USER MANUAL

MULTIPROTOCOL “KEY” GATEWAYS SERIES

OPC-UA / MODBUS RTU&TCP GATEWAYS

SENECA S.r.l.
Via Austria 26 – 35127 – Z.I. - PADOVA (PD) - ITALY
Tel. +39.049.8705355 – 8705355 Fax +39 049.8706287
www.seneca.it

ORIGINAL INSTRUCTIONS

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

CAUTION

SENECA does not guarantee that all specifications and/or aspects of the product and firmware, included in them, will meet the requirements of the actual final application even if the product referred to in this documentation is in compliance with the technological state of the art.
The user assumes full responsibility and/or risk with regard to the configuration of the product to achieve the intended results in relation to the specific installation and/or end application.
SENECA may, with prior agreement, provide consultancy services for the successful completion of the final application, but under no circumstances can it be held responsible for its proper functioning.
The SENECA product is an advanced product, the operation of which is specified in the technical documentation supplied with the product itself and/or can be downloaded, if desired prior to purchase, from the www.seneca.it website.
SENECA has a policy of continuous development and accordingly reserves the right to make and/or introduce - without prior notice - changes and/or improvements to any product described in this documentation.
The product described in this documentation may solely and exclusively be used by personnel qualified for the specific activity and in accordance with the relevant technical documentation, with particular attention being paid to the safety instructions.
Qualified personnel means personnel who, on the basis of their training, competence and experience, are able to identify risks and avoid potential hazards that could occur during the use of this product.
SENECA products may only be used for the applications and in the manner described in the technical documentation relating to the products themselves.
To ensure proper operation and prevent the occurrence of malfunctions, the transport, storage, installation, assembly, maintenance of SENECA products must comply with the safety instructions and environmental conditions specified in this documentation.
SENECA's liability in relation to its products is governed by the general conditions of sale, which can be downloaded from www.seneca.it.
Neither SENECA nor its employees, within the limits of applicable law, will in any case be liable for any lost profits and/or sales, loss of data and/or information, higher costs incurred for goods and/or replacement services, damage to property and/or persons, interruption of activities and/or provision of services, any direct, indirect, incidental, pecuniary and non-pecuniary, consequential damages in any way caused and/or caused, due to negligence, carelessness, incompetence and/or other liabilities arising from the installation, use and/or inability to use the product.

CONTACT US	
Technical support	supporto@seneca.it
Product information	commerciale@seneca.it

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Document revisions

DATE	REVISION	NOTES	AUTHOR
02/10/2024	0	First revision	MM
24/10/2024	1	fix project name in title Added only 1 client supported Fix various -I instead of -U Fix parameter STOP MODBUS READING WHEN NO OPC-UA CONNECTION Added Modbus TCP-IP server info	MM
11/11/2024	2	Added max 50 TAG	MM
22/11/2024	3	New limits from firmware rev 107: max 100 TAG, 3 remote server modbus tcp-ip, 1 remote client modbus tcp-ip. New connection with User/Password authentication from fw rev 107	MM
24/02/2025	4	Added Led chapter	MM
04/07/2025	5	Added new tag setup page from firmware rev 110	MM

This document is the property of SENECA srl.
Copies and reproduction are prohibited unless authorised.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

TABLE OF CONTENTS

1. DESCRIPTION 6
1.1. OPC- UA PROTOCOL 6
1.2. FEATURES OF THE "KEY" SERIES COMMUNICATION PORTS 6

2. DEVICE HARDWARE REVISION 7

3. FLEX TECHNOLOGY FOR PROTOCOL CHANGE 8
3.1. CHANGING PROTOCOLS WITH THE SENECA DISCOVERY DEVICE SOFTWARE 9

4. LED MEANING 10
4.1. Z-KEY-U (OPC-UA) MODEL LED 10
4.2. R-KEY-LT-U (OPC-UA) MODEL LED 11
4.3. Z-KEY-2ETH-U (OPC-UA) MODEL LED 12

5. ETHERNET PORT 13

6. FIRMWARE UPDATE 13

7. OPERATING MODE 14
7.1. OPC-UA SERVER / MODBUS MASTER 14
7.2. OPC-UA SERVER / MODBUS MASTER / CLIENT MODBUS TCP-IP 15

8. GATEWAY CONFIGURATION 16

8.1. CONFIGURATION OF THE UAEXPERT™ CLIENT FOR BASIC CONNECTION . 16

9. GATEWAY WEBSERVERS 20
9.1. "-U" GATEWAY WEBSERVER 20
9.1.1. WEBSERVER MODE AND OPC-UA MODE 20
9.1.2. WEB/OPCUA WORKING STATUS 20
9.1.2.1. LED SD/COM 20
9.1.2.2. SENECA DISCOVERY DEVICE 20
9.1.3. CHANGE OF WEB/OPC-UA OPERATING MODE 21
9.1.3.1. MANUAL PROCEDURE FOR SWITCHING FROM OPC-UA MODE TO WEBSERVER MODE AND VICE VERSA ..21
9.1.3.2. SENECA DISCOVERY DEVICE 21
9.1.3.3. WEB SERVER 22
9.1.4. STEP BY STEP GUIDE FOR THE FIRST ACCESS TO THE WEBSERVER 22
9.1.5. WEBSERVER DEVICE CONFIGURATION 23
9.1.5.1. WEBSERVER SECTIONS 24
9.1.5.2. "STATUS" SECTION 25
9.1.5.3. "SETUP" SECTION 26
9.1.5.4. "SETUP TAGS" SECTION" 31

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.5.1. "FIRMWARE UPDATE" SECTION 32
9.1.5.1. UTC TIME SETUP 32
9.1.5.1. "DATABASE UPDATE" SECTION 32
9.1.5.2. SERIAL "SERIAL TRAFFIC MONITOR" 32

10. RESETTING THE DEVICE TO ITS FACTORY CONFIGURATION 33

11. TEMPLATE EXCEL 34

12. SUPPORTED MODBUS COMMUNICATION PROTOCOLS 35
12.1. SUPPORTED MODBUS FUNCTION CODES 35

13. SENECA DISCOVERY DEVICE 35

14. INFORMATION ABOUT MODBUS REGISTERS 36
14.1. NUMBERING OF "0-BASED" OR "1-BASED" MODBUS ADDRESSES 36
14.2. NUMBERING OF MODBUS ADDRESSES WITH "0-BASED" CONVENTION 36
14.3. NUMBERING OF MODBUS ADDRESSES WITH "1 BASED" CONVENTION (STANDARD) 37
14.4. BIT CONVENTION WITHIN A MODBUS HOLDING REGISTER 38
14.5. MSB and LSB BYTE CONVENTION WITHIN A MODBUS HOLDING REGISTER 38
14.6. REPRESENTATION OF A 32-BIT VALUE IN TWO CONSECUTIVE MODBUS HOLDING REGISTERS 39
14.7. TYPE OF 32-BIT FLOATING POINT DATA (IEEE 754) 39

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1. DESCRIPTION

The Z-KEY-U, R-KEY-LT-U, Z-KEY-2ETH-U products allow to convert data coming from the Modbus serial bus or Modbus TCP-IP Ethernet into the OPC-UA server protocol.

1.1. OPC- UA PROTOCOL

OPC Unified Architecture (OPC UA) is a cross-platform, open source IEC62541 standard for exchanging data from sensors to cloud and SCADA applications developed by the OPC Foundation.

PROTOCOL	
Type of protocol	OPC- UA Protocol OPC-UA server (IEC 62541 server) TLS 1.2 connection, X.509 certificate management 1 remote supported Client OPC- UA Modbus protocols: Modbus TCP-IP Modbus RTU Modbus ASCII Max 3 remote Modbus TCP- IP servers Max 128 serial ModBUS slave devices (for serial port) Max 1 remote supported Client Modbus TCP- IP

MEMORY	
Memory size of variables	Max 100 Tag

1.2. FEATURES OF THE "KEY" SERIES COMMUNICATION PORTS

PRODUCT	*ETHERNET PORTS*	*SERIAL PORT # 1 RS232/RS485 CONFIGURABLE*	*RS485 SERIAL PORT # 2*	*ISOLATED SERIAL PORTS*
Z-KEY-U	1	1	1	Yes, both ports
R-KEY-LT-U	1	1	NO	NO
Z-KEY-2ETH-U	2	1	1	Yes, both ports

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2. DEVICE HARDWARE REVISION

With a view to continuous improvement, Seneca updates and makes the hardware of its devices increasingly more sophisticated. It is possible to know the hardware revision of a product via the label on the side of the device.
An example of an R-KEY-LT product label is the following:



The label also shows the firmware revision present in the device (in this case 2.0.1.0) at the time of sale, the hardware revision (in this case) is E00.
To improve performance or extend functionality, Seneca recommends updating the firmware to the latest available version (see the section dedicated to the product on www.seneca.it).

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3. FLEX TECHNOLOGY FOR PROTOCOL CHANGE

Starting from the hardware revision indicated in the following table, the KEY series devices include Flex technology.

GATEWAY	*FLEX TECHNOLOGY SUPPORTED BY HARDWARE REVISION*
Z-KEY	"G00"
R-KEY-LT	"E00"
Z-KEY-2ETH	"C00"

Flex allows you to change the combination of industrial communication protocols supported by the gateways at will from a list of available ones, the development is continuously updated, for a complete list refer to the page: https://www.seneca.it/flex/

Some examples of supported protocols are:

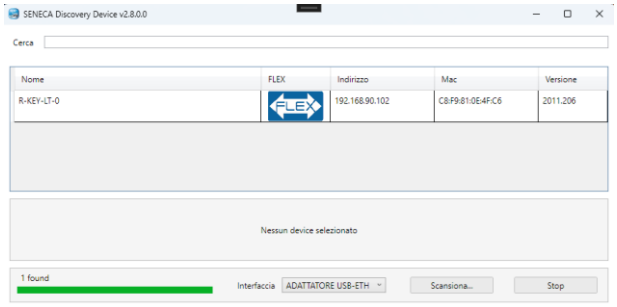
The gateway then becomes "universal" and compatible with Siemens or Rockwell or Schneider systems etc. without the need to purchase different hardware.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

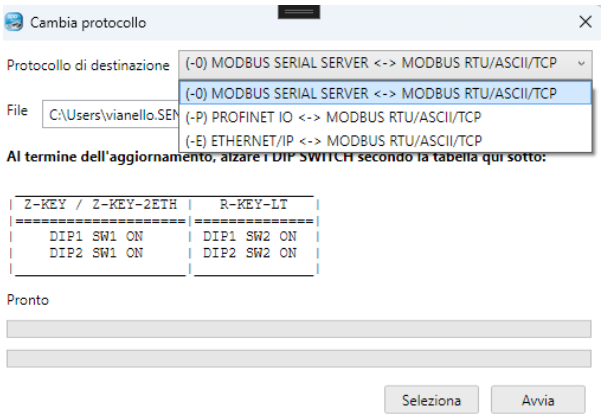
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3.1. CHANGING PROTOCOLS WITH THE SENECA DISCOVERY DEVICE SOFTWARE

From revision 2.8 the Seneca Discovery Device software identifies the devices that support the “Flex” technology:



For example, in the case in the figure it is possible to press the “Change Protocol” button and select the destination protocol from those in the list:



At the end of the operation, bring (only at the first power-on) the dip switches 1 and 2 to “ON” to force the device to default (see also the chapter “RESETTING THE DEVICE TO ITS FACTORY CONFIGURATION”).

Always refer to the user manual of the communication protocol installed in the device by downloading it from the Seneca website.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4. LED MEANING

The devices are equipped with LEDs whose meaning is as follows:

4.1. Z-KEY-U (OPC-UA) MODEL LED

LED	STATUS
PWR	***Steady on***: device powered and in OPC-UA mode ***Flashing:*** Device powered and in Webserver mode ***Off***: device not powered
COM	Not used
TX1	***Flashing:*** data transmission on serial port #1 ***Off:*** no transmission on serial port #1
RX1	***Flashing:*** data reception on serial port #1 ***Steady on:*** check wiring on serial port #1 ***Off:*** no reception on serial port #1
TX2	***Flashing:*** data transmission on serial port #2 ***Off:*** no transmission on serial port #2
RX2	***Flashing:*** data reception on serial port #2 ***Steady on:*** check wiring on serial port #2 ***Off:*** no reception on serial port #2
ETH ACT (GREEN)	***Flashing:*** presence of data on ethernet port ***Steady on:*** ethernet port connected but no data present ***Off:*** check wiring of the ethernet port
ETH LNK (YELLOW)	***Steady on:***ethernet cable connected ***Off:*** check the wiring of the ethernet port

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.2. *R-KEY-LT-U (OPC-UA) MODEL LED*

LED	*STATUS*
PWR	***Steady on***: device powered and in OPC-UA mode ***Flashing:*** Device powered and in Webserver mode ***Off***: device not powered
COM	Not used
TX	***Flashing:*** data transmission on serial port ***Off:*** no transmission on serial port
RX	***Flashing:*** data reception on serial port ***Steady on:*** check wiring on serial port ***Off:*** no reception on serial port
ETH ACT (GREEN)	***Flashing:*** presence of data on ethernet port ***Steady on:*** ethernet port connected but no data present ***Off:*** check wiring of the ethernet port
ETH LNK (YELLOW)	***Steady on:***ethernet cable connected ***Off:*** check the wiring of the ethernet port

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4.3. *Z-KEY-2ETH-U (OPC-UA) MODEL LED*

LED	*STATUS*
PWR	***Steady on***: device powered and in OPC-UA mode ***Flashing:*** Device powered and in Webserver mode ***Off***: device not powered
COM	Not used
TX1	***Flashing:*** data transmission on serial port #1 ***Off:*** no transmission on serial port #1
RX1	***Flashing:*** data reception on serial port #1 ***Steady on:*** check wiring on serial port #1 ***Off:*** no reception on serial port #1
TX2	***Flashing:*** data transmission on serial port #2 ***Off:*** no transmission on serial port #2
RX2	***Flashing:*** data reception on serial port #2 ***Steady on:*** check wiring on serial port #2 ***Off:*** no reception on serial port #2
ET1	***Flashing:*** presence of data on ethernet port #1 ***Steady on:*** ethernet port #1 connected but no data present ***Off:*** check wiring of ethernet port #1
ET2	***Flashing:*** presence of data on ethernet port #2 ***Steady on:*** ethernet port #2 connected but no data present ***Off:*** check wiring of ethernet port #2

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

5. ETHERNET PORT

The factory configuration of the Ethernet port is:

STATIC IP: 192.168.90.101
SUBNET MASK: 255.255.255.0
GATEWAY: 192.168.90.1

Multiple devices must not be inserted on the same network with the same static IP.

⚠ ATTENTION!

DO NOT CONNECT 2 OR MORE FACTORY-CONFIGURED DEVICES ON THE SAME NETWORK, OR THE DEVICE WILL NOT WORK
(CONFLICT OF IP ADDRESSES 192.168.90.101)

6. FIRMWARE UPDATE

In order to improve, add or optimize the functions of the product, Seneca releases firmware updates on the device section on the www.seneca.it website

The firmware update is performed using Seneca tools or the webserver.

⚠ ATTENTION!

NOT TO DAMAGE THE DEVICE DO NOT REMOVE THE POWER SUPPLY DURING THE FIRMWARE UPDATE OPERATION.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

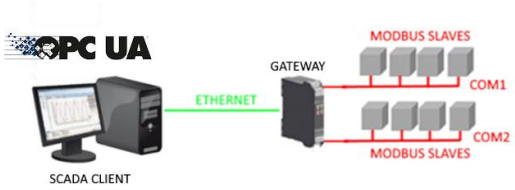
7. OPERATING MODE

The Gateway allows you to operate in the following mode:

OPC-UA SERVER / MODBUS SERIAL-ETHERNET MASTER/CLIENT

7.1. OPC-UA SERVER / MODBUS MASTER

This operating mode allows to connect an OPC-UA SCADA client with Modbus RTU/ASCII Slave and/or remote TCP Server I/O devices





The Gateway, on the field side, works as a Modbus master / Modbus Client device and on the other side as an IEC 61850 server via Ethernet.
The Modbus requests (read or write commands) are configured in the gateway device and an ICD file is automatically generated according to the SCL standard.
Once this file is imported into the SCADA (it is also possible to search for the node) all the configured IO will be accessible without any other configuration.

In addition to the serial devices, it is also possible to connect up to 3 remote Modbus TCP-IP servers.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

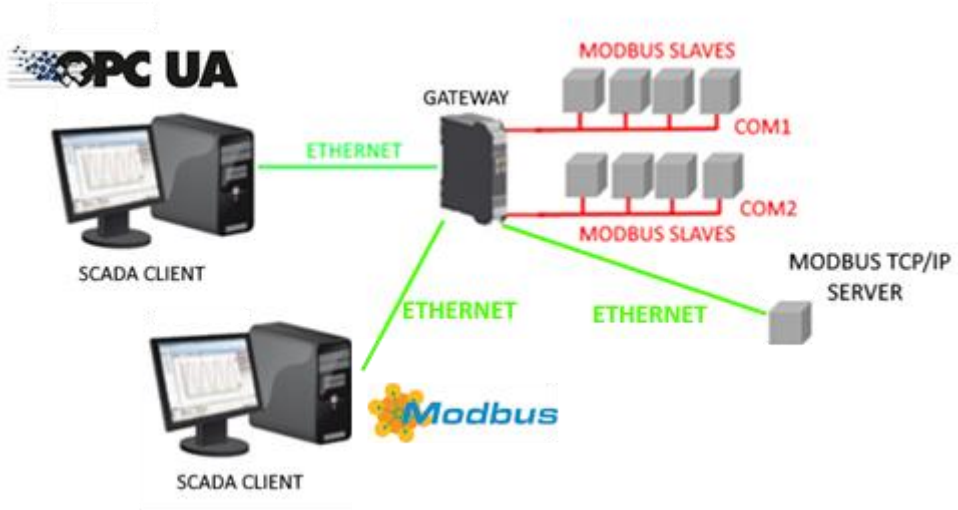
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7.2. OPC-UA SERVER / MODBUS MASTER / CLIENT MODBUS TCP-IP

In addition to the OPC-UA server, the Gateway also provides a Modbus TCP-IP server with the support for 1 remote client.

> ***ATTENTION!***
>
> ***IN ADDITION TO OPC-UA SERVER, THE DEVICE ALSO ACTIVATE A MODBUS TCP-IP SERVER***

It is therefore possible to obtain connections of the type:



ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

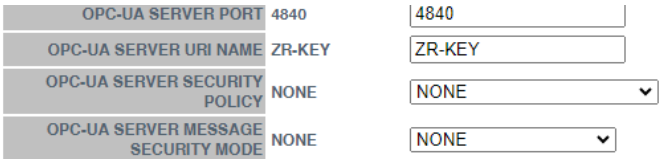
8. GATEWAY CONFIGURATION

8.1. CONFIGURATION OF THE UaEXPERT™ CLIENT FOR BASIC CONNECTION

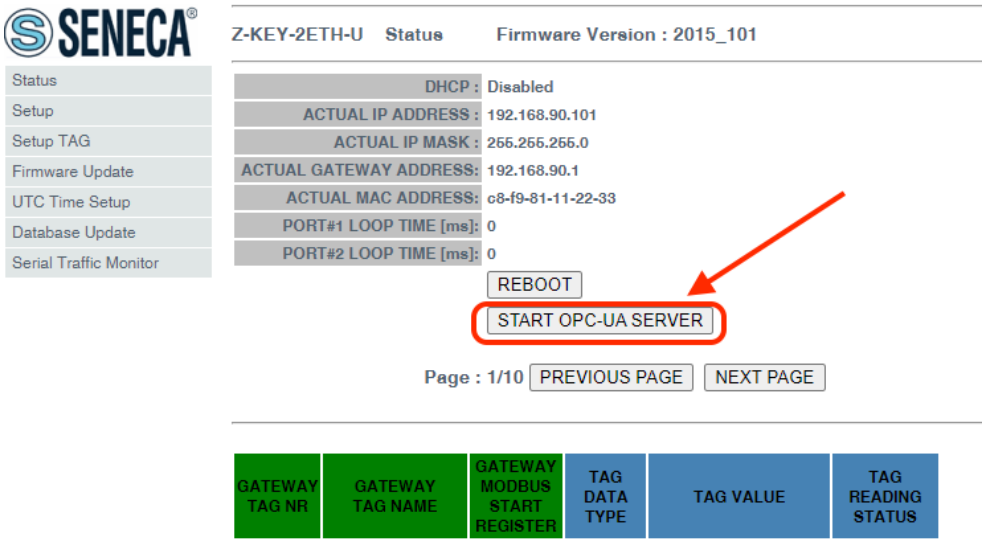
To perform a test connection, use the UaExpert™ software.
UaExpert™ is a complete OPC UA client capable of supporting different OPC UA profiles and features.
The free version can be downloaded from the link:

https://www.unified-automation.com/downloads.html

First, we bring the device into WEB mode (see the relevant chapter of this manual) and configure the OPC-UA server parameters in the device's web server (setup section):



Now we need to activate the OPC-UA protocol in the gateway, from the “Status” web page:

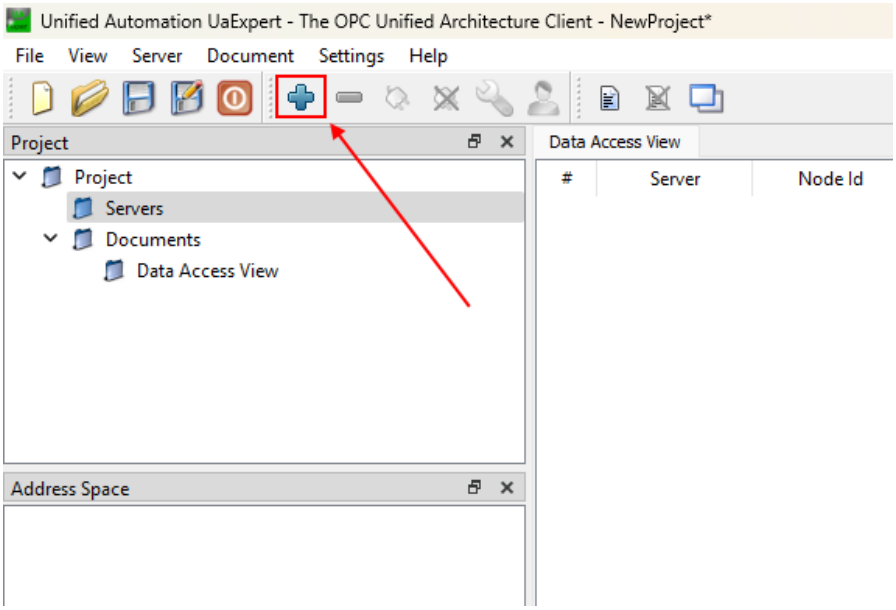


At this point, the web server is disabled and the OPC-UA server is enabled.

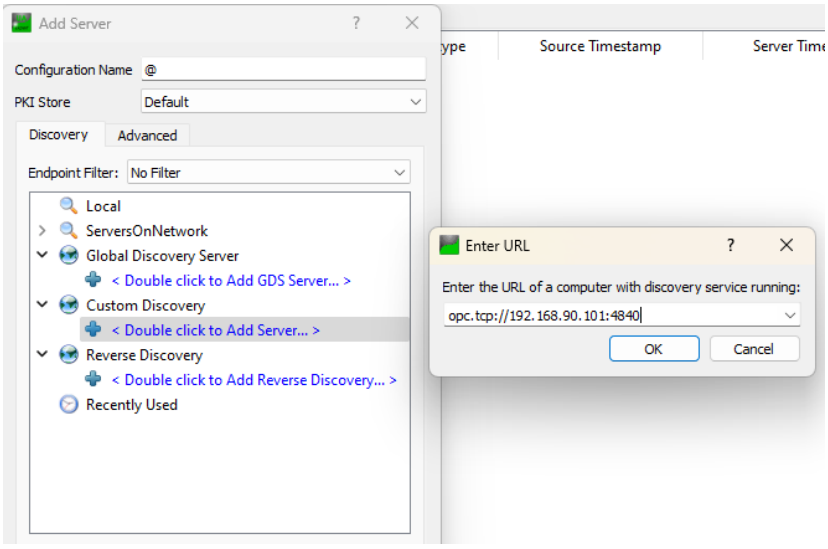
ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Now open the OPC-UA client and press the “+” icon to add an OPC-UA server:



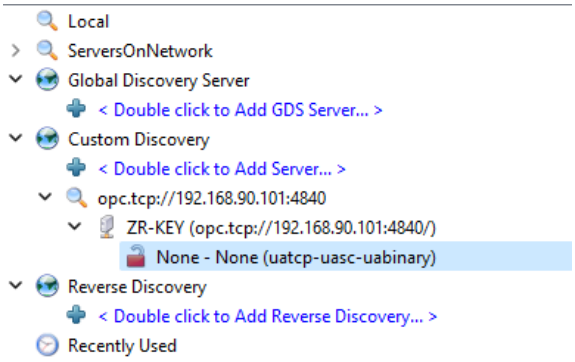
At this point under "Custom directory" we enter the IP address of the Z-KEY-U device (192.168.90.101 in the example) and the configured port (4840 in the example):



ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

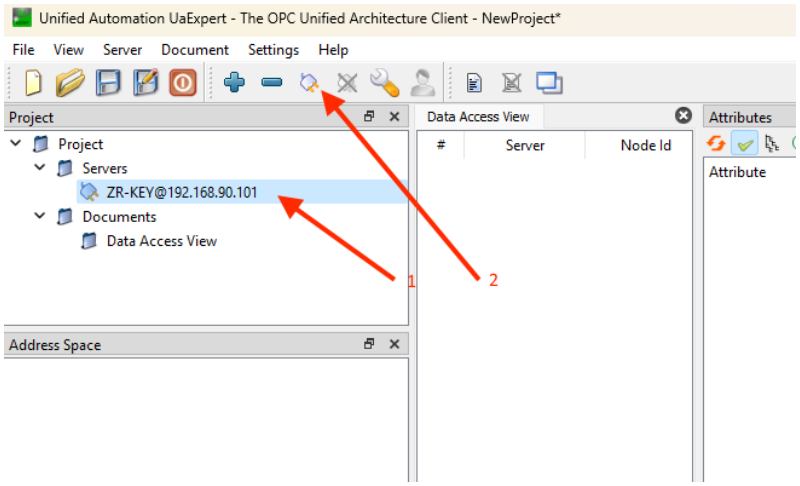
By pressing OK the server is added to the list, select the desired encryption (None in this example):



Press OK

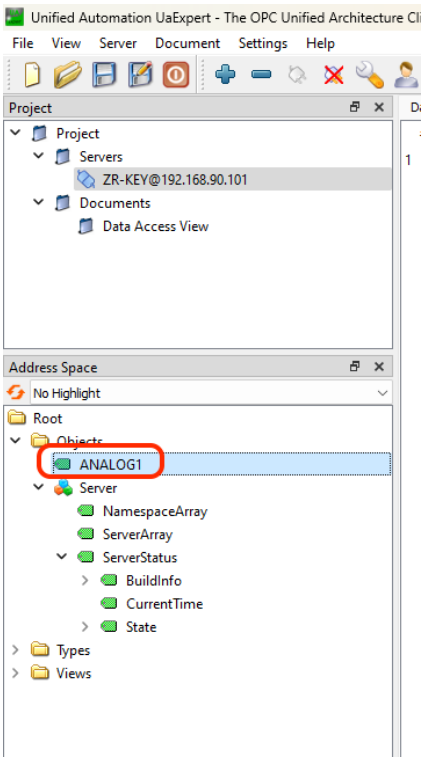
Now the server is added.

First select the server and then press the connection icon:

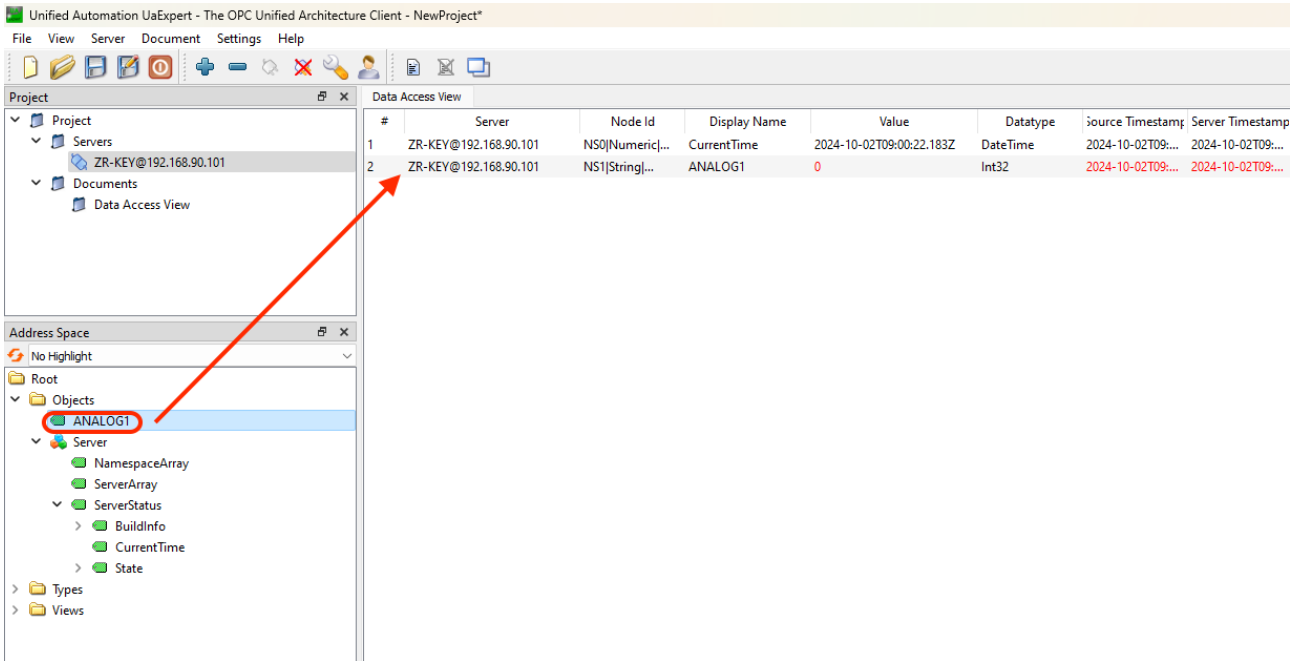


LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Now the connection is established and the configured list of variables appears:



Now you can drag the variables you want to view:



It is also possible to write to read/write variables.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9. GATEWAY WEBSERVERS

9.1. "-U" GATEWAY WEBSERVER

9.1.1. WEBSERVER MODE AND OPC-UA MODE

To access the internal webserver, you must put the device in Webserver mode.
To make the OPC-UA server work, you need to disable the webserver.

9.1.2. WEB/OPCUA WORKING STATUS

To know the current working state (OPC-UA or WEBSERVER):

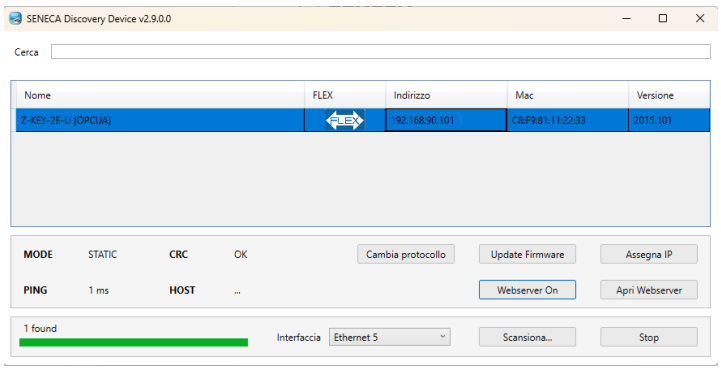
9.1.2.1. LED SD/COM

If the device is in Webserver mode the SD/COM LEDs flash slowly.

If the device is in OPC-UA server mode the SD/COM LEDs are on.

9.1.2.2. SENECA DISCOVERY DEVICE

The gateway status can be read also by the Seneca Discovery Device software:



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.3. CHANGE OF WEB/OPC-UA OPERATING MODE

9.1.3.1. MANUAL PROCEDURE FOR SWITCHING FROM OPC-UA MODE TO WEBSERVER MODE AND VICE VERSA

To force webserver mode:

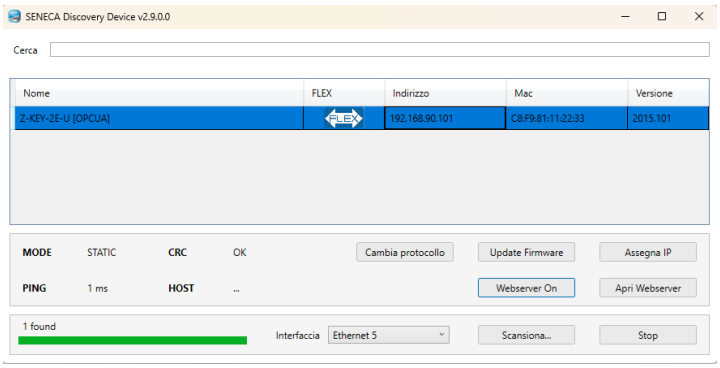
1) Turn on the device
2) Keep the PS1 button pressed until all LEDs turn off
3) Release the button
4) The device restarts and the “PWR” led flash slowly to indicate webserver mode

To force OPC-UA mode

1) Turn on the device
2) Keep the PS1 button pressed until all LEDs turn off
3) Release the button
   The device restarts and the “PWR” led flash slowly to indicate OPC-UA mode

9.1.3.2. SENECA DISCOVERY DEVICE

It is possible to change the Webserver/OPC-UA mode from the Seneca Discovery Device software:

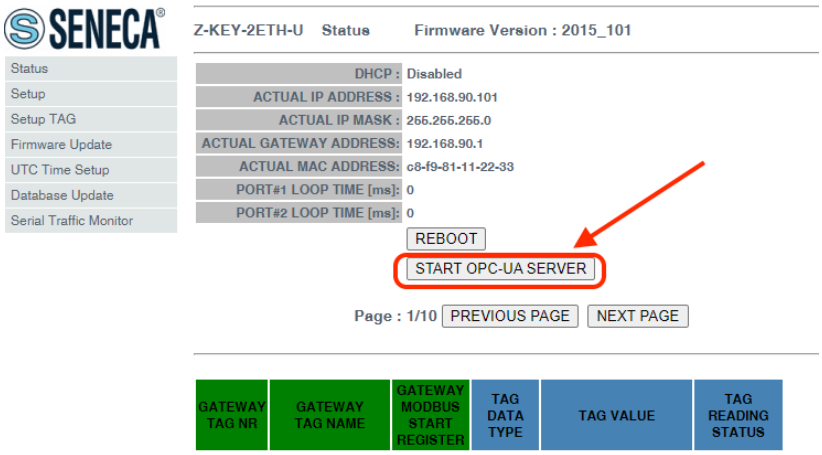


ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.3.3. WEB SERVER

You can switch from Webserver only to OPC-UA mode via the Status web page:

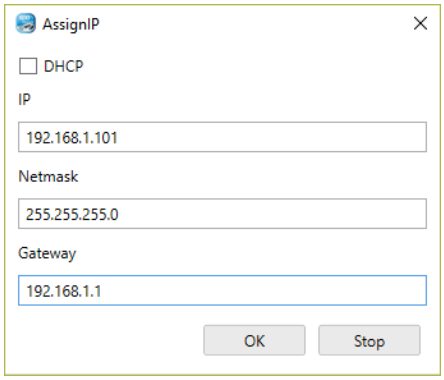


9.1.4. STEP BY STEP GUIDE FOR THE FIRST ACCESS TO THE WEBSERVER

STEP 1: POWER THE DEVICE AND CONNECT THE ETHERNET PORT, PUT THE DEVICE IN WEBSERVER MODE

SENECA DISCOVERY DEVICE SOFTWARE STEP 2

If you need to change the IP address of the device (default 192.168.90.101), launch the Seneca Discovery Device software and perform the SCAN, select the device and press the “Assign IP” button, set a configuration compatible with your PC, for example:



Confirm with OK. Now the device can be reached via Ethernet from your PC.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

STEP 3 ACCESS TO THE CONFIGURATION WEBSERVER

ENTER your access credentials:
user: admin
password: admin

⚠ ATTENTION!
THE WEB BROWSERS WHICH HAVE BEEN TESTED FOR COMPATIBILITY WITH THE DEVICE WEBSERVER ARE:
MOZILLA FIREFOX AND GOOGLE CHROME.
THEREFORE, THE OPERATION WITH OTHER BROWSERS IS NOT GUARANTEED

9.1.5. WEBSERVER DEVICE CONFIGURATION

For further information on the access to the webserver of a new device, please refer to chapter 9.1.4.

⚠ ATTENTION!
THE WEB BROWSERS WHICH HAVE BEEN TESTED FOR COMPATIBILITY WITH THE DEVICE WEBSERVER ARE:
MOZILLA FIREFOX AND GOOGLE CHROME.
THEREFORE, THE OPERATION WITH OTHER BROWSERS IS NOT GUARANTEED

⚠ ATTENTION!
AFTER THE FIRST ACCESS CHANGE USER NAME AND PASSWORD IN ORDER TO PREVENT ACCESS TO THE DEVICE TO UNAUTHORIZED PEOPLE.

⚠ ATTENTION!
IF THE PARAMETERS TO ACCESS THE WEBSERVER HAVE BEEN LOST, TO ACCESS IT, IT IS NECESSARY TO GO THROUGH THE PROCEDURE TO RESET THE FACTORY-SET CONFIGURATION

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.5.1. WEBSERVER SECTIONS

The Webserver is divided into pages (sections) representing the various gateway functions:

Status
It is the section that displays the values of Modbus requests in real time.

Setup
This is the section that allows the basic configuration of the device, it also allows you to export or import a configuration.

Setup Tag
It is the section that allows you to add/modify the Modbus device TAGs connected to the gateway.

Firmware Update
This is the section that allows you to update the device firmware.

UTC Time Setup
This allows you to set the device date/time

Database Update
This allows you to update the TAG list of Seneca devices

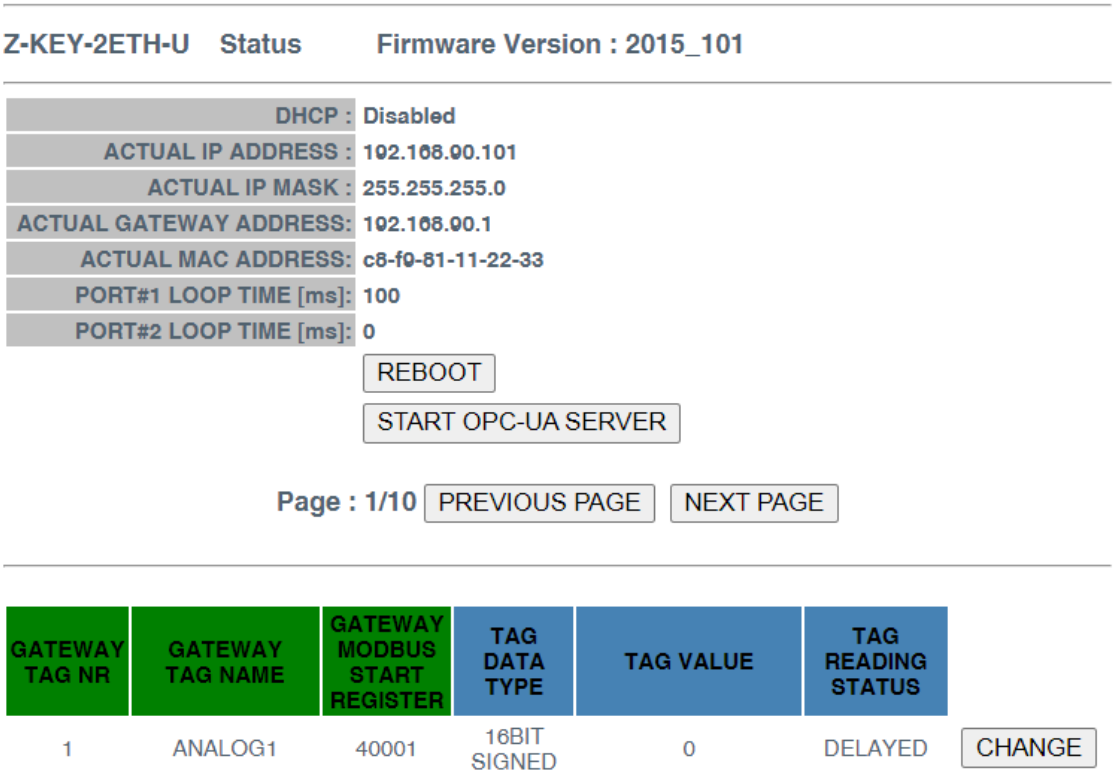
Serial Traffic Monitor
It allows to analyse the ModBUS frames of the serials.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.5.2. "STATUS" SECTION

The Status section displays the status of the values acquired from modbus:



It is also possible to force tag writing with the "CHANGE" button.
The START OPC-UA SERVER button allows you to restart the device by activating the OPC-UA server instead of the web server (see the relevant chapter in this manual).
The REBOOT button restarts the device.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.5.3. "SETUP" SECTION

At the top of the web page you can load a configuration or save one with the buttons "Load conf file" and "Save conf file".

A configuration includes the configured tags.



DHCP (ETH) (default: Disabled)
Sets the DHCP client to get an IP address automatically.

STATIC IP (default: 192.168.90.101)
Sets the device static address. Careful not to enter devices with the same IP address into the same network.

STATIC IP MASK (default: 255.255.255.0)
Sets the mask for the IP network.

STATIC GATEWAY (default: 192.168.90.1)
Sets the gateway address.

TCP-IP PORT (default: 502)
Sets the communication port for the Modbus TCP-IP client protocol.

TCP-IP TIMEOUT [ms] (default 512 ms)
Sets the waiting time for a request to be considered in timeout.

PORT #1 MODBUS PROTOCOL (default RTU)
Sets the protocol on the serial between Modbus RTU or Modbus ASCII

PORT #2 MODBUS PROTOCOL (default RTU)
Sets the protocol on the serial between Modbus RTU or Modbus ASCII

PORT #1 BAUDRATE (default: 38400 baud)
Selects the communication speed of the COM #1 serial port

PORT #1 DATA BITS (default: 38400 baud)
Selects the communication speed of the COM #1 serial port

PORT #1 PARITY (default: None)

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Sets the parity for the COM #1 serial communication port.

PORT #1 STOP BIT (default: 1)
Sets the number of stop bits for the COM #1 serial communication port.

PORT #1 TIMEOUT [ms]
Sets the wait time before defining fail.

PORT #1 WRITING RETRIES (default: 3)
Selects the number of writing attempts to be made on a serial slave before returning an error.

PORT #1 MAX READ NUM
Sets the maximum number of simultaneous serial reading ModBUS registers, the firmware will use this value to optimize the ModBUS readings.

PORT #1 MAX WRITE NUM
Sets the maximum number of simultaneous writing ModBUS registers of the serial, the firmware will use this value to optimize the ModBUS writings.

PORT #2 BAUDRATE (default: 38400 baud) (only for Z-KEY-U and Z-KEY-2ETH-U)
Selects the communication speed of the COM #2 serial port

PORT #2 DATA BITS (default: 38400 baud) (only for Z-KEY-U and Z-KEY-2ETH-U)
Selects the communication speed of the COM #2 serial port

PORT #2 PARITY (default: None) (only for Z-KEY-U and Z-KEY-2ETH-U)
Sets the parity for the COM #2 serial communication port.

PORT #2 STOP BIT (default: 1) (only for Z-KEY-U and Z-KEY-2ETH-U)
Sets the number of stop bits for the COM #2 serial communication port.

PORT# 2 TIMEOUT [ms] (only for Z-KEY-U and Z-KEY-2ETH-U)
Sets the wait time before defining fail.

PORT #2 WRITING RETRIES (default: 3) (only for Z-KEY-U and Z-KEY-2ETH-U)
Selects the number of writing attempts to be made on a serial slave before returning an error.

PORT #2 MAX READ NUM (only for Z-KEY-U and Z-KEY-2ETH-U)
Sets the maximum number of simultaneous reading ModBUS registers of the remote TCP-IP Modbus server, the firmware will use this value to optimize the ModBUS readings.

PORT #2 MAX WRITE NUM (only for Z-KEY-U and Z-KEY-2ETH-U)

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Sets the maximum number of simultaneous writing ModBUS registers of the serial, the firmware will use this value to optimize the ModBUS writings.

WEB SERVER PORT (default: 80)
Sets the communication port for the web server.

WEB SERVER AUTHENTICATION USER NAME (default: admin)
Sets the username to access the webserver.

WEB SERVER PASSWORD (default: admin)
Sets the password to access the webserver and to read/write the configuration (if enabled).

IP CHANGE FROM DISCOVERY (default: Enabled)
Selects whether or not the device accepts the IP address change from the Seneca Discovery Device software.

DIAGNOSTIC REGISTERS MAPPING
You can choose whether the diagnostic registers are placed on Holding registers or Input Registers.

DIAGNOSTIC REGISTERS START ADDRESS
It is the starting address of the diagnostic registers

PORT#1 TAGS QUARATINE [s]
Sets the number of quarantine seconds after a tag has been declared in fail (i.e. these tags are no longer considered) before being interrogated again.

PORT TAGS QUARATINE [s] (*only for Z-KEY-U and Z-KEY-2ETH-U)*
Sets the number of quarantine seconds after a tag has been declared in fail (i.e. these tags are no longer considered) before being interrogated again.

MODBUS TCP-IP CLIENT
Enables or not the TCP-IP client Modbus

MODBUS TCP-IP SERVER#1…10 PORT
Sets the port for the max 10 remote TCP-IP Modbus servers

MODBUS TCP-IP SERVER#1…10 ADDRESS
Sets the IP address for the max 10 remote TCP-IP Modbus servers

MODBUS TCP-IP CLIENT TIMEOUT [ms]
Sets the timeout for remote TCP-IP Modbus servers

MODBUS TCP-IP CLIENT DELAY BETWEEN POLLS [ms]

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Sets the time between requests for remote Modbus TCP-IP servers

MODBUS TCP-IP CLIENT WRITING RETRIES

Selects the number of writing attempts to be made on a remote TCP-IP Modbus server before returning an error and activating the quarantine.

MODBUS TCP-IP CLIENT MAX READ NUM

Sets the maximum number of simultaneous reading ModBUS registers of the remote TCP-IP Modbus server, the firmware will use this value to optimize the ModBUS readings.

MODBUS TCP-IP CLIENT MAX WRITE NUM

Sets the maximum number of simultaneous writing ModBUS registers of the remote TCP-IP Modbus server, the firmware will use this value to optimize the ModBUS writings.

STOP MODBUS READING WHEN NO OPC-UA CONNECTION

If active, it allows to stop the modbus communication when the communication with the OPC-UA client is lost. This allows to trigger any timeouts present in the modbus slave/server devices.

SYNC CLOCK WITH INTERNET TIME

Allows you to enable date/time updating via connection to NTP servers (RFC 5905).

⚠ATTENTION!

AT EACH SWITCHING OFF THE DEVICE MUST BE ABLE TO RETRIEVE THE DATE/TIME FROM AN NTP SERVER OTHERWISE THIS WILL BE SET TO 1/1/1970 0:00

⚠ATTENTION!

PLEASE REMEMBER THAT NTP SERVERS USE THE UDP 123 PORT (WHICH MUST THEREFORE ALWAYS BE OPEN IN THE CONFIGURATION OF THE NETWORK USED)

NTP SERVER 1 ADDRESS

This is the IP address of the first NTP server (for example 193.204.114.232 for INRIM's NTP)

NTP SERVER 2 ADDRESS

This is the IP address of the second NTP server (in case the first one does not respond)

WATCHDOG

Enables or disables automatic device reboot with adjustable cycle time

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

WATCHDOG TIMEOUT [min]
Sets the device auto-reboot time

OPC-UA SERVER PORT
Sets the port for the OPC-UA server.

OPC-UA SERVER URI NAME
Sets the URI (Uniform Resource Identifier) of the OPC-UA server

OPC-UA SERVER SECURITY POLICY
Selects whether the connection should be secure (encrypted) or not. In this case, you can choose the crypto algorithm to use.

OPC-UA SERVER MESSAGE SECURITY MODE
OPC UA supports the selection of different security modes: “None”, “Sign”, “SignAndEncrypt”. The “None” security mode can only be used with the None security profile.

The choice of “Sign” or “SignAndEncrypt” depends on the CSMS (Cyber Security Management System), in some applications where data confidentiality is not required, “Sign” may be sufficient.

OPC-UA AUTHENTICATION
Sets whether the connection is to be ‘Anonymous’ or with ‘User/Password’

OPC-UA AUTHENTICATION. USER
If authentication is set to ‘User/Password’ this represents the user name

OPC-UA AUTHENTICATION. PASSWORD
If authentication is set to ‘User/Password’ this represents the password

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9.1.5.4. "SETUP TAGS" SECTION"

In this section you can add, modify or delete a modbus TAG, a TAG represents a variable that will then be displayed on the OPC-UA server. A TAG consists of one or more modbus registers depending on the type.

It is also possible to compose and import the list of TAGs from the Excel template available on the Seneca website on the device page.

You can select multiple tags at the same time by holding down the CTRL key and clicking the desired tags.

Using the ADD button you can add a new TAG.
Using the CLONE button it is possible to clone one or more TAGs.
Using the DELETE button it is possible to delete the selected TAGs.
Using the MOVE UP/ DOWN button it is possible to move the selected TAG.

GATEWAY MODBUS START REGISTER
This is the register in which to store the value of the TAG, it must be a progressive number. The 1-based convention is used (i.e. 1= 40001 / 30001) etc…

GATEWAY TAG NAME
This is the identifying name of the TAG as it will appear in the OPC-UA server.

TARGET MODBUS DEVICE
It represents the Seneca Modbus device selected from those available in the database.
In the case of a non-Seneca device or for advanced configurations, select CUSTOM.

TARGET RESOURCE
It represents the Seneca device variable you want to add.

TARGET CONNECTED TO
It selects the serial or server to be used to acquire the specified TAG.

TARGET MODBUS STATION ADDRESS
It selects the station address to use for the TAG.

TARGET MODBUS START REGISTER
It represents the starting Modbus address of the command (in the case of a Seneca device it is filled in automatically).

TARGET MODBUS REQUEST TYPE
It represents the type of Modbus command to use (Read Holding Register, Coil etc.).
In the case of a Seneca device it is filled in automatically.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

TARGET REGISTER DATA TYPE

It selects the type of data associated with the TAG, you can choose between:
various types of data from 1 to 64 bit with or without sign.

9.1.5.1. "FIRMWARE UPDATE" SECTION

In order to improve, add, optimize the functions of the product, Seneca releases firmware updates on the device section on the www.seneca.it website

⚠ ATTENTION!

NOT TO DAMAGE THE DEVICE DO NOT REMOVE THE POWER SUPPLY DURING THE FIRMWARE UPDATE OPERATION.

9.1.5.1. UTC TIME SETUP

It allows you to manually set the date/time in CUT (Coordinated Universal Time) format.

⚠ ATTENTION!

IF AN NTP SERVER IS NOT SET, THE DEVICE WILL HAVE THE DATE/TIME 1/1/1970 0:00 WHEN IT RESTARTS

9.1.5.1. "DATABASE UPDATE" SECTION

This section allows you to send or delete a certificate and/or the private key of the device.
The used format is PEM.
It is also possible to update the database with Seneca device registers.

9.1.5.2. SERIAL "SERIAL TRAFFIC MONITOR"

Allows you to view the serial packets that are in transit.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

10. RESETTING THE DEVICE TO ITS FACTORY CONFIGURATION

The factory configuration resets all parameters to default.

To reset the device to the factory configuration it is necessary to follow the procedure below:

Z-KEY-U/ Z-KEY-2ETH-U:

1) Remove power from the device
2) Turn dip switches 1 and 2 to ON
3) Power up the device and wait at least 10 seconds
4) Remove power from the device
5) Turn dip switches 1 and 2 to OFF
6) At the next restart the device will have loaded the factory configuration

R-KEY-LT-U:

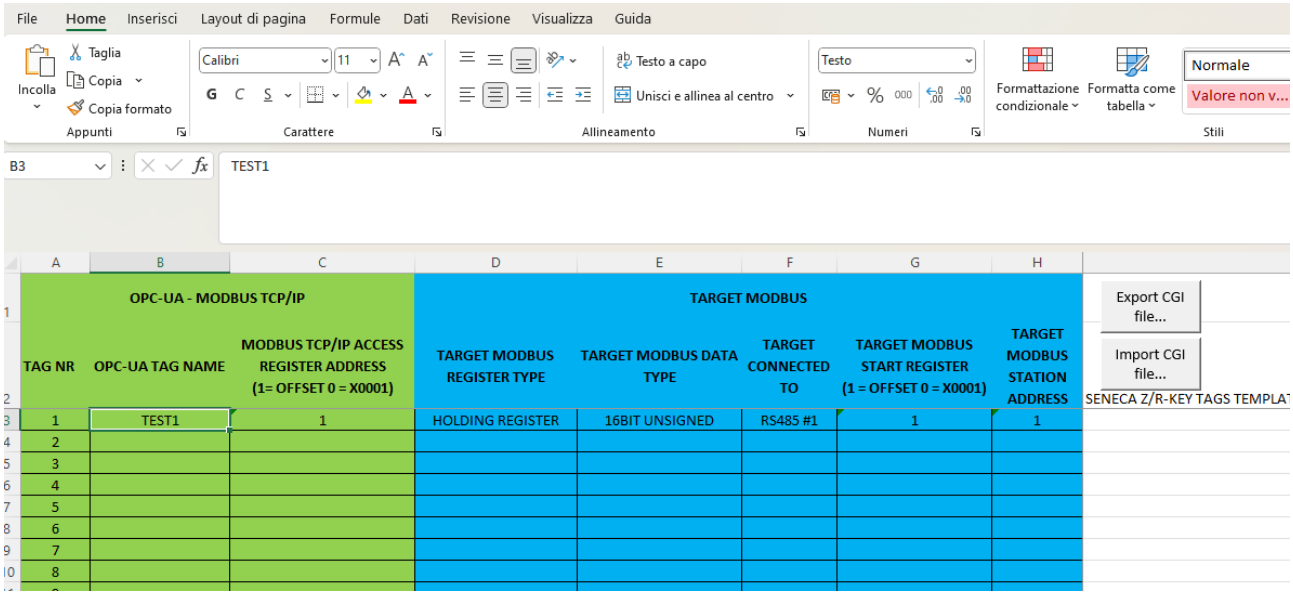
1) Remove power from the device
2) Set dip switches 1 and 2 of SW2 to ON
3) Power up the device and wait at least 10 seconds
4) Remove power from the device
5) Turn 2 SW2 dip switches to OFF.
6) At the next restart the device will have loaded the factory configuration

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

11. TEMPLATE EXCEL

The preparation of the Tag configuration can be a frustrating operation if done with the webserver, so a software and a Microsoft Excel™ Template are available to create a .bin file to import into the gateway. The model can be freely downloaded from the Seneca website.



ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

12. SUPPORTED MODBUS COMMUNICATION PROTOCOLS

The Modbus communication protocols supported are:

- Modbus RTU/ASCII master (from #1 and #2 serial ports)
- Modbus TCP-IP Client (from the Ethernet port) up to 10 remote TCP-IP Modbus Servers

For more information on these protocols, see the website:
http://www.modbus.org/specs.php.

12.1. SUPPORTED MODBUS FUNCTION CODES

The following Modbus functions are supported:

- Read Coils (function 1)
- Read Discrete Inputs (function 2)
- Read Holding Registers (function 3)
- Read Input Registers (function 4)
- Write Single Coil (function 5)
- Write Single Register (function 6)
- Write multiple Coils (function 15)
- Write Multiple Registers (function 16)

⚠ ATTENTION!
All 32-bit variables are contained in 2 consecutive Modbus registers
All 64-bit variables are contained in 4 consecutive Modbus registers

13. SENECA DISCOVERY DEVICE

The Seneca Discovery Device Tool is available free of charge from the Seneca website.
With this software it is possible to search for Seneca devices via the Ethernet port and change the current IP configuration even if the PC has a different subnet.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

14. INFORMATION ABOUT MODBUS REGISTERS

The following abbreviations are used in the following chapter:

MS	Most Significant
LS	Least Significant
MSBIT	Most Significant Bit
LSBIT	Least Significant Bit
MMSW	“Most” Most Significant Word (16bit)
MSW	Most Significant Word (16bit)
LSW	Least Significant Word (16bit)
LLSW	“Least” Least Significant Word (16bit)
RO	Read Only
RW*	Read-Write: REGISTERS CONTAINED IN FLASH MEMORY: WRITABLE ABOUT 10,000 TIMES MAXIMUM
RW**	Read-Write: REGISTERS THAT CAN BE WRITTEN ONLY AFTER WRITING THE COMMAND "ENABLE WRITE CUSTOM ENERGIES = 49616"
UNSIGNED 16 BIT	Unsigned integer register that can assume values from 0 to 65535
SIGNED 16 BIT	Signed integer register that can take values from -32768 to +32767
UNSIGNED 32 BIT	Unsigned integer register that can assume values from 0 to 4294967296
SIGNED 32 BIT	Signed integer register that can take values from -2147483648 to 2147483647
UNSIGNED 64 BIT	Unsigned integer register that can assume values from 0 to 18446744073709551615
SIGNED 64 BIT	Signed integer register that can assume values from -2^63 to 2^63-1
FLOAT 32 BIT	32-bit, single-precision floating-point register (IEEE 754) https://en.wikipedia.org/wiki/IEEE_754
BIT	Boolean register, which can take the values 0 (false) or 1 (true)

14.1. NUMBERING OF "0-BASED" OR "1-BASED" MODBUS ADDRESSES

According to the Modbus standard the Holding Registers are addressable from 0 to 65535, there are 2 different conventions for numbering the addresses: "0-BASED" and "1-BASED".
For greater clarity, Seneca shows its register tables in both conventions.

ATTENTION!

CAREFULLY READ THE DOCUMENTATION OF THE MODBUS MASTER DEVICE IN ORDER TO UNDERSTAND WHICH OF THE TWO CONVENTIONS THE MANUFACTURER HAS DECIDED TO USE

SENECA USES THE “1 BASED” CONVENTION FOR ITS PRODUCTS

14.2. NUMBERING OF MODBUS ADDRESSES WITH "0-BASED" CONVENTION

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

The numbering is:

HOLDING REGISTER MODBUS ADDRESS (OFFSET)	*MEANING*
0	FIRST REGISTER
1	SECOND REGISTER
2	THIRD REGISTER
3	FOURTH REGISTER
4	FIFTH REGISTER

Therefore, the first register is at address 0.
In the following tables, this convention is indicated with ***"ADDRESS OFFSET".***

14.3. NUMBERING OF MODBUS ADDRESSES WITH "1 BASED" CONVENTION (STANDARD)

The numbering is that established by the Modbus consortium and is of the type:

HOLDING REGISTER MODBUS ADDRESS 4x	*MEANING*
40001	FIRST REGISTER
40002	SECOND REGISTER
40003	THIRD REGISTER
40004	FOURTH REGISTER
40005	FIFTH REGISTER

This convention is indicated with ***"ADDRESS 4x"*** since a 40000 is added to the address so that the first Modbus register is 40001.
A further convention is also possible where the number 4 is omitted in front of the register address:

HOLDING MODBUS ADDRESS WITHOUT 4x	*MEANING*
1	FIRST REGISTER
2	SECOND REGISTER
3	THIRD REGISTER
4	FOURTH REGISTER
5	FIFTH REGISTER

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

14.4. BIT CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

For instance, if the value of the register in decimal is
12300
the value 12300 in hexadecimal is:
0x300C

the hexadecimal 0x300C in binary value is:
11 0000 0000 1100

So, using the above convention, we get:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0

14.5. MSB and LSB BYTE CONVENTION WITHIN A MODBUS HOLDING REGISTER

A Modbus Holding Register consists of 16 bits with the following convention:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

LSB Byte (Least Significant Byte) defines the 8 bits ranging from Bit 0 to Bit 7 included, we define MSB Byte (Most Significant Byte) the 8 bits ranging from Bit 8 to Bit 15 inclusive:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE MSB								BYTE LSB							

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

14.6. REPRESENTATION OF A 32-BIT VALUE IN TWO CONSECUTIVE MODBUS HOLDING REGISTERS

The representation of a 32-bit value in the Modbus Holding Registers is made using 2 consecutive Holding Registers (a Holding Register is a 16-bit register). To obtain the 32-bit value it is therefore necessary to read two consecutive registers:
For example, if register 40064 contains the 16 most significant bits (MSW) while register 40065 contains the least significant 16 bits (LSW), the 32-bit value is obtained by composing the 2 registers:

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40064 MOST SIGNIFICANT WORD															

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
40065 LEAST SIGNIFICANT WORD															

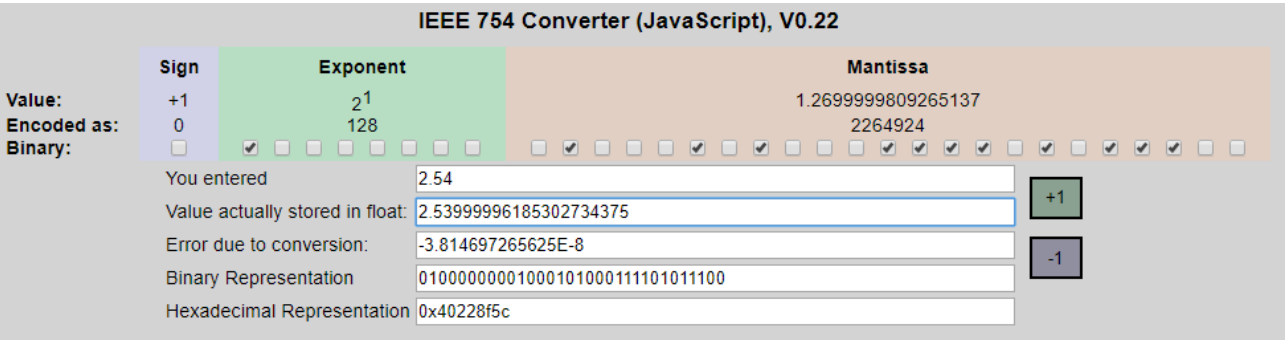
$$Value_{32bit} = Register_{LSW} + (Register_{MSW} * 65536)$$

In the reading registers it is possible to swap the most significant word with the least significant word, therefore it is possible to obtain 40064 as LSW and 40065 as MSW.

14.7. TYPE OF 32-BIT FLOATING POINT DATA (IEEE 754)

The IEEE 754 standard (https://en.wikipedia.org/wiki/IEEE_754) defines the format for representing floating point numbers.
As already mentioned, since it is a 32-bit data type, its representation occupies two 16-bit holding registers.
To obtain a binary/hexadecimal conversion of a floating point value it is possible to refer to an online converter at this address:

http://www.h-schmidt.net/FloatConverter/IEEE754.html



ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Using the last representation the value 2.54 is represented at 32 bits as:

0x4022 8F5C

Since we have 16-bit registers available, the value must be divided into MSW and LSW:

0x4022 (16418 decimal) are the 16 most significant bits (MSW) while 0x8F5C (36700 decimal) are the 16 least significant bits (LSW).

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT PRIOR PERMISSION.

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000