

# User manual Web BACnet Router

Version: 1.0

Copyright © 2013 by EUROICC. All rights reserved. Published in Serbia. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of EUROICC. Information in this document is subject to change without notice.

WARNING: This document contains EUROICC's confidential and proprietary information.

UNAUTHORIZED COPYING, USE, DISTRIBUTION, PUBLICATION, TRANSFER, SALE, RENTAL OR DISCLOSURE IS PROHIBITED AND MAY RESULT IN SERIOUS LEGAL CONSEQUENCES. Do not copy or circulate this document without EUROICC's express written permission. Use of any portion of the contents of this document is subject to and restricted by your signed written agreement with EUROICC.

# **1** Table of Contents

Т	able o	f Contents	2
1.2	Intro	duction to user manual	4
lr	ntrodu	ction to Web BACnet Router	6
2.1	Wha	t is Web BACnet Router	6
2.2	Tech	nical Data	6
2.3	Wirir	ng Diagram	8
2.4	Mou	nting	9
2.5	Batte	ery Replacement	9
C	Quick S	Start Guide	.11
С	Configu	uration	.12
4.1	Main	Menu on Index Page	.13
4.2	Data	link layer configuration	.14
4	.2.1	MS/TP	.16
4	.2.2	BACnet/IP (B/IP)	.18
4	.2.3	Modbus-to-BACnet (M2B)	.22
4.3	Appl	ication layer configuration	.25
4.4	IP in	terface settings	.26
4.5	Save	e and load configuration	.27
4.6	Expo	ort/Import configuration	.27
4.7	Coni	necting to WBR via USB	.28
4	.7.1	For Windows XP	.28
4	.7.2	For Windows 7	.38
4	.7.3	For MAC OS	.45
4	.7.4	For Linux	.47
V	Veb B/	ACnet Router Control (start   stop   restart)	.48
V	Veb B/	ACnet Router Status (run   error   idle   bad configuration)	.49
	1.2 In 2.1 2.2 2.3 2.4 2.5 C 4.1 4.2 4 4.3 4.4 4.3 4.5 4.6 4.5 4.6 4.5 4.6 4.7 4.2 4.0 4.2 4.1 4.2 4.1 4.2 4.1 4.2 4.1 4.2 4.1 4.2 4.1 4.2 4.1 4.2 4.2 4.1 4.2 4.2 4.2 4.2 4.2 4.2 4.2 4.2 4.2 4.2	<ol> <li>1.2 Intro Introdu</li> <li>2.1 What</li> <li>2.2 Tech</li> <li>2.3 Wirin</li> <li>2.4 Mou</li> <li>2.5 Batta</li> <li>Quick S</li> <li>Configu</li> <li>4.1 Main</li> <li>4.2 Data</li> <li>4.2.1</li> <li>4.2.1</li> <li>4.2.2</li> <li>4.2.3</li> <li>4.3 Appl</li> <li>4.4 IP in</li> <li>4.5 Save</li> <li>4.6 Expo</li> <li>4.7 Cons</li> <li>4.7.1</li> <li>4.7.2</li> <li>4.7.3</li> <li>4.7.4</li> <li>Web B/</li> </ol>	Introduction to Web BACnet Router

7		Vi	iew BACnet devices	.50
	7.′	1	Change BACnet properties	.51
8		Sı	upported BACnet services	.52
	8.′	1	Who-is Service	.53
	8.2	2	Who-has Service	.53
	8.3	3	ReadProperty Service	.54
	8.4	4	ReadPropertyMultiple Service	.55
	8.	5	WriteProperty Service	.56
	8.6	6	WritePropertyMultiple Service	.57
	8.7	7	Timesync and Timesync-UTC Service	.57
9		Sı	upported BACnet Objects and Properties	.58
10	)	Μ	ODBUS Services	.64
11		U	pdate Web BACnet Router	.66
12	<u>)</u>	Se	etup Network Time Protocol (NTP)	.67
13	3	N	TP Control (restart)	.69

## 2.2 Introduction to user manual

The manual is intended for the people who are responsible for administration and using Web BACnet Router Module. The reader is expected to have basic knowledge of electrical fundamentals and Building Automation and Control networks (BACnet).

#### Terms and acronyms used in this manual

Term	Description
APDU	Application Layer Protocol Data Units are used in BACnet to convey the information contained in the application service primitives and associated parameters. BACnet APDUs consist of protocol control information and, possibly, user data. The variable portion of each APDU may contain service-specific information.
BACnet	Building Automation and Control networks is a registered trademark of American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). For more information, see <u>http://www.bacnet.org/</u> .
BACnet device	Any device, real or virtual, that supports digital communication using the BACnet protocol
BACnet device object	The device object type defines a standardized object whose properties represent the externally visible characteristics of a BACnet device. Each BACnet device must have only one device object that in practice identifies the device in the BACnet network.
BACnet/IP (B/IP)	A BACnet/IP network is a collection of one or more IP subnetworks (IP domains) that are assigned a single BACnet network number.
BBMD	BACnet/IP Broadcast Management Device Each IP subnetwork that is part of a B/IP network comprised of two or more subnets has one BBMD. Each BBMD possesses a Broadcast Distribution Table (BDT) which is the same in every BBMD in a given B/IP network.

BDT	Each BBMD possesses a Broadcast Distribution Table (BDT). BDT contains a list of external BBMDs to which the broadcast messages are transported.
MAC address	The MAC address of any BACnet device in any BACnet network. Different datalink types may have different lengths and formats for MAC addresses.
MS/TP	Master-Slave/Token-Passing protocol designed specifically for building automation and control devices as part of the BACnet standard. It uses RS485 serial communication as a physical layer.
UDP	User Datagram Protocol uses the Internet Protocol as the underlying protocol. It enables programs running on different computers on a network to communicate by sending short messages known as datagrams to each other.
WBR	Web BACnet router
Modbus	A high-level protocol for industrial networks developed in 1979 by Modicon (now Schneider Automation Inc.). Providing services at layer 7 of the OSI model, it defines a request/response message structure for a client/server environment. Modbus runs over various data links including its own Modbus+ token passing network and serial links such as RS-232 and RS-485. It is widely used with TCP/IP over Ethernet.
Modbus-to-BACnet (M2B)	Communication bridge from Modbus to BACnet. It allows user to map Modbus devices and data to BACnet devices and objects.

# 2 Introduction to Web BACnet Router

### 2.3 What is Web BACnet Router

WBR is a BACnet router with 4 RS485 ports and one Ethernet port. It is capable of having up to 32 datalinks, of which up to 4 can be MS/TP and the rest can be used for B/IP. Aside from BACnet capabilities, WBR can be used for Modbus-to-BACnet bridging. Both RTU and ASCII mode for serial Modbus are supported, as well as Modbus over IP. Since BACnet and Modbus message formats are not interchangeable, serial ports and IP port numbers cannot be shared between the two.

For serial ports, all standard baud rates are supported, as well as one BACnet-specific (76800).

WBR supports standard BACnet routing with MAC addresses' length up to 6, but doesn't support half-routers.

	Term	Description
Electrical specifications	Power supply	24VAC/VDC 5W
Communication channels	Ethernet	10/100BASE-TX
	4 x RS485	Programmable baud rate (2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 230400)
	USB	USB device, USB B connector
Hardware resources	Microprocessor	ARM9 (32bit architecture, 400 MIPS)
	RAM memory	64MB
	Flash memory	256MB
	RTC	With auxiliary battery backup
	Storage temperature	-40 +85°C

#### 2.4 Technical Data

	Operating temperature	-10+70°C
Additional specifications	Operating humidity	max 95% r.H., no condensation
	Protection degree	IP20
	Mounting	DIN rail, for indoor use only
	Dimensions	107.6x90x62.2mm
	Weight	250g

#### Note:

The device is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.

It may only be installed by suitably trained personnel.

Any legal regulations or regulations issued by authorities must be observed during assembly.

The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.

The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

# 2.5 Wiring Diagram

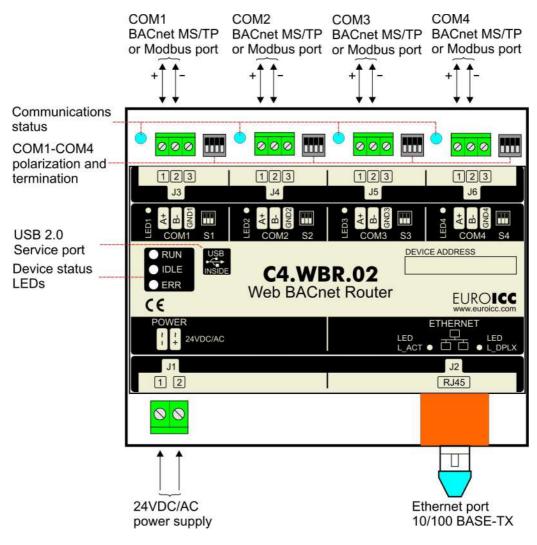


Figure 1: Wiring diagram

# 2.6 Mounting

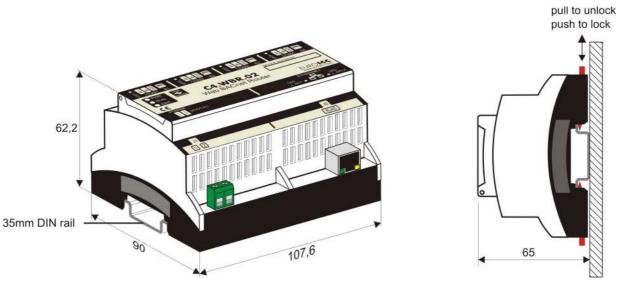


Figure 2: Mounting

# 2.7 Battery Replacement

To replace a battery for WBR, follow these steps:

1. Using a screwdriver, open the lid of the WBR (Figure 3)

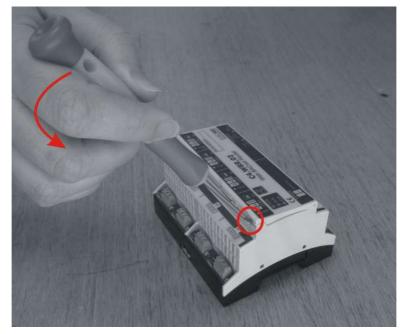
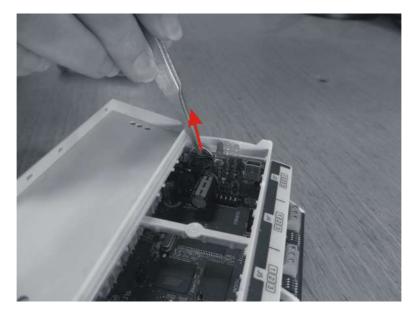


Figure 3

2. Remove the battery using tweezers (Figure 4)





3. Insert standard CR 1220 battery in WBR's battery holder (Figure 5)

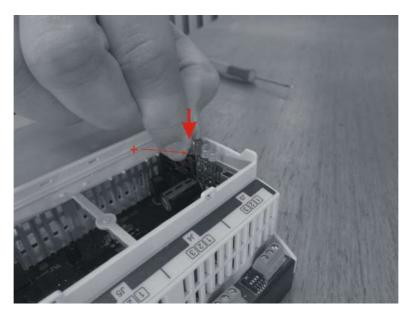


Figure 5

# **3 Quick Start Guide**

In order to access and configure WBR, follow these steps:

- Connect WBR to power source and Ethernet cable (chapter 2.3).
- Default IP address and settings for WBR are:
  - o Address: 192.168.0.100
  - o Broadcast mask: 192.168.0.255
  - Netmask: 255.255.255.0

Adjust your address and network mask accordingly.

- Turn on WBR.
- Open any internet browser (for example: Firefox, Chrome, Safari, Opera, Internet Explorer, etc.)
- Type the IP address of the WBR in the address bar (default address is 192.168.0.100).
- Continue with configuration (<u>chapter 4</u>).

# 4 Configuration

In your web browser, enter the IP address that you gave to BACnet router, for example **http://192.168.0.100**. The router module displays "Login to web server" page.

	name	
Password	sword	

Figure 6: Administrator Login Page

Username for login is **admin** and default password is **admin**. The "Reset password" button resets user name and password to factory defaults; this button is functional only when the user accesses web interface via USB connection. Explanation on how to change user name and password may be found later in this manual (Chapter 2.8).

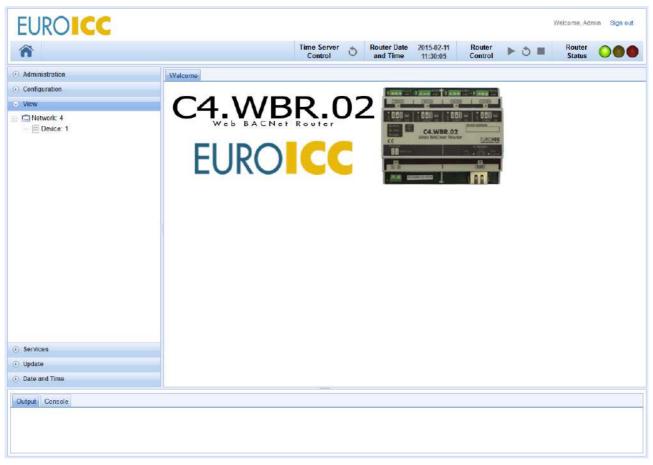


Figure 7: Main index page

If connection through Ethernet cable, for some reason, doesn't work, as a backup connection mini-USB should be used. Connection setup for USB is different for different operating systems. Configuration for most frequently used operating systems, such as Windows XP, Windows 7, MAC OS and Linux Debian is described with instructions in the following chapters.

#### 2.8 Main Menu on Index Page

Panel for configuration on WBR are as follows:

- Home Page
- Administrator
- Configuration
- View
- Services
- Update
- Date and Time

*Administrator* page contains setup for Admin account which can access Web BACnet Router Application and use all privileges. Setup can change Admin name and Admin password.

**Configuration** tab contains setup for BACnet layers (datalink, network, and application) and IP settings for BACnet router. Setup for configuration layers is explained in the following chapters of this manual.

*View* tab contains view of properties of BACnet devices and objects, which are present in BACnet networks connected to WBR.

*Services* tab gives the user a way to manually send and receive BACnet messages. Should be used mainly for network debugging.

*Update* tab is used for uploading newer versions of WBR software. <u>User should upload</u> <u>only software packages issued by EuroICC</u>.

*Date and Time* tab contains setup for NTP servers and Time Zone.

#### 2.9 Datalink layer configuration

Datalink setup supports three datalink layers: two standard ones, and one specific to EuroICC (MODBUS-to-BACnet bridge):

- MS/TP
- BACnet/IP (B/IP)
- Communication Bridge between MODBUS and BACnet protocols (MODBUS-to-BACnet, m2b).

Â			Time Ser Contro		Router Date and Time	1970-01-01 00:10:31	Router Control	▶ 3	Router Status	00
Administration	Welcome Datalink	& Application 🛞								
Configuration	Datalink cor	figuration								
etalink & Application Tayer ? settings		5								
	Add new datalink	Save configurati	on to router	Load conf	guration from ro	uter				
	Type Net	Mac	Availat	le actions						
	mstp 1	0	Edit	Delete						
	mstp 2	0	Edit	Delete						
	mstp 3	0	Edit	Delete						
	Export/Impo		ration							
	Import configuration									
View	Browse	-1								
Services										
Update	Import configuration	on to local								
					TT .					

Figure 8: Main datalink and application configuration tab

#### 4.1 MS/TP

Since MS/TP datalink uses serial communication, user must choose serial port and baud rate. Serial ports can't be shared among multiple communication layers.

MAC address for MS/TP is one byte; it must be unique within one BACnet sub-network, and should be in the range of 0 to Nmax\_master (which is 127 by default).

Other parameters of MS/TP configuration are given in the following table. Note that the majority of users have no need for changing these parameters, aside from Nmax\_info\_frames and Tusage\_timeout, which should be set according to the network topology and baud rate.

Parameters	Description	Minimum- Maximum	Default value
Nmax_info_frames	This parameter represents the value of the Max_Info_Frames property of the node's Device object. The value of Max_Info_Frames specifies the maximum number of information frames the node may send before it must pass the token. Max_Info_Frames may have different values on different nodes. This may be used to allocate more or less of the available link bandwidth to particular nodes. If Max_Info_Frames is not writable in a node, its value shall be 1.	1-4	1
Nmax_master	This parameter represents the value of the Max_Master property of the node's Device object. The value of Max_Master specifies the highest allowable address for master nodes. The value of Max_Master shall be less than or equal to 127. If Max_Master is not writable in a node, its value shall be 127.	1-254	127
Npoll	The number of tokens received or used before a Poll For Master cycle is executed: 50.	10-500	50
Nretry_token	The number of retries on sending Token: 1.		1
Nmin_octets	The minimum number of DataAvailable or ReceiveError events that must be seen by a receiving node in order to declare the line "active": 4.	1-10	4

Tframe_abort	The minimum time without a DataAvailable or ReceiveError event within a frame before a receiving node may discard the frame: 60 bit times. (Implementations may use larger values for this timeout, not to exceed 100 milliseconds.)	10-100	60
Tno_token	The time without a DataAvailable or ReceiveError event before declaration of loss of token: 500 milliseconds.	200-800	500
Tusage_timeout	The minimum time without a DataAvailable or ReceiveError event that a node must wait for a remote node to begin using a token or replying to a Poll For Master frame: 20 milliseconds. (Implementations may use larger values for this timeout, not to exceed 100 milliseconds.)	20-100	20

Â			e Server 👌 Router Date Control d and Time	2014-02-12 Router 15:44:32 Control	► ð ■	Router Status	000
Administration	Welcome Datalink	3					
Configuration	Back to datalink list	Save changes to loca					
Detalink IP settings		Network: 2	Mac: 0	Number of messages:			
	Port.	Baud. 38400 -	Max info frames (1-16):				
	Max master (1-254):	Poll (10-500):	default: 1 Retry token (1-4):				
	Min octets (1-10):	Frame abort (10-100):	default: 1 No token (200-800):				
	default: 4 Usage timeout (20-100	default: 80 ):	default: 500				
	sefault: 26						
• View							
Services							
🕑 Update							
Date and Time							
Output Console							

Figure 9: MS/TP configuration tab

Additionally user can enable polarization and termination resistors independently for every serial port using provided dipswitches. Figure 10 depicts one serial port with described dipswitch functionality.

When dipswitch 4 is in "ON" position, termination resistor of 120  $\Omega$  is connected between A+ and B- lines.

When dipswitches 3 and 2 are in "ON" positions, 560  $\Omega$  resistor is connected between GND and B-, and another 560  $\Omega$  resistor is connected between VCC and A+. Dipswitches 2 and 3 should always be used together.

Dipswitch 1 is unused.

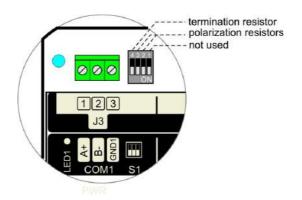


Figure 10: Termination and polarization resistors

#### 4.2 BACnet/IP (B/IP)

B/IP datalink layer enables integration of BACnet devices on IP networks, with some limitations. MAC address is six bytes long, and consists of IP address (first four bytes) and port (last two bytes). Default IP port for BACnet is 47808 (0xBAC0), but others can be used at user's discretion. It is possible to define different B/IP networks on WBR by using different port numbers. BACnet over IP uses UDP protocol, which is packet-oriented, lightweight, but doesn't guarantee that each transaction actually reached its destination.

The main limitation of BACnet/IP is message broadcasting over different sub-networks. To amend this, the concepts of BBMD (BACnet Broadcast Management Device), BDT (Broadcast Distribution Table) and FDT (Foreign Device table) are introduced.

Each IP sub-network shall have one and only one BBMD, which will handle all broadcast requests. All BBMD's in one B/IP network must have identical BDT, and it is the duty of system integrator to make sure they do.

In the case where one BACnet device wants to join B/IP network, but there are no BBMDs in its sub-network, device can register itself as a Foreign Device to any of the existing BBMDs in that BACnet network.

1	Time Server Control     Router Date     2014-02-12 and Time     Router     Noter       Status     Status
O Administration	Welcome Datalink 3
Configuration	Back to datalink list Save changes to local
atalink 2 sottings	Type: bip • Network: 678 Mac: 192.168.0.122.47808 Number of mossages: B/P Interface Type of usage. Device is BACnet Broadcast Management Device (BBMD) Firoadcast Distribution Table (BDT) Add new address IP Address Port Broadcast Endpoint: 192.168.0.112 47808 255.255.252.0
View Services	
N. Heidatta	
Update     Date and Time	

Figure 11: BACnet/IP configuration tab when device is BBMD

Default IP interface for B/IP is "eth0", which is ethernet connection. The other option, which should be used only for debugging purposes is "usb0", which stands for USB-to-ethernet bridge.

P satings     Type: bp     B/P     B/P     Interface     Type of usage.        Device uses BACnet Broadcast Management Device (BBMD)     • View     • View     • View     • View     • Update	ñ	Time Server ControlRouter Date and Time2014-02-13 19:49:12Router ControlNouter StatusRouter Status
Back to datalink hat Save changes to local   P sattings Hype: bip • Network: 678 Mac: 192.168.0.122.47808 Number of modesage:   B/P Interface   Interface Sevice uses BACnet Broadcast Management Device (BBMD)   • Vrew. BACnet Broadcast Management Device (BBMD)   • Vrew. Services   • Vrew. Services	O Administration	Welcome Datalink 3
Type: bp • Network: 678 Mac: 192.168.0.12247608 Innour of modelagos:     B/P   Intoface   Set interface   Type of usage:   Device uses BACnet Broadcast Management Device (BBMD)   • Update	Datalink	Back to datalink list Save changes to local
<ul> <li>View</li> <li>Services</li> <li>Update</li> <li>Date and Time</li> </ul>		B/P     Iteration       B/P       Interface       Set interface       Device uses BACnet Broadcast Management Device (BBMD)       P       BACnet Broadcast Management Device (BBMD)
• Update	🕑 View	
Date and Time	Update	

Figure 12: BACnet/IP configuration tab when device use BBMD

On B/IP configuration page, user can set the type of device usage. Options are:

- WBR is a simple B/IP device. No additional configuration options are available.
- WBR is a BACnet/IP Broadcast Management Device (as shown on image 2.1.b). Initial BDT can be set in the following format: IP address, port, BACnet broadcast mask (which is identical to IP netmask).
- WBR is a Foreign Device. The only additional parameter is IP address and port of a BBMD.

EUROICC		Time Server Control	Router Date and Time	2014-02-13 10:50:34	Router Control	► ७ ■	Router Status	000
Administration	Welcome Datalink ③							
Configuration	Back to datalink list Save change	to local						
Jatalink Pisottings	Type: bip • Network: 678 B/P Interface Type of usage. Foreign Device uses BACnetBroadco Foreign Device BACnet Broadcast Management Devi 192.168.0.100	ist Management Devi	e: 192.168.0.122		iber of sagos:			
View								
Services								
O Update								
Date and Time								
Output Console								

Figure 13: Foreign Device configuration tab when use BBMD

#### 4.3 Modbus-to-BACnet (M2B)

Addiministration         Configuration         Database & Application Toyse         P settings         Connection: Served         Type: mab         Network & Mest: 0         Number of messages         Connection: Served         Type: mab         Network & Mest: 0         Number of messages         Connection: Served         Type: mab         Network & Mest: 0         Number of messages         Connection: Served         Type: mab         Network & Mest: 0         Network (Ker         Mathew device         State       Network (Mest: 1)         Network (Ker         State:       Network (Mest: 1)         Type       Network (Mest: 1)         Network (Ker         State:       Object finame         Under workpresender       Networkpresender         Type       Networkpresender         Networkpresender       Networkpresender         Networkpresender	Roster Da	Time Serve Control	Time Server O Router Control O and T	Date 1970-01-07 Re me 00:22:39 Co	Router 🕨 👌 🖩	Router O
Datalink configuration  Exclusion  Exclusion						
() Vine						
· Services						
Opfate     Defe and Time:						

Figure 14: M2B configuration tab with RTU mode

Modbus communication can operate in two serial modes (rtu and ascii) and one IP mode. There are several things that should be kept in mind:

- rtu mode requires 8 data bits
- ascii mode requires 7 data bits and 2 stop bits
- default parity is even, but odd and no parity are supported
- no parity implies 2 stop bits in any serial mode
- IP mode implies an additional address field for each slave device
- MAC should be 0 for all Modbus types, since it is reserved value and can't be used in Modbus network.

ô	Time Server 🖒 Router bate 1970.01.07 Router 🕨 🖒 🗏 Router 🔾 🌑
n	Coerrol U and Time 0022:45 Control P U = Status U
Administration	Welcome Dataink & Application ©
> Configuration Infinite & Application layer settings	Datalink configuration         Back to dataink list       Save dranges to local         Type:       mcs:       0         Numbur of messages:       messages:         Connection:       P         Deckes       Save Maxe         Save Maxe       Object Name:         Save Maxe       Save P Addrese         Save Maxe       Object Name:         Save Maxe       Object Name:         Save Maxe       Object Name:         Save Maxe       MeadInstrese Save P Addrese         Save Maxe       Object Name:         Save Maxe       MeadInstrese Save P Addrese         Save Maxe       MeadInstrese Save P Addrese         Save Maxe       MeadInstrese Save P Addrese         Save Maxe       MeadInstrese Save Maxee         Save Maxee       MeadInstrese Save P Addrese         Save Maxee       MeadInstrese Save Maxee         Save Maxee       MeadInstrese Save P Addrese         Save Maxee       MeadInstrese Save Maxee         Save Maxee       MeadInstrese Save P Addrese         Save Maxee       MeadInstrese Save P Addrese         Save Maxee       Maxee Maxee Maxee         Save Maxee       Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Maxee Ma
View Servicas Update Date cell Time	
Dutput Console	
Julput   Console	

Figure 15: M2B configuration tab with IP communication

M2B provides mapping for Modbus slave devices into BACnet devices by setting the following values:

- slave id of the Modbus device (1-247)
- name and instance id for the device (both should be unique across BACnet internetwork)
- communication timeout the value in milliseconds after which the driver will consider the error in communication, if no valid message was received
- turnaround timeout the value in milliseconds of the minimum time the driver will take between two consecutive reads of the same device
- for Modbus/IP only: address and port (default port for Modbus is 502, but others can be used)
- each Modbus device can support one or more Modbus functions: read coils, read discrete inputs, read holding registers, read input registers, write single coil, write single register, write multiple coils, write multiple registers, read file record, and write file record. WBR will not allow definition of an object without support for read function for that data type. Write functions are optional, and at least one version (single or multi-write) is necessary for Write-Property service support.

EUROICC		Time Server & Router Date 1970.01.07 Router > & Router Control Status
		Control 🔮 and Time 00:24:03 Control 📕 🗸 🖬 Status 🗸 🖤
Administration	Welcone Datainie & Application 6	
<ul> <li>Configuration</li> <li>Californi &amp; Application layer</li> <li>Bebingt</li> </ul>	Datalink configuration         Index databilities       Save changes to local         Type:::rob       Network: 4         Mar::::::::::::::::::::::::::::::::::::	
O Vimer		
E Services		
E .Update		
Date and Time		
Output Console		
Output Cousons		

Figure 16: M2B configuration tab with ASCII mode

Aside from device mapping, M2B also maps Modbus values to BACnet objects:

- Coils are mapped to Binary Values, Discrete Inputs to Binary Inputs, Holding Registers to Analog Values, Input Registers to Analog Inputs, and Modbus Files to BACnet Files with record access.
- Holding Registers and Input Registers can be used as one register containing unsigned or signed 16-bit integer value, or as two consecutive registers treated as single wide register with 32-bit float value in normal (higher 16 bits in lower register) or swapped order (lower 16 bits in lower register).
- all objects must have names and instance ids, which must be unique within one device
- registers can have specified units of measurements
- discrete inputs can have specified polarity

Slave	Instance	Object Name	Comm Tim	eout (ms) Tu	rnaround Timeout (m	s)
	1	some device	500	200	00	
Read coils Write single coil	Read discrete inp Write single regi			Read input registe Nrite multiple reg	ers Read file re jisters Write file re	
Туре		Instance	Object Name	Units		
input register un	isigned> analog input	▼ 4	example 1	Millimeters	🔍 💥 🗶	
Туре		Instance	Object Name	Polarity		
discrete input	> binary input	▼ 1	test	reverse	- 🗔 📈 🗙	
Туре		Instance	Object Name			
coil> binary v	alue	▼ 25	tst	🔍 🗶 🗶		
Туре		Instance	Object Name	Units		
holding register	unsigned> analog value	▼ 15	temp	Milliamperes		

Figure 17: MODBUS devices configuration field

#### 2.10 Application layer configuration

There are two options for Application layer:

- APDU timeout the time WBR will wait for a reply for Confirmed services before attempting retry or declaring communication timeout.
- Retry count the number of times WBR will try sending the same message after the first APDU timeout has passed.

#### Application configuration

Message queue	
APDU_TIMEOUT(millise	conds):
3000	
Retry count:	

Figure 18: Application Layer configuration

## 2.11 IP interface settings

Â	Time Server Time Server and Time 11:50:32 Control	Router OOO
(2) Administration	Welcome IP satings (3)	
Configuration	- WBR IP settings	
Datalnk & Application layer IP actings	IP address:         192 168.0 122         Not mask.         255 255 258 29.0         Broadcaat:         192 168.3 255         Gateway         192 168.0.1    Save network interfaces Load network interfaces	
<ol> <li>Mew .</li> </ol>		
(i) Services		
Vnew     Services     Update     Date and Time		

Figure 19: IP settings configuration

WBR has two network interfaces: ethernet and USB. Only settings for ethernet connection can be changed, because USB port is used mainly for debugging purposes.

#### IP Settings page

The following parameters for ethernet connection are available:

Parameters	Description
IP Address	The IP address of the router module in the designated network
Netmask	The subnet mask of the router module according to the IP address
Broadcast	Broadcast refers to transmitting a packet that will be received by every device on the network
Gateway	In networks where subnetworks are connected by IP routers, this address is used to define the gateway to other networks (the IP address of the router of the

	subnetwork where your router module is installed). If default gateways are used, broadcast messages are most likely blocked by the IP routers and you need to use a BBMD to transport the broadcast messages.
--	---

2.12 Save and load configuration

The **Save changes to local** button temporarily saves the changes made on this page. If you want to save configuration on router, you need to go back on datalink list and click **save configuration to router** button. Also, if you want to load configuration from router you click **load configuration from router** button.

Back to datalink list	Save changes to local	
Add new datalink Sav	e configuration to router	Load configuration from router

Figure 20: Save and Load XML configuration

**Note**: You must save your changes before switching to another configuration page. If you switch to another page without saving, the changes will be lost.

#### 2.13 Export/Import configuration

The "*Export configuration from router*" button saves Web BACnet Router configuration to local machine. This configuration can be loaded to any WBR device by using "Import configuration" dialog.

## Export/Import configuration

## 2.14 Connecting to WBR via USB

If, for any reasons, user can't connect to WBR via Ethernet (for example: bad address, bad netmask, etc.), there is a fallback network communication for WBR via USB. WBR's IP address on USB interface is 10.0.0.1 and it cannot be changed by user. The DHCP on WBR will assign IP addresses in the range of [10.0.0.10 - 10.0.0.40] to any connecting device.

In order to enable network communication over USB with WBR, user must:

- Install the appropriate driver on their computer (see below)
- Turn on WBR.
- Connect WBR and their computer via micro-USB cable.
- Open any internet browser (for example: Firefox, Chrome, Safari, Opera, Internet Explorer, etc.)
- Type 10.0.0.1 in the address bar.
- Reconfigure Ethernet IP settings on WBR.
- Do a soft restart of WBR.
- Disconnect WBR from computer.

#### 4.4 For Windows XP

When USB cable is plugged into the Windows XP, it should detect the new hardware and display a dialog. If so, proceed to Step 4, if not, then start setup from Step 1.

#### <u>Step 1: Right click on My Computer → Properties</u>

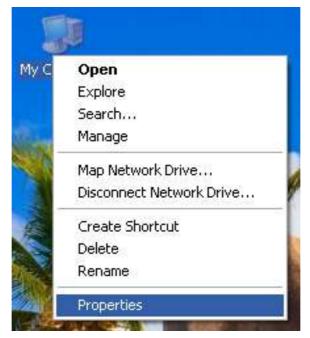


Figure 22: First Step for USB Setup

#### Step 2: Select Device Manager

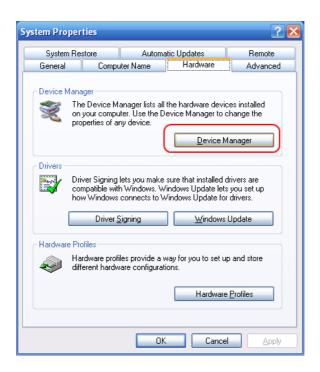


Figure 23: Step 2 for USB Setup

<u>Step 3: Right click on device found by Windows XP name RNDIS/Ethernet</u> <u>Gadget →</u> <u>Update Driver.</u>

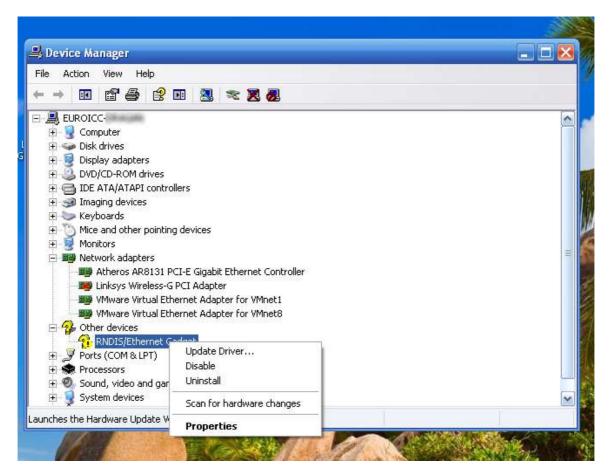


Figure 24: Step 3 for USB Setup

#### Step 4: Choose "No, not this time"



Figure 25: Found New Hardware Wizard - Step 1

Step 5: Choose "Install from a list or specific location" and click Next

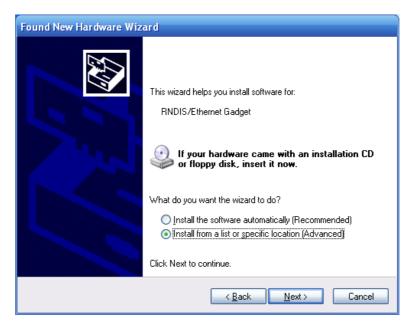


Figure 26: Found New Hardware Wizard - Step 2

<u>Step 6: Choose "Don't search. I will choose the driver to install."</u>



Figure 27: Found New Hardware Wizard - Step 3

Step 7: Select Network Adapters and click Next.

Found New Hardware Wizard			
Hardware Type.			
Select a hardware type, and then click Next. Common <u>h</u> ardware types:			
Multifunction adapters Multi-port serial adapters Metwork adapters Metwork Client Network Protocol Network Service Non-Plug and Play Drivers NT Apm/Legacy Support PCMCIA adapters			
[	< <u>B</u> ack	<u>N</u> ext >	Cancel

Figure 28: Found New Hardware Wizard - Step 4

Step 8: Click on Have Disk ...

Found New Hardware Wizard	
Select Network Adapter Which network adapter do you want to install?	
Click the Network Adapter that matches your hardware, then click OK. If you have an installation disk for this component, click Have Disk.	
(Unable to find any drivers for this device)	
<u>H</u> ave Disk	ו
< <u>Back</u> <u>N</u> ext > Cancel	

Figure 29: Found New Hardware Wizard - Step 5

<u>Step 9: Find the directory containing the linux.inf file. USB driver can be found</u> on the accompanying USB drive, in folder "drivers", or on the address: <u>http://www.davehylands.com/linux/gumstix/usbnet/linux.inf</u>,

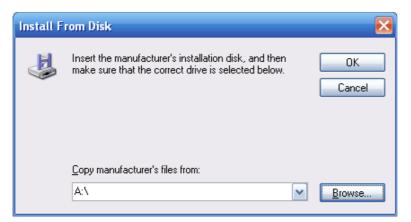


Figure 30: Found New Hardware Wizard - Step 6

Step 10: Select the linux.inf file



Figure 31: Found New Hardware Wizard - Step 7

#### Step 11: The directory containing the linux.inf file should be selected. Click OK.

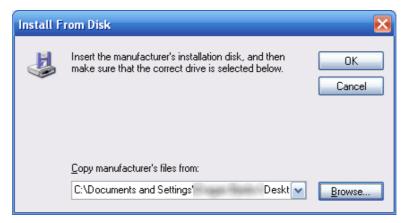


Figure 32: Found New Hardware Wizard - Step 8

Step 11: Select the Linux USB Ethernet/RNDIS Gadget and click Next.

Hardware Update Wizard
Select Network Adapter Which network adapter do you want to install?
Click the Network Adapter that matches your hardware, then click OK. If you have an installation disk for this component, click Have Disk.
Show compatible hardware
Network Adapter:
Linux USB Ethemet/RNDIS Gadget
This driver is not digitally signed!       Have Disk         Tell me why driver signing is important       Have Disk
< <u>B</u> ack <u>N</u> ext > Cancel

Figure 33: Found New Hardware Wizard - Step 9

Step 11: You'll probably get this warning from XP. Click Continue Anyway.



Figure 34: Found New Hardware Wizard - Step 10

#### Step 12: Click Finish



Figure 35: Found New Hardware Wizard - Step 11

Step 13: Result of installation is shown on Figure 36

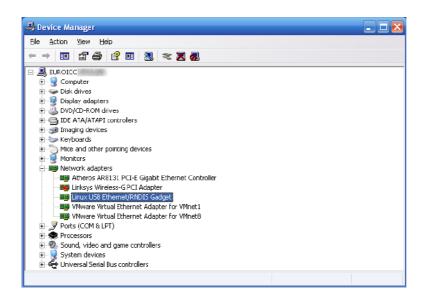


Figure 36

<u>Step 14: In your web browser, enter the immutable IP address of the BACnet</u> <u>router, http://10.0.0.1. The router module will then display "Login to web server"</u> <u>page, and you can proceed with configuration by going to chapter 4.</u>

#### 4.5 For Windows 7

#### Step 1: Click Start

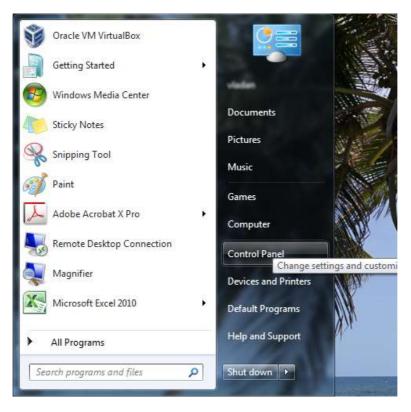


Figure 37

## Step 2: Open Device Manager

Control Panel + All C	ontrol Panel Items 🔺		
Adjust your computer's setting	s		View by: Large icons 👻
Action Center	Administrative Tools	Alcohol iSCSI Sharing Center	AutoPlay
Backup and Restore	BitLocker Drive Encryption	Color Management	Credential Manager
Date and Time	Default Programs	Desktop Gadgets	Device Manager
Devices and Printers	💐 Display	Ease of Access Center	Flash Player (32-bit)
Folder Options	Fonts	Getting Started	📢 HomeGroup
Indexing Options	🚱 Internet Options	Java	🧠 Keyboard
Location and Other Sensors	I Mouse	Network and Sharing Center	Notification Area Icons
Arental Controls	Performance Information and Tools	Personalization	Phone and Modem
Power Options	Programs and Features	Realtek HD Audio Manager	r 🍂 Recovery
Region and Language	RemoteApp and Desktop Connections	Sound	) Speech Recognition
Sync Center	System	Taskbar and Start Menu	Troubleshooting
		<u> </u>	-

Figure 38

## <u>Step 3: Right click on USB Controller → Properties</u>

e Action View Help		
🧆 📰 🔚 📓 🖬 👧 😰 🐙 65		
<ul> <li>B Mice and other pointing devices</li> <li>Monitors</li> <li>Network adapters</li> <li>Other devices</li> </ul>	-	
Gound And Angel Serial Bus (USB) Control      Gound Angel Serial Bus (USB) Control      Ports (COM & LPT)      Processors      Sound, video and game controllers      Storage controllers      Gound Angel Serial Bus Controller      Gound An	Update Driver Software Disable Uninstall Scan for hardware changes Properties	
AMD USB 3.0 Host Controller AMD USB 3.0 Root Hub AMD USB 3.0 Root Hub Standard Enhanced PCI to USB Host Standard Enhanced PCI to USB Host Standard OpenHCD USB Host Cont Standard OpenHCD USB Host Cont USB Root Provice USB Root Hub	t Controller roller	
USB Root Hub USB Root Hub USB Root Hub USB Root Hub USB Root Hub		

Figure 39

<u>Step 4: Select "Browse my computer for driver software"</u>

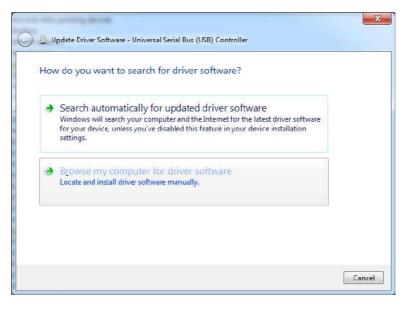


Figure 40

<u>Step 5: Select "Let me pick from a list of device drivers on my computer"</u>

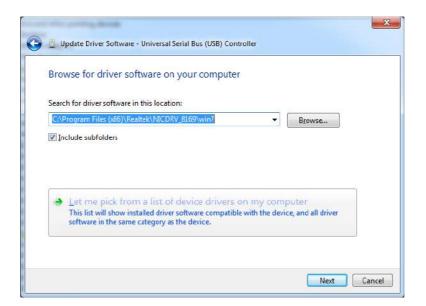


Figure 41

## Step 6: Select "Network adapters" from the list of devices

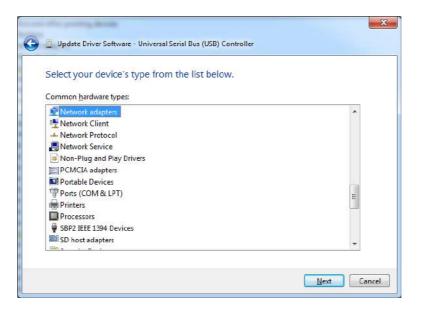


Figure 42

<u>Step 7: In Manufacturer column, select "Microsoft Corporation"</u>

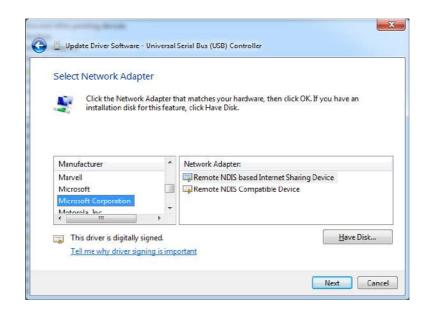


Figure 43

<u>Step 8: In Network Adapter column, select "Remote NDIS based Internet</u> <u>Sharing Device"</u>

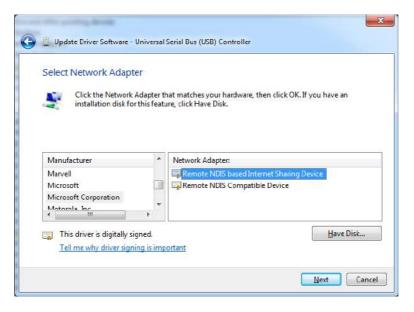


Figure 44

Step 9: When prompted security issue for Windows, click Yes



Figure 45

#### Step 10: Wait for Windows to install driver

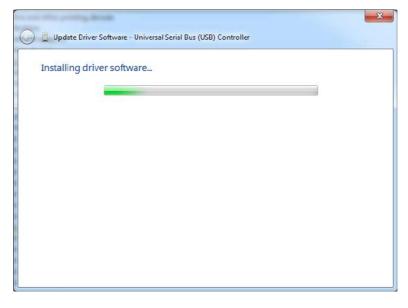


Figure 46

<u>Step 11: After installation, installed device will be shown in Device Manager</u> <u>window</u>

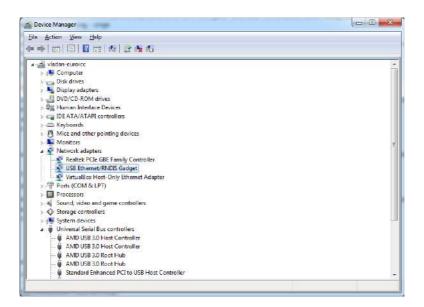


Figure 47

<u>Step 12: In your web browser, enter the immutable IP address of the BACnet</u> <u>router, http://10.0.0.1. The router module will then display "Login to web server"</u> <u>page, and you can proceed with configuration by going to chapter 4.</u>

#### 4.6 For MAC OS

When USB cable is plugged into the MAC OS computer, it should detect the new hardware and connect automatically as Ethernet interface *RNDIS/Ethernet Gadget*. To check if this is the case, follow the next three steps.

#### <u>Step 1: Open System Preferences → Network</u>



Figure 48

## <u>Step 2: Check if RNDIS/Ethernet Gadget Status is "Connected"</u>

► Show All		a	
Locati	ion: Automatic	<b>\$</b> ]	
RNDIS/Gadget	1	Connected RNDIS/Ethernet Gadget is cur and has the IP address 10.0.0	
<ul> <li>FireWire Not Connected</li> <li>Wi-Fi</li> <li>Off</li> <li>Bluetooth PAN No IP Address</li> </ul>	Configure IPv4: IP Address: Subnet Mask: Router: DNS Server: Search Domains:	10.0.0.10	;
+ - \$*		C	Advanced) (?

Figure 49

<u>Step 3: In your web browser, enter the immutable IP address of the BACnet</u> <u>router, http://10.0.0.1. The router module will then display "Login to web server"</u> <u>page, and you can proceed with configuration by going to chapter 4.</u>

#### 4.7 For Linux

When USB cable is plugged into the Linux computer, it should detect the new hardware and connect automatically as *Network Interface*. To check if this is the case, follow the next two steps.

#### Step 1: Click System Tray Icon for Network



Figure 50

## <u>Step 2: Select Network Interface, check if it is Connected, and if IP address is</u> in the range [10.0.0.10 – 10.0.0.40]

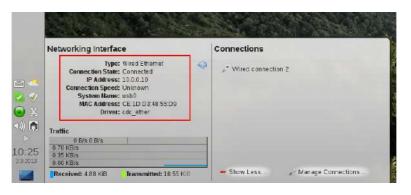


Figure 51

# **5 Web BACnet Router Control (start | stop | restart)**



Figure 52: WBR Controls

Main page can be used for router control. Either because the user wants to upload new configuration for the router, or some other reason, router can be started, stopped and restarted. Each of these commands can be issued to the device by pressing the appropriate buttons, as shown on the Figure 52

# 6 Web BACnet Router Status (run | error | idle | bad configuration)



Figure 53: WBR Status

There are three lights visible on the Configuration page, which are the mirror image of the three LEDs on the device; these LEDs are labeled: RUN – green, IDLE – yellow, ERR – red. Their current state is indicative of the general status of WBR. Descriptions of these states are:

- Run green light is on
- Idle yellow light goes on and off
- Error red light is on
- Bad configuration green and red lights alternate between on and off.

# 7 View BACnet devices

Â		Time Server Control	Router Date 1970-01-01 and Time 00:16:08	Router Control	► ð ■	Router Status	00
D Administration	Welcome Device: 1 3						
Configuration	Properties						
🕑 View	Refresh device properties						
Services	Celete device						
/hols /hoHas	Object Name:	some device	5				
ead Property	Vendor Name:	EuroICC	3				
ead Property Multiple Inte Property	Vendor Identifier:	536	3				
rite Property Multiple	Model Name:	EuroICC BACnet2Modbus bridge device	- 🕰				
me Sync me Sync UTC	Firmware Revision:	1.0	3				
	Application Software Version:	1.0					
	Protocol Version:	1	3				
	Protocol Revision:	10	5				
	Max APDU Length Accepted.	480	3				
	APDU Timeout:	3000	8 9				
	Number of APDU Retries:	1	2				
	Database Revision:	0					
) Update	System Status:	operational	5				
Date and Time		(analog input,					
Output Console							
970-01-01 00 15:59: success Read-	Property 4 01						

Figure 54: View BACnet devices tab

View page gives hierarchical summary of all BACnet networks and devices and objects on those networks. In order for a device or an object to be visible on the View page, they must be previously accessed by the WBR in some way (e.g. Who-Is, Who-Has, Read-Property). For each visible device, list of their properties and queried objects can be seen.

It is also possible to either refresh the values of all device properties or to remove the device and all of its objects. The buttons for these functionalities are on the top of the Device tab.

## 2.15 Change BACnet properties

Protocol Object Types Supported	{analog input, analog value, binary input, binary value, device, file}	3	Send
Segmentation Supported:	No Segmentation		change value
Protocol Services Supported:		2	1
Local Time:		2 🗃	
Local Date:		23	
Location:		S 🗃	
Description:		2	
Max Info Frames:		2 🗃	
Max Master:		23	
Daylight Savings Status:		2	

Figure 55: Change value command

Some properties of BACnet objects are writable, and can be changed via Write-Property service. There is also a shortcut for this operation in the View panel, as shown in the Figure 55

## **8 Supported BACnet services**

Services tabs offers eight BACnet services, which are:

- Who-is Service
- Who-has Service
- ReadProperty Service
- ReadProperty Multiple Service
- WriteProperty Service
- WriteProperty Multiple Service
- Timesync
- Timesync UTC

EUROICC								Welcome, Adr	min Sign out
ñ			Time Server Control	S Router Date and Time	e 2014-02-12 15:47:12	Router Control	► ð =	Router Status	000
Administration     Configuration     View     Services Who Is Who Has Read Property Multiple White Property Multiple Time Sync Time Sync Time Sync UTC	Welcome Benico BACnet Se Priotity: Normal Low limit: Execute	rvice - Who	IS Select by Device ID		evice ID: 1				
Update     Determined Target									
Date and Time     Output Console									

Figure 56: BACnet services

User can set network priority of the message, as well as the addressing method. BACnet services require target network and MAC, but WBR offers two new ways of addressing: by device ID and by device name. These addressing modes are available only for devices which were already queried by the WBR in the past. Standard format of MAC address is one bytes address from 00 to FF, and in case of BACnet/IP communication MAC has 6 bytes address contain IP address and port, which in most cases is from BAC0 to BACF (e.g. 192.168.0.45:BAC0).

#### 2.16 Who-is Service

The Who-Is service is used by a client BACnet user to determine the device object identifier, the network address, or both, of other BACnet devices that share the same internetwork. It is the default service type selected when you open **Services** page.

For every service type supported, Object types and Properties are explained in Chapter 9 of this manual.

EUROICC										Welcome, Adr	nin Sign out
Â			Time Server Control	ð	Router Dat and Time	e 2014-02-12 15:47:30		•	3	Router Status	000
① Administration	Welcome Service	es - Who-Has 🛞									
Configuration     View	BACnet Se	rvice - Who-	Has								
- Services	Priotity:		Select by:			Device ID:					
Who Is	Normal	•	Device ID			1					
Who Has Read Property	Low limit.	High limit.	Sele	ect by:			Object name:				
Read Property Multiple Write Property			i na	ame							
Write Property Multiple Time Sync	Execute										
Time Sync UTC											
🕞 Update											
Date and Time											
Output Console											
Conocia											

## 2.17 Who-has Service

Figure 57: Who-has selected service type

The Who-Has service is used by a client BACnet user to identify the device object identifiers and network addresses of other BACnet devices which contain an object with a given *Object\_Name* or a given *Object\_Identifier*.

#### 2.18 ReadProperty Service

The ReadProperty service is used by a client BACnet user to request the value of one property of one BACnet Object.

Â			Time Server Scontrol	Router Date and Time	2014-02-13 13:43:11	Router Control	5 🔳	Router Status	000
O Administration	Welcome Services - Read	Property	0						
Configuration	BACnet Service	- Rear	Property						
View		- nouc							
Services	Priotity	_	Select by:		wice ID:				
Who is Who Has Read Property Read Property Multiple	Normal		Device ID		1				
	Object type.		Instance id:						
tead Property Multiple Write Property	Analog Input								
Write Property Multiple Time Sync	Object property:		Index.						
ime Sync UTC	Object Identifier	-	-1						
	Execute								
	Execute								
⊙ Update	Execute								
<ul> <li>Update</li> <li>□ Date and Time</li> </ul>	Execute								
	Execute								

Figure 58: ReadProperty service type

## 2.19 ReadPropertyMultiple Service

The ReadPropertyMultiple service is used by a client BACnet user to request the values of one or more specified properties of one or more BACnet Objects on a single device.

ñ			ter Date 2014-02-12 Rou I Time 15:48:06 Con		Status
O Administration	Welcome Services - Rea	d Property Multiple			
<ul> <li>Configuration</li> <li>View</li> </ul>	BACnet Service	e - Read Property Mulitple			
Services	Priotity:	Select by:	Device ID:		
Vho Is	Normal	Device ID	1		
Who Is Who Has Read Property Read Property Multiple Write Property Multiple Write Property Multiple	Object type: Ins	ance id: Prope Object property:	rties: Index: Add new property	Add new object	
ime Sync Ime Sync UTC	Device 🔹	ObjectList + 1 ObjectIdentifier + 1		×	
	Filo 👻	Object property: Index: Object Identifier	Add new property	×	
	Analog input 👻	Object property: Index: Object Identifier +	Add new property	×	
	Execute				
🕑 Update					
Date and Time					
Output Console					

Figure 59: ReadPropertyMultiple service type

## 2.20 WriteProperty Service

The WriteProperty service is used by a client BACnet user to modify the value of a single specified property of a BACnet object.

â		Time Sen Control	er 👌 Router Date and Time	2014-02-13 Router 13:45:29 Control	Router O
Administration	Welcome Genices - Write Pro	erty 🛞			
Configuration	BACnet Service - V	Vrite Property			
) View	Priotity:	Select by:	Dev	ice ID:	
Services	Normal	Device ID	• 1		
/ho Has ead Property	Object type:	Instance id.			
ad Property Multiple rite Property	Binary Input	1			
rite Property Multiple	Object property.	Index:			
me Sync me Sync UTC	Event State	-1			
	Value type.	Value:			
	Enumerated				
) Update					
) Update ) Dato and Time					

Figure 60: WriteProperty service

## 2.21 WritePropertyMultiple Service

The WritePropertyMultiple service is used by a client BACnet user to modify the value of one or more specified properties of a BACnet object.

Properties shall be modified by the WritePropertyMultiple service in the order specified in the 'List of Write Access Specifications' parameter, and execution of the service shall continue until all of the specified properties have been written to or a property is encountered that for some reason cannot be modified as requested.

- · · · · · · · · · · · · · · · · · · ·		Control O and	d Time 15:49:06 Control	Status
O Administration	Welcome Services - Write Prop	erty Multiple 🛞		
<ul> <li>Configuration</li> </ul>	BACnet Service - W	/rite Property Mulitple		
① View				
<ul> <li>Services</li> </ul>	Priotity: Normal	Select by Device ID	Device ID:	
'ho Is 'ho Has	noma	DAAICA ID		
ead Property ead Property Multiple /rite Property /rite Property Multiple	Object type: Instance id:	a	Properties:	Add new object
ime Sync ime Sync UTC		Object property: Index:	Value: Type: Add new prop	erty
	Analog Input -	Units -1	Enumerated - X	×
	Analog input	Status Flags -1	Bit String - 🗙	<u>^</u>
		Object Type 👻 -1	Enumerated -	
	Binary Output 👻	Object property: Index:	Value: Type: Add new property	×
		Object Identifier 🔻 -1	Object ID 🔹 💥	
	Device -	Object property:	Index: Value: Type:	Add new property
		Protocol Version + -1	Unsigned Int 👻 🗙	
	Execute			
🕥 Update				
Date and Time				
Outout Console				
Curput Console				

Figure 61: WritePropertyMultiple service

## 2.22 Timesync and Timesync-UTC Service

Time synchronization in BACnet can be done with two protocols: Timesync and Timesync UTC. Both send current time on WBR to other devices, and the difference is that Timesync sends local time, and Timesync UTC sends UTC time. For example, if WBR is set to CET (UTC +1), and it is currently 14:51:32 2013-11-12 in local time, Timesync would send that time, but Timesync UTC would send 13:51:32 2013-11-12.

# **9 Supported BACnet Objects and Properties**

BACnet departs from traditional industry conventions with its object-oriented nomenclature. The industry has long used the general-purpose term "points", which could refer to sensor inputs, control outputs or control values, with different characteristics according to manufacturer.

BACnet instead defines a standard set of "*Objects*", each of which has a standard set of "*Properties*"; that describe the Object and its current status to other devices on the BACnet internetwork. It is through these properties that the Object may be controlled by other BACnet devices.

The WBR can send commands to the following Object types:

- Analog Input
- Analog Output
- Analog Value
- Binary Input
- Binary Output
- Binary Value
- Multi-state Input
- Multi-state Output
- Multi-state Value
- Device
- File

For each Object type, there are Object properties, explained in the following table:

Object type	Object property
Analog Input / Analog Value	Object Identifier
	Object Name
	Object Type
	Present Value

Status FlagsEvent StateOut Of ServiceUnitsObject IdentifierObject NameObject TypeObject TypePresent ValueStatus FlagsEvent StateOut Of ServiceUnitsBinary InputObject IdentifierObject IdentifierObject TypeObject IdentifierObject IdentifierObject IdentifierObject IdentifierDisct IdentifierStatus FlagsStatus Flags						
Out Of ServiceUnitsObject IdentifierObject NameObject TypeObject TypePresent ValueStatus FlagsEvent StateOut Of ServiceUnitsRelinquish DefaultBinary InputObject TypeObject TypeObject TypePresent ValueStatus FlagsOut Of ServiceUnitsRelinquish DefaultObject IdentifierObject TypePresent ValueStatus FlagsStatus Flags		Status Flags				
Image: Constraint of the series of the se		Event State				
Object IdentifierObject NameObject TypeObject TypePresent ValueStatus FlagsEvent StateOut Of ServiceUnitsRelinquish DefaultBinary InputObject IdentifierObject NameObject TypePresent ValueStatus FlagsBinary InputObject IdentifierObject NameObject TypePresent ValueStatus FlagsStatus Flags		Out Of Service				
Object Name         Object Type         Present Value         Status Flags         Event State         Out Of Service         Units         Relinquish Default         Object Name         Object Type         Status Flags         Dut Of Service         Units         Relinquish Default         Object Name         Object Type         Present Value         Status Flags		Units				
Analog Output Analog Output Analog Output Analog Output  Analog Output  Cout Of Service  Units  Binary Input  Object Identifier  Object Name  Object Type  Present Value  Status Flags		Object Identifier				
Analog Output Analog Output Present Value Status Flags Event State Out Of Service Units Relinquish Default Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Object Name				
Analog Output Status Flags Event State Out Of Service Units Relinquish Default Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Object Type				
Event State Out Of Service Units Relinquish Default Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Present Value				
Out Of ServiceUnitsRelinquish DefaultBinary InputObject IdentifierObject NameObject TypePresent ValueStatus Flags	Analog Output	Status Flags				
Units Units Relinquish Default Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Event State				
Relinquish Default Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Out Of Service				
Binary Input Object Identifier Object Name Object Type Present Value Status Flags		Units				
Object Name Object Type Present Value Status Flags		Relinquish Default				
Object Type Present Value Status Flags	Binary Input	Object Identifier				
Present Value Status Flags		Object Name				
Status Flags		Object Type				
		Present Value				
Event State		Status Flags				
		Event State				

Out Of Service			
Polarity			
Dbject Identifier			
Dbject Name			
Dbject Type			
Present Value			
status Flags			
Event State			
Out Of Service			
Polarity			
Relinquish Default			
Dbject Identifier			
Dbject Name			
Dbject Type			
Present Value			
status Flags			
Event State			
Out Of Service			

Device	Object Identifier
	Object Name
	Object Type
	System Status
	Vendor Identifier
	Vendor Name
	Model Name
	Firmware Revision
	Application Software Version
	Protocol Services Supported
	Object Types Supported
	Protocol Services Supported
	Protocol Version
	Protocol Revision
	Object List
	Max APDU Length Accepted
	Segmentation Supported
	APDU Timeout

User Manual Web BACnet Router

Number Of APDU RetriesDatabase RevisionLocal TimeLocal DateLocationDiject IdentifierObject IdentifierObject NamePresent ValueStatus FlagsEvent StateOut Of ServiceNumber of StatesMulti-state OutputObject IdentifierObject IdentifierStatus FlagsEvent StateOut Of ServiceStatus FlagsMulti-state OutputObject IdentifierObject NameObject NameObject NameOut Of ServiceStatus FlagsEvent StateOutper of StatesOut Of ServiceStatus FlagsStatus Flags						
Local Time Local Date Location Location Multi-state Input / Multi-state Value Iterest		Number Of APDU Retries				
Local Date Location Location Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Status Flags Event State Out Of Service Number of States Multi-state Output Object Identifier Object Name Present Value Status Flags Event State Out Of Service Out Of Service Status Flags Event State Out Of Service Out Of Service Out Of Service Out Of Service		Database Revision				
Location Disect Identifier Status Flags Event State Out Of Service Number of States Object Identifier Object Name Present Value Status Flags Event State Object Name Object Name Cobject Name Internet Disect Value Status Flags Event State Out Of Service Out Of Service Out Of Service Out Of Service		Local Time				
Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Event State Out Of Service Number of States Multi-state Output Object Identifier Object Name Present Value Status Flags Event State Out Of Service		Local Date				
Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Event State Out Of Service Number of States Multi-state Output Object Identifier Object Name Present Value Status Flags Event State Out Of Service Out Of Service Out Of Service Out Of Service		Location				
Multi-state Input / Multi-state Value Multi-state Input / Multi-state Value Event State Out Of Service Number of States Multi-state Output Object Identifier Object Name Present Value Status Flags Event State Out Of Service Out Of Service		Object Identifier				
Multi-state Input / Multi-state Value       Status Flags         Event State       Out Of Service         Number of States       Number of States         Multi-state Output       Object Identifier         Object Name       Present Value         Status Flags       Event State         Out Of Service       Out Of Service		Object Name				
Event StateOut Of ServiceNumber of StatesMulti-state OutputObject IdentifierObject NamePresent ValueStatus FlagsEvent StateOut Of Service		Present Value				
Out Of Service         Number of States         Multi-state Output       Object Identifier         Object Name         Present Value         Status Flags         Event State         Out Of Service	Multi-state Input / Multi-state Value	Status Flags				
Number of States         Multi-state Output       Object Identifier         Object Name         Present Value         Status Flags         Event State         Out Of Service		Event State				
Multi-state Output Object Identifier Object Name Present Value Status Flags Event State Out Of Service		Out Of Service				
Object Name Present Value Status Flags Event State Out Of Service		Number of States				
Present Value Status Flags Event State Out Of Service	Multi-state Output	Object Identifier				
Status Flags Event State Out Of Service		Object Name				
Event State Out Of Service		Present Value				
Out Of Service		Status Flags				
		Event State				
Number of States		Out Of Service				
		Number of States				

	Relinquish Default	
	Object Identifier	
	Object Name	
	File Type	
File	File Size	
File	Archive	
	Read Only	
	File Access Method	
	Record Count	

# 10 MODBUS Services

The Modbus protocol provides the internal standard that the Modicon controllers use for parsing messages. During communications on a Modbus network, the protocol determines how each controller will recognize a message addressed to it, determine the kind of action to be taken, and extract any data or other information contained in the message. If a reply is required, the controller will construct the reply message and send it using Modbus protocol.

When Modbus-to-BACnet page is open, MODBUS services can be defined for every MODBUS device on network, services that WBR support is:

- Read coils
- Read discrete inputs
- Read holding registers
- Read input registers
- Write single coil
- Write single register
- Write multiple coils
- Write multiple registers
- Read file record
- Write file record

Administration Configuration Datalink 8 Application layer P settings	Welcome         Datalink & Application         Image: Comparison of the second s	to local Mac: 0	Number of		
atalink & Application layer					
	Type: m2b • Network: 4	Mac: 0			
			messages:		
	Connection: Serial 👻	Data		Stop	
		Baud: 57600      Data Bits:	8 • Parity: even	<ul> <li>Stop Bits: 1</li> </ul>	-
	Devices				1
	Add new device				-
	Slave Instance		Timeout (ms) Turnaround Timeo	ut (ms)	9 <b>x</b>
	1 1	some device 500	2000		
	Read coils Read discrete		V Read input registers Read	file record file record	
	1 ·	and the second sec			
View					
Services	inputregister -> analog input -> +	example i mili		MODBUS supr	orted
	A			services	
Update					
View     Services	Write single coil Write single a	register 🖾 Write multiple colls Istance Object Name Units	Write multiple registers 🖾 Write	MODBUS supp	

Figure 62: Modbus supported services

# 11 Update Web BACnet Router

Update Web BACnet Router is used for updating firmware on WBR. To update firmware, follow these steps:

- 1. Download the update for WBR from <a href="http://store.euroicc.com/1-web-bacnet-router-c4wbr02.html">http://store.euroicc.com/1-web-bacnet-router-c4wbr02.html</a> and save it on your computer.
- 2. Click on "Upload firmware" and select the update file from your computer.
- 3. When uploading is successfully completed, click "Upgrade" to upgrade the firmware for WBR from the uploaded file.
- 4. After successful update, WBR will initiate soft restart.

EUROICC		Time Server Control	ð	Router Date and Time	2014-02-12 15:49:51	Router Control	•	0	Router Status	000
Administration	Welcome Update ®									
• Configuration	WBR firmware update	( Current firm	war	o vorsion	10)					
View	WBR IIIIware update	( current min	wai	e version	. 1.0 j					
Services	Upload firmware									
<ul> <li>Update</li> </ul>	opolo interes									
pgrade finnware	Important note: • Only upload files issued officially Upgrade	by EUROICC.								
Date and Time										
Output Console										

#### Figure 63: Update WBR tab

**Note:** Only files issued by EUROICC should be uploaded and used to update Web BACnet Router Firmware.

# 12 Setup Network Time Protocol (NTP)

NTP is a protocol designed to synchronize the clocks of computers over a network. Web BACnet Router has data and time configuration on Main Manu selecting Date and Time.

EUROICC		Time Server Control	5	Router Date and Time	2014-02-12 15:50:05	Router	► 0 I	lmin Sign out
Administration     Configuration     View     Sorvices     Update     Date and Time Set Time Zone; Manual Time Set	Welcome       Set Time Zone         Save NTP changes         Time Zone         Choose Time Zone (TZ):         (UTC +0140, DST+02200) Europe/Be         NTP Server List         Add new sorver         Domain : pool nip org		Ŧ					
Output Console								

Figure 64: Setup time zone

NTP can be configured by choosing local time zone and adding NTP server in NTP server list. Also NTP can be configured manually on Manual Time Set tab showing on Figure 65.

ñ	Time Server to Router Date 2014-02-12 Router biological Router Status
O Administration	Welcome Manual Time Set 📀
Configuration	Save NTP changes
🕑 View	
Services	Set time
D Update	Time: 15:50:16 @
Date and Time	Date:
et Time Zone Ianual Time Set	O February 2014 O
	Su Mo Tu We Th Fr Sa
	9 10 11 12 13 14 15
	16 17 18 19 20 21 22
	23 24 25 26 27 28
	1
Output Console	

Figure 65: Manual Time Set Tab

# 13 NTP Control (restart)

Main setup page, if it's needed, can send command to restart NTP server on Web BACnet Router which is show on Figure 66.

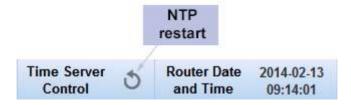


Figure 66: NTP control panel