RUTX10 DNP3

The information in this page is updated in accordance with firmware version **RUTX_R_00.07.07.1**.

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Contents

- 1 Summary
- 2 DNP3 Parameters
  - 2.1 External Modem Parameters
- 3 TCP Client
  - 3.1 TCP Client Configuration
  - 3.2 Requests Configuration
  - 3.3 Request Configuration Testing
- 4 Serial Client
  - 4.1 Serial Client Configuration
  - 4.2 Requests Configuration
  - 4.3 Request Configuration Testing
- 5 DNP3 Outstation
- 6 DNP3 Serial Outstation
  - 6.1 DNP3 Serial Outstation Configuration
  - 6.2 RS Device DNP3 Outstation Configuration

Summary

Distributed Network Protocol 3 (DNP3) is a set of communications protocols used between components in process automation systems. It is primarily used for communications between a client station and Remote Terminal Units (RTUs) or Intelligent Electronic Devices (IEDs).

This manual page provides an overview of the DNP3 functionality in RUTX10 devices.

Note: DNP3 is additional software that can be installed from the **System → Package Manager** page.

DNP3 Parameters

DNP3 parameters are held within **indexes**. The index numbers and corresponding system values are described in the table below:

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	required value	index	group type
Uptime		0	Counter

Hostname	3	Octet String
Router Serial Number	5	Octet String
LAN MAC Address	6	Octet String
Router name	7	Octet String
IO din1, is high?	72	Binary
IO dout1, is high?	74	Binary

External Modem Parameters

If you are using an external modem on your device, use these index numbers for corresponding system values:

required value	index	group type
Modem VID and PID	100 + 50 * modem_number	Octet String
Mobile data received today (SIM1)	101 + 50 * modem_number	Counter
Mobile data sent today (SIM1)	102 + 50 * modem_number	Counter
Mobile data received this week (SIM1)	103 + 50 * modem_number	Counter
Mobile data sent this week (SIM1)	104 + 50 * modem_number	Counter
Mobile data received this month (SIM1)	105 + 50 * modem_number	Counter
Mobile data sent this month (SIM1)	106 + 50 * modem_number	Counter
Mobile data received last 24h (SIM1)	107 + 50 * modem_number	Counter
Mobile data sent last 24h (SIM1)	108 + 50 * modem_number	Counter
Mobile data received last week (SIM1)	109 + 50 * modem_number	Counter
Mobile data sent last week (SIM1)	110 + 50 * modem_number	Counter
Mobile data received last month (SIM1)	111 + 50 * modem_number	Counter
Mobile data sent last month (SIM1)	112 + 50 * modem_number	Counter
Mobile data received today (SIM2)	113 + 50 * modem_number	Counter
Mobile data sent today (SIM2)	114 + 50 * modem_number	Counter
Mobile data received this week (SIM2)	115 + 50 * modem_number	Counter
Mobile data sent this week (SIM2)	116 + 50 * modem_number	Counter
Mobile data received this month (SIM2)	117 + 50 * modem_number	Counter
Mobile data sent this month (SIM2)	118 + 50 * modem_number	Counter
Mobile data received last 24h (SIM2)	119 + 50 * modem_number	Counter
Mobile data sent last 24h (SIM2)	120 + 50 * modem_number	Counter
Mobile data received last week (SIM2)	121 + 50 * modem_number	Counter
Mobile data sent last week (SIM2)	122 + 50 * modem_number	Counter
Mobile data received last month (SIM2)	123 + 50 * modem_number	Counter
Mobile data sent last month (SIM2)	124 + 50 * modem_number	Counter
Modem temperature (in 0.1 °C)	125 + 50 * modem_number	Octet String
Operator	126 + 50 * modem_number	Octet String
Network state	127 + 50 * modem_number	Octet String
Connection state	128 + 50 * modem_number	Octet String
Signal Strength	129 + 50 * modem_number	Octet String

The **modem_number** of the external modem is **0** (internal modem is skipped).

To get the exact index of a parameter, use the formula in the table above. For example, the index of

an external modem operator is 126. Formula is: 126 + 50 * 0.

TCP Client

A client in DNP3 is a component that communicates (requests data) with a single outstation via a communication channel. By default, the client list is empty. To add a new client, click the 'Add' button.

After clicking 'Add' you will be redirected to the newly added client's configuration page.

TCP Client Configuration

The **TCP Client Configuration** section is used to configure the parameters of a DNP3 Outstation that the Client (this RUTX10 device) will be querying with requests. The figure below is an example of the TCP Client Configuration and the table below provides information on the fields contained in that section:

Field	Value	Description
Enable	off | on; default: **off**	Turns communication with the outstation device on or off.
Name	string; default: **none**	Name of the TCP client, used for easier management purposes.
IP address	ip; default: **none**	DNP3 Outstation IP address.
Port	integer [0..65535]; default: **none**	DNP3 Outstation Port.
Local Address	integer [0..65535]; default: **none**	Clients Link-Layer address.
Remote Address	integer [0..65535]; default: **none**	Outstation Link-Layer address.
Period	integer [1..60]; default: **none**	Interval at which requests are sent to the outstation device.
Timeout	integer [1..60]; default: **none**	Maximum response wait time.
Save to flash	off | on; default: **off**	When enabled, stores request information in device flash.

Requests Configuration

A DNP3 **request** is a way of obtaining data from DNP3 Outstations. The client sends a request to an outstation specifying the function codes to be performed. The outstation then sends the requested data back to the DNP3 client.

The Request Configuration list is empty by default. To add a new Request Configuration look to the Add New Instance section. Enter a custom name into the 'New Configuration Name' field and click

the 'Add' button:

The new Request Configuration should become visible in the list:

Field	Value	Description
Name	string; default: **Unnamed**	Name of this Request Configuration. Used for easier management purposes.
Start Index	integer [0..65535]; default: **none**	Start index of the data subarray.
End Index	integer [0..65535]; default: **none**	End index of the data subarray.
Data Type	Binary | Double Binary | Counter | Frozen Counter | Analog | Octet String | Analog Output Status | Binary Output Status; default: **Binary**	Data object group of the requested index(-es).
Enabled	off | on; default: **off**	Turns the request on or off.
Actions	- interactive button	Deletes request configuration.

Request Configuration Testing

This section is used to check whether the configuration works correctly. Simply click the 'Test' button and a response should appear in the box below. The last value represents the configured request data. A successful response to a test may look something like this:

Serial Client

The **Serial Client** page is used to configure the device as a DNP3 RTU Client. DNP3 RTU (remote terminal unit) is a serial communication protocol mainly used in communication via serial interfaces.

By default, the list is empty. To add a new client instance, enter the instance name, select serial interface and click the 'Add' button.

After clicking 'Add' you will be redirected to the newly added client instance configuration page.

Serial Client Configuration

The **Serial Client Configuration** section is used to configure the parameters of a DNP3 Outstation that the Client (this RUTX10 device) will be querying with requests. The figure below is an example of the Serial Client Configuration and the table below provides information on the fields contained in that section:

Field	Value	Description
Enable	off | on; default: **off**	Turns communication with the outstation device on or off.
Name	string; default: **none**	Name of the Serial client, used for easier management purposes.
Serial port	USB RS232 interface; default: **USB RS232 interface**	Selects which serial port to use for communication.
Baud rate	300 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200; default: **115200**	Serial data transmission rate (in bits per second).
Data bits	5 | 6 | 7 |8; default: **8**	Number of data bits for each character.
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.
Parity	Even | Odd| Mark | Space | None; 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. • **Space** (**s**) - the parity bit will always be a binary 0. • **Mark** (**M**) - the parity bit will always be a binary 1.
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.
Open delay	integer [0..10000]; default: **none**	Some physical layers need time to 'settle' so that the first tx isn't lost.
Local Address	integer [0..65535]; default: **none**	Client Link-Layer address.

Remote Address	integer [0..65535]; default: **none**	Outstation Link-Layer address.
Period	integer [1..60]; default: **none**	Interval at which requests are sent to the outstation device.
Timeout	integer [1..60]; default: **none**	Maximum response wait time.
Save to flash	off | on; default: **off**	When enabled, stores request information in device flash.

Requests Configuration

A DNP3 **request** is a way of obtaining data from DNP3 Outstations. The client sends a request to an outstation specifying the function codes to be performed. The outstation then sends the requested data back to the DNP3 client.

The Request Configuration list is empty by default. To add a new Request Configuration look to the Add New Instance section. Enter a custom name into the 'New Configuration Name' field and click the 'Add' button:

The new Request Configuration should become visible in the list:

Field	Value	Description
Name	string; default: **Unnamed**	Name of this Request Configuration. Used for easier management purposes.
Start Index	integer [0..65535]; default: **none**	Start index of the data subarray.
End Index	integer [0..65535]; default: **none**	End index of the data subarray.
Data Type	Binary | Double Binary | Counter | Frozen Counter | Analog | Octet String | Analog Output Status | Binary Output Status; default: **Binary**	Data object group of the requested index(-es).
Enabled	off | on; default: **off**	Turns the request on or off.
Actions	- interactive button	Deletes request configuration.

Request Configuration Testing

This section is used to check whether the configuration works correctly. Simply click the 'Test' button and a response should appear in the box below. The last value represents the configured request data. A successful response to a test may look something like this:

DNP3 Outstation

An outstation in DNP3 is a component that communicates with a single client via a communication channel. It makes measurements of the physical world and then sends them to a client upon request (solicited) or on its own accord (unsolicited). Occasionally a client requests that it do something by sending it a control. This provides the user with the possibility to get system parameters.

The figure below is an example of the DNP3 Outstation window section and the table below provides information on the fields contained in that window:

Field	Value	Description
Enable	off | on; default: **off**	Turns DNP3 Outstation on or off.
Local Address	integer [0..65535]; default: **none**	Outstation Link-Layer address.
Remote Address	integer [0..65535]; default: **none**	Client Link-Layer address.
Unsolicited enabled	off | on; default: **none**	Enables the transmission of unsolicited messages.
Protocol	TCP | UDP; default: **TCP**	Protocol used for DNP3 communications.
Port	integer [0..65535]; default: **none**	Port used for DNP3 communications.
UDP response address	ipv4; default: **none**	UDP response address.
UDP response port	integer [0..65535]; default: **none**	UDP response port.
Allow Remote Access	off | on; default: **off**	Allows remote DNP3 connections by adding an exception to the device's firewall on the port specified in the field above.

DNP3 Serial Outstation

An outstation in DNP3 is a component that communicates with a single client via a communication channel. It makes measurements of the physical world and then sends them to a client upon request (solicited) or on its own accord (unsolicited). Occasionally a client requests that it do something by sending it a control. This provides the user with the possibility to get system parameters.

DNP3 Serial Outstation Configuration

The **DNP3 Serial Outstation Configuration** page is used to configure the device as a DNP3 RTU Outstation. DNP3 RTU (remote terminal unit) is a serial communication protocol mainly used in communication via serial interfaces.

By default, the list is empty. To add a new outstation instance, enter the instance name, select serial interface and click the 'Add' button.

After clicking 'Add' you will be redirected to the newly added outstation instance configuration page.

RS Device DNP3 Outstation Configuration

The **RS Device DNP3 Outstation Configuration** section is used to configure the parameters of a Serial DNP3 Outstation that will be queried by other Client devices. The figure below is an example of the Serial Outstation Configuration and the table below provides information on the fields contained in that section:

Field	Value	Description
Enable	off | on; default: **off**	Turns communication with the outstation device on or off.
Name	string; default: **none**	Name of the Serial outstation, used for easier management purposes.
Serial port	USB RS232 interface; default: **USB RS232 interface**	Selects which serial port to use for communication.
Baud rate	300 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200; default: **115200**	Serial data transmission rate (in bits per second).
Data bits	5 | 6 | 7 |8; default: **8**	Number of data bits for each character.
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.
Parity	Even | Odd| Mark | Space | None; 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. • **Space** (**s**) - the parity bit will always be a binary 0. • **Mark** (**M**) - the parity bit will always be a binary 1.

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.
Local Address	integer [0..65535]; default: **none**	Outstation Link-Layer address.
Remote Address	integer [0..65535]; default: **none**	Client Link-Layer address.
Unsolicited enabled	off | on; default: **none**	Enables the transmission of unsolicited messages.