RUT955 RS485

The information in this page is updated in accordance with firmware version **RUT9_R_00.07.06.8**.

RS485 service was moved to Serial Utilities page from FW version *RUT9_R_00.07.03*.
Note: click here for the old style WebUI (FW version RUT9XX_R_00.06.09.5 and earlier) user manual page.

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Summary

The **RS485** page is used to configure the operating parameter of RS485 serial connector.

This manual page provides an overview of the RS485 page in RUT955 devices.

General information

RS485 connector pinout

Below is a depiction of the RS485 connector pins:

RS485 connector pinout		
Pin	Name	Description
1	D_N	Driver negative signal
2	R_N	Receiver negative signal
3	GND	Device ground
4	D_P	Driver positive signal
5	R_P	Receiver positive signal
6	NC	Power input 9-30 VDC

Cable Type

Recommended cable parameters:

PARAMETER	VALUE
Cable Type	22-24 AWG, 2 – pair (used for full-duplex networks) or 1-pair (used for half duplex networks). One addtitional wire for ground connection is needed
Characteristic cable Impedance	120 Ω @ 1MHz
Capacitance (conductor to conductor)	36 pF/m
Propagation Velocity	78% (1.3 ns/ft)

Maximum data rate vs. transmission line length

The RS485 standard can be used for network lengths up to 1200 meters, but the maximum usable data rate decreases as the transmission length increases. A device operating at the maximum data transfer rate (10 Mbps) is limited to a transmission length of about 12 meters, while a distance up to 1200 meters can be achieved at 100 Kbps. A rough relation between maximum transmission length and data rate can be calculated using this approximation:

Where:

- $\mathbf{L_{max}}$ - maximum cable length in meters.
- **DR** - maximum data rate in bits per second.

Twisted pair is the preferred cable type for RS485 networks. Twisted pair cables pick up noise and other electromagnetically induced voltages as common mode signals, which are rejected by the differential receivers.

2-Wire and 4-Wire Networks

Below is an example of a 4-wire network electrical connection. There are 3 devices shown in the example. One of the devices is the "master" and other two are "slaves". Termination resistors (120 Ω each) are placed at each cable end. Four-wire networks consists of one master with its transmitter connected to each of the slaves' receivers on one twisted pair. The slave transmitters are all connected to the master receiver on a second twisted pair:

Example 2-wire network electrical connection: to enable a 2-wire RS485 configuration you need to connect D_P to R_P and D_N to R_N on the device’s RS485 socket. Termination resistors are placed at each cable end (120 Ω each):

RS485 Configuration

The **RS485 Configuration** section is used to set up the main operating parameters and the serial type of the RS485 connector.

Field	Value	Description
Enabled	off | on; default: **off**	Turns the RS485 service on or off.
Baud rate	300 | 600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200 | 230400 | 460800 | 921600 | 1000000 | 3000000; default: **115200**	Data rate for serial data transmission (in bits per second (bps)).
Data bits	5 | 6 | 7 | 8; default: **7**	Number of data bits for each character.
Parity	None | Odd | Even; default: **None**	In serial transmission, parity is a method of detecting errors. An extra data bit is sent with each data character, arranged so that the number of 1 bits in each character, including the parity bit, is always odd or always even. If a byte is received with the wrong number of 1s, then it must have been corrupted. However, an even number of errors can pass the parity check. • **None** (**N**) - no parity method is used. • **Odd** (**O**) - the parity bit is set so that the number of "logical ones (1s)" has to be odd. • **Even** (**E**) - the parity bit is set so that the number of "logical ones (1s)" has to be even.
Stop bits	1 | 2; default: **1**	Stop bits sent at the end of every character allow the receiving signal hardware to detect the end of a character and to resynchronise with the character stream. Electronic devices usually use one stop bit. Two stop bits are required if slow electromechanical devices are used.

Flow control	None | RTS/CTS | Xon/Xoff; default: **None**	In many circumstances a transmitter might be able to send data faster than the receiver is able to process it. To cope with this, serial lines often incorporate a "handshaking" method, usually distinguished between hardware and software handshaking. • **RTS/CTS** - hardware handshaking. RTS and CTS are turned OFF and ON from alternate ends to control data flow, for instance when a buffer is almost full. • **Xon/Xoff** - software handshaking. The Xon and Xoff characters are sent by the receiver to the sender to control when the sender will send data, i.e., these characters go in the opposite direction to the data being sent. The circuit starts in the "sending allowed" state. When the receiver's buffers approach capacity, the receiver sends the Xoff character to tell the sender to stop sending data. Later, after the receiver has emptied its buffers, it sends an Xon character to tell the sender to resume transmission.
Serial type	Console | Over IP | Modem | Modbus gateway; default: **Console**	Specifies the serial connection type. **Look to the sections below for information on different RS485 serial type options.**
Full Duplex	off | on; default: **off**	Turns RS485 Full Duplex mode on or off.

Console

Console mode requires no further configuration than the settings above and is used as a direct-access method to the device's shell interface. For this purpose you may want use such applications as PuTTY on Windows and microcom, minicom, picocom or similar applications on Linux.

Over IP

The **Over IP** serial type is used to manage serial connections over a TCP/IP network.

Field	Value	Description
Protocol	TCP | UDP; default: **TCP**	Protocol used in the communication process.
Raw mode	off | on; default; default: **off**	When enabled, all data will be transmitted transparently.

Mode	Server | Client | Bidirect; default: **Server**	This device's role in the connection: • **Server** - the device waits for incoming connections. • **Client** - the device initiates the connection. • **Bidirect** - acts as client by default but waits for incoming connections at the same time.
No leading zeros	off | on; default: **off**	When checked, indicates that the first hex zeros should be skipped.
Server settings: Port	integer [0..65535]; default: **none**	Internal port number used to listen for incoming connections.
Server settings | TCP: Timeout (s)	integer [0..32767]; default: **300**	Specifies an inactivity time limit (in seconds) after which an inactive clients is disconnected.
Bidirect: Output	Output (4) | Isolated Output (3,4,8) | Relay (5,10); default: **Output (4)**	Specifies which output to manage.
Bidirect: Output state	0 | 1; default: **0**	Default output state value, when the application is started.
Server settings | UDP: Number of clients	1-10; default: **1**	Specifies how many UDP clients will be supported simultaneously (predefined clients does not count towards this limit).
Server settings | UDP: Predefined client 1 address	ip4; default: **none**	Specifies IP address for predefined connection 1.
Server settings | UDP: Predefined port 1	port; default: **none**	Specifies port number for predefined connection 1.
Server settings | UDP: Predefined client 2 address	ip4; default: **none**	Specifies IP address for predefined connection 2.
Server settings | UDP: Predefined port 2	port; default: **none**	Specifies port number for predefined connection 2.
Client settings: Server Address	ip | host; default: **none**	IP address or hostname of the server that this client will connect to.
Client settings: Port	integer [0..65535]; default: **none**	Server's listening port number.
Client settings: Reconnect interval (s)	integer; default: **none**	Time period (in seconds) between reconnection attempts in case a connection fails.

Serial device read time	integer [0..1000]; default: **none**	Specifies custom read time for the serial device.
Full Duplex	0 | 1; default: **0**	Enables RS485 Full-Duplex.
Server settings | TCP: Max clients	integer [1..32]; default: **32**	Specifies how many clients are allowed to connect simultaneously.
TCP: Always reconnect	off | on; default: **off**	When enabled, a new TCP connection will be made after sending every data package.

Modem

The **Modem** serial type is used to manage modem functionality which could be accessed using shell interface. For this purpose you may want use such applications with CR/LF (Carriage Return, Line Feed) capable applications like PuTTY on Windows and microcom, minicom, cutecom or similar applications on Linux.

Field	Value	Description
Mode	Partial control | Full control; default: **Partial control**	Specifies modem control mode. • **Partial control** - enables modem control with AT commands, mobile connection will be controlled by RUTOS. • **Full control** - enables modem control with AT commands, mobile connection will be controlled by user.

Modbus gateway

The **Modbus gateway** serial type allows redirecting TCP data coming to a specified port to an RTU specified by the Slave ID. The Slave ID can be specified by the user or be obtained directly from the Modbus header.

Field	Value	Description
Listening IP	ip; default: **0.0.0.0**	IP address to listen for incoming connections. The default value (*0.0.0.0*) means that this device will listen for incoming connections on any interface or IP address.
Port	integer [0..65535]; default: **502**	Port number to listen for incoming connections.
Slave ID configuration type	User defined | Obtained from TCP; default: **User defined**	Specifies whether slave IDs are user defined or automatically obtained from TCP.

Slave ID | Permitted slave IDs	integer | range of integers; default: **1 or 1-247**	Specifies the slave ID of range of permitted slave IDs. The way this field is named and its function depends on the value of the *Slave ID configuration* field. A range of IDs can be specified by placing a hyphen (-) between two integer numbers. For example, if you permit slave IDs in the range of 10 to 20, you would specify it as: *10-20* You can also specify multiple values that are not connected in a range using commas (,). For example, to specify 6, 50 and 100 as permitted slave IDs, you would have to use: *6,50,100*
Open port automatically	off | on; default: **on**	Automatically adds a traffic rule in the firewall configuration to open the required port for serial communication. **Caution:** use with care if listening IP is left as the default value (*0.0.0.0*). Leaving it as such will leave the device open for remote connections on the specified port.
Full duplex	off | on; default: **off**	Turns RS485 full duplex on or off.

IP Filter

The **IP Filter** section is used for configuring which network is allowed to communicate with the device. You may add a new instance by selecting the Interface and pressing Add.

Then enter the IP address and save.