

Installation Guide

Anybus BACnet to Modbus Gateway

Doc. SP1820
Rev. 1.00

Important User Information

This document provides installation instructions and other relevant information applicable to the Anybus BACnet to Modbus Gateway.

Liability

Every care has been taken in the preparation of this document. Please inform HMS Industrial Networks AB of any inaccuracies or omissions. The data and illustrations found in this document are not binding. We, HMS Industrial Networks AB, reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be considered as a commitment by HMS Industrial Networks AB. HMS Industrial Networks AB assumes no responsibility for any errors that may appear in this document.

There are many applications of this product. Those responsible for the use of this product must ensure that all the necessary steps have been taken to verify that the applications meet all performance and safety requirements, including any applicable laws, regulations, codes or standards.

HMS Industrial Networks AB will, under no circumstances, assume liability or responsibility for any problems that may arise as a result from the use of undocumented features, timing, or functional side effects found outside the documented scope of this product. The effects caused by any direct or indirect use of such aspects of the product are undefined, and may include e.g. compatibility issues and stability issues.

The examples and illustrations in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular implementation, HMS Industrial Networks AB cannot assume responsibility for actual use based on these examples and illustrations.

Trademark Acknowledgements

Anybus ® is a registered trademark of HMS Industrial Networks AB. All other trademarks are the property of their respective holders.

Specifications are subject to change without notice. Other product names may be trademarks or registered trademarks of their respective companies. BACnet is a registered trademark of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc. (ASHRAE).

Declaration of Conformity

Information about regulatory compliance can be found at: www.anybus.com

Anybus BACnet to Modbus Gateway Install Guide

Copyright© HMS Industrial Networks AB, September 2014

Table of Contents

Important User Information	3
Overview	6
Specifications	8
Electrical	8
Communications	8
Mounting	9
Shipping Weight	9
Regulatory Compliance	9
Environmental	10
Ethernet Connector Pinout	10
RS-485 Connector Pinout	10
RS-485 Bias and Termination Jumpers (J5)	11
Mechanical	11
Power	12
Limited Power Sources	16
Hardware & Cabling	18
LEDs	18
Reset Switch	18
Cabling	18
Modbus Port	19
RS-485 Bias and Termination Jumpers	21
Configuration	22
Further Help	23

1. Overview

Modbus is a popular network interface commonly used with boiler controllers, variable speed drives, and metering applications, although many of these devices have no BACnet compliance. The Anybus BACnet to Modbus Gateway is used to make Modbus devices appear as individual BACnet devices.

The gateway has one 10/100 Mbps Modbus TCP or BACnet/IP Ethernet port, and one opto-isolated Modbus RS-485 serial port for Modbus RTU or Modbus ASCII devices.

Up to 30 Modbus serial devices can share the unit's Modbus port, and up to 1000 Modbus registers can be processed. The virtual routing feature in the Anybus BACnet to Modbus gateway allows each connected Modbus device to appear as an individual BACnet-compliant device.

A device profile is required for each Modbus device type. Common device profiles are available from www.anybus.com. Device profiles can be customized.

Using web pages and a database of common Modbus device profiles, Modbus registers from Modbus Serial devices can be mapped to BACnet objects.

The Anybus BACnet to Modbus Gateway provides:

Gateway functionality between

- Modbus Serial (RTU or ASCII) and BACnet/IP
- Modbus TCP and BACnet/IP

Routing functionality between:

- Modbus Serial (RTU and ASCII) and Modbus TCP

Flexible communication ports:

- 10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX
- Opto-isolated serial port supports either 2-wire or 3-wire RS-485
- Baud rates at 2.4–115.2 kbps

Convenient Installation

- 24 VAC/VDC powered
- DIN-rail mounting

2. Specifications

2.1 Electrical

	DC	AC
Input voltage:	24 V	24 V
Input power:	6 W	10 VA
Input frequency:	N/A	47–63 Hz

(Intended for use with Class 2 circuits only.)

2.2 Communications

	Ethernet		RS-485	
Compliance	IEEE 802.3		Modbus V1.02	
Protocols supported	Modbus TCP BACnet/IP		RTU Master ASCII Master	
Data rates	10 Mbps, 100 Mbps		2.4, 4.8 9.6, 19.2, 38.4, 57.6, 76.8, 115.2 kbps	
Physical layer	10BASE-T, 100BASE-TX		RS-485, 3-wire isolated	
Max cable length	100m		1200m	
Port connector	Shielded RJ-45		5-pin removable terminal	
LED:s	L (Link) Green=100Mbps Yellow=10Mbps Flash=Activity	D (Duplex) Green=Full-duplex Off=Half-duplex Flash=Collision	Tx Green=Activity	Rx Green=Activity

2.2.1 Protocol Compliance

BACnet/IP:	ASHRAE 135-2004, Annex J, B-ASC Profile
Modbus TCP: (modbus.org)	Modbus Appl. Protocol Spec. V1.1b, Dec. 28, 2006 Modbus Messaging on TCP/IP Impl. Guide V1.0b, Oct. 24, 2006
Modbus Serial: (modbus.org)	Modbus over Serial Line Spec. and Implementation Guide V1.02b, Dec. 20, 2006

2.3 Mounting

TS-35 DIN-rail

2.4 Shipping Weight

1 lb. (0.45 kg)

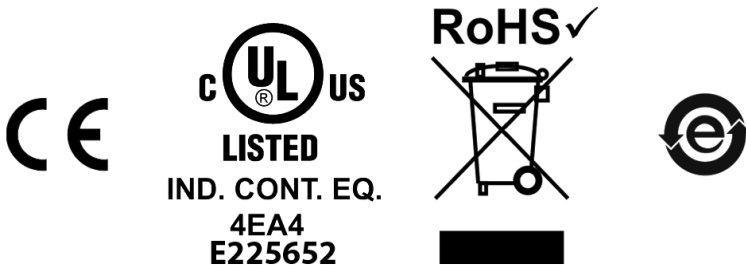
2.5 Regulatory Compliance

CE Mark — CFR 47

Part 15 Class A

RoHS,

UL 508, C22.2 No. 142-M1987



2.6 Environmental

Operating temperature:	0°C to +60°C
Storage temperature:	-40°C to +85°C
Humidity:	10—95%, non-condensing

2.7 Ethernet Connector Pinout

1 TD+	3 RD+
2 TD-	6 RD-

(All other pins unused.)

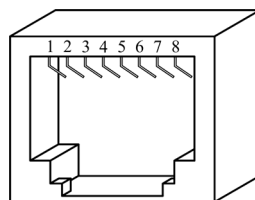


Figure 1: RJ-45 socket

2.8 RS-485 Connector Pinout

+	Signal High
–	Signal Low
SC	Signal Common
COM	0V
SH	Shield (Chassis)

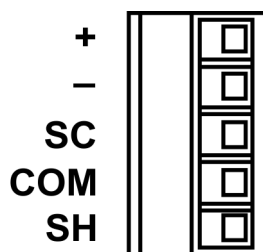
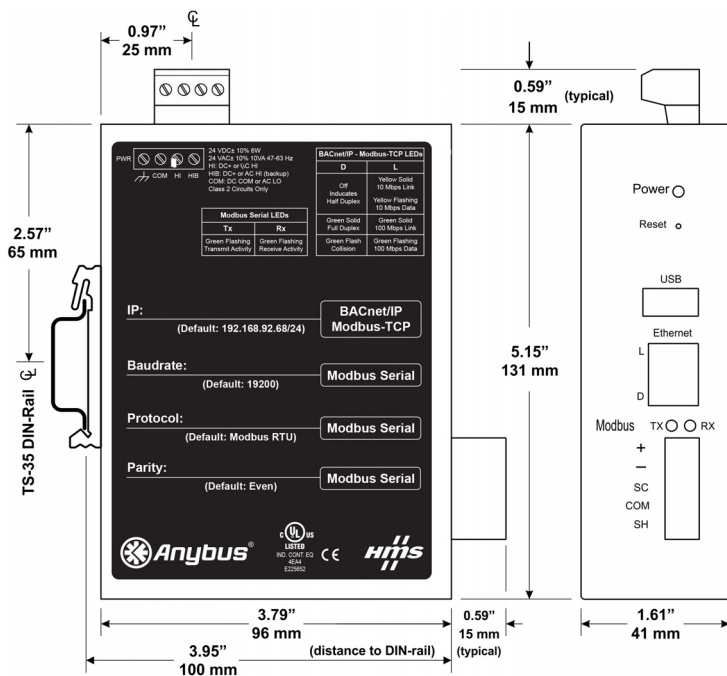


Figure 2: RS-485 connector



3. Power

The Anybus BACnet to Modbus gateway requires 24 VAC or 24 VDC, and draws a commensurate amount of current. The recommended wire gauge is 16–18 AWG. COM is directly connected to zero volts, and the chassis is DC-isolated from zero volts. Input connections are reverse-polarity protected.

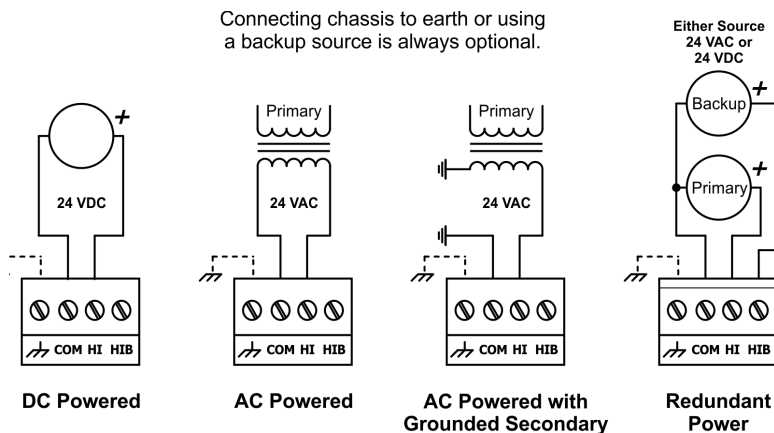


Figure 5: Power options



WARNING: Powering devices can present hazards. Read the following carefully.

The product's half-wave rectifier circuit means that it can share the same 24V AC power with other half-wave rectified devices. It can also be powered from a 24 VDC source. A redundant power connection exists for back-up power schemes.

The product incorporates a 3-wire optically-isolated RS-485 interface for the serial connection, for better circuit protection and noise immunity. Use a 1-to-1 connection to other 3-wire devices.

When connecting to 2-wire non-isolated devices, the signal common (SC) on the product must share the reference used by the 2-wire devices. Do this by tying the SC pin to COM on the product and by grounding the low side of each

power supply on all connected devices. In this way all RS-485 transceivers share the same earth reference.

Note that the SC pin is signal-common and is not a shield pin. For shield connections, use the SH pin.

Far-end external termination is required as shown.

Internal termination is not provided. If this is required, use the external termination included with the product.

For devices that share a power source with this product, see Figure 6 for correct 2-wire bus connections and Figure 7 for correct 3-wire bus connections.

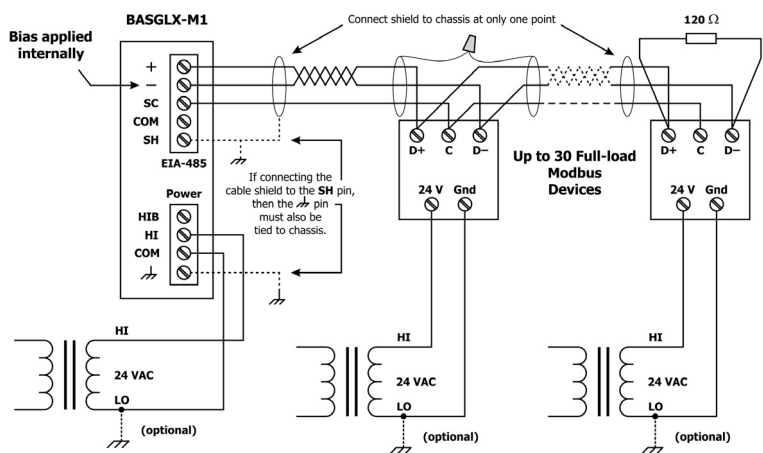


Figure 6: 2-wire RS-485 Bus with Shared Power Source

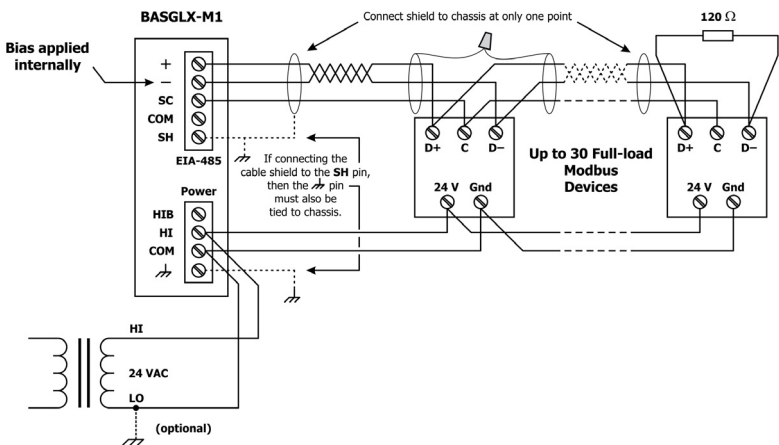


Figure 7: 3-wire RS-485 Bus with Shared Power Source

For devices that do not share power with this product, see Figure 8 for correct 2-wire bus connections and Figure 9 for proper 3-wire bus connections.

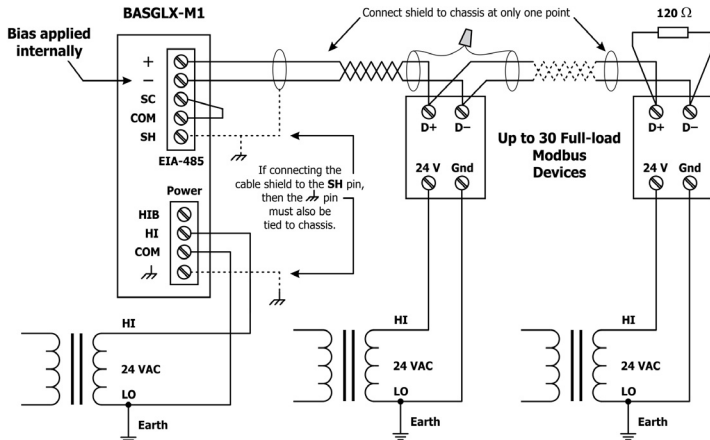


Figure 8: 2-wire RS-485 Bus with Separate Power Source

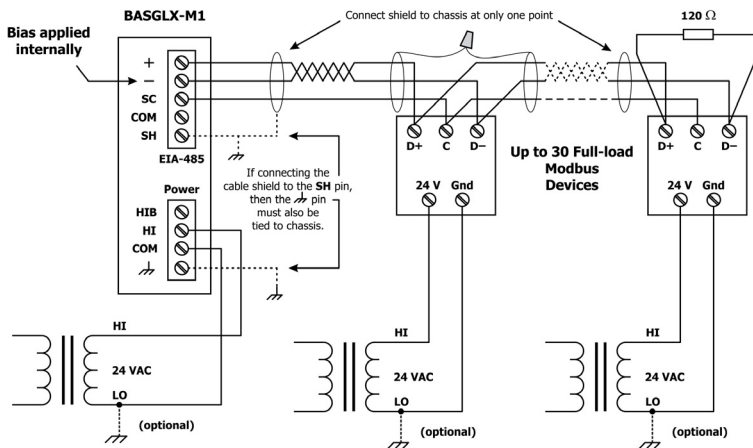


Figure 9: 3-wire RS-485 Bus with Separate Power Source

3.1 Limited Power Sources

The gateway should be powered by a limited power source complying with the requirements of the National Electric Code (NEC) article 725, or other international codes (SELV) meeting the same intent of limiting the amount of power of the source. Under NEC article 725, a Class 2 circuit is the part of the wiring system between the load side of a Class 2 power source and the connected equipment. For AC or DC voltages up to 30 volts, the power rating of a Class 2 power source is limited to 100 VA. The transformer or power supply complying with the Class 2 rating must carry a corresponding listing from a regulatory agency such as Underwriters Laboratories (UL).

4. Hardware & Cabling

4.1 LEDs

Power	This LED is green when power is supplied correctly to the unit.
Ethernet	L shows green for a 100 Mbps link and yellow for 10 Mbps. Flashes indicate activity.
	D shows green for a full-duplex link and off for a half-duplex link.
RS-485	Tx flashes green when transmitting RS-485 traffic.
	Rx flashes green when receiving RS-485 traffic.

4.2 Reset Switch

To reset the gateway to its default authentication and IP values (other settings are unaffected), use a paper clip or similar to press the **Reset IP** button for at least 3 seconds while the gateway has power. Then release the button and remove power from the gateway for 3 seconds. Restore power and the unit will then use the default IP values and User ID/Password.

4.3 Cabling

When attaching cables to the unit, the following should be considered.

Function	Signalling & Data Rate	Minimum Cable Required	Maximum Segment Distance
Ethernet	10BASE-T, 10 Mbps	Category 3 UTP	100 m (328 ft)
Ethernet	10BASE-TX, 100 Mbps	Category 5 UTP	100 m (328 ft)
Modbus	2.4–115.2 kbps	Belden® 9841, 3106A, 9842	1200 m (3937 ft)

NOTE: If using shielded cables, these should connect to the chassis at one point only. Wire size may be dictated by electrical codes for the area in which the equipment is being installed. Consult local regulations.

In the table above, observe that 10BASE-T segments can use Category 3, 4 or 5 cable, although 100BASE-TX segments must use Category 5 cable. Category 5e cable is highly recommended as the minimum for new installations.

The Ethernet port of the gateway employs Auto-MDIX technology, meaning that straight-through or crossover cables can be used.

4.4 Modbus Port

This port uses an isolated RS-485 transceiver connected to a 5-pin removable connector. The transceiver + and – lines tie to + and – pins of the connector. The SC pin ties to the transceiver ground. The SC pin must be connected to the Modbus segment signal common, or RS-485 communication will fail.

Figure 8 shows a simplified schematic of the isolated RS-485 transceiver. Note that the transceiver common (SC) is electrically isolated from the gateway power supply common (COM) through the use of opto-isolators and an isolated DC-DC converter. An isolated RS-485 transceiver offers less chance of damage to the transceiver from high common-mode voltages, but there is still a risk. Surge suppression is applied between the two differential inputs and between each input and ground. Since the transceiver is electrically isolated, the transceiver circuit common must be brought out for connection to the other devices on the RS-485 network. This is accomplished by pin SC. The differential pair is labelled + and –, and requires a three-wire connection to the RS-485 network. Connecting other isolated RS-485 devices is not a problem, as each device requires a 3-wire connection. Simply make the corresponding connections.

For non-isolated RS-485 devices, usually only a 2-wire connection is provided. The third wire is the power supply common. In this situation, the SC connection **MUST** be made to the power supply common of the non-isolated device. Refer to the instructions provided by the vendor for connecting such a device.

In an application where one connection is made to Ethernet and the other to RS-485, the location of the gateway is probably at the end of the RS-485 bus segment, meaning that both bias and termination must be applied to the segment end.

The product is shipped with bias and termination disabled by default. This can be changed by using the terminating resistors included in the package. Termination is required if the gateway is to be connected anywhere between the end RS-485 devices.

The gateway can address up to 30 Modbus devices on the local bus, at baud rates from 2.4 to 115.2 kbps.

5. Configuration

The Anybus BACnet to Modbus Gateway contains an interactive web server, which is accessible from any PC on the local network, and is compatible with recent versions of Internet Explorer or other browsers. The factory default IP address is 192.168.92.68, and the Class C subnet mask is 255.255.255.0 (/24).

Figure 10 shows the setup for accessing the RS-485 network using Anybus BACnet to Modbus Gateway, a computer for configuration, and a connection to the RS-485 network.

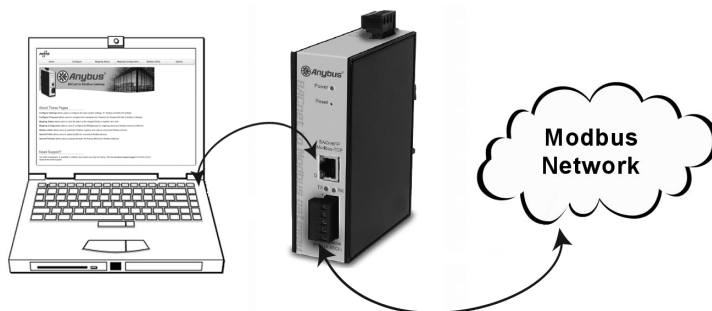


Figure 10: Setup for Initial IP Address Configuration

To configure the Anybus BACnet to Modbus Gateway, attach it to a computer with an Ethernet connection and a standard web browser. For initial configuration, the PC chosen for this procedure should have its IP address modified temporarily, to an address on the same subnet as the gateway. This can be anywhere in the range 192.168.92.3-254 (except for 68 which is used by the gateway itself).

After changing the IP address of the PC, a browser running on that PC can then access the device at the default IP address, where the Logon Screen will prompt for the User Name and Password. The default value for both is “admin”.

After logging on, the Anybus BACnet to Modbus Gateway Home Page initially appears as shown in Figure 11. To interact with the Anybus BACnet to Modbus Gateway, you must enable Java in your browser. When you access the Anybus BACnet to Modbus Gateway's first Java applet, you may encounter an additional Java security screen prompting for User ID and Password. These will be the same values as before. After satisfying these prompts, the remaining Java screens should display with no further security prompts.

As you interact with the Anybus BACnet to Modbus Gateway, you will find convenient, context-relevant help information on the right side of each screen.

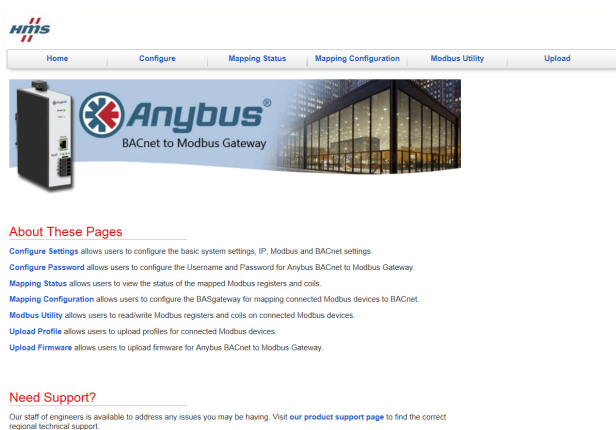


Figure 11: Anybus BACnet to Modbus Gateway Home Page

5.1 Further Help

The product features embedded help which can be useful during installation. More information can be found on our web site at www.anybus.com