

RTU32S

RTU32S Series – Small Compact Utility RTU

Installation and Wiring Guide

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BRODERSEN

simplifying systems



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1. Customer Information

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We want you to get the maximum performance from your products. So if you run into technical difficulties, we are here to help. For the most frequently asked questions, you can easily find answers in the product documentation. These answers are normally a lot more detailed than the ones we can give over the phone. So please consult this manual first.

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Choose the product in question under product search and under each product you will find accompanying data sheets, manuals, user guides, etc.

If you still cannot find the answer, gather all the information or questions that apply to your problem, and with the product close at hand, call your dealer. Our distributors are well trained and ready to give you the support you need to get the most from your Brodersen products. In fact, most problems reported are minor and are able to be easily solved over the phone.

In addition, technical support is available from Brodersen engineers every business day. We are always ready to give advice on application requirements or specific information on the installation and operation of any of our products. Please do not hesitate to call or e-mail us on support@brodersen.com.

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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

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

- **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

External I/O Expansion Ports

Quantity:	1
Data Bus:	Localbus
Maximum I/O modules:	12
Connection:	RJ45 Socket
Position:	RTU top

IP Networking

Type:	Ethernet
Number of Ethernet Ports:	1 x 10/100BASE-Tx Ethernet
Connection:	RJ45 Socket
Position:	RTU top
Communications protocols:	See data sheet

COM ports

Quantity:	3
Data Bus:	Multiple – see data sheet
Connection:	COM1 & COM3: D-sub 9 pin male, COM2: 3 way screw terminal
Position:	RTU top



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

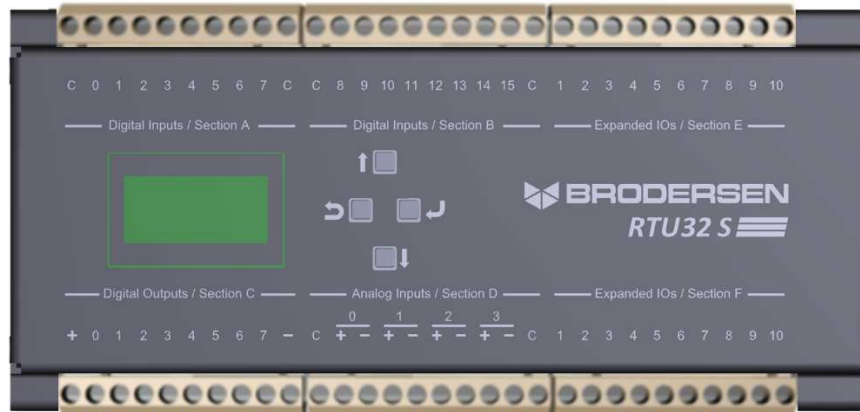


Figure 1: RTU32S Front Panel

Front Panel LCD and Keys

On the RTU32S front panel, there are a LCD display and 4 keys. Important statuses of the RTU32S, 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

RTU Top Panel



Figure 2: RTU32S Top Panel

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.
- CPU: Indicating power on RTU/CPU.
- LAN1: LAN connector green LED indicate network connected and yellow indicate Rx/Tx traffic.



RTU Interfaces and Connectors

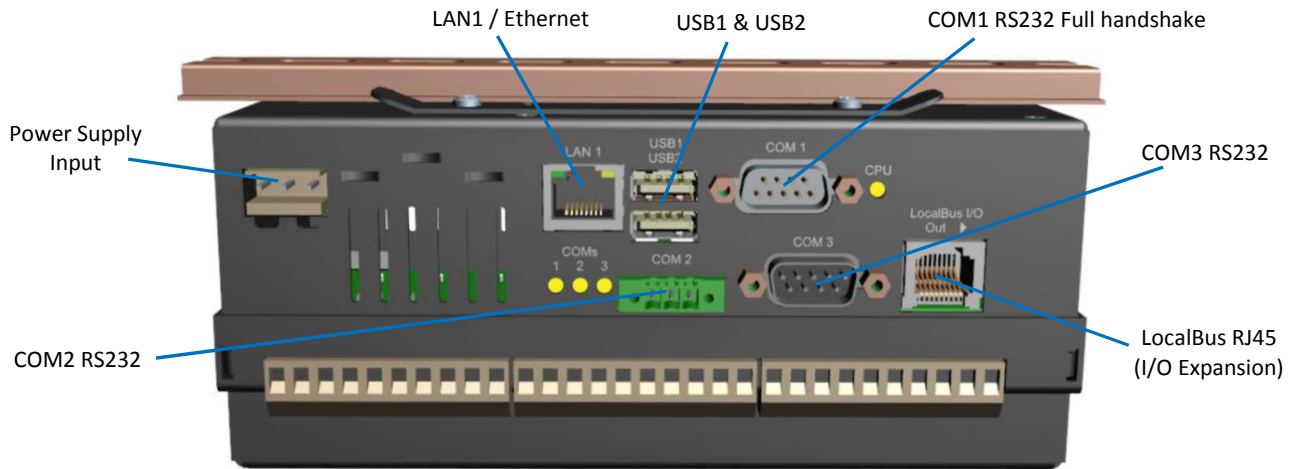


Figure 3: RTU32S Top Panel Interfaces and Connectors

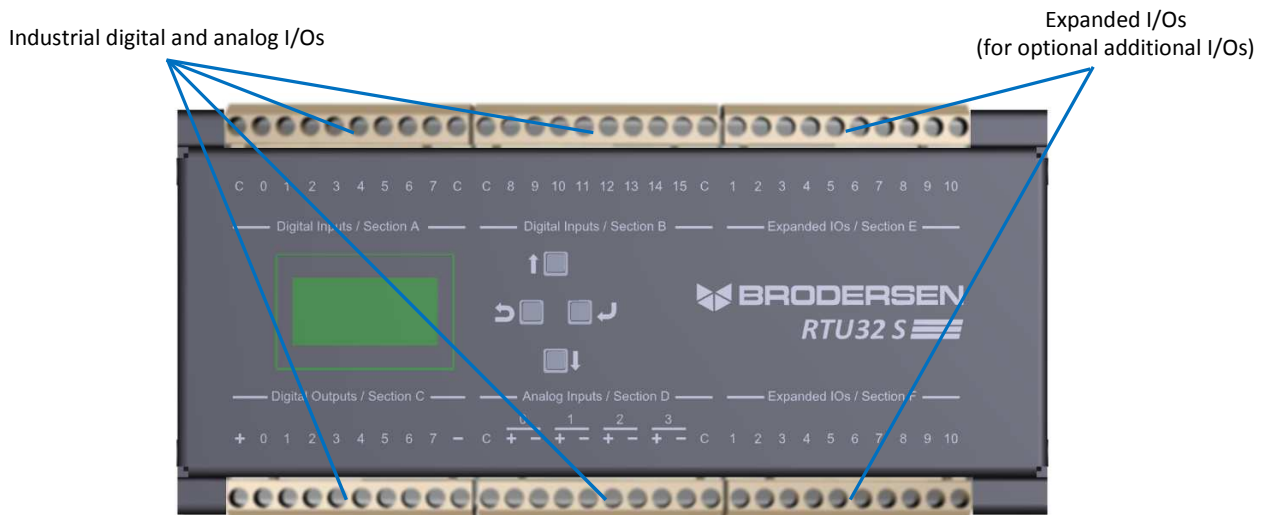


Figure 4: RTU32S Front Panel Interfaces and Connectors

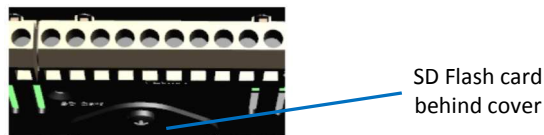


Figure 5: SD Flash card

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



4. Installation

Equipment and Tool Requirements

- The RTU32S 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 RTU32S 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	AC Mains: Normal standard mains cabling installation. Current rating to suit particular installation. DC: 1.5mm ² wire with ferules. Earth: Earth wiring must be 2,5mm ² and kept as short as possible.
Ethernet Port	Cabling connector: RJ45 Socket Standard unscreened LAN cable
Expansion LocalBus	Cabling connector: RJ45 Socket. Special Brodersen UCC-5xx LocalBus cable
I/O terminals and COM2	Cables max 1.5mm ²
COM1 and COM3 ports RS232	Standard Null-Modem or Modem cables
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 RTU32S 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 of the RTU32S.
- Connect the wiring for digital and analogue input ports, digital output ports, expansion bus, COM ports, USB ports and Ethernet port 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.

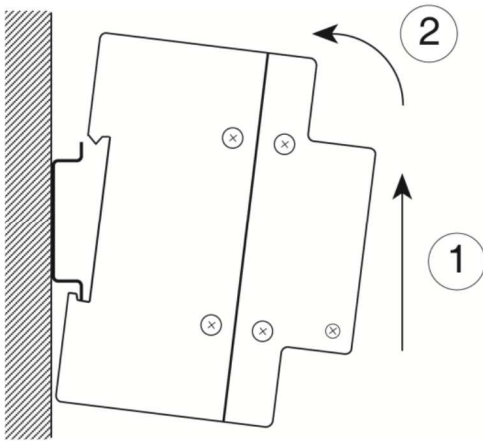


Figure 6: Mounting procedure

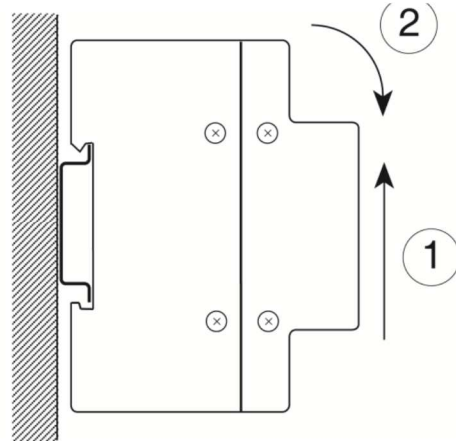


Figure 7: De-mounting procedure

NOTE: ALWAYS MOUNT RTU HORIZONTAL!

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.
- LAN and LocalBus are RJ45 - Note: Be careful to connect correctly. If a network interface cable is connected to the LocalBus interface the PC, switch, router or other network equipment it will most likely be damaged.
- COMs are 9 pole sub-D male connectors and a 3 pole screw connector.
- The wiring diagrams cover all versions of the RTU32S variants. For RTU32S version without I/O this section is still relevant as it include wiring details for supply voltage and comms interfaces.

Wire size

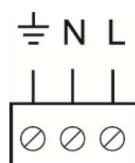
Earth and power supply: max. 2.5mm² (earth wiring must be 2.5mm² and kept as short as possible).

Other connectors: Max. 1.5mm² with ferrules.

Wiring diagrams

Power Supply

Version 10 (Main Supply)



Version 05 and 30 (VDC Supply)

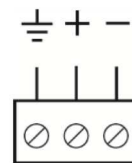


Figure 8: Power supply wiring diagram

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



Power supply version 05:

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

Power supply version 10:

L: 115-230VAC Mains supply
N: 0V Mains supply (neutral).

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 additionally used for S0 counter inputs.

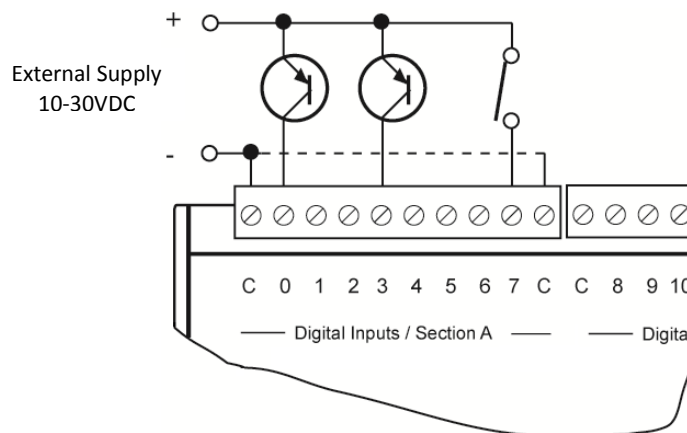


Figure 9: Digital input wiring diagram

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.

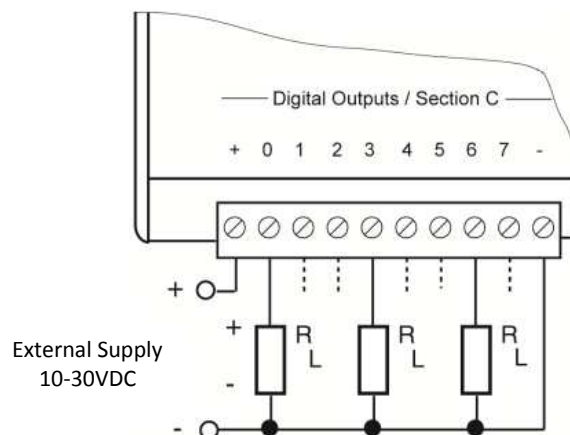


Figure 10: Digital output wiring diagram



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.

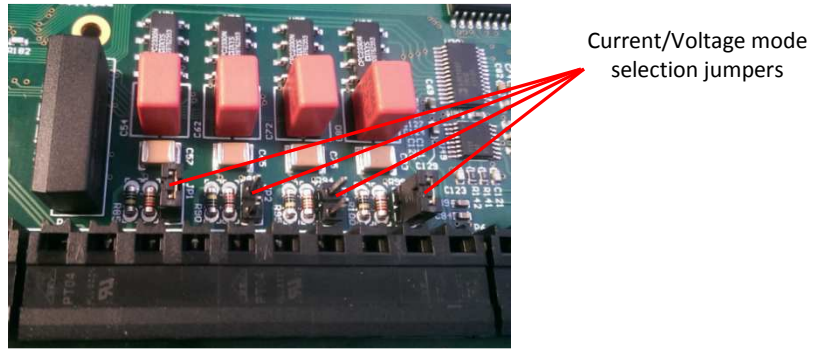


Figure 11: Current/Voltage mode selection jumpers (for AI0-AI3)

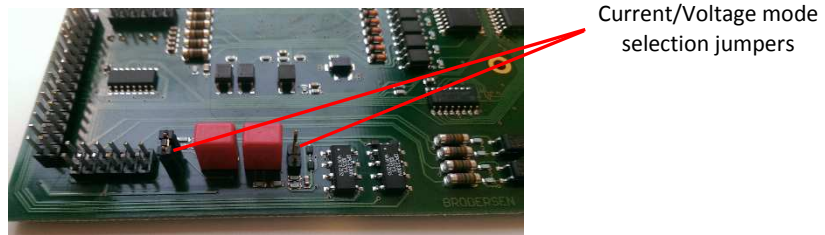


Figure 12: Current/Voltage mode selection jumpers in extended board (for extended AIs)

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).

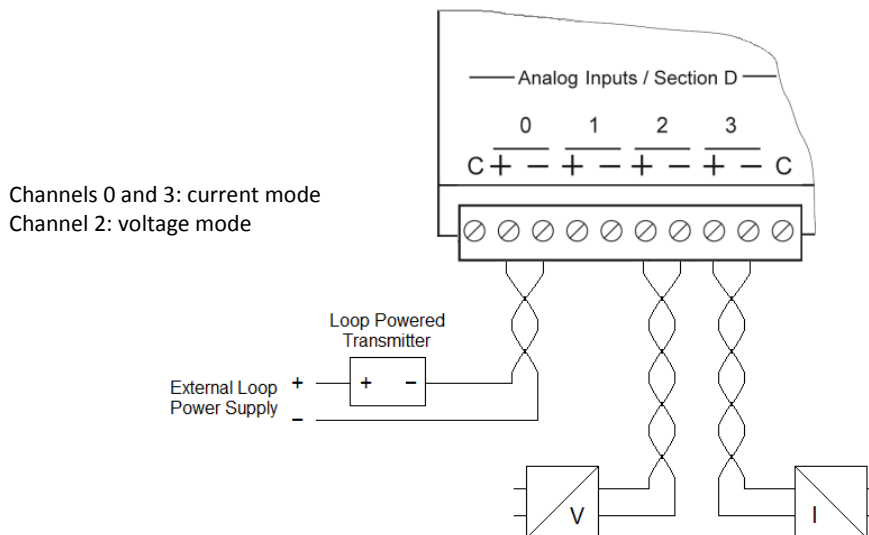


Figure 13: Analog input wiring diagram

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



Extended I/Os 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. 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 I/Os

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

Expanded I/Os / 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 I/Os / 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 I/Os 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 I/Os (- 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 COM1 wiring – RS232 with full handshake

RS232 port connector (9 pole sub-D - male). 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

3 way removable screw connector.

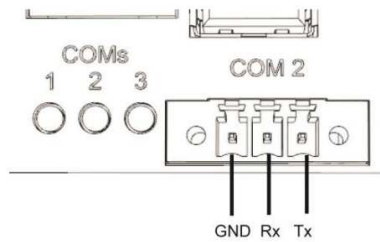


Figure 15: COM2 connector

Pin no	Signal	Description/Remarks	Input / Output
1	SG	Signal ground	GND
2	RX	Receive data	Input
3	TX	Transmit data	Output

Interface COM3 wiring – RS232

RS232 port connector (9 pole sub-D - male)

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	NC	Not used	-
8	NC	Not used	-
9	NC	Not used	-

Ethernet

Ethernet interface connector: 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 interface, you may need to use cross-wired network cable (if your PC Ethernet interface do not support auto switching Rx/Tx).

Factory settings for LAN1:

- IP: 192.168.0.1
- Subnet: 255.255.255.0

Dual USB

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

LocalBus RJ45

LocalBus RJ45 connector for Brodersen I/O expansion modules. The LocalBus provide also support also power supply to I/O Expansion modules. NOTE that load is limited to 600mA@12VDC. Consult data sheet for details.



7. I/O Expansion Modules

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 and the RTU32S. 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.

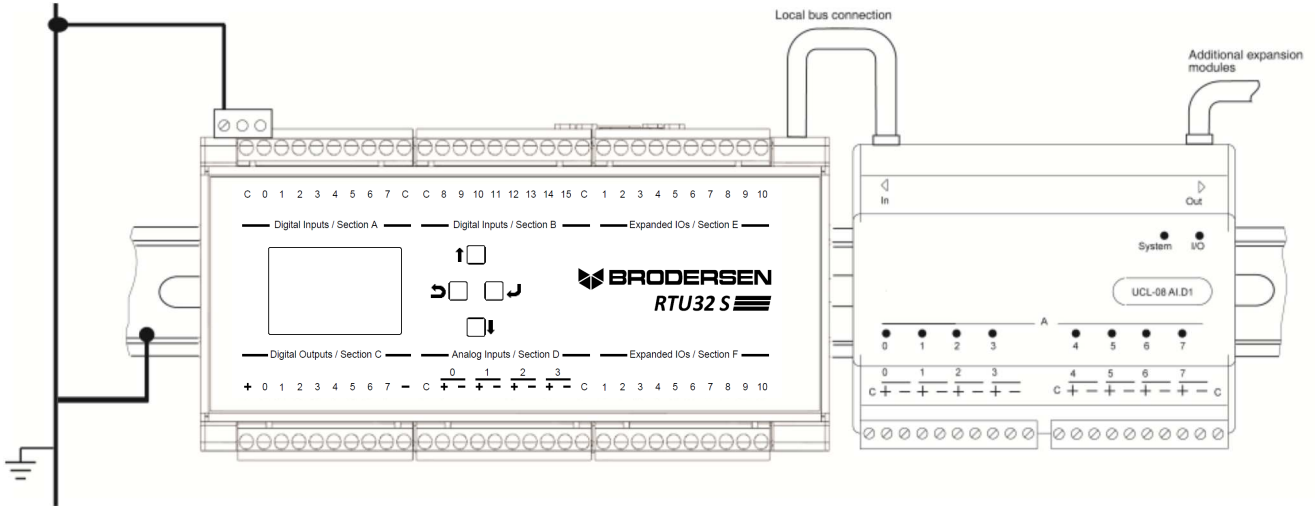


Figure 16: RTU32S with 8AI Expansion module

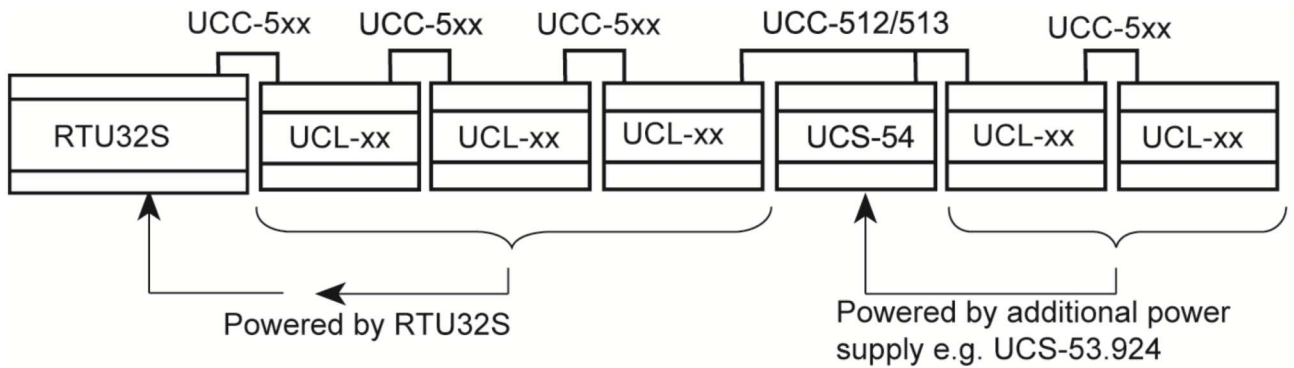


Figure 17: RTU32S with multiple Expansion modules and additional power supply

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.



8. Display and Keys

On the RTU32S front panel, there are a LCD display and 4 keys. Important statuses of the RTU32S, 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 RTU32S 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



9. How to Remove the SD Flash Disc

The SD card includes the PLC runtime application files and optional driver files. If you want to delete a PLC runtime application with code that i.e. freeze the RTU32S, you can remove it from the SD card and then the RTU will start with default PLC application “Empty”.

When you need to remove or replace the flash disc, you must be very careful and follow these instructions:

- It is recommended to dismount the RTU32S from the DIN rails to get easier access to the SD card slot.
- Find on the bottom panel the cover locked by a screw.
- Release the screw by one single turn to unlock the cover.
- Release the cover by pressing it gently forwards against the front of the RTU and open it up.
- Release the SD card by pressing it once and take it out – and note the orientation of the card connection terminals.

Install the SD card again by following these instructions:

- Insert the SD card by pressing it into the slot gently once and make sure that it is locked. Note the orientation of the card connection terminals should be facing against the front of the RTU at mounting.
- Mount the cover by closing it over the lock screw using the “hinges”.
- Now press the cover against the back of the RTU and tighten the lock screw to lock the cover.
- The SD Card is now safely in place again and you can mount and power up the RTU again.



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 RTU32S.
2. Application programming, driver configuration and control of IO's is done with a PC running Brodersen WorkSuite package.

Please read the RTU32S User Guide carefully before starting configuration.

11. Maintenance

Under operation no special product specific maintenance measures are required.

Internal battery supporting the RTC and BIOS have a lifetime of minimum 5 years when RTU32S is not connected to power supply. When RTU is running the RTC and BIOS are NOT powered by battery.

In general we recommend that you keep the RTU32S 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.

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!