
3	0 VDC	4	Not used
5	+ 24 VDC	6	
7	Not used	8	
9		10, 11	Shield

Termination connector – P3 (D-SUB)

The P3 connector is an end termination of the serial bus, with a fix 100 Ω resistor. It's a 9-pole male D-SUB connector. The pins 10 and 11 represent the screw locks of the D-SUB.

Table 3 P3 pin allocation

Pin	Name	Pin	Name
1	Data serial diff. BUS Positive	2	Data serial diff. BUS Negative
3	Not used	4	Not used
5		6	
7		8	
9		10, 11	Shield

Connector – XP1 / XP2 (RJ45)

It is also possible to interface the RCU to the I/O BUS via a RJ 45 connector with twisted pair/patch cable.

Figure 7 XP1 pin layout

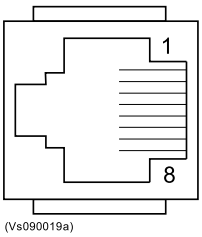


Table 4 XP1 pin allocation

Pin no.	Name	Function
1	Data-H	Data serial diff. BUS Positive
2	Data-L	Data serial diff. BUS Negative
3		Not used
4	0 VDC	GND BUS supply
5		
6		Not used
7	+24 VDC	+24 VDC BUS supply
8		Not used

Field Terminal X1

Consists of: Phoenix IDC 3.81 8-pin X1: 1–4 and 6–9 and MSTBV 2,5/ 3-GF-5,08 X1: 11–13.

X1 is divided into five different terminal blocks. X1 pin 1 to 4 and X1 pin 6 to 9 are Phoenix 8-pin IDC (as illustrated in figure 8 below) fast-lock knife-contact terminal blocks. X1 terminals 5 and 10 are metal based strain reliefs for the field cables (> 3 mm diameter). X1 pin 11 to 13 is a terminal block with 3 screw terminals for single wires and with removable header, as illustrated in figure 9.

Note

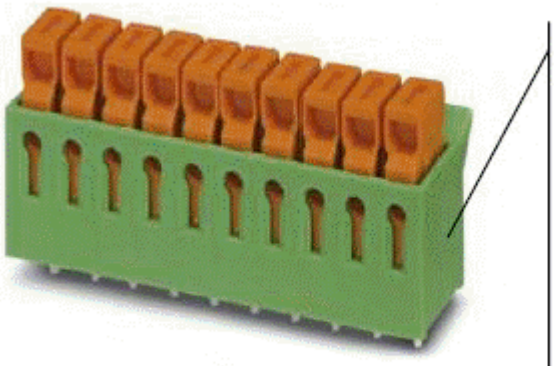
Note that the figures shows a 10-position version of the contact.

Cable cross section (stranded wire):

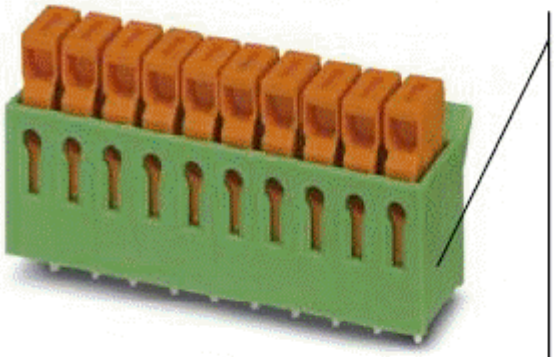
Minimum 0.22 mm^2 (AWG 22)

Maximum 0.34 mm^2 (AWG 26)

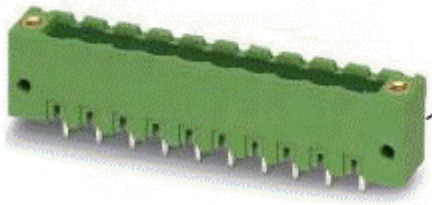
Figure 8 Pin layout on field terminal X1 signal termination



Pin# (X1)	Signal name	Description
1	DATA_H_IN	Data serial diff. bus Positive
2	DATA_L_IN	Data serial diff. bus Negative
3	+24V	Power
3	+24V	Power
3	+24V	Power
4	0V	Signal ref.
4	0V	Signal ref.
4	0V	Signal ref.



Pin# (X1)	Signal name	Description
6	DATA_H_OUT	Data serial diff. bus Positive
7	DATA_L_OUT	Data serial diff. bus Negative
8	+24V	Power
8	+24V	Power
8	+24V	Power
9	0V	Signal ref.
9	0V	Signal ref.
9	0V	Signal ref.



Pin# (X1)	Signal name	Description
11	PE/IE	Ground
12	0V	Signal ref.
13	+24VIN	Power

Note

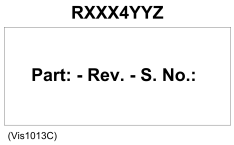
X1. 11–13: Cable cross section: 2.5 mm²

Sheild is connected with Aluminium cable clamp (X1 pin 5 and 10).

Plug X1 power termination: MCVW 1,5/3-STF-3,81. Figure 9 shows a 10-position version of the product.

Figure 9 Termination, 10-position

Module identification



For any written communication with KM regarding the BUS-Term module, please refer to the module name (BUS-Term) and the information in the rectangle (Assembly-Revision -Serial No.).

Ex label

The Ex label contains two lines of information:

- Nemko 07ATEX3090X is the type approval certificate number.
- II 3G EEx nA II T4 Ta: 55ºC are the Ex requirements satisfied by the module.

Installation

Ex Zone 2 installation requirements

The choice of enclosure, placement of modules, components and free volume inside enclosure will affect the temperature.

When the module is used in Ex Zone 2, the following requirements must be met:

- The RIO module shall be mounted in an enclosure which complies with the requirement of clause 26.3 of EN 60079-15 and fulfil IP 54, or alternatively is mounted in an EEx e-enclosure.
- Maximum surface temperature shall not exceed temperature class T4 corrected for the maximum ambient temperature at service (Ta: 55°C) within the safety margin of 5°K.
- Maximum ambient temperature inside enclosure shall not exceed 75°C.

Installation procedure

1 Label the board.

2 Clip the BUS-Term Phoenix cassette on to the DIN-rail.

3 Remove the insulation from the field cable to get proper connection to the strain relief metal area.

4 Fix the field cables to the module using the strain reliefs and bolts.

5 Terminate each wire to the IDC knife terminals X1: 1–4 and 6–9 by putting each end into the appropriate holes and then push down the locking key.

Note

It is not necessary to strip the wires before terminating them.

6 Connect the power wires as appropriate to the screw terminals on X1 terminals 11 to 13.

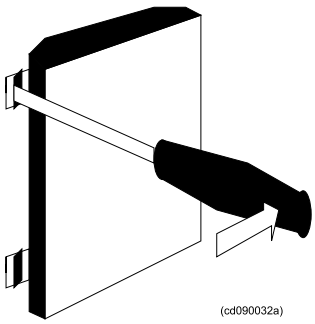
7 Connect the internal RBUS cables at P1 and P2 or P3, or at XP1 and XP2 as appropriate.

8 Turn ON the RBUS and RIO system power supply(s).

9 Verify the RIO system works properly.

Replacement

1. Turn OFF the RBUS and RIO system power supply(s).
2. Disconnect RBUS power wires by unscrewing the end-bolts and pull off the snap-on header of terminal block X1 terminal 11 to 13.
3. Disconnect the field-cable wires by opening the connector locks X1: 1–4 and 6–9 one by one, and finally pull out the wires.
4. Release the strain reliefs to remove the field cables. Keep the strain reliefs on the cables.
5. Disconnect the internal cable from P1 and P2 or P3, or at XP1 and XP2 as appropriate.
6. Remove the board to be replaced by detaching the BUS-Term Phoenix cassette from the DIN-rail (see illustration).



7. Label the new board.
8. Remove the snap-on header from X1 terminal 11 to 13 on the new board and the two strain reliefs.
9. Clip the BUS-Term Phoenix cassette on the DIN-rail.
10. Fix the field cables to the module using the strain reliefs and bolts.
11. Terminate each wire to the knife terminals on X1: 1–4 and 6–9 by putting each end into the appropriate holes and then push down the locking key.
12. Connect the snap-on terminal header on X1 terminals 11 to 13 and fix the end-bolts.
13. Connect the internal RBUS cable to P1 and P2 or P3, or at XP1 and XP2 as appropriate.
14. Turn ON the RBUS and RIO system power supply(s).
15. Verify the RIO system works properly.