RTU32N

RTU32N Series – Compact Utility RTU

Installation and Wiring Guide

Version 1.00 / Aug. 2018/ DOC 40361

BRODERSEN
simplifying systems

Contents

1. Customer Information

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To receive the latest version of the user manual, please visit our Web site at: http://www.brodersen.com .

Choose the product in question under product search and under each product you will find accompanying data sheets, manuals, user guides, etc.
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This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Brodersen, or which have been subject to misuse, abuse, accident or improper installation. Brodersen assumes no liability under the terms of this warranty as a consequence of such events. Because of Brodersen's high quality control standards and rigorous testing, most of our customers never need to use our repair service. If a Brodersen product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time, and freight. Please consult your distributor for more details. If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, Product type and s/n, hardware and software version etc.) Note anything abnormal and describe the error in a product failure report.
2. Call your distributor and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, make arrangement with your distributor about this.
4. Carefully pack the defective product, a complete failure report and a photocopy of proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Ship it to your distributor.

2. Introduction

This equipment is designed and manufactured to conform to the following EC standards:
EN55011: Class A EN55022: Class A
EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6 EN61000-4-8
EN61000-4-11
EN61000-3-2 EN61000-3-3
EN60950 Safety of information technology equipment

Failure to use the equipment in the manner described in the product literature will invalidate the warranty.

A 'Declaration of Conformity' statement to the above standards, and a list of auxiliary equipment used for compliance verification, is available on request.

This product must be disposed of in accordance with the WEEE directive.

3. General Information

Technical Specification Summary

Mechanical

Enclosure:	Aluminium enclosure for DIN rail mounting
Dimensions (H x W x D):	80mm x 178 x 80mm (excl. connectors)
Weight:	0.8kg (approx.)

Environmental

Temperature:	−20°C to +60°C (operation)
Humidity Range:	0% to 95% non-condensing
IP rating:	IP20

IP Networking (LAN ports)

Quantity:	2
Type:	10/100BASE-Tx Ethernet
Connection:	RJ45 sockets
Position:	RTU top
Communications protocols:	See data sheet

COM ports

Quantity:	4
Type:	COM1: RS232 (with full handshaking signals), COM2: RS232/RS485/RS422 (configurable), isolated, COM3 & COM4: RS232 (simple RX/TX)
Protocols:	Multiple - See data sheet
Connection:	COM1 & COM2: D-sub 9 pin male, COM3 & COM4: RJ12 (RJ11) Sockets
Position:	COM1 & COM2: RTU top, COM3 & COM4: RTU bottom

External I/O Expansion Ports

Quantity:	2
Maximum I/O modules:	LocalBus1: 12 UCL-xx I/O modules LocalBus2: 32 new I/O modules
Connection:	RJ45 sockets
Position:	LocalBus1: RTU top, LocalBus2: RTU bottom

Embedded I/Os

- **Section A / Digital Inputs**

Channels:	8 x digital input
Connection:	10 pin removable screw terminals
Position:	RTU top left
Available on:	28IO, 42IO and 16DIO versions

- **Section B / Digital Inputs**

Channels:	8 x digital input
Connection:	10 pin removable screw terminals
Position:	RTU top middle
Available on:	28IO, 42IO and 16DIO versions

- **Section C / Digital Outputs**

Channels:	8 x digital output
Connection:	10 pin removable screw terminals
Position:	RTU bottom left
Available on:	28IO, 42IO and 16DIO versions

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- **Section D / Analog Inputs**

Channels:	4 x analog input (28IO and 42IO versions) or 8 x digital output (16DIO version)
Connection:	10 pin removable screw terminals
Position:	RTU bottom middle
Available on:	28IO, 42IO and 16DIO versions

- **Section E / Extended IOs**

Channels:	8 x configurable digital input/output
Connection:	10 pin removable screw terminals
Position:	RTU top right
Available on:	42IO version

- **Section F/ Extended IOs**

Channels:	2 x analog input + 4 x fast digital/32-bit counter input
Connection:	10 pin removable screw terminals
Position:	RTU bottom right
Available on:	42IO version

I/O Characteristics

- **Digital Inputs**

Input Range:	Standard: 10 to 30VDC, others on request
Isolation:	2KV Opto-isolated
Available on:	28IO, 42IO and 16DIO versions

- **Digital Outputs**

Input Range:	Standard: 10 to 30VDC, others on request
Output switch type:	Smart high side switch (28IO and 42IO versions) or Transistor PNP (16DIO version)
Maximum Current/output:	0.5A
Protections	
- Short-circuit:	Yes (only for 28IO and 42IO versions)
- Overload:	Yes (only for 28IO and 42IO versions)
- Overvoltage:	Yes (only for 28IO and 42IO versions)
- Over temperature:	Yes (only for 28IO and 42IO versions)
- Wrong connections:	Yes (only for 28IO and 42IO versions)
Absolute maximum ratings:	Supply voltage: 40V
Isolation:	2KV Opto-isolated
Available on:	28IO, 42IO and 16DIO versions

- **Analog Inputs**

Input Range:	Current mode: 0 to 20mA, -20mA to +20mA, 4mA to 20mA (configurable) Voltage mode: 0 to 10V, 0 to 5V, -5V to +5V, -10V to +10V (configurable)
Mode selection:	By on-board jumpers for each channel (set jumper: current mode, remove jumper: voltage mode)
Resolution:	Effective: 16 bit ADC: 24 bit
Accuracy:	At 25°C: ±0.1%
Input impedance:	Current mode: 125 Ohm ±0.1% Voltage mode: More than 1MΩ
Linearity:	> ± 0.001%
Temperature Stability:	> ± 25ppm/°C (typical)
Common mode voltage:	Max. ±80V DC
CMRR:	Min. 80dB
Power Freq. noise rejection:	Standard: 50Hz On request: 60Hz (set by manufacturer)
Digital Low-pass filter:	Yes (configurable)
Absolute maximum ratings:	Current: ±40mA Voltage: ±40V DC
Isolation:	Input to electronics: at least 350V Channel to channel: at least 350V
Available on:	28IO and 42IO versions

- **Fast digital / 32-bit Counter Inputs**

Input Range:	Standard: 5 to 30VDC, others on request
Maximum frequency:	up to 5 KHz
Isolation:	2KV Opto-isolated
Available on:	42IO version

Mains Power Supply

- **Power Supply version 05**

Power Supply:	10-30 VDC
Power Consumption:	4-12W depending on configuration and connected I/O expansion modules
Connection:	Removable screw connector – 3 wires (+, -, Gnd)
Position:	RTU top left

- **Power Supply version 10**

Power Supply:	90-265V AC/DC
Power Consumption:	4-12W depending on configuration and connected I/O expansion modules
Connection:	Removable screw connector – 3 wires (+, -, Gnd)
Position:	RTU top left

- **Power Supply version 30**

Power Supply:	20-60 VDC
Power Consumption:	4-12W depending on configuration and connected I/O expansion modules
Connection:	Removable screw connector – 3 wires (+, -, Gnd)
Position:	RTU top left

RTU Front Panel

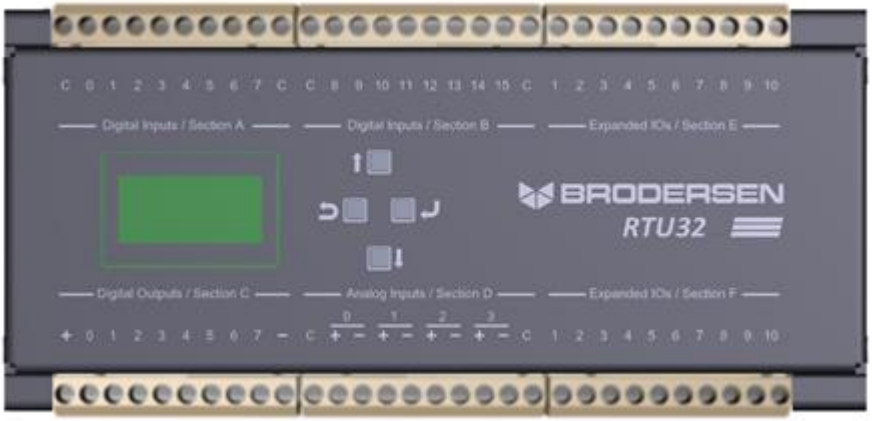

Figure 1: RTU32N Front Panel

Front Panel LCD and Keys

On the RTU32N front panel, there are a LCD display and 4 keys. Important statuses of the RTU32N, including statuses of communication buses and I/O ports are shown on the LCD display. The displayed parameter on the LCD can be changed by the keys.

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RTU Interfaces and Connectors

Top view

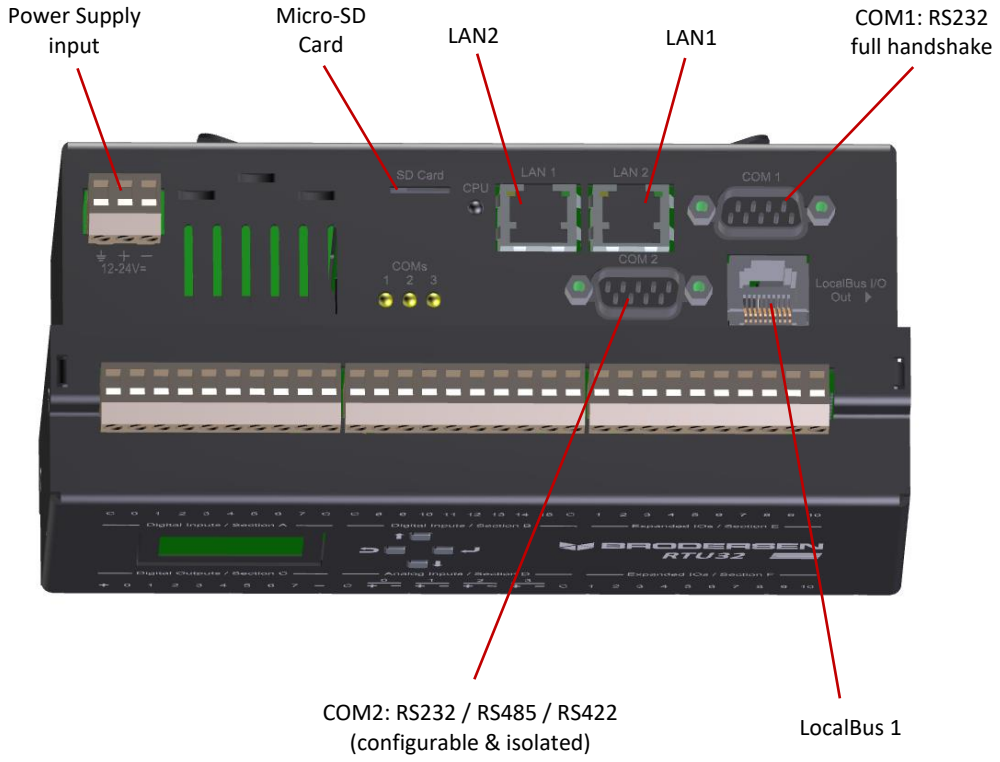

Figure 3: RTU32N Top Panel Interfaces and Connectors

Bottom view

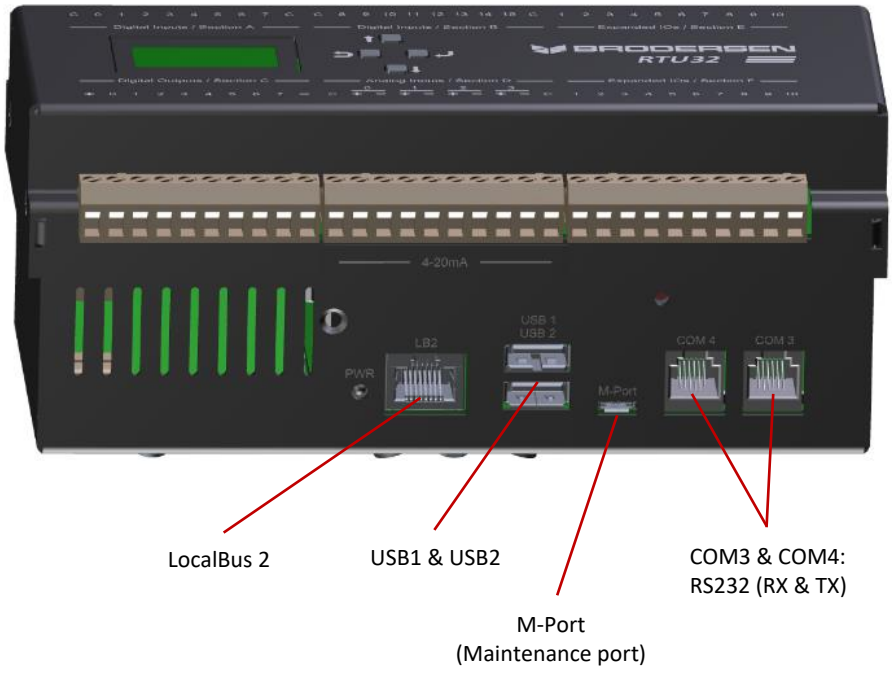

Figure 4: RTU32N Bottom Panel Interfaces and Connectors

Front view

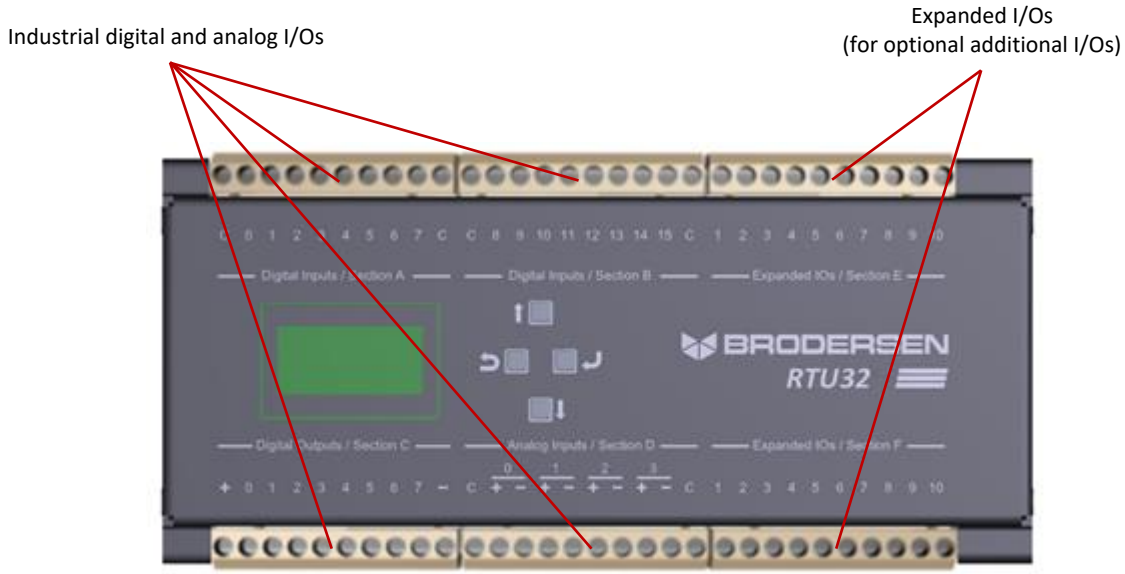

Figure 5: RTU32N Front Panel Interfaces and Connectors

Top Panel Indicators Description

COM1:	Indicating RX/TX activity on COM1.
COM2:	Indicating RX/TX activity on COM2.
COM3:	Indicating RX/TX activity on COM3 and/or COM4.
CPU:	Indicating activity of RTU/CPU.
LAN1:	LAN connector green LED indicate network connected and yellow indicate RX/TX traffic.
LAN2:	LAN connector green LED indicate network connected and yellow indicate RX/TX traffic.
PWR:	Indicating power on RTU.

RTU Interfaces and Connectors

Port Name	Connector	Functions
Power supply input	3 way removable screw terminal	Power Supply Input
LAN1, LAN2	RJ45 Socket	IP Network Connections
COM1, COM2	D-sub 9pin Male	Serial interfaces
COM3, COM4	RJ12 (RJ11) Socket	Serial interfaces
USB 1 & 2	USB socket for Type A connector	External Connection
LB1, LB2	RJ45 Socket	Brodersen LocalBus ports
Micro-SD Flash	Micro-SD card interface slot	Software Flash disc slot
I/Os	10 ways removable screw terminals	Industrial I/O interfaces

4. Installation

Equipment and Tool Requirements

- The RTU32N unit
- A small flat-bladed screwdriver.
- A pair of wire cutters/strippers.
- A standard panel / cabinet with DIN rail with space for mounting and wiring RTU32N and any I/O Expansion modules, modems, additional power supplies, terminals, fuses etc. required.

External Cabling Requirements

Connection	Termination and Suggested Type
Power supply input	1.5mm² wire with ferules. Earth: Earth wiring must be 2,5mm² and kept as short as possible.
Ethernet Ports	Cabling connector: RJ45 socket Standard unscreened LAN cable
Expansion LocalBuses	Cabling connector: RJ45 socket Special Brodersen LocalBus cables
I/O terminals	Cables max 1.5mm²
COM1 serial port	Cabling connector: D-sub 9pin Male Standard Null-Modem or Modem cable
COM2 serial port	Cabling connector: D-sub 9pin Male Connection: According to its wiring diagram
COM3 and COM4 serial ports	Cabling connector: RJ12 (RJ11) socket Connection: According to their wiring diagram
USB 1 & 2	Shielded USB cable recommended for Modems

Recommended Installation Procedure

- Please read and observe the instructions and guidelines in Section “Safety and Precautions” prior to installation. Failure to follow these instructions and guidelines may cause personal injury and/or damage to the equipment.
- Fit the RTU32N unit and any additional I/O Expansion modules to a panel or cabinet with pre-mounted DIN rail.
- Ensure that there is space available for mounting comms cables like D-sub connectors on the top panel or RJ12 (RJ11) connectors on the bottom panel of the RTU32N.
- Connect the wiring for digital and analogue input ports, digital output ports, expansion bus, COM ports, USB ports and Ethernet ports to the connectors according to the application.
- Connect ground cabling and the power supply cabling (as appropriate) to the power supply connector.

5. Mounting instruction

The RTU is mounted on a 35mm DIN-rail (EN50022). For mounting and de-mounting - see the figures below.

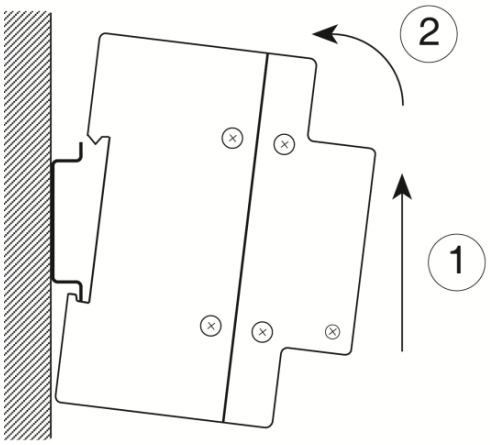

Figure 6: Mounting procedure

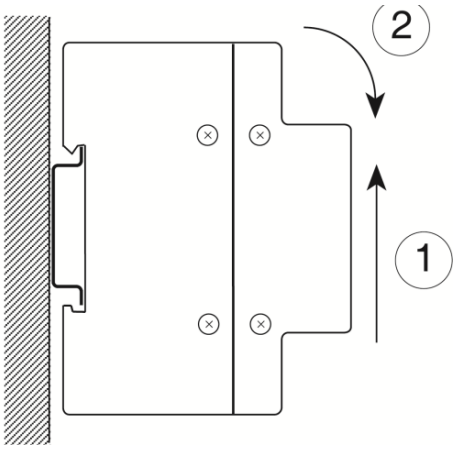

Figure 7: De-mounting procedure

NOTE: ALWAYS MOUNT RTU HORISONTAL!

6. Wiring details and diagrams

Wiring - general

- Terminal blocks for I/O and power supply are plug-in connectors with screw terminals. It is recommended to use ferrules on wires.
- LANs and LocalBuses are RJ45 - Note: Be careful to connect correctly. If a network interface cable is connected to a LocalBus interface, the PC, switch, router or other network equipment will most likely be damaged.
- COMs are 9 pole sub-D male connectors and RJ12 (RJ11) connectors.
- The wiring diagrams cover all versions of the RTU32N variants. For RTU32N version without I/O this section is still relevant as it include wiring details for supply voltage and comms interfaces.

Wire size

Earth and power supply: max. 2.5mm² (earth wiring must be 2.5mm² and kept as short as possible).
Other connectors: Max. 1.5mm² with ferrules.

Wiring diagrams

Power Supply

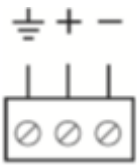

Figure 8: Power supply wiring diagram

Earth connects to PE conductor - wire as short as possible.

Power supply version 05:

+: +12-24V DC positive
-: 0V negative

Power supply version 30:

+: +24-48V DC positive
-: 0V negative

Digital Input Wiring

All digital input channels are equipped with optocouplers. To activate the inputs an external voltage is required. All Inputs are additional used for S0 counter inputs.

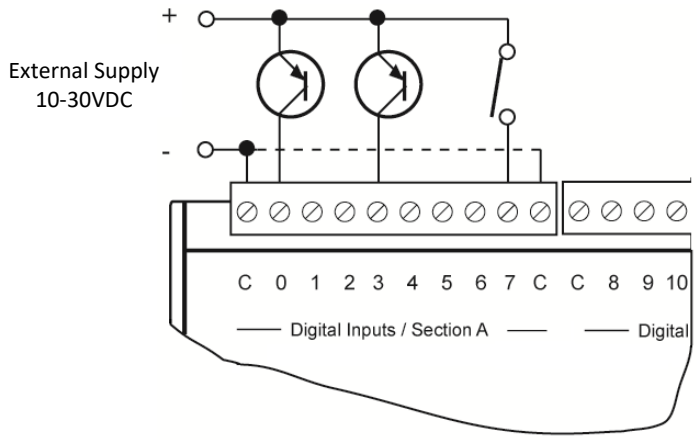

Figure 9: Digital input wiring diagram

Note: Common (C) is NOT internally connected between the sections. It means that C must be connected to “minus” for each section.

Digital Output Wiring

Each digital output channel includes a smart high side switch and equipped with optocouplers. Output current is maximum 0.5A per channel. All outputs are short-circuit, overload, overvoltage, over temperature and wrong connections protected.

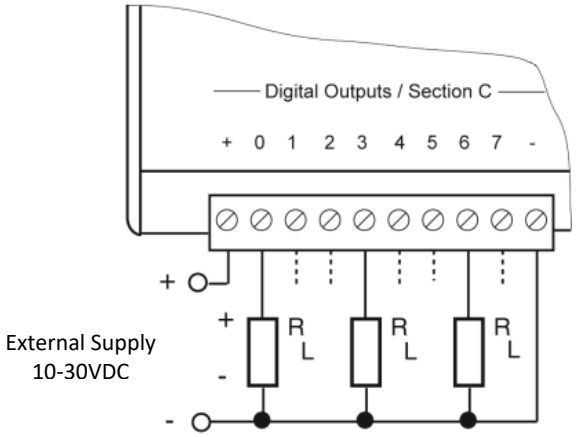

Figure 10: Digital output wiring diagram

Analogue Input Wiring

Each analog input channel is individually isolated from each other and from other electronics (CPU, LocalBus and etc.). Current or voltage mode is selected for each channel individually by setting or removing dedicated jumpers on the boards. The jumpers are

located on the I/O board, beside the output of each channel (for AI0-AI4), and also on the extended board, if available (in 42IO version for extended AIs). For each channel, the related jumper should be set for current mode, or should be removed for voltage mode.

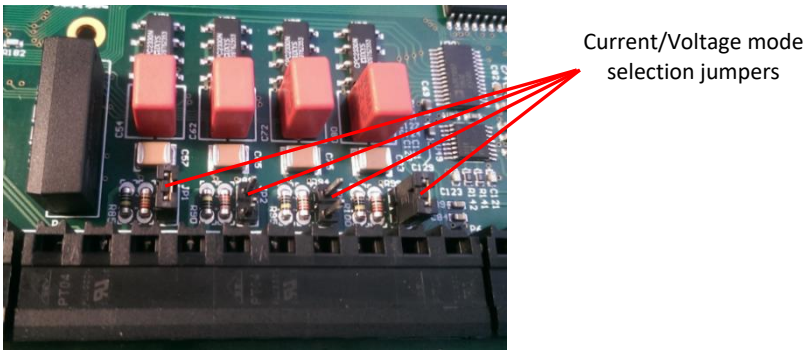

Figure 11: Current/Voltage mode selection jumpers (for AI0-AI3)

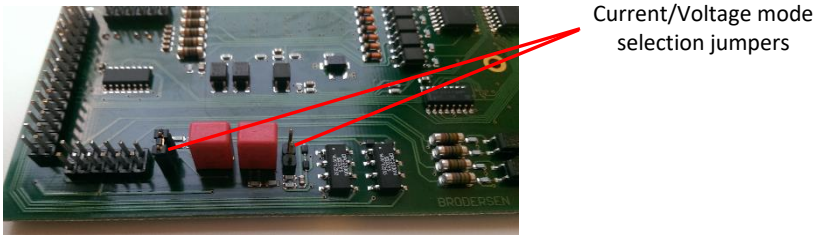

Figure 12: Current/Voltage mode selection jumpers in extended board (for extended AIs)

For each channel in each mode, the values for input range and filter are configured through web-based configurator and/or WorkSuite configuration (details are provided in RTU User Guides).

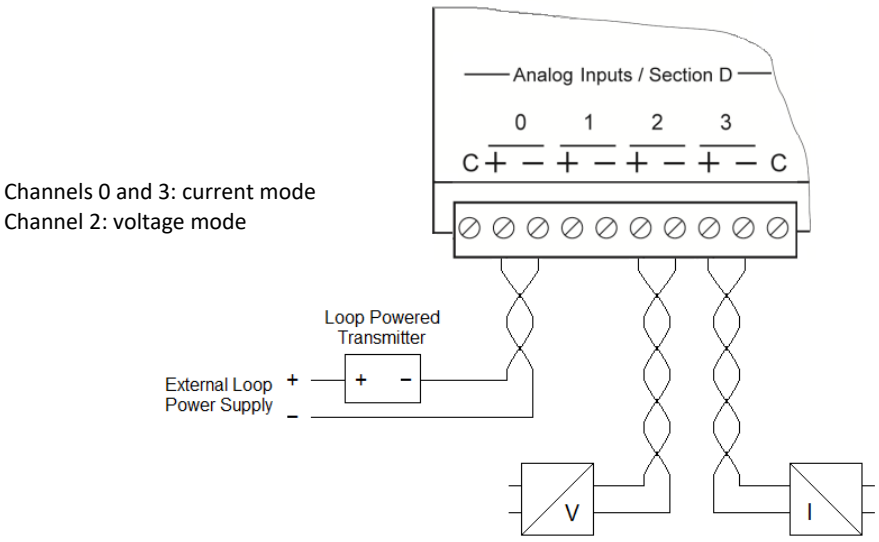

Figure 13: Analog input wiring diagram

Note: The shield must be connected to the common terminal (C).

Extended IOs Wiring

Type of these I/Os are not fixed and could be varied according to the I/O card (I/O plug-in expansion card) version.

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For 42IO version, the type of these I/Os are 8 channels configurable digital inputs/outputs on section E, and 2 channels analog inputs plus 4 channels fast digital / 32-bit counter inputs on section F.
Each channel of Configurable digital I/Os can be configured as digital input or digital output through web-based configurator and/or WorkSuite configuration (details are provided in RTU User Guides).

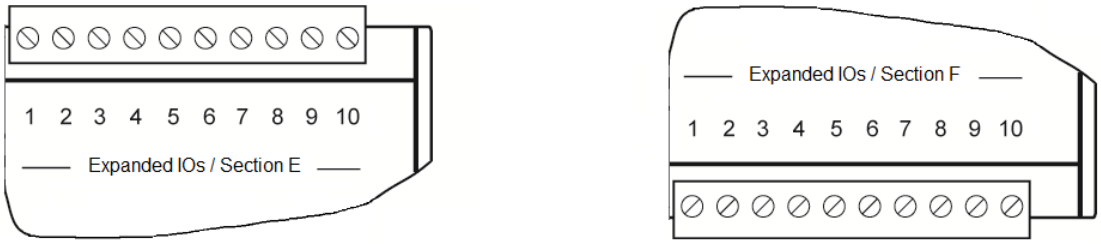


Figure 14: Expanded IOs

For 42IO version, pin assignment of the expanded I/Os (on section E and section F connectors) are described in the following tables:

Expanded IOs / Section E		
Pin	**Name**	**Description**
1	- (or C)	Negative power supply (or common)
2	DIO0	Configurable digital I/O channel 0
3	DIO1	Configurable digital I/O channel 1
4	DIO2	Configurable digital I/O channel 2
5	DIO3	Configurable digital I/O channel 3
6	DIO4	Configurable digital I/O channel 4
7	DIO5	Configurable digital I/O channel 5
8	DIO6	Configurable digital I/O channel 6
9	DIO7	Configurable digital I/O channel 7
10	+	Positive power supply

Expanded IOs / Section F		
Pin	**Name**	**Description**
1	AI4+	Analog input channel 4, positive input
2	AI4-	Analog input channel 4, negative input
3	AI5+	Analog input channel 5, positive input
4	AI5-	Analog input channel 5, negative input
5	Com0,1	Common for digital/counter input channels 0 & 1
6	CI0	Digital/counter input channel 0
7	CI1	Digital/counter input channel 1
8	CI2	Digital/counter input channel 2
9	CI3	Digital/counter input channel 3
10	Com2,3	Common for digital/counter input channels 2 & 3

Characteristics and wiring diagrams for all digital and analog I/O channels of the expanded IOs are the same as the other I/Os described before. Digital/counter inputs group 1 (CI0 and CI1) and digital/counter inputs group 2 (CI2 and CI3) are electrically isolated from each other (equipped with optocouplers with separated commons for each group).

Note 1: Common or negative pin of Configurable digital I/Os on section E of expanded IOs (- or C) is NOT internally connected to the common or minus of the other sections.

Note 2: Commons for Digital/counter input channels (Com0,1 and Com2,3) are NOT internally connected. It means that they must be connected to “minus” separately. In other words, if COM0,1 is connected to the minus and COM2,3 is not connected, only CI0 and CI1 will work according to their applied signals, and CI2 and CI3 will not work.

Interface COM-Ports Wiring

Interface COM1 wiring – RS232 with full handshake
D-sub 9pin Male connector. The wiring is standard V.24 RS232 wiring.

Pin no	Signal	Description/Remarks	Input / Output
1	DCD	Data carrier detect	Input
2	RX	Receive data	Input
3	TX	Transmit data	Output
4	DTR	Data terminal ready	Output

5	SG	Signal ground	GND
6	DSR	Data set ready	Input
7	RTS	Request to send	Output
8	CTS	Clear to send	Input
9	RI	Ringing indicator	Input

Interface COM2 wiring – RS232 / RS485 / RS422 configurable, isolated.
D-sub 9pin Male connector. The wiring is according to the following tables:

For RS232:

Pin no	Signal	Description/Remarks	Input / Output
1	NC	Not used	-
2	RX	Receive data	Input
3	TX	Transmit data	Output
4	NC	Not used	-
5	SG	Signal ground	GND
6	NC	Not used	-
7	RTS	Request to send	Output
8	CTS	Clear to send	Input
9	NC	Not used	-

For RS485:

Pin no	Signal	Description/Remarks	Input / Output
1	NC	Not used	-
2	NC	Not used	-
3	Data-	Inverting data line	Bi-Directional
4	NC	Not used	-
5	SG	Signal ground	GND
6	NC	Not used	-
7	Data+	Noninverting data line	Bi-Directional
8	NC	Not used	-
9	NC	Not used	-

For RS422:

Pin no	Signal	Description/Remarks	Input / Output
1	NC	Not used	-
2	RX+	Noninverting receiver	Input
3	TX-	inverting driver	Output
4	NC	Not used	-
5	SG	Signal ground	GND
6	NC	Not used	-
7	TX+	Noninverting Driver	Output
8	RX-	Inverting receiver	Input
9	NC	Not used	-

Interface COM3 and COM4 wiring – RS232
RJ12 (RJ11) connector. The wiring is according to the following table:

Pin no	Signal	Description/Remarks	Input / Output
1	NC	Not used	-
2	TX	Transmit data	Output
3	SG	Signal ground	GND

4	SG	Signal ground	GND
5	RX	Receive data	Input
6	NC	Not used	-

Ethernets (LAN1 and LAN2)
Ethernet interface connectors: RJ45 10/100BASE-Tx Fast Ethernet compatible.
It is recommended to use shielded network cables. And note that if you connect your PC directly to the LAN1 or LAN2 interfaces, you may need to use cross-wired network cable (if your PC Ethernet interface do not support auto switching RX/TX).

Factory settings:

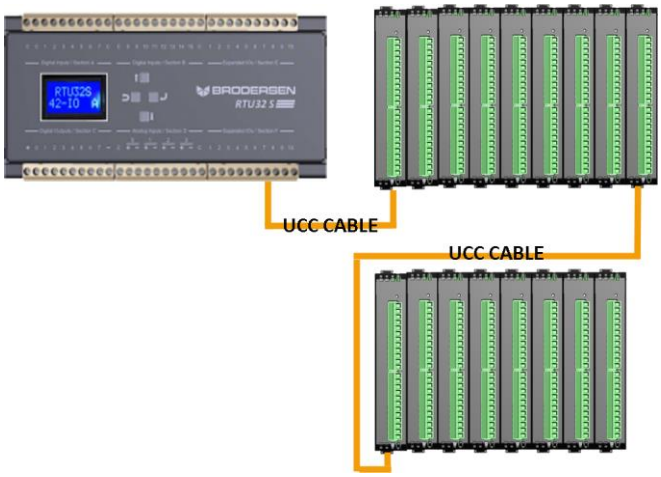
- LAN1: 192.168.0.1 , Subnet: 255.255.255.0
- LAN2: DHCP

Dual USB
Dual USB interface type 2.0. Use UCM-9x modem always in USB2 connector.

LocalBuses (LB1 and LB2)
LocalBus RJ45 connectors for Brodersen I/O expansion modules. The LocalBuses provide also power supply for I/O Expansion modules. NOTE that load is limited to 600mA@12VDC. Consult data sheet for details.

7. LB2 I/O modules

For configuring the system with LB2I/O please use our online configurator Link here The online configurator calculates the power, and inform when additional power supply is needed. The online configurator is always updated with the available types of I/O modules. The LB2 series support Hot-Sap and redundant Power supply options for the I/Os.



8. UCL-xx I/O Expansion Modules

UCL-xx I/O Expansion modules are mounted next to the RTU and connected via a LocalBus cable (type UCC-5xx). Maximum 12 I/O Expansion modules can be connected to the RTU32N. Internal supply can only supply 600mA@12VDC to the I/O configuration. If the required I/O modules exceed a total use of 600mA then an additional power supply must be added. Additional power suppliers are UCS-53.924 for 12-48VDC and UCS-54.230 for 230VAC.

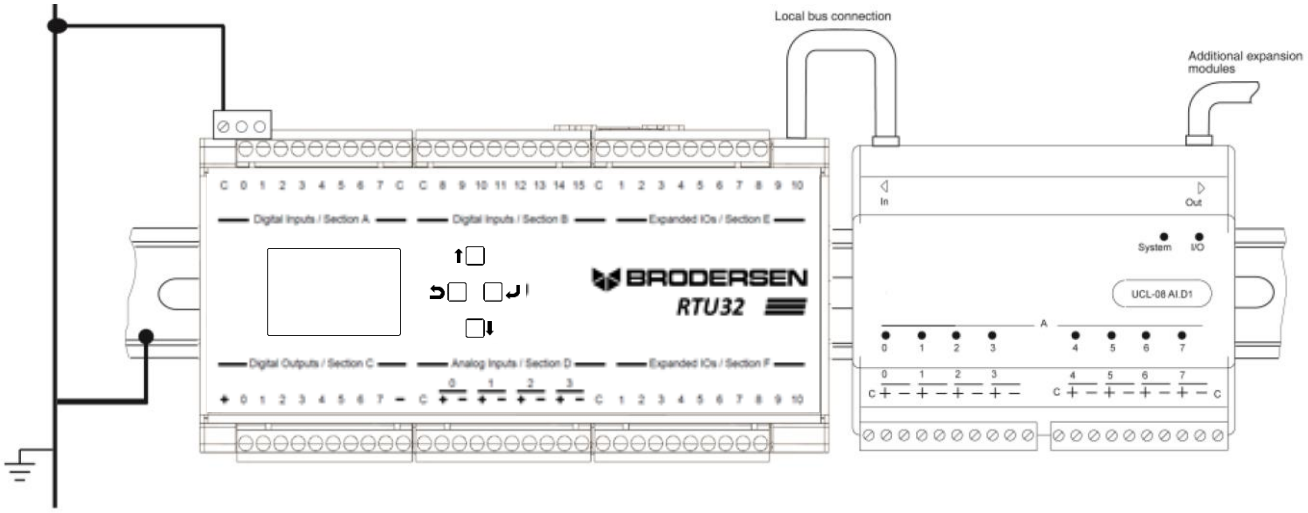


Figure 16: RTU32N with 8AI Expansion module

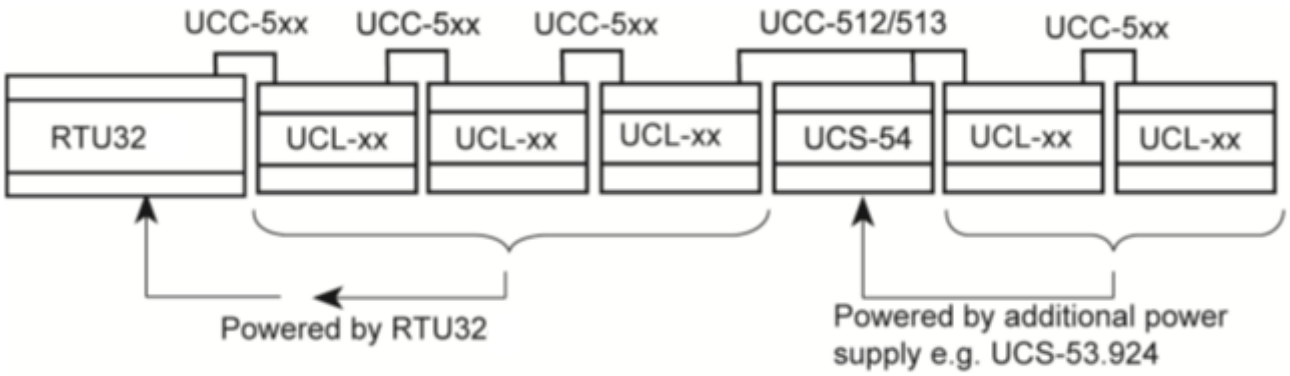


Figure 17: RTU32N with multiple Expansion modules and additional power supply

Wiring of IO Expansion modules – see module data sheet.

NOTE: DO NOT USE STANDARD PATCH OR NETWORK CABLE TO CONNECT I/O MODULES. IT WILL DAMAGE THE LOCALBUS INTERFACES ON BOTH THE RTU AND THE I/O EXPANSION MODULE. ONLY USED UCC-5xx CABLES.

9. Display and Keys

On the RTU32N front panel, there are a LCD display and 4 keys. Important statuses of the RTU32N, including statuses of communication buses and I/O ports are shown on the LCD display. The displayed parameter on the LCD can be changed by the keys.

Figure 18: Display and Keys on the RTU32N Front Panel

After power up, the backlight of the LCD is ON and all parameters are shown sequentially, in this way that a parameter is shown for about one second and then it changes to another parameter, and it will continue in the same way. In this mode, only “Enter” key is worked and the other keys are not functional. By pressing “Enter”, the parameter which is showed on the LCD is fixed to display and is not changed to another parameter. In this mode, the displayed parameter can be changed by “Up” and “Down” keys. Also, by pressing “Esc” key, the LCD returns to the primary mode which displays all parameters sequentially.
When the backlight of the LCD goes ON, it will be turned down automatically after one minute if no key has been pressed. When the backlight is OFF, it will be turned on by hitting each key.

In the following pictures, some examples of displayed values and statuses on the LCD display are illustrated.

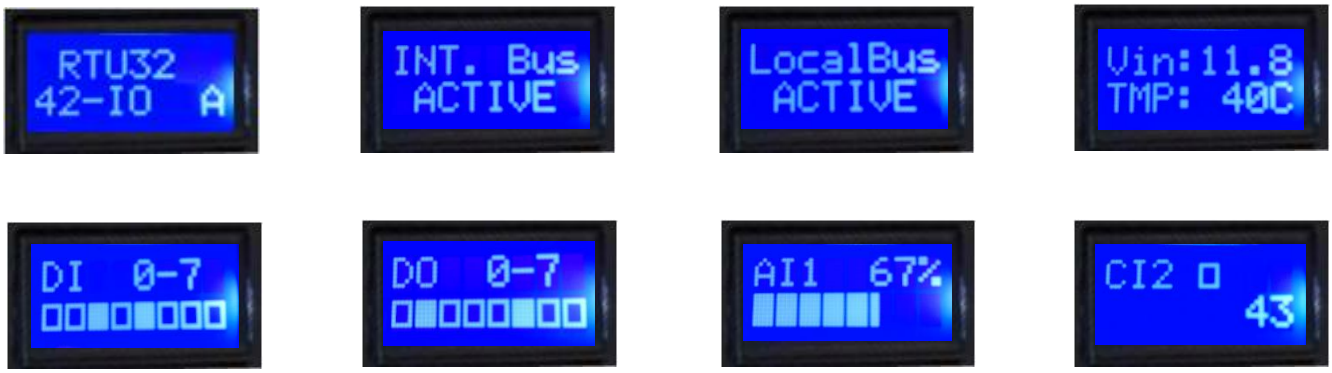


Figure 19: Some examples of displayed values and statuses on the LCD Display

10. Configuration of the RTU

The RTU is configured in 2 steps:

1. Basic settings are configured with your browser. Connect your PC to LAN1 and configure your PC to communicate with RTU32N.
2. Application programming, driver configuration and control of IO's is done with a PC running Brodersen WorkSuite package.

Please read the RTU32N User Guide carefully before starting configuration.

11. Maintenance

Under operation no special product specific maintenance measures are required.

In general we recommend that you keep the RTU32N free from dust and moisture and periodically ensure the all ventilation holes are free and not covered by any means.

12. Safety and Precautions

Environmental

Always ensure adequate ventilation is provided for the equipment and do not obstruct ventilation holes.

The temperature and humidity ranges shown in the specifications for this product must not be exceeded.

This equipment must not be installed in an area that is subject to a corrosive atmosphere, excessive moisture or may allow water or other liquids to come into contact with the unit or its external connections.

ESD

This product contains static-sensitive devices. Observe ESD precautions when working on the equipment with the cover removed.

Electrical Safety

When powered by a Mains Power supply the product contains wiring that is energised to 230 V RMS AC mains.

Always ensure that the equipment is correctly earthed by connection to an AC mains supply with a protective earthing connection.
Ensure power supply cabling is adequately rated for the unit's operating current and protected, in case of short circuit, by a correctly rated fuse or circuit breaker.

Always replace blown fuses with the correct type and rating.

Unpacking and Handling

The equipment should be unpacked and inspected immediately on receipt. If damage has occurred please advise your carrier or supplier.

This equipment contains electronic devices that are sensitive to electrostatic discharge. Please take precautions to avoid damage to the electronics by static electricity.
It is advisable to retain the original equipment packing in the event that the equipment ever needs returning for service.

Ensure that the name and address of the Authorised Distributor from whom you purchased the unit is recorded for future reference.

Packing for Return for Repair

All electronics assemblies must be properly packed in ESD protective packing for transport, to prevent physical and ESD damage.

The filler material used for packing for return for repair must be antistatic or static dissipative, as this may come into contact with exposed connectors, wiring, or PCB assemblies. The use of nonconductive filler material may cause damage to the electronic assemblies reducing their operational life, or even destroying them.

Advice on packing the product for return can be provided by Brodersen.

13. Accessories

Contact your local distributor for list of available accessories like SD Flash discs, cables, software tools etc.

14. Other RTUs in the Brodersen RTU32 Series family

The range of RTU32 Series products covers a wide range of products. The family include the below listed sub-family products:

RTU32
Powerful DIN rail mounted RTU supporting same functions and software as the RTU32 - but with enhanced performance, additional communication interfaces and support drivers.

RTU32S
Small DIN rail mounted RTU supporting same functions and software as the RTU32.

RTU32R
19" Mountable RTU with same facilities and software compatibility with the RTU32.

RTU32E
Low enclosure profile RTU32 Series products - also compatible with main RTU32 products.

For more info please use our document download facilities on our homepage

www.brodersen.com

or contact your local distributor.

NOTE: This document is subject to change without any prior notice!

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