USER MANUAL

R-KEY-LT

1-PORT MODBUS RTU/ASCII GATEWAY



CE

SENECA®

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ORIGINAL INSTRUCTIONS

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Introduction

Contents of the present documentation refer to products and technologies described in it.
All technical data contained in the document may be modified without prior notice.
Content of this documentation is subject to periodical revision.
To use the product safely and effectively, read carefully the following instructions before use.
The product must be used only for the use for which it was designed and built: any other use must be considered with full responsibility of the user.
The installation, programming and set-up is allowed only to authorized operators, physically and intellectually suitable.
Set up shall be performed only after a correct installation and the user shall perform every operation described in the installation manual carefully.
Seneca is not considered liable for failure, breakdown, accident caused because of ignorance or failure to apply the indicated requirements.
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Seneca reserves the right to modify the device, for any commercial or construction requirements, without the obligation to promptly update the reference manuals.
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Use the concepts, examples and other content at your own risk.
There may be errors and inaccuracies in this document that may of course be damaging to your system.
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Document revisions

DATE	REVISION	NOTES
20/09/2017	1.0.0.0	First revision
15/11/2017	1.0.0.1	Fixed chapter 1 Fixed chapter 7
06/12/2017	1.0.0.2	Fixed Support and Product Information emails
25/01/2020	3	Eliminate common parts between installation and user manuals

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⚠ WARNING!

This User Manual extend the information from the installation manual about the device configuration. Use the installation manual for more info.

⚠ WARNING!

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1. DESCRIPTION

R-KEY-LT is a Modbus RTU/ASCII Gateway with a RS232/RS485 port and a Fast Ethernet 100MBits.

An internal Webserver is also available for configuration and real time traffic view.

R-KEY-LT is configurable in 2 different modes:

- Modbus Ethernet to Serial (From Modbus TCP-IP to Modbus RTU/ASCII)
- Modbus Serial to Ethernet (From Modbus RTU/ASCII to Modbus TCP-IP)

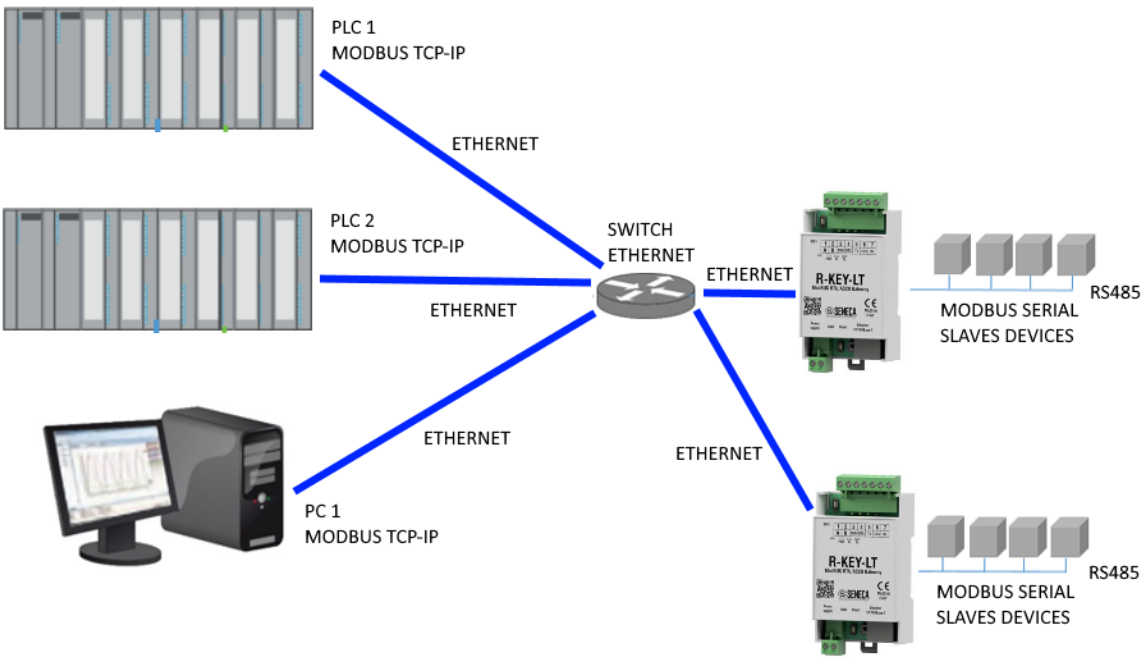
1.1. MODBUS ETHERNET TO SERIAL

In this scenario a Modbus TCP-IP master is connected with ethernet to R-KEY-LT, one or more serial Modbus slaves (for example the Z-PC Seneca Series) are connected to the serial port.

A typical LAN connection is represented into this figure:



Also a communication with multiple clients is possible (Max 8 clients for device):

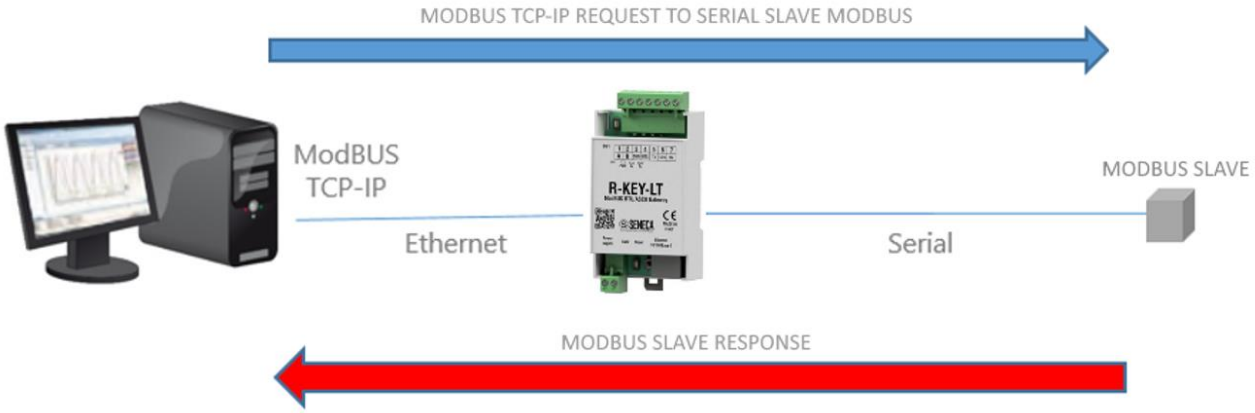


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1.1.1. HOW IT WORKS

The Modbus ethernet to serial is the simplest way to communicate with Modbus RTU/ASCII slaves by an ethernet connection.
There is no need to configure which registers must be requested because the conversion from Ethernet to serial is executed in real time.
Only the serial configuration must be made (baud rate, parity etc…).



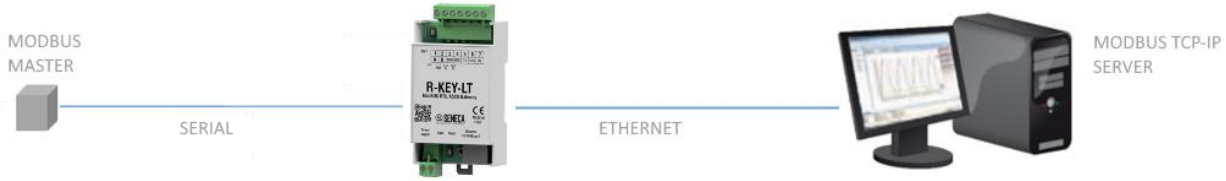
The Master (client) Modbus TCP-IP request a modbus register by ethernet, then the R-KEY-LT convert the request to the serial Modbus slave, the serial Modbus slave response is also retranslated in Modbus TCP to the Master.

WARNING!

It's not possible to connect two Modbus serial slaves with the same Modbus address, if you need to connect 2 Modbus RTU slaves with the same Modbus address (not configurable) you must use 2 R-KEY-LT devices.

1.2. MODBUS SERIAL TO ETHERNET

In this scenario a Modbus serial master must be connect to one or multiple Modbus TCP-IP servers.
The Modbus serial master is connected with the serial port to the R-KEY-LT, one or more Modbus TCP-IP servers are connected to the Ethernet port:

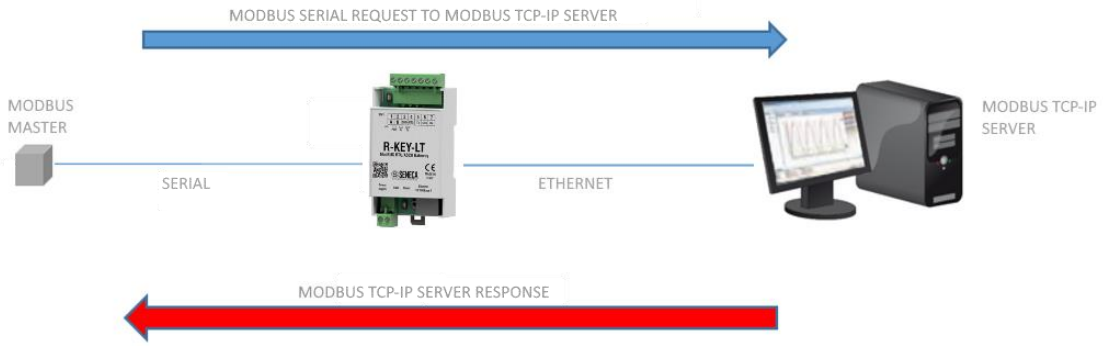


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1.2.1. HOW IT WORKS

The Modbus serial to Ethernet is the simplest way to create a communication between a serial master Modbus device and one or more Modbus Ethernet TCP-IP server.
There is no need to configure which registers must be requested because the conversion from serial to Ethernet is executed in real time.
Only the serial configuration must be made (baud rate, parity etc…) and the server modbus station address range (because one server can manage multiple station addresses).



The Master serial Modbus request a register from the RS232/RS485 port, then the R-KEY-LT convert the request to the Modbus TCP-IP server, the Modbus TCP-IP server response is also retranslated in Modbus serial to the Master.

WARNING!

It's not possible to connect more than one Modbus server using the same station address

2. *DEFAULT CONFIGURATION*

The default configuration is:
IP: DHCP mode
Mode: Modbus Ethernet to Modbus RTU
Serial: Baud rate 38400,8bit ,No parity,1 stop bit

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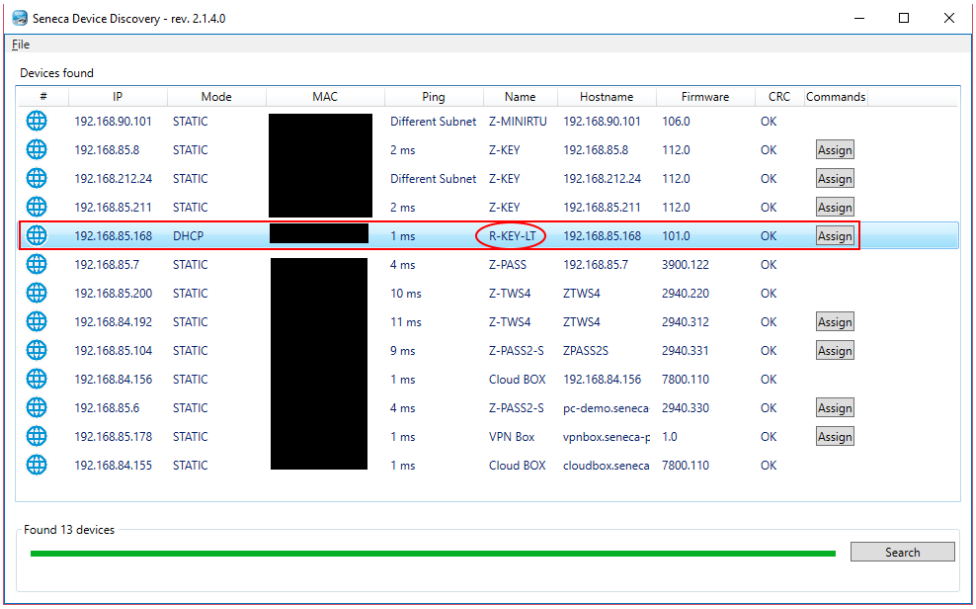
3. CONFIGURING THE DEVICE

WARNING!

Dip switches configuration are active only after a reboot!
For reboot the device you can power off/on the power supply or press the "Reset" button until all leds are ON (about 5 seconds).

3.1. FIRST ACCESS TO THE WEB SERVER WITH A DHCP SERVER

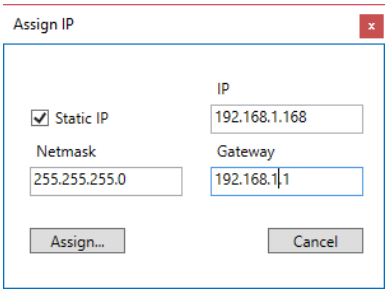
1) Switch OFF the R-KEY-LT
2) Force to flash the factory configuration by setting on SW2:
   DIP 1 ON
   DIP 2 ON
   This will change the last configuration to factory default (with the IP set to DHCP, web server access set to admin/admin).
3) Switch ON the R-KEY-LT
4) Set to use the flash configuration by setting on SW2:
   DIP 1 OFF
   DIP 2 OFF
5) Download from here: http://www.seneca.it/products/r-key-lt the Seneca Discovery Device tools then install it.
6) Launch the Seneca Discovery Device tool and click on the "Search" button, a list of Seneca devices will be found. Now select the R-KEY-LT device:



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7) If you need to force a static IP compatible with your PC select the R-KEY-LT device and click on the "ASSIGN" button



8) Now the device can be configured from the internal web server by typing in a browser the device ip address, for example:

http://192.168.1.168

the default username/password are: username: **admin** - password: **admin**

WARNING!

As long as the dhcp server does not provide a valid ip address (PWR led is flashing), the R-KEY-LT will not be visible from the Discovery Device tool.

WARNING!

If R-KEY-LT is configured with the ip set to DHCP but the DHCP server is not active, after 5 minutes from the power up the R-KEY-LT will force the following fault ip address: 169.254.x.y
Where x.y are the last 2 MAC address values.

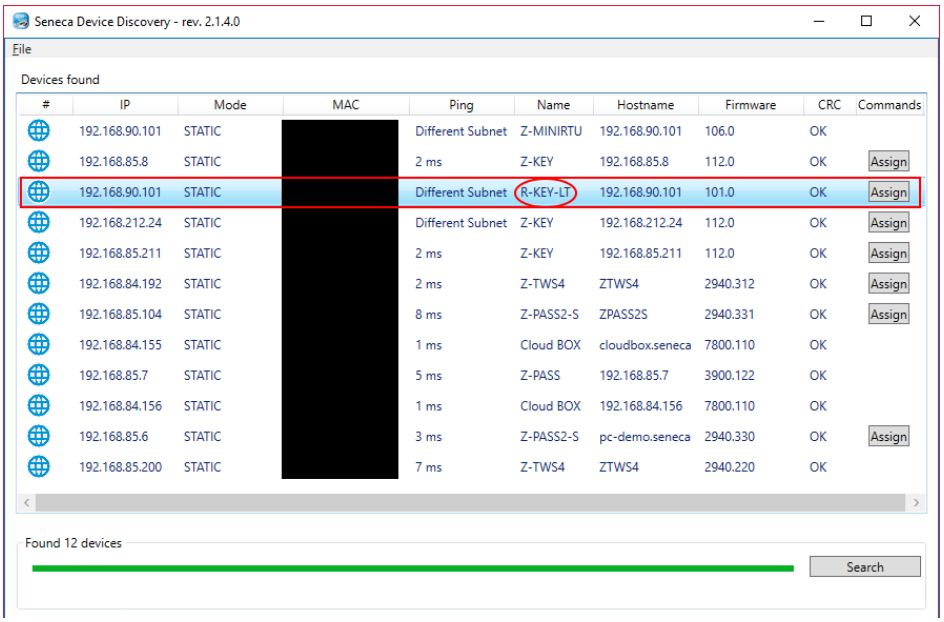
For example:
R-KEY-LT mac address = C8:F9:81:11:1A (hexadecimal values)
Fault ip address = 169.254.17.26

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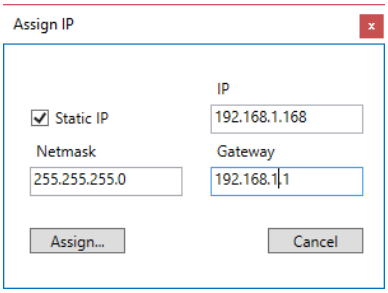
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3.2. FIRST ACCESS TO THE WEB SERVER WITHOUT A DHCP SERVER

1) Switch OFF the R-KEY-LT
2) Force to static ip configuration by setting on SW2:
   DIP 1 OFF
   DIP 2 ON
   This will force the ip to 192.168.90.101 static ip address
3) Switch ON the R-KEY-LT
4) Set to use the flash configuration by setting on SW2:
   DIP 1 OFF
   DIP 2 OFF
5) Download from here: http://www.seneca.it/products/r-key-lt the Seneca Discovery Device tools then install it.
6) Launch the Seneca Discovery Device tool and click on the "Search" button, a list of Seneca devices will be found. Now select the R-KEY-LT device:



7) Force a static IP compatible with your PC: select the R-KEY-LT device with ip 192.168.90.101 and click on the "ASSIGN" button



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8) Now the device can be configured from the internal web server by typing in a browser the device ip address, for example:

http://192.168.1.168

the default username/password are: username: **admin** - password: **admin**

WARNING!

Don't connect on a network two or more devices with the same ip address!
Don't connect on a network two or more devices with the SW2 DIP1=OFF and SW2 DIP2=ON configuration!
In this cases the R-KEY-LT will not be able to communicate from the ethernet port.

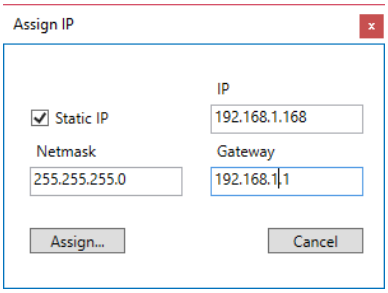
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3.3. TIPS FOR CONFIGURING IP FOR MULTIPLE R-KEY-LT DEVICES

If in a network there are multiple R-KEY-LT devices to be installed, for speed up the installation follow this tips:

- Install all the R-KEY-LT with the SW2 DIP1 = OFF and SW2 DIP2=OFF. If the devices are not used before the ip is set to DHCP, if not force the device to DHCP with the dip switch.
- If you have a DHCP server, all the devices can be found and configured with the Device Discovery tool.
  If you don't have a DHCP server after 5 minutes from the power up the devices will set a different static ip 169.254.x.y ,where x.y depends form the mac address and can once again can be found and configured with the Device Discovery tool (without changing the PC ip configuration).



WARNING!

As long as the dhcp server does not provide a valid ip address (PWR led is flashing), the R-KEY-LT will not be visible from the Discovery Device tool.

WARNING!

If R-KEY-LT is configured with the ip set to DHCP but the DHCP server is not active, after 5 minutes from the power up the R-KEY-LT will force the following fault ip address: 169.254.x.y
Where x.y are the last 2 MAC address values.

For example:
R-KEY-LT mac address = C8:F9:81:11:1A (hexadecimal values)
Fault ip address = 169.254.17.26

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3.4. DIP SWITCHES SW1 AND SW2 CONFIGURATION

WARNING!

Dip switches configuration are active only after a reboot!
For reboot the device you can power off/on the power supply or press the "Reset" button until all leds are ON (about 5 seconds).

SW1 ACTION	*SW1 DIP1*	*SW1 DIP2*
RS485 BUS POLARIZER ON	ON	ON
RS485 BUS POLARIZER OFF	OFF	OFF

SW2 ACTION	*SW2 DIP1*	*SW2 DIP2*
USE CONFIGURATION FROM FLASH (DEFAULT)	OFF	OFF
WRITE AND USE FACTORY DEFAULT CONFIGURATION (WITH DHCP ON)	ON	ON
FORCE IP TO 192.168.90.101	OFF	ON
RESERVED	ON	OFF

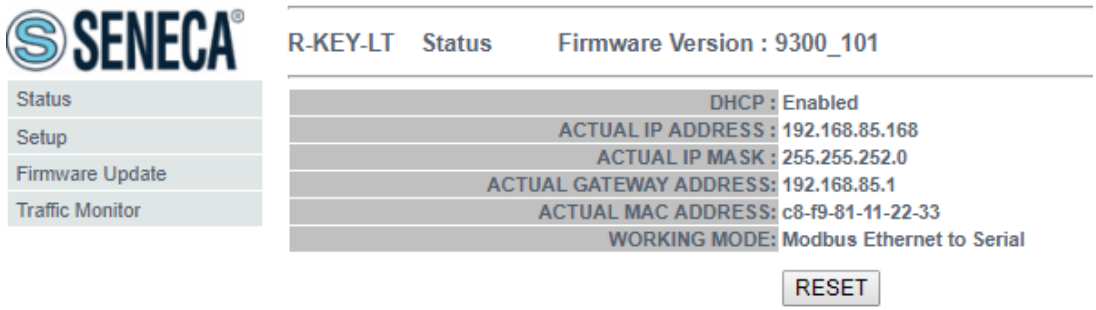
3.5. WEB SERVER CONFIGURATION

For access to the internal webserver type in a browser the R-KEY-LT ip address, for example:

http://192.168.90.101

then enter the username and password (default: user name = admin, password = admin).

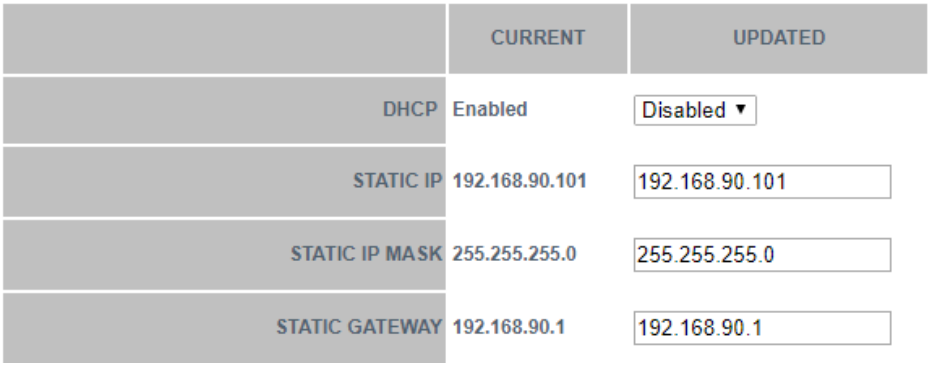
The first page is the "Status" page:



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Now click on “Setup” for configure the device:



If you need to reset to the default parameters click on “FACTORY DEFAULT” button.
In this page you can save and load a previous configuration.
The first column represents the parameter name, the second column (current) it’s the current parameter value.
The last column can be used for changing the current configuration.

The parameters are explained below:

DHCP
Disable: A static Ip address is used
Enable: The IP address, the IP-Mask and the Gateway address are obtained from the DHCP server.
The R-KEY IP address can be obtained with the Device Discovery utility.

WARNING!

If R-KEY-LT is configured with the ip set to DHCP but the DHCP server is not active, after 5 minutes from the power up the R-KEY-LT will force the following fault ip address: 169.254.x.y
Where x.y are the last 2 MAC address values.
For example:
R-KEY-LT mac address = C8:F9:81:11:1A (hexadecimal values)
Fault ip address = 169.254.17.26

STATIC IP ADDRESS
Static IP address when DHCP is Disable

STATIC IP MASK
mask when DHCP is Disable

STATIC GATEWAY
Gateway address when DHCP is Disable

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	CURRENT	UPDATED
DHCP	Enabled	Enabled ▼
WORKING MODE	Modbus Ethernet to Serial	Modbus Ethernet to Serial ▼
TCP/IP PORT	502	502
PORT#1 MODBUS PROTOCOL	RTU	RTU ▼
PORT#1 BAUDRATE	38400	38400 ▼
PORT#1 DATA BITS	8	8 ▼
PORT#1 PARITY	None	None ▼
PORT#1 STOP BITS	1	1 ▼
PORT#1 TIMEOUT [ms]	500	500
WEB SERVER PORT	80	80
WEB SERVER AUTHENTICATION USER NAME	admin	admin
WEB SERVER AUTHENTICATION USER PASSWORD	admin	admin
IP CHANGE FROM DISCOVERY	Enabled	Enabled ▼

When a configuration it's made you must confirm with "APPLY", then the new configuration became operative.

WORKING MODE

Select between Modbus Serial to Ethernet or Modbus Ethernet to Serial.

TCP/IP PORT

TCP-IP port for the Modbus TCP-IP protocol used in "Modbus Ethernet to serial" mode (Max 8 clients).

PORT#1 MODBUS PROTOCOL

Select between Modbus RTU or Modbus ASCII protocol.

PORT#1 BAUDRATE

Used to Set the port baudrate

PORT #1 BITS

Used to Set the number of bits for the serial communication.

PORT #1 PARITY

Used to Set the port parity (None, Odd or even).

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PORT #1 STOP BITS

Used to Set the port parity (1 or 2; note that if the parity is set, only 1 bit can be used).

PORT #1 TIMEOUT

Used to Set the timeout on Modbus Master mode before making a new call.

WEB SERVER PORT

Used to Set the TCP-IP port for the Webserver.

WEB SERVER AUTHENTICATION USER NAME

Used to Set the User Name for accessing the Webserver (if User Name and Password are leave empty no authentication is require for webserver access)

WEB SERVER AUTHENTICATION USER PASSWORD

Used to Set the Password for accessing the Webserver (if User Name and Password are leave empty no authentication is require for webserver access)

IP CHANGE FROM DISCOVERY

Used to Set if a user is allowed to change IP configuration from the software "Seneca Discovery Device"

If "Modbus Serial to Ethernet" mode is selected you need to compile also the Modbus TCP-IP servers parameters:

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SERVER#1 MODE	ENABLED	DISABLED ▼
SERVER#1 TCP/IP PORT	502	502
SERVER#1 TCP/IP ADDRESS	192.168.85.163	
SERVER#2 MODE	ENABLED	DISABLED ▼
SERVER#2 TCP/IP PORT	502	502
SERVER#2 TCP/IP ADDRESS	192.168.85.163	
SERVER#3 MODE	DISABLED	DISABLED ▼
SERVER#3 TCP/IP PORT	502	502
SERVER#3 TCP/IP ADDRESS		
SERVER#4 MODE	DISABLED	DISABLED ▼
SERVER#4 TCP/IP PORT	502	502
SERVER#4 TCP/IP ADDRESS		
SERVER#5 MODE	DISABLED	DISABLED ▼
SERVER#5 TCP/IP PORT	502	502
SERVER#5 TCP/IP ADDRESS		
SERVER#6 MODE	DISABLED	DISABLED ▼
SERVER#6 TCP/IP PORT	502	502
SERVER#6 TCP/IP ADDRESS		
SERVER#7 MODE	DISABLED	DISABLED ▼
SERVER#7 TCP/IP PORT	502	502
SERVER#7 TCP/IP ADDRESS		
SERVER#8 MODE	DISABLED	DISABLED ▼
SERVER#8 TCP/IP PORT	502	502
SERVER#8 TCP/IP ADDRESS		
SERVER#9 MODE	DISABLED	DISABLED ▼
SERVER#9 TCP/IP PORT	502	502
SERVER#9 TCP/IP ADDRESS		
SERVER#10 MODE	DISABLED	DISABLED ▼
SERVER#10 TCP/IP PORT	502	502
SERVER#10 TCP/IP ADDRESS		
SERVER TIMEOUT [ms]	5000	5000
SERVER#1 START SLAVE ADDRESS	3	3
SERVER#1 LAST SLAVE ADDRESS	3	3
SERVER#2 START SLAVE ADDRESS	6	6
SERVER#2 LAST SLAVE ADDRESS	6	6
SERVER#3 START SLAVE ADDRESS	7	7
SERVER#3 LAST SLAVE ADDRESS	7	7
SERVER#4 START SLAVE ADDRESS	8	8
SERVER#4 LAST SLAVE ADDRESS	8	8
SERVER#5 START SLAVE ADDRESS	9	9
SERVER#5 LAST SLAVE ADDRESS	9	9
SERVER#6 START SLAVE ADDRESS	10	10
SERVER#6 LAST SLAVE ADDRESS	10	10
SERVER#7 START SLAVE ADDRESS	11	11
SERVER#7 END SLAVE ADDRESS	11	11
SERVER#8 START SLAVE ADDRESS	12	12
SERVER#8 LAST SLAVE ADDRESS	12	12
SERVER#9 START SLAVE ADDRESS	13	13
SERVER#9 LAST SLAVE ADDRESS	13	13
SERVER#10 START SLAVE ADDRESS	14	14
SERVER#10 LAST SLAVE ADDRESS	14	14

FACTORY DEFAULT

APPLY

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SERVER #n MODE
Enable or not the selected server

SERVER #n TCP/IP PORT
Server#n TCP-IP port for the Modbus TCP-IP protocol

SERVER #n TCP/IP ADDRESS
Server#n IP address

SERVER TIMEOUT
Used to Set the server timeout before making a new TCP-IP call

SERVER #n START SLAVE ADDRESS
Used to Set the First Modbus station address slave connected to the Server #n.

SERVER #n LAST SLAVE ADDRESS
Used to Set the Last Modbus station address slave connected to the Serve r#n.

For example:

SERVER#1 START SLAVE ADDRESS = 1
SERVER#1 LAST SLAVE ADDRESS = 2
SERVER#2 START SLAVE ADDRESS = 3
SERVER#2 LAST SLAVE ADDRESS = 9
SERVER#3 START SLAVE ADDRESS = 10
SERVER#3 LAST SLAVE ADDRESS = 10

If the serial master makes a request to the slave address 1 the R-KEY-LT will request the registers from the Modbus TCP-IP server #1.

If the serial master makes a request to the slave address 2 the R-KEY-LT will request the registers from the Modbus TCP-IP server #2.

If the serial master makes a request to the slave address 3 the R-KEY-LT will request the registers from the Modbus TCP-IP server #2.
…
If the serial master makes a request to the slave address 9 the R-KEY-LT will request the registers from the Modbus TCP-IP server #2.

If the serial master makes a request to the slave address 10 the R-KEY-LT will request the registers from the Modbus TCP-IP server #3.

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If the serial master makes a request to the slave address >= 11 the R-KEY-LT will not convert the serial to Ethernet packets (so ModBus registers from slaves 11,12 etc.. can be directly requested from the RS485 master).

WARNING!

REMEMBER ALWAYS TO CONFIGURE THE WEBSERVER AUTHENTICATION USER NAME AND PASSWORD FOR RESTRICT THE ACCESS TO THE WEBSERVER. IF YOU LEAVE THE TWO PARAMETERS TEXT BOXES BLANK NO AUTHENTICATION IT'S REQUIRED FOR ACCESS

WARNING!

For using the webserver with Internet explorer 9 (or newer) you must enable the compatibility mode (see the arrow below):



3.6. SAVE OR LOAD A CONFIGURATION

In the Setup page it's also possible to export (save) or import (load) a configuration:



WARNING!

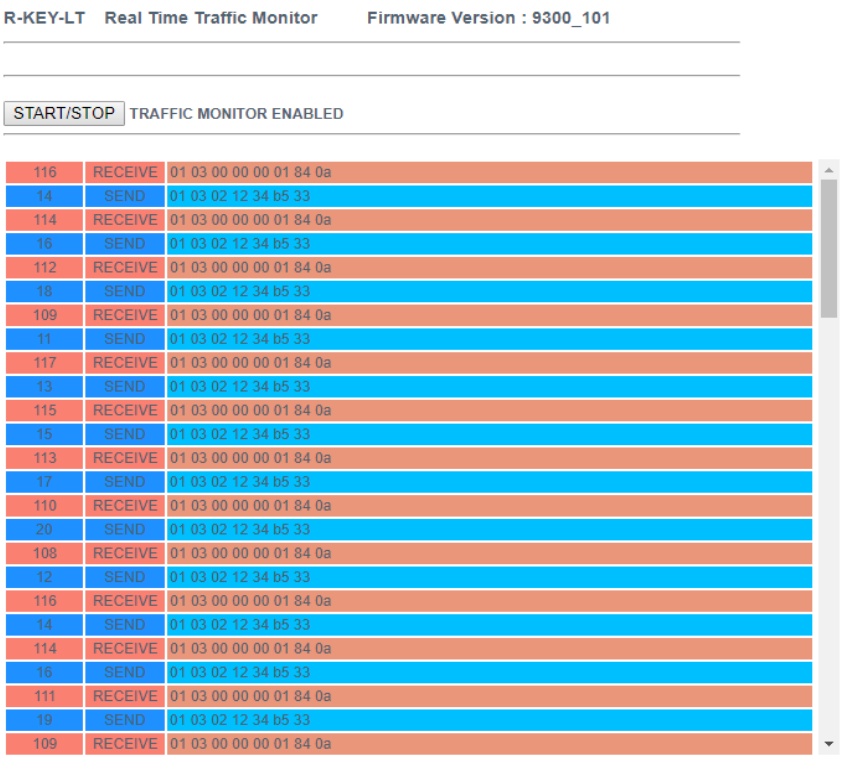
Don't connect on a network two or more devices with the same ip address!

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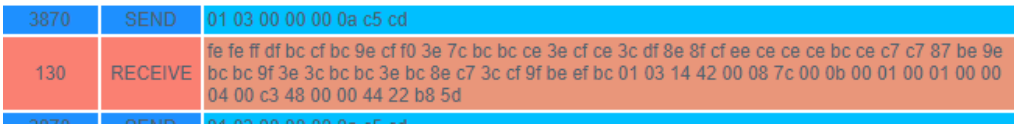
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4. TRAFFIC MONITOR

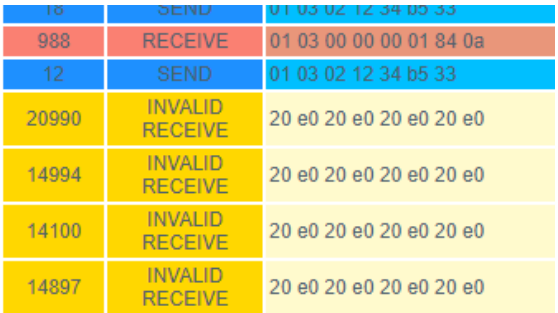
The Traffic Monitor page shows the packets that R-KEY-LT is receiving and transmitting for line debug purpose:



The first column is the delay in milliseconds from the last packet, the second column is the packet verse (received from R-KEY-LT or transmitted from the R-KEY-LT), the last column is the packet content in hexadecimal format. Only the ModBus stream is displayed (stripped of the TCP-IP layer).
In Modbus Ethernet to serial mode the traffic monitor shows all the received packets from the serial line, for example this is a serial slave with a Modbus wrong response:



In the ModBus serial to Ethernet mode the traffic monitor will display also bad packet in yellow (for example a serial master with incorrect baud rate):



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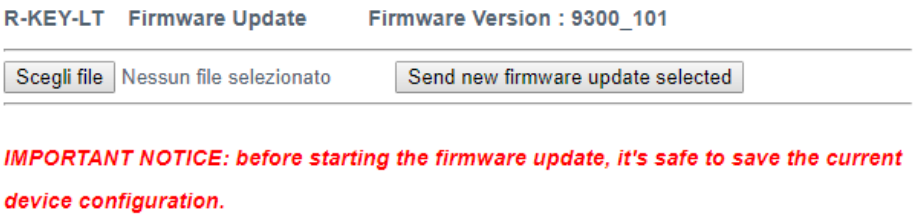
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5. *FIRMWARE UPDATE*

New firmware's can enhance or fix features for the R-KEY-LT device, when available they can be downloaded from:

http://www.seneca.it/products/r-key-lt

Use the Firmware Update page for update the device.



WARNING!

Don't power down or reset the R-KEY-LT until the updating process is completed.

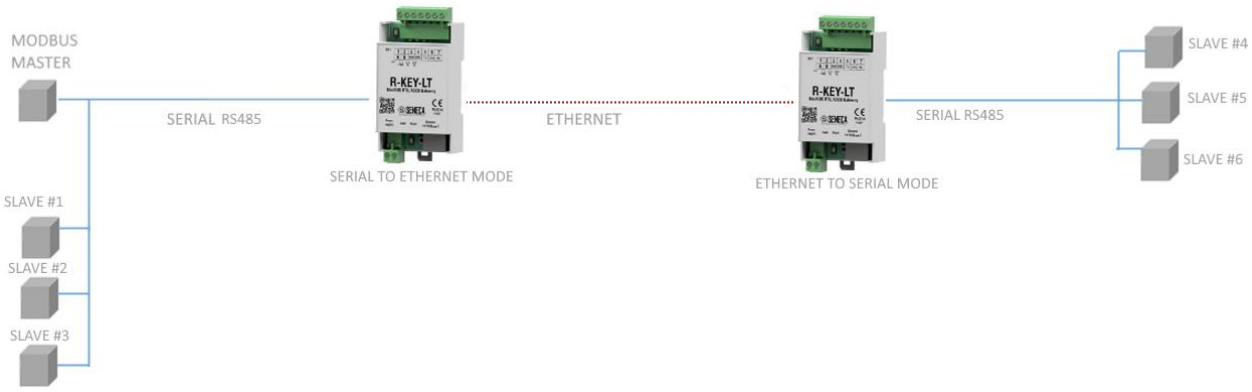
The firmware revision loaded in the device can be read in the webserver upper section.

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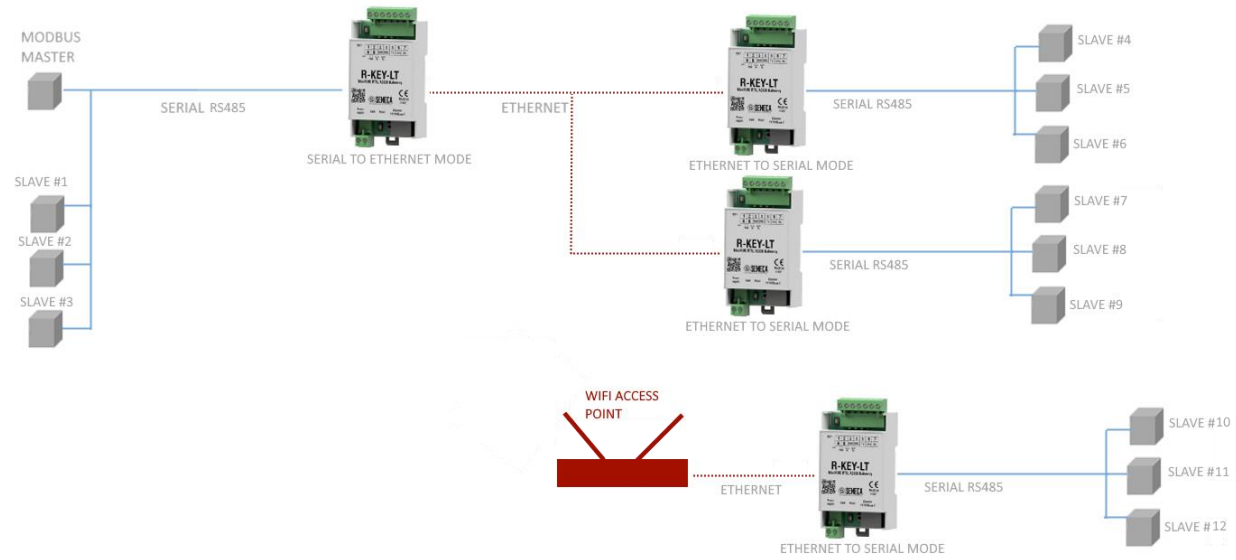
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6. EXTEND RS485 OVER ETHERNET: MODBUS SERIAL TO ETHERNET AND THEN ETHERNET TO SERIAL

For example we need to extend the RS485 using the Ethernet or Wi-Fi infrastructure, for obtain this feature you need at least two R-KEY-LT devices: one configured in Serial to Ethernet mode and the other configured in Ethernet to Serial mode:



Up to 10 R-KEY-LT devices can be used in Ethernet to serial mode (10 Modbus TCP-IP server).
You can mix also Wi-Fi / Ethernet like in figure:



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7. GLOSSARY

- MODBUS RTU

An open protocol for the serial communications developed by Modicon Inc. (AEG Schneider Automation International S.A.S.). Simple and robust, it has since become a de facto standard communication protocol.
For more info http://www.modbus.org/specs.php

- MODBUS TCP-IP

The Modbus RTU protocol with a TCP interface that runs on Ethernet.
For more info http://www.modbus.org/specs.php

- MODBUS ASCII

A variant of the Modbus RTU protocol that makes use of ASCII characters for protocol communication.

- MODBUS GATEWAY ETHERNET TO SERIAL

A device that translates, in real time, from Modbus TCP-IP Ethernet protocol to Modbus RTU/ASCII serial protocol.

- MODBUS GATEWAY SERIAL TO ETHERNET

A device that translates, in real time, from Modbus RTU/ASCII serial protocol to Modbus TCP-IP Ethernet protocol.

- MODBUS RTU/ASCII MASTER-SLAVE

The Master is connected with one or more slaves, the slave waits for an incoming register(s) request from the master. In a serial ModBus bus only one master is allowed.

- MODBUS TCP-IP CLIENT-SERVER

The Client (called Master in Modbus RTU/ASCII) establishes a connection with the Server (called Slave in Modbus RTU/ASCII). The Server waits for an incoming connection from the Client. Once a connection is established, the Server then responds to the registers queries from the Client.

- WEBSERVER

A software that store, process and deliver web pages to clients. Clients web can be PCs, Smartphones, Tablets with a browser (Chrome, Internet Explorer, Firefox etc.).

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