

MuLOGIC
RSA-1x20

**INDUSTRIAL REMOTE
ACCESS ROUTER
(SOFTWARE VERSION 2.1)**



RSA-1120, RSA-1220 Industrial Remote Access Router

Compliances

CE Compliance

- EMC: Directive 2004/108/EC (EN 55022, EN55024)
- Safety: Directive 2006/95/EC (EN 60950)

The RSA series of routers complies with EMC directive 2004/108/EC and is classified for use in Residential areas. Test standard: EN 55022 Class B

The RSA series also complies with the Immunity standard for ITE equipment EN 55024 with the applicable test levels increased to levels compatible with Industrial standards (ref. EN 61000-6-2).

About this user guide

Although this user guide was written with greatest possible care, omissions and errors cannot be precluded.

MuLogic BV accepts no liability for any inaccuracies that may be found.

However, if you have comments or suggestions about this guide, please don't hesitate to contact us in order to help us to improve our product documentation.

Use of open source software

The firmware of the RSA series partly contains open source software that was written under GNU General Public Licence (GPL). The source code of this open source software can be made available on request.

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1 Introduction

RSA-1120(W3/W4), RSA-1220(W3/W4)

Industrial DSL/WWAN routers for Remote Site Access.

The MuLogic RSA series of routers is designed for access to remote locations such as power substations, traffic management systems and similar remote equipment.

The products are primarily intended for access via ADSL or VDSL2 services while using mobile cellular WWAN networks for back-up, should the DSL service fail.

The “W3” versions are equipped with an internal 2G/3G cellular modem, the “W4” versions have a 2G/3G/4G cellular modem.



Features

- Access routers with multiple WAN ports: ADSL, VDSL2, Ethernet and mobile wireless WAN (WWAN). (Note: depending on model).
- DSL port supports ADSL, ADSL2, ADSL2+ and VDSL2*.
*(RSA-1220 models only).
- One hardware/software version for ADSL Annex A (PSTN overlay) and Annex B (ISDN overlay).
- ADSL rates: up to 25 Mbit/s downstream, up to 3.5 Mbit/s upstream.
- VDSL rates: up to 100mbit/s downstream, up to 50 Mbit/s upstream. (RSA-1220 models only).
- Wireless WAN: W3-versions: 2G/3G, 5-Band UMTS, 4-Band GSM. (Worldwide use).
W4 versions: 2G/3G/4G versions: 5-band LTE, 3-band UMTS, Dual band GSM. (USA-bands versions available on request)
- ADSL ATM Encapsulation protocols: PPPoA, PPPoE, IPoA, IPoE and Layer-2 bridging.
- VDSL PTM protocols: PPPoE with or without VLAN ID and Layer 2 bridging. (RSA-1220 versions only).

- Automatic Network Failover operation between DSL, Ethernet-WAN and Wireless WAN ports.
- Ethernet port supports 10/100baseT, Auto-MDI/MDIX. All Ethernet port can be used as LAN or WAN port.
- IEEE 802.1Q VLAN support for VDSL2/PTM, LAN and WAN Ethernet interfaces.
- LAN side Ethernet switch can be configured as Hub for monitoring purposes.
- Two Serial Port Gateways for remote serial data (TCP/IP or UDP/IP).
- Two serial ports (one RS-232, one RS-485) for data rates from 300 to 115200 bit/s.
- Support for SCADA protocols like Modbus RTU/ASCII, Modbus/TCP, DNP3, DNP3/IP, IEC60870-5-101 and IEC60870-5-104.
- IPsec and OpenVPN tunnels for secure access and data transport.
- OpenVPN bridged (layer 2) and routed (Layer-3) modes.
- GRE tunnels for linking multicast protocols like RIPv2 and OSPF over IPsec.
- Internal DHCP server, DNS gateway and Dynamic DNS client.
- Static routing and dynamic routing (BGP, OSPF, RIPv1 and RIPv2)
- NAT features: Dynamic NAT (IP masquerading) and NAT (Port forwarding)
- Stateful firewall for Access Control, Forwarding control, NAT routing and port forwarding.
- Device Management: HTTP/HTTPS, Telnet/SSH, SNMP and serial command port.
- Alerts for system events by means of Email, SNMP traps, SMS, Dry contact and LED
- Independent watchdog/reset controller for monitoring vital system functions to guarantee automatic failure recovery.
- Dry contact sensor (input) and dry contact for status/alarm indication and remote control.
- Isolated supply voltage input for industrial applications (suitable for low Voltage AC and DC).
- Extended operating temperature range: -40°C to +70°C.
- Rugged metal housing for DIN-rail or panel mounting..

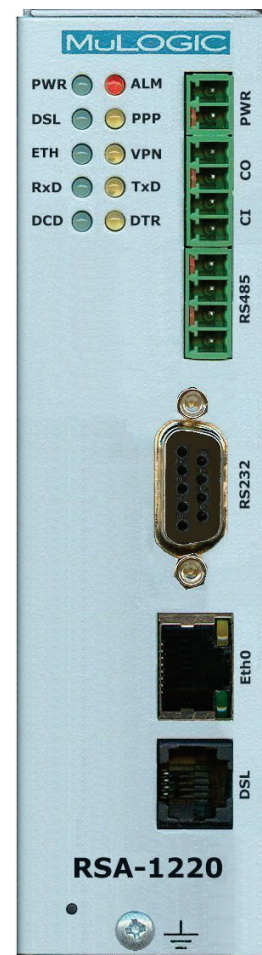
2

Hardware Details and Installation

LED Indicators

The LED indicators display the status of the various ports and functions of the unit. In case a communication problem occurs, these LEDs can help you determine the cause of the problem.

LED	Description
PWR	Indicates that the unit is powered on and functions correctly. After start-up, this LED briefly blinks once per second to indicate the “alive” signal sent to the system watchdog.
ALM	Indicates a System Alert.
DSL	Indicates the ADSL link status. This LED blinks slowly when the remote DSLAM is detected and blinks rapidly during the training stage. When the ADSL link is established the LED will be on continuously.
PPP	Indicates that a WAN connection is established.
ETH/WRL	On the RSA-1x20 the ETH LED indicates that the Ethernet port is connected. On the RSA-1x20W the WRL LED Indicates the WWAN link status. This LED blinks shortly every 2 seconds when registered on the mobile network. The LED will blink during establishment of a data connection and will be on continuously when the data connection is established.
VPN	Indicates that one or more VPN tunnel connections are established.
RxD	Flashes when the unit sends data to the device connected to the serial port. (RS-232 and/or RS-485)
TxD	Flashes when the unit sends data to the device connected to the serial port. (RS-232 and/or RS-485)
DCD	Indicates that the serial port is in use. (RS-232 and/or RS-485)
DTR	Indicates that the RS-232 DTR input is active (high).



Controls

Reset button

The reset button is positioned behind the tiny hole near the ground terminal screw on the front panel. It can be used to restart the unit, enable the serial console port and to restore the factory default settings.

Restart

The unit is restarted by pressing the reset button for 1 second.

Serial RS-232 port console mode

The serial RS-232 port is normally used for the internal serial port gateway. However, for configuration without IP network access or for maintenance purposes, the serial port gateway can be disabled and command line access is enabled via the serial port.

To enable the serial port console mode, press and hold the reset button while connecting the power. Then release the reset button. After the system is started up, the DCD LED will go on to indicate that the port is in console mode. The RS-232 port will remain in this state until the power is disconnected.

The RS-232 port is of the type DCE and can be connected to a serial port of a PC by means of a straight male to female cable or a USB to RS-232 serial converter. The data rate and format is 115200, 8, N.

Factory default settings

To reset the unit to its original factory default settings, power on the unit and wait at least 60 seconds. Then press and hold the reset button for more than 5 seconds until the PWR, DSL, PPP and VPN LEDs start blinking. Then release the reset button. The unit will restart within 15 seconds.

After a restart with restored factory settings, the following settings will apply:

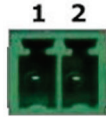
- LAN IP address: **192.168.1.1**
- user name: **admin**
- password: **rsa-admin**

Custom default settings

When custom default settings are present (custom defaults settings are made by the user, not the factory), the procedure as described above will force a reset to the custom default settings. To force factory default settings when a custom defaults file is present, wait at least 60 seconds after power on and then press and hold the reset button for more than 30 seconds. The unit will restart within 15 seconds.

Connectors

Power connector



The operating power of the RSA series is supplied at pins 1 and 2 of the PWR screw terminal connector. The voltage range depends on the model and is indicated by the “Vr suffix”:

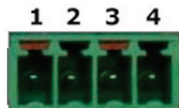
Vr1: 11-36 Vdc, 11-28 Vac

Vr2: 18-60 Vdc, 18-28 Vac

Vr3: 18-72 Vdc, (no ac)

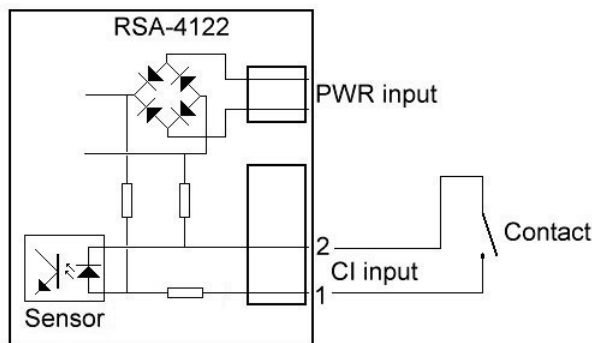
Note: The power input of the unit is not polarised.
You can connect DC power (+/- or -/+) in either way.

I/O connector



Input

Pins 1 and 2 (marked CI) of the I/O connector are connected to a dry contact sensor.



Status changes of this input can be monitored via one of the management services or reported via one of the system alerts:
Email, SNMP-trap, SMS, or read by means of an SNMP-Get.

- Maximum closed contact current (depending on PWR voltage): 6 mA.
- Maximum loop resistance (contact plus cable): 100Ω.

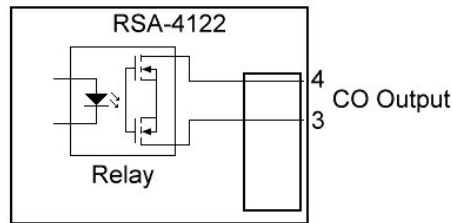
Note: Only use this input for “dry contacts” like the contact of a switch or relay.
Caution: Do not connect to any power source, including the unit’s power source, nor apply any voltage to the input pins. The contact inputs are galvanically connected with the unit’s power input.

Output

Pins 3 and 4 (marked CO) of the I/O connector are connected to an internal relay contact (electronic solid state relay). The relay contacts are galvanically isolated from the device and power input.

The contact state (open/closed) can be controlled by means of an SNMP set, http request or selected as system alert output.

- Maximum load voltage: 100V
- Maximum load current: 150mA
- Maximum On-resistance: 8Ω.
- Isolation Voltage: 1500 Vrms.



RS-485 connector



Pin	Description	Direction	
		Input	Output
1	Rx- Receive data input, negative	•	
2	TR- Transmit/Receive data, negative	•	•
3	TR+ Transmit/Receive data, positive	•	•
4	Rx+ Receive data input, positive	•	

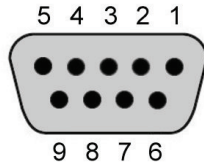
- A 2-wire RS-485 connection is made to pins 2 and 3.
- Pins 1 and 4 are RS-485/RS-422 “Rx” inputs used in 4-wire RS-485/RS-422 mode. (Note 2).
- Pins 2 and 3 are used for 2-wire RS-485 or as “Tx” outputs in 4-wire RS-485/R422 mode. (Note 2).

Note 1: The RS-485 output/inputs are not terminated. In general no termination resistors are needed.

Note 2: The receive data input connector pins 1 and 4 are biased with 10kΩ. When not used (2-wire RS-485 mode) these pins can remain unconnected.

RS-232 Connector

The RS-232 connector is of the type **DCE** (as used on a modem). It can connect directly to a DTE type of serial port (as used on a PC) using a straight cable. For connection to another DCE port, a “cross cable” is needed. See page 24 for details.



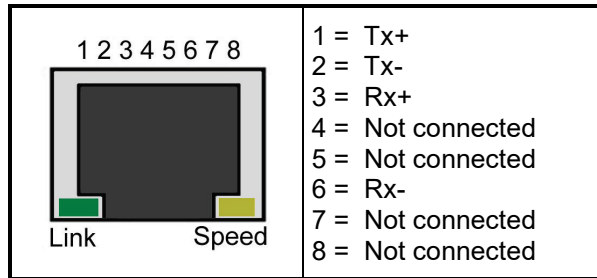
Pin	V.24	Description	Input	Output
1	109	DCD – Data Carrier Detect		•
2	104	RxD – Received data		•
3	103	TxD – Transmitted data	•	
4	108	DTR – Data Terminal Ready	•	
5	-	Signal ground		
6	107	DSR – Modem ready (not used)		
7	105	RTS – Request to send	•	
8	106	CTS – Clear to Send		•
9	125	Rng – Ring indicator (not used)		

Notes:
 The DCD output will become active when the port is in use by either the serial gateway (during IP connection) or when the port is in CLI Mode.
 The CTS output is used for flow control of the incoming (transmit) data.
 The RTS input is used for flow control of the outgoing (receive) data.
 The DTR input is used for indicating that an active DTE port is connected..

DSL Connector

	<p>1 = Not connected 2 = Not connected 3 = DSL line wire a 4 = DSL line wire b 5 = Not connected 6 = Not connected</p>
--	---

Ethernet Connectors



Ethernet LEDs

- **Link** (green): Indicates that an Ethernet device is connected with this port. This LED will blink when there is data activity on this Ethernet port.
- **Speed** (yellow): Indicates that the Ethernet link is running at 100mbit/s.

Antenna Connector

The antenna connector (W3/W4-versions only) is of the type “SMA”. You can connect an antenna with SMA connector directly or use coaxial cable to an external antenna.

The used antenna and coaxial cable must have a characteristic impedance of 50Ω and must be matched for 900MHz/1800MHz/2100Mhz or 850Mhz/1900Mhz, depending on the frequency bands used by the cellular network operator.

SIM Card slot (W3/W4-versions only)

The SIM card tray is located at the rear of the unit and can be removed by pressing the eject button adjacent to the card tray.

Installation

This chapter covers the hardware installation procedure.

Power connection

Connect the power cable to the screw terminal socket called PWR. The unit can be powered from low voltage DC or AC sources. The voltage range indication (Vr1, Vr2 or Vr3) is printed on the serial number label.

Refer to page 20 (Power supply) for specification of the voltage ranges.

Note: *The power input of the RSA-4x22 is not polarised. You can connect DC power in either direction.*

DSL line connection

If the line is used only for connecting the RSA unit and no telephony service is needed, then the line can be connected directly to the DSL connector.

If, apart from the DSL service, telephone service is required, then a splitter must be added.

Note: *Use the appropriate splitter for the telephone service:*
- a "POTS (PSTN) splitter" for use with traditional telephone service (Annex A).
- an "ISDN splitter" for use with ISDN service (Annex B).
For VDSL2 services, make sure that the splitter is suitable for VDSL.

- Connect the outside telephone line (coming from the telephone exchange/DSLAM) with the splitter port called "LINE"
- Connect the splitter port called "Phone" with the telephone set or ISDN NT.
- Connect the splitter port called "Modem" or "DSL" with the LINE connector of the modem.

When properly connected to the line, the DSL LED of the modem shall start blinking within 1 minute after power-on. When the DSL connection is established, the DSL LED is On continuously. The actual Internet connection will not be established until the unit is configured with the correct parameters (like VPI/VCI, and ATM Encapsulation Protocol). These parameters are provided by your ISP.

Ethernet cable(s)

The Ethernet ports support 10/100baseT, HD or FD with Auto-MDI/MDIX feature. The ports will automatically adapt to the operating mode of the connected device and will automatically make a straight or crossed connection. When the unit is powered on and the Ethernet cable is properly connected between the unit's Ethernet port and the Ethernet device, the green (link) LED at the Ethernet connector unit will be on. When data passes over the Ethernet cable, the link will briefly blink off. When connected in 100baseT mode, the yellow LED will be on.

RS-232 connection

The RS-232 port of the unit is of the type “DCE”, which means that it has the pin-out and behaviour of a (DB9) serial port of a modem.

The port can be connected directly to the serial port of a PC using a straight “DB9-male to DB9-female” or “DB9-male to DB25-female” cable. It can also connect directly to a USB-to-Serial converter cable.

For connecting to the serial port of another DCE device, a “crossed DB9-male to DB9/DB25-male” cable is used. See chapter 5.

RS-485 connection

The RS-485 port of the unit is factory configured for both 2-wire and 4-wire operation. This means that the RS-485 port can receive data from the RS-485 bus at both pins 1/4 and pins 2/3.

To disable the receive data input on pins 2/3, select “4-wire only” in the RS-485 port setup page. In “4-wire only” mode, pins 2 and 3 of the RS-485 connector are only used for transmitted data (like for an RS-422 interface) but still go into high impedance mode while not transmitting. This allows the 4-wire interface to be used for both point-to-point and multidrop circuits.

Note:

The RS-485 inputs are biased with 10kΩ to the internal signal ground and 3,3V.

SIM card insertion (W3/W4-versions only)

The SIM card slot is located at the rear of the unit. The SIM card tray can be removed by pressing the eject button adjacent to the card tray. Place the SIM card in the card tray and reinsert the card tray making sure it is inserted correctly in the card slot.

Note: *Make sure to enter the correct SIM PIN. When a wrong PIN is detected, no further action is taken until the next restart of the unit. After 3 restarts with the wrong PIN, the SIM will be locked and the PUK code must be entered to unlock the SIM card.*

3

Configuration access

Introduction

Configuration interfaces

The RSA series routers can be configured by means of:

- Web browser interface (HTTP or HTTPS).
- Command line interface (telnet, SSH or RS-232 port*).

Note*: *command line access over the serial RS-232 port is possible when the RS-232 port is set to console mode or CLI mode.*

To enable the serial port as console port, keep the reset button pressed while the power is connected and release the button when the power LED is on. The serial port will remain in this state until the power is disconnected. CLI mode can be enabled in the web interface under Tools>Serial CLI

The RS-232 port is of the type DCE and can be connected to a serial port of a PC by means of a straight male-to-female cable or a USB to RS-232 serial converter. The data rate and format is 115200 bit/s, 8 bit, No parity.

Default settings

The factory default access credentials are:

- LAN IP address: **192.168.1.1**
- user name: **admin**
- password: **rsa-admin**

When in doubt on whether or not these settings are still active and when no LAN connection can be made with address 192.168.1.1, use the reset button to restore the factory default settings. (see page 10).

First time Login

The RSA series web interface allows you to set up, modify, and view configuration variables and operational data.

Note: *To access the web interface in factory default settings, make sure that the PC's LAN port is operating on LAN network 192.168.1.0/24*

- Connect to **http://192.168.1.1**
- Log in with user name **admin** and password **rsa-admin**.
- After you have successfully logged in, you should see the Device Info Summary page.

Device Info page

The Info page will show the model and general information and status of the unit. For example:

The screenshot shows the MuLogic web interface for an RSA-4122W router. The top header includes the MuLogic logo and the user is logged in as 'admin' with a 'logout' link. The left sidebar contains a navigation menu with categories like 'Device info', 'Summary', 'WAN interfaces', 'IPsec tunnels', 'OpenVPN tunnels', 'DSL', 'WWAN', 'Ethernet', 'Serial Gateways', 'Routing table', 'ARP table', 'DHCP leases', 'Setup', 'Tools', and 'Management'. The 'Device info' section is expanded, showing a table of system details.

Device info	
System name	
System location	
System contact	
Mainboard	RSA-M1 Rev1.0-A
Add-on board	4122-A1 Rev2.0
WWAN modem	PH8
MAC address	00:24:55:00:ff:12
Firmware version	2.0-2028 (Nov 30 2015 15:16:14)
xDSL PHY/Driver	A2pD039f.d26a
WWAN firmware	02.003/01.001.00
Active WAN address	83.163.132.144
Primary LAN address	192.168.1.1/24
System uptime	5 days, 23:28:50
System temperature	41.0 °C
System time	2015-12-07 11:32:05

At the bottom of the page, there is a footer with the version '2.0-2028', the website 'www.mulogic.com', and the user 'syslog'.

Configuration

Further details on configuration are outside the scope of this manual. Please refer to the RSA series configuration guide for additional information.

Command line access

On factory default, ssh and telnet access is enabled for the LAN port. You can log in with user name **admin** and password **rsa-admin**. Upon successful log-in you will get a ~# prompt.

Further details on configuration are outside the scope of this manual. Please refer to the RSA series configuration guide for additional information.

4

Technical Specifications

Supported DSL Standards

Handshake:

- ITU-T G.994.1 (G.hs)
- ANSI T1.413 Issue 2 (ADSL)

Modulation:

- ANSI T1.413 Issue 2 (ADSL)
- ITU-T G.992.1 (G.dmt)
- ITU-T G.992.2 (G.lite)
- ITU-T G.992.3/4 (ADSL2)
- ITU-T G.992.3 Annex L (RE-ADSL)
- ITU-T G.992.3 Annex M (ADSL2 A/M)
- ITU-T G.992.3 Annex J (ADSL2 B/J)
- ITU-T G.992.5 (ADSL2+)
- ITU-T G.992.5 Annex M (ADSL2+ M)
- ITU-T G.992.5 Annex J (ADSL2 B/J)
- ITU-T G.993.2 (VDSL2, profiles 8a, 8b, 8c, 8d, 12a, 12b, 17a) *

Note*: RSA-1220 models only

Wireless WAN modes (W3/W4 versions only)

- W3 versions: Five Band UMTS (WCDMA/FDD): 800, 850, 1900, 1700AWS and 2100 MHz.
Quad-Band GSM: 850, 900, 1800 and 1900 MHz.
- W4 versions: Five band LTE 800/900/1800/2100/2600 MHz;
FDD-Band (20,8,3,7,1); Tri Band UMTS (WCDMA):
900/1800/2100 MHz; FDD-Band (8,3,1);
Dual Band GSM/GPRS/EDGE: 900/1800 MHz
- UMTS/HSPA+, 3GPP release 6/7.
- GSM/GPRS/EDGE, 3GPP release 99/4.
- HSDPA/HSUPA data rates DL: 7.2/14.4 Mbit/s, UL: 2.0/5.76 Mbit/s.
concurrent data rate: DL 7.2 Mbit/s / UL 5.76 Mbit/s.
- LTE Cat. 3 DL: max. 100 Mbps, UL: max. 50 Mbps, 2x2 DL MIMO
- Approvals: R&TTE, GCF, CE, FCC, IC, PTCRB, UL

Ethernet ports

- 10/100baseT
- Half and Full duplex
- Auto-MDI/MDIX
- IEEE 802.1Q VLAN support

Serial ports

- RS-232 DB9 Female connector (DCE pin assignment)
- RS-485/RS-422 at 4-pin screw terminal connector.
- Port rates: 300-115200 bit/s asynchronous.
- Data format: 7 or 8 data bits, None, Odd or Even parity, 1 or 2 stop bits.

I/O Contacts

- Input: dry contact sensor maximum current: 1,25-6mA
- Input: contact sensor maximum allowed loop resistance: 100Ω
- Output: maximum load voltage: 100V
- Output: maximum load current: 150mA
- Output: maximum On-resistance: 8Ω.
- Output: isolation Voltage: 1500 Vrms.

xDSL Line connection

- 2-wire “RJ11” type 6P2C modular jack for connection to line or DSL splitter.

Power supply

The power supply input of the unit accepts both DC and AC voltages. The DC input is not polarised. Three Voltage Ranges (Vr1, Vr2 and Vr3) are available.

Vr1 versions	Vr2 and Vr3 versions
<ul style="list-style-type: none"> • 11-3Vdc (11-28Vac) • Power consumption: 8W max. • In-rush current (12Vdc): 612mA. 	<ul style="list-style-type: none"> • Vr2: 18-60 Vdc (18-30Vac) Vr3: 18-72 Vdc (No AC) • Power consumption: 8W max. • In-rush current (24Vdc): 295mA.

Mechanical and environmental characteristics

Dimensions and weight

- 143x38x95mm (HxWxD).
- Weight: 560 gr.

Temperature range

- Operating temperature: -40°C to +70°C, Humidity: 5..95%
- Storage temperature: -40°C to +80°C, Humidity: 5..95%

Hardware Version indication format

Format: **RSA-[e][d][s][u][w]/[v]**

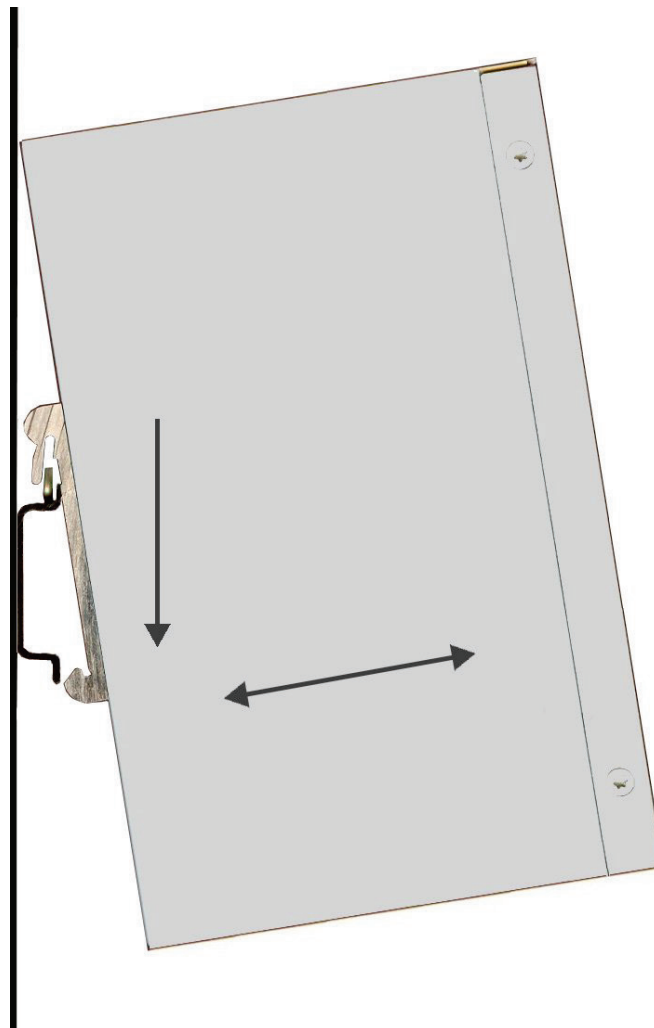
- e: Number of Ethernet ports(1,4)
- d: 1=ADSL, 2=ADSL/VDSL
- s: Number of Serial ports (2)
- u: Number of USB ports (0,2)
- w: none, W3=2G/3G, W4=2G/3G/4G.
- v: Voltage range Vr1, Vr2, Vr3 (see Power Supply).

5 Appendix

Mounting instructions

The units of the RSA series are supplied with a mounting bracket for symmetrical rails of 35 mm according to DIN 46277-3, BS5584:1978 or EN 50-022.

To mount the unit on the DINrail, hook the upper side of the DINrail clamp on the DINrail and then move the lower end housing towards the DINrail until it latches. Pressing the housing downwards will make the latching easier.



To remove the housing from the DINrail, press the housing downwards while moving the lower end of the housing away from the DINrail.

Note: For reliable operation over the full temperature range up to +70°C, it is important that the ventilation slots on top and bottom have free air flow.

Cross Cables for connection to a device with RS-232 DCE port.

The RS-232 connector of the unit is of the type **DCE**.

It can connect directly to a DTE type of serial port using a straight cable.

For connection to another DCE port, a “cross cable” is needed.

Note:

An RS-232 DCE port (modem) usually has a female DB9 or DB25 connector.

An RS-232 DTE port (PC) usually has a male DB9 or DB25 connector.

The following tables show the wiring of such cables.

Connector A (DB9 Male)		Direction	Connector B (DB9 Male)	
Pin	Signal		Pin	Signal
1	DCD (output)	→	4	DTR (input)
2	RxD (output)	→	3	TxD (input)
3	TxD (input)	←	2	RxD (output)
4	DTR (input)	←	1	DCD (output)
5	Signal ground	--	5	Signal ground
6	DSR (not used)		6	DSR(not used)
7	RTS (input)	←	8	CTS (output)
8	CTS (output)	→	7	RTS (input)
9	Ring (not used)		9	Ring (not used)

DB9 to DB9 DCE-DCE cross cable

Connector A (DB9 Male)		Direction	Connector B (DB25 Male)	
Pin	Signal		Pin	Signal
1	DCD (output)	→	20	DTR (input)
2	RxD (output)	→	2	TxD (input)
3	TxD (input)	←	3	RxD (output)
4	DTR (input)	←	8	DCD (output)
5	Signal ground	--	7	Signal ground
6	DSR (not used)		6	DSR(not used)
7	RTS (input)	←	5	CTS (output)
8	CTS (output)	→	4	RTS (input)
9	Ring (not used)		22	Ring (not used)

DB9 to DB25 DCE-DCE cross cable

