



# User Guide

## BACnet MS/TP Communication with MBS UBR-01 Router

VLT<sup>®</sup> HVAC Drive FC 102 • VACON<sup>®</sup> 100 HVAC





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# 1 Introduction

## 1.1 Purpose of the Manual

This user guide provides information on the configuration and use of the universal BACnet Router UBR-01 from MBS with Danfoss VLT® HVAC Drive FC 102 and VACON® 100 HVAC, using the embedded BACnet MS/TP communication.

The user guide details:

- The electrical connection of the RS485.
- The IP settings of the PC.
- The settings of the UBR-01 router.
- The relevant communication parameters of the frequency converter.

For further settings of the UBR-01, refer to [www.mbs-ugw.de/ubr-01bacnet-router/](http://www.mbs-ugw.de/ubr-01bacnet-router/).

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## 1.2 Additional Resources

Resources available for the frequency converters and optional equipment:

- The *VLT® HVAC Drive FC 102 Operating Guide* provides the necessary information for getting the frequency converter up and running.
- The *VLT® HVAC Drive FC 102 Design Guide* provides detailed information about capabilities and functionality to design motor control systems.
- The *VLT® HVAC Drive FC 102 Programming Guide* provides greater detail on working with parameters and many application examples.
- The *VACON® 100 BACnet Installation Manual* describes how to commission and parameterize the BACnet protocol.
- The *VACON® 100 HVAC Application Manual* provides greater detail on the parameters and application examples.

Supplementary publications and manuals are available from Danfoss. See [drives.danfoss.com/knowledge-center/technical-documentation/](http://drives.danfoss.com/knowledge-center/technical-documentation/) for listings.

## 1.3 Product Overview

Use the BACnet MS/TP UBR-01 router to enable communication in a BACnet network. The router is the device sending messages through the network. The messages can be from master to slave or slave to master, and the router can trigger alarms and/or warnings if the communication is lost.

## 1.4 Symbols, Abbreviations, and Conventions

Abbreviation	Definition
BMS	Building management system
EMC	Electromagnetic compatibility
IP	Internet protocol
PC	Personal computer
TCP	Transmission control protocol

Table 1.1 Symbols and Abbreviations

### Conventions

- Numbered lists indicate procedures.
- Bullet lists indicate other information and description of illustrations.
- Italicized text indicates the following:
  - Cross-reference.
  - Link.
  - Parameter name.
  - Parameter option.
  - Parameter group name.
- All dimensions are in metric values (imperial values in brackets).
- An asterisk (\*) indicates the default setting of a parameter.

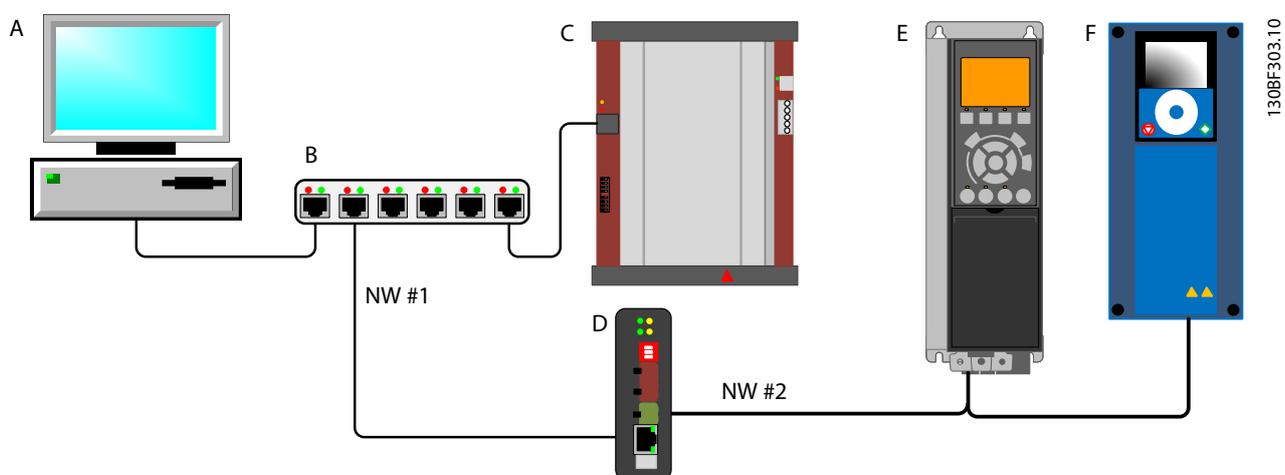
## 2 Network

### 2.1 Network Set-up

The system consists of 2 networks:

- Ethernet network (shown as Network number 1-NW#1)
- BACnet MS/TP network (shown as Network number 2-NW#2)

For the correct function of this network system, it is mandatory to follow the instructions on installation of the communication cables given in this user guide.



A	PC with web browser
B	Ethernet switch
C	BMS controller
D	UBR-01 BACnet Ethernet to MS/TP router
E	VLT® HVAC Drive FC 102
F	VACON® 100 HVAC
NW #1	Ethernet network, network number 1
NW #2	BACnet MS/TP network, network number 2

Illustration 2.1 Router Running BACnet Ethernet

## 2.2 Cabling of the Networks

### 2.2.1 BACnet MS/TP Cabling (NW #2)

To ensure correct functionality of the BACnet MS/TP network, be sure to do the cabling correctly. Pay special attention to mounting of the cable shield and to termination of the network.

#### NOTICE

Never connect the shield to terminal 61 on the frequency converter.

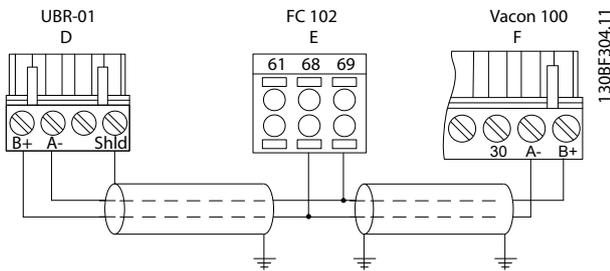


Illustration 2.2 Grounding Shielded Cables

#### Shielding of frequency converters connected to the same ground potential

1. Use an adequate equalizing cable to eliminate the risk of equalizing current running into the shield of the BACnet cables.
2. Mount the shield at the terminal marked *Shld* on the router.
3. On the frequency converters, connect the shield to the ground shield brackets.

#### Shielding of frequency converters without the same ground potential

If the frequency converters do not have the same ground potential, only connect the shield to ground in 1 location. Expect a lower EMC performance.

### 2.2.2 Ethernet Cabling (NW #1)

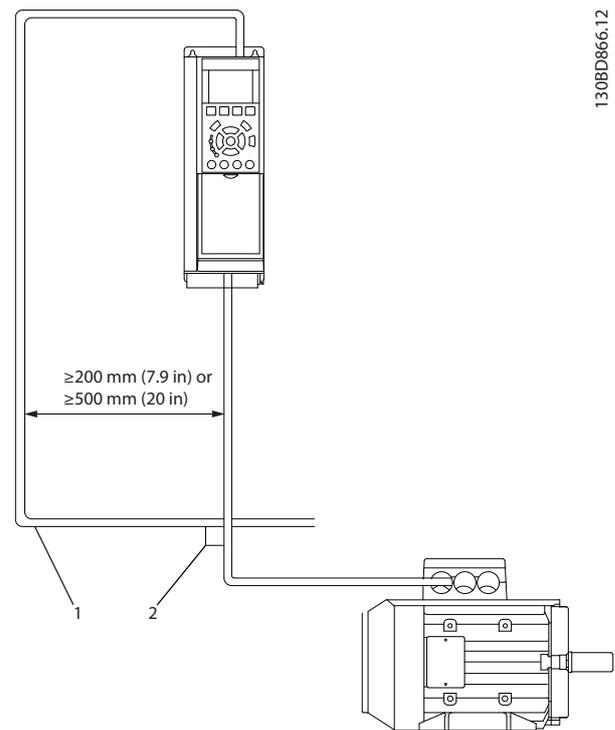
#### NOTICE

##### EMC INTERFERENCE

Use shielded cables for motor and control wiring, and separate cables for fieldbus communication, motor wiring, and brake resistor. Failure to isolate fieldbus communication, motor, and brake resistor cables can result in unintended behavior or reduced performance. Minimum 200 mm (7.9 in) clearance between power, motor, and control cables is required. For power sizes above 315 kW (450 hp), increase the minimum distance to 500 mm (20 in).

#### NOTICE

When the fieldbus cable crosses a motor cable or a brake resistor cable, ensure that the cables cross at an angle of 90°.



1	Ethernet cable
2	90° crossing

Illustration 2.3 Cable Routing

For the Ethernet, use standard shielded Cat5e patch cables. Maximum cable length is 100 m (328 ft).

An Ethernet switch distributes the packets to the participants on the Ethernet network. For industrial installation, only use industrial graded products as other products may cause faults and sporadic loss of communication.

## 3 Addressing and Setting up the Devices on the Networks

For proper function of the network, configure each device correctly.

Device	Product	Device instance	MAC address	Network number	Baud rate	IP address	Subnet mask
A	PC	10000	N/A	N/A	N/A	192.168.0.xxx	255.255.255.000
B	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	N/A	1	N/A	1	N/A	N/A	N/A
D	UBR-01 router, RS485	100	0	1 & 2	38400	192.168.0.1	255.255.255.0
E	VLT® HVAC Drive FC 102, 1 <sup>st</sup> frequency converter	1001	1	N/A	38400	N/A	N/A
F	VACON® 100 HVAC, 2 <sup>nd</sup> frequency converter	1002	2	N/A	38400	N/A	N/A

Table 3.1 BACnet and Ethernet Settings

### 3.1 Setting up the IP Address and Subnet Mask of the PC

On the PC, set up the IP address in the *Internet Protocol Version 4 (TCP/IP) Properties* configuration menu.

1. Open the *Control panel* window.
2. Select *View network status and tasks*.
3. Select *Local Area Connection*.
4. Select *Properties*.
5. Select *Internet Protocol Version 4 (TCP/IPv 4)*.
6. Select *Properties*.
7. Select *Use the following IP address*.
8. Set the IP address to 192.168.0.xx, where xx must be a number not currently used on the network.
9. Set the subnet mask to 255.255.255.000.
10. Exit the windows to activate the new IP addresses.

### 3.2 Setting up the UBR-01

To route to and from the MS/TP network, configure the UBR-01 router via the router web page.

As factory setting, the UBR-01 has the IP address 192.168.0.1.

1. Enter the IP address 192.168.0.1 in the web browser address bar.
2. Press *Enter*.
  - 2a The main page of the router web page opens.

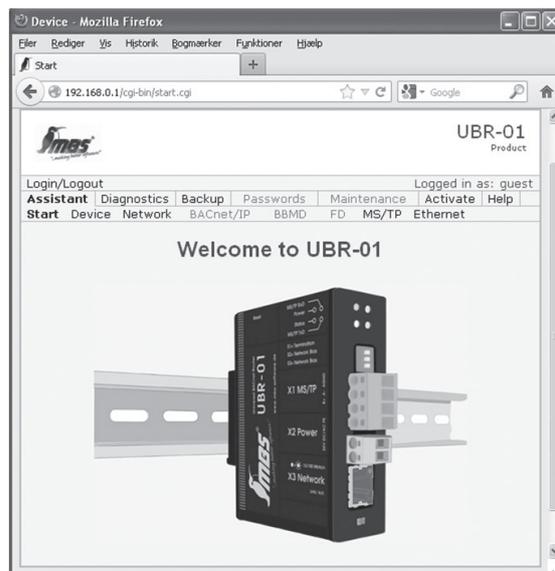
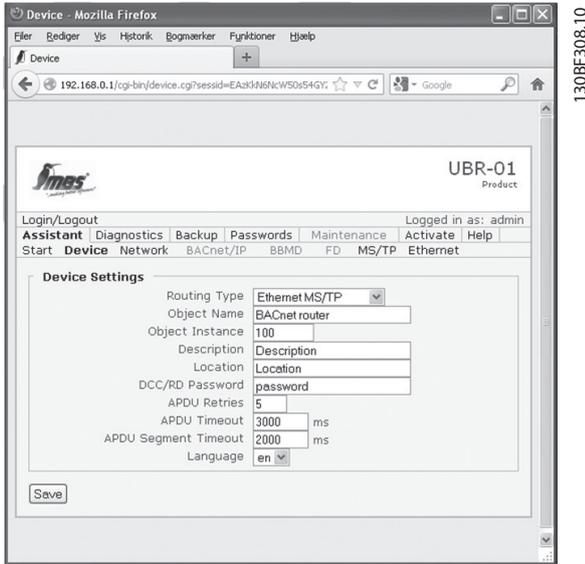


Illustration 3.1 Entering the IP Address in the Web Browser

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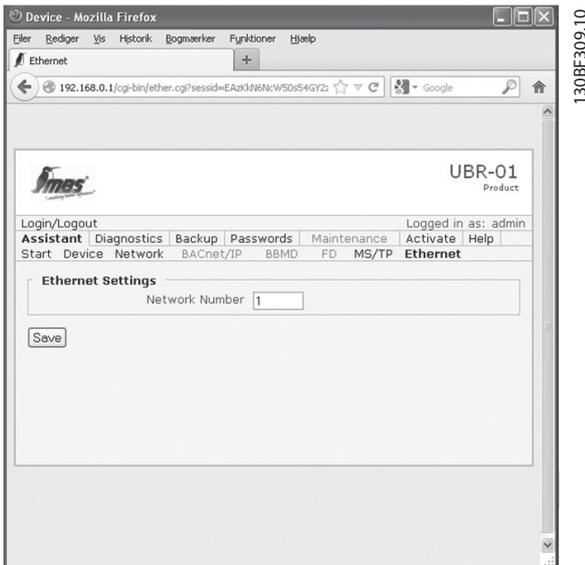
3. Consult the manual for the UBR-01 for login and password. Danfoss recommends to change the default login and password, since keeping the default is a security vulnerability.
4. Open the *Device* menu.
5. Enter the settings shown in *Illustration 3.2*.



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Illustration 3.2 Settings in the *Device* Menu

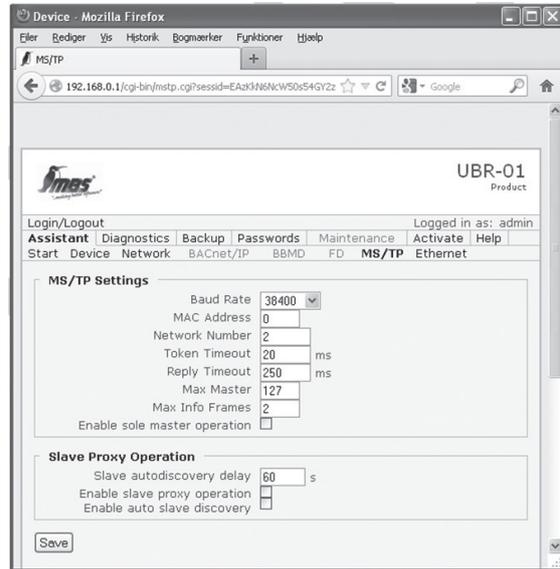
6. Click *Save*.
7. Open the *Ethernet* menu.
8. Enter the settings shown in *Illustration 3.3*.



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Illustration 3.3 Settings in the *Ethernet* Menu

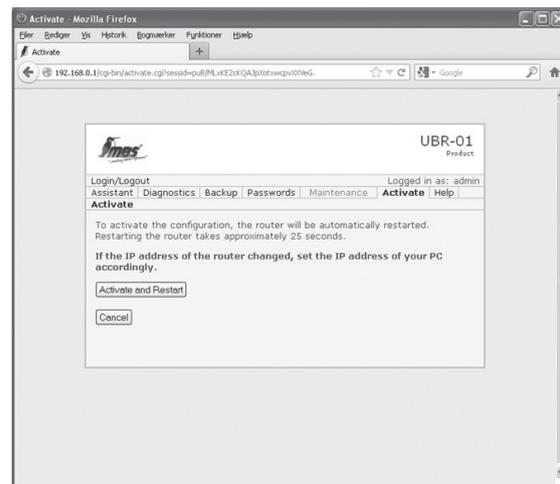
9. Click *Save*.
10. Open the *MS/TP* menu.
11. Enter the settings shown in *Illustration 3.4*.



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Illustration 3.4 Settings in the *MS/TP* Menu

12. Click *Save*.
  13. Open the *Activate* menu.
  14. Click *Activate and restart* to activate the settings, see *Illustration 3.5*.
- 14a The router restarts and the new settings become active, see *Illustration 3.6*.



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Illustration 3.5 Settings in the *MS/TP* Menu

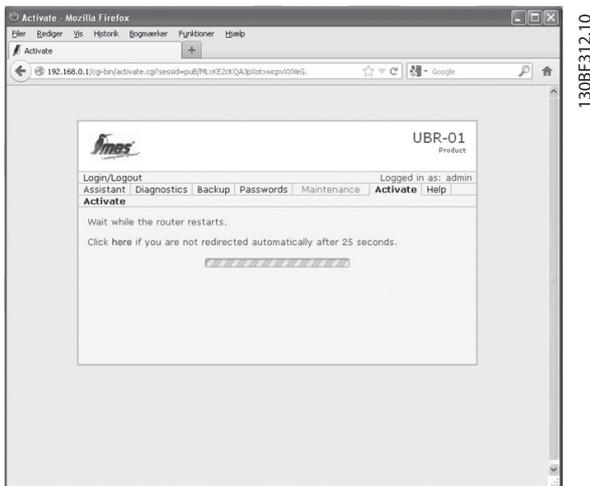


Illustration 3.6 Router Restarting

### 3.3 Configuring the Frequency Converters

To enable the frequency converters to communicate over the embedded BACnet MS/TP network, set the parameters listed in *Table 3.2* and *Table 3.3*.

For correct programming of the frequency converter, see the *VLT® HVAC Drive FC 102 Programming Guide* for details on setting up motor size, motor voltage, ramp times, and more.

Parameter	Setting
	First frequency converter (E)
Parameter 8-01 Control Site	[2] Control word only
Parameter 8-02 Control Source	[1] FC Port
Parameter 8-03 Control Timeout Time	10.0 s <sup>1)</sup>
Parameter 8-04 Control Timeout Function	[2] Stop <sup>1)</sup>
Parameter 8-10 Control Profile	[0] FC Profile
Parameter 8-30 Protocol	[5] BACnet
Parameter 8-31 Address	1
Parameter 8-32 Baud Rate	[4] 38400 Baud
Parameter 8-70 BACnet Device Instance	1001

Table 3.2 Required Communication Parameters and their Correct Settings, VLT® HVAC Drive FC 102

Parameter	Setting
	Second frequency converter (F)
Parameter 3.2.1 Control Place	FieldbusCTRL
Parameter 3.2.2 Local/Remote Control	Remote
Parameter 5.8.3.1.5 Communication Timeout	10.0 s <sup>1)</sup>
Parameter 3.9.1.6 (ID 733) Fieldbus Fault	Stop
Parameter 5.8.1.1 Protocol	BACnet MSTP
Parameter 5.8.3.1.2 MAC Address	2
Parameter 5.8.3.1.1 Baud Rate	38400
Parameter 5.8.3.1.3 Instance Number	1002

Table 3.3 Required Communication Parameters and their Correct Settings, VACON® 100 HVAC

1) To achieve a stable system, it is recommended that 3 write commands are sent within the timeout set in parameter 8-03 Control Timeout Time.

## 4 Testing the BACnet Settings in a Delta BMS System

For testing the settings in the UBR-01 router and in the frequency converters, a BMS tool is used for:

- Scanning the network.
- Find the BACnet devices.
- Showing the device objects.

4

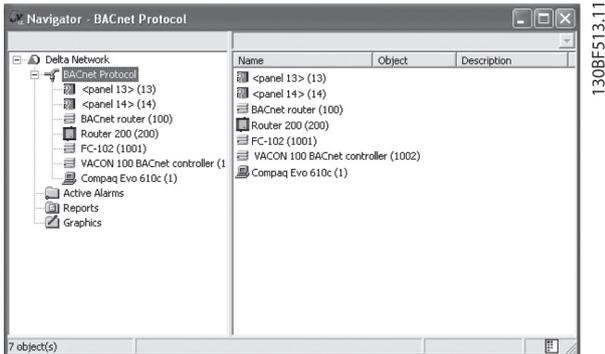


Illustration 4.1 BMS Tool Scanning the Network

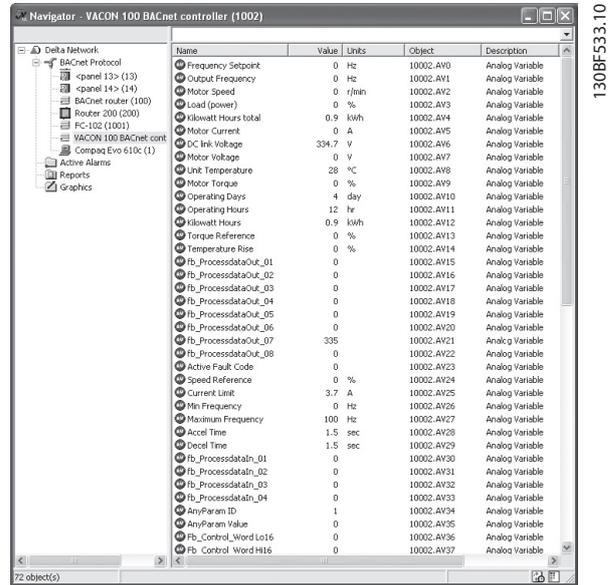


Illustration 4.3 List of VACON® 100 Objects and their Values

By selecting the frequency converter with device instance 1001, the BMS starts the discovery of the frequency converter objects and shows their present value. This proves the correct function of the UBR-01 and the frequency converters connected via BACnet.

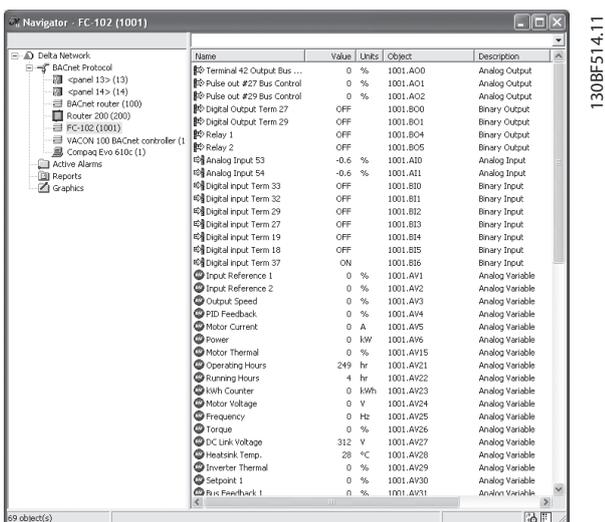


Illustration 4.2 List of VLT® HVAC Drive FC 102 Objects and their Values



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