# BACnet Modbus Gateway

The BACnet Modbus Gateway, a Modbus to BACnet/IP Protocol Converter product, from ProtoSense Technologies serves the industry needs for converging towards the ever popular BACnet standard and the widely used Ethernet networking standard. Presently in the Building Automation field there are diverse networking and protocol standards in use. The various networking and protocols standards have been and are being selected to suit the automation system needs specific to a building, factory etc. But the latest trend and actually a necessity in today's business environment is to have all these different control systems talking different protocols to be integrated in one central system which could be a Building Management System(BMS), SCADA or HMI. The ProtoBeamer products enables system integrators and control system designers to converge various physical and data-link layer standards(like RS-485, Low-Power Wireless) and application layer protocol standards(like Modbus, ZigBee, M-Bus, BACnet-MS/TP etc.) to BACnet/IP protocol which is becoming a de-facto standard in the BMS/BAS area.

The Modbus-RTU/TCP to BACnet/IP protocol converter product enables integrating Meter/Controller devices which talk Modbus protocol into a BACnet/IP client based BMS. The Gateway can interface with both Modbus-RTU slaves as well as Modbus-TCP/IP slave devices. The Gateway then makes the data-points in these Modbus devices available as BACnet objects belonging to a BACnet/IP Device Server. This BACnet/IP Device Server can support multiple BACnet/IP client connections simultaneously.

In <u>BACnet/IP configuration mode</u> a BACnet/IP Client, normally as part of a PC/Server based BMS software, can access these objects in the BACnet/IP Device Server to indirectly read/write to the corresponding Modbus device's data-points.
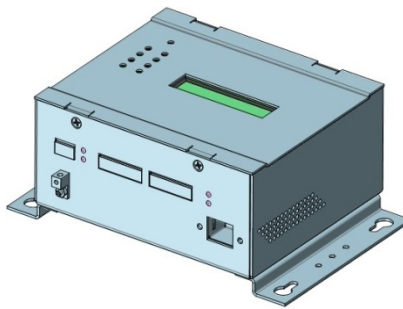
FEATURES
- Embedded fan-less and rugged system for industrial applications.
- Compact aluminum enclosure with provisions for both DIN-rail and wall mounting.
- Support for both 24V DC and 24V AC power source.
- Minimal power consumption design at the given CPU speed.
- Fast, efficient and full-featured BACnet protocol stack.
- Two isolated serial ports provides for reliable field connections.
- Each RS-485 serial port allows connecting up to 31 field devices.
- Serial ports Baud support: Modbus-RTU: 9600, 19200, 38400.
- Easy to use Windows based GUI configuration tool with support for MS Excel spreadsheet file import.
- Web based UI for status and statistics display.

HARDWARE PLATFORM

- SoC with CPU core running at 800 MHz.
- 128 MB RAM and 512 MB Flash.
- Watchdog timer for reliable operation.
- Battery backed Real-Time Clock.

SOFTWARE PLATFORM

- Real-time Embedded Operating System.
- Multi-threaded and fast response application architecture.
- Embedded Web Server

COMMUNICATION PORTS

- Isolated RS-485 serial ports with built-in ADDC support.
  - ✓ Isolation barrier withstands $2500V_{RMS}$ for 1 minute.
  - ✓ +/- 15kV ESD protection.
- 10/100 Mbps Ethernet port.
- Phoenix-Contact Screw-terminal connectors for easy connection.

USER INTERFACE

- Rx and Tx activity status LEDs for each RS-485 serial port.
- BACnet and Modbus activity status and error indication LEDs.
- Push-button for easy 'Reset to factory defaults' operation.

POWER SUPPLY

- 22 to 26V DC, 170 mA@24V DC.
- 24V AC.
- Screw-terminal connector.

MECHANICAL

- Aluminum enclosure with DIN-rail and wall-mount options.
- Dimensions: 143mm x 121mm x 65mm (Width x Height x Depth).
- Good EMI protection and EMC adherence.
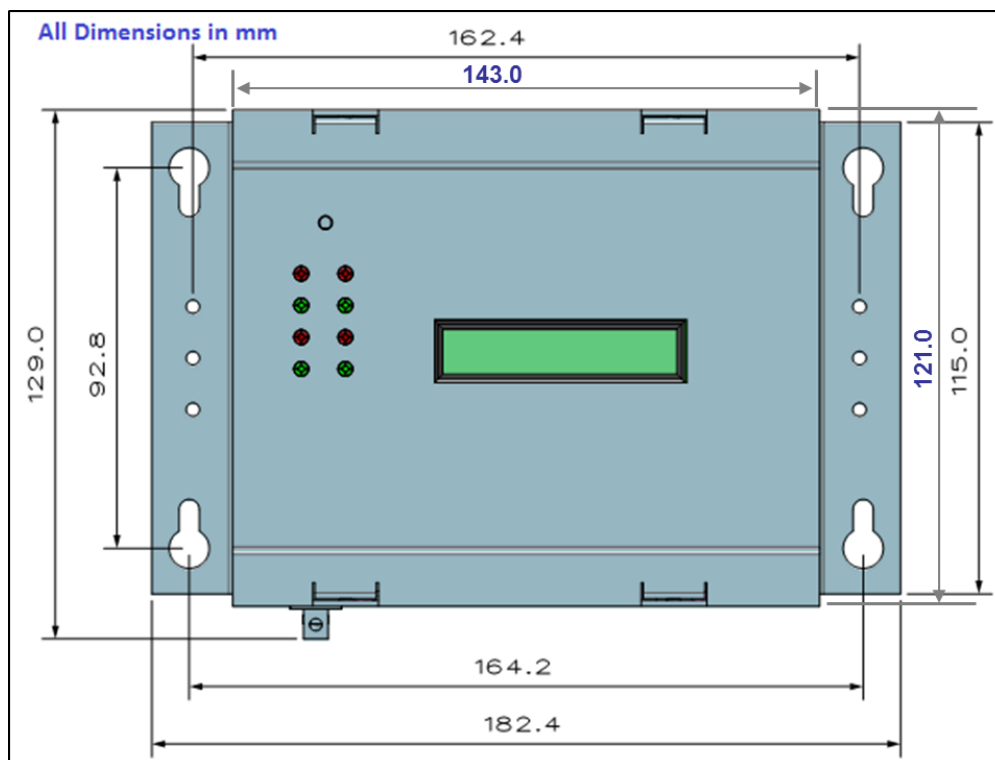
ENVIRONMENTAL

- Operating (ambient) temperature: 0 to 40 degree Celsius.
- Humidity: 10-90% non-condensing.

PROTOCOL SPECIFICATIONS

BACnet Services Supported

Object and Device Access Services
- ✓ ReadProperty
- ✓ ReadPropertyMultiple
- ✓ WriteProperty
- ✓ WritePropertyMultiple
- ✓ SubscribeCOV
- ✓ GetAlarmSummary
- ✓ Who-Is
- ✓ TimeSyncronization
- ✓ UTCTimeSyncronization
- ✓ Bi-directional Segmentation support

Supported Object Properties
- ✓ Present Value
- ✓ Reliability
- ✓ Event State
- ✓ Status Flags

BACnet Object Types Supported

- ✓ Analog Input/Analog Output/Analog Value
- ✓ Binary Input/Binary Output/Binary Value
- ✓ Multi-state Input/Multi-state Output/Multi-state Value

Modbus Services Supported

Datapoint Access Services
- ✓ Read Coils (FC 0x01)
- ✓ Read Discrete Inputs (FC 0x02)
- ✓ Read Holding Registers (FC 0x03)
- ✓ Read Input Registers (FC 0x04)
- ✓ Write Single Coil (FC 0x05)
- ✓ Write Single Register (FC 0x06)
- ✓ Write Multiple Coils (FC 0x0F)
- ✓ Write Multiple Registers (FC 0x10)
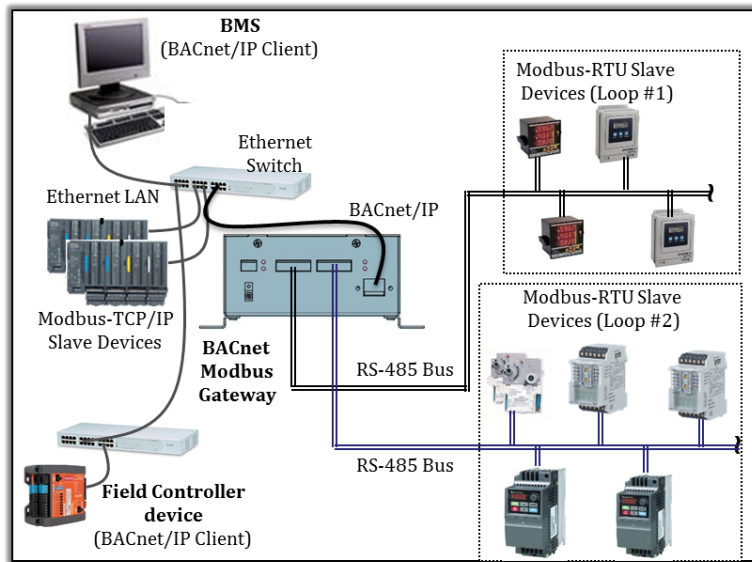
A typical application scenario with Modbus-RTU(connected on RS-485 multi-drop networks) or Modbus-TCP/IP field devices connected through the Gateway to BACnet/IP Client based BMS is shown in the next picture. The Modbus-RTU/TCP Master driver in the Gateway accesses the slave devices as per the Modbus protocol. The BACnet/IP Device Server in the Gateway makes all the data-points accessed from all the configured Modbus slave devices as the corresponding object instances in a BACnet device. This BACnet/IP device server, running in the Gateway, is then accessed by any BACnet/IP Client based software(BMS) or field controller and use it to indirectly read and write to the data-points in the Modbus devices.
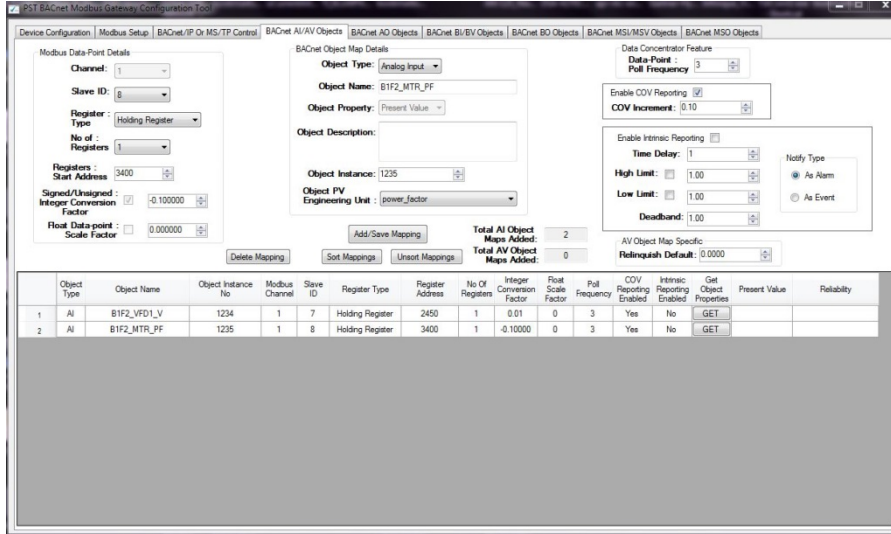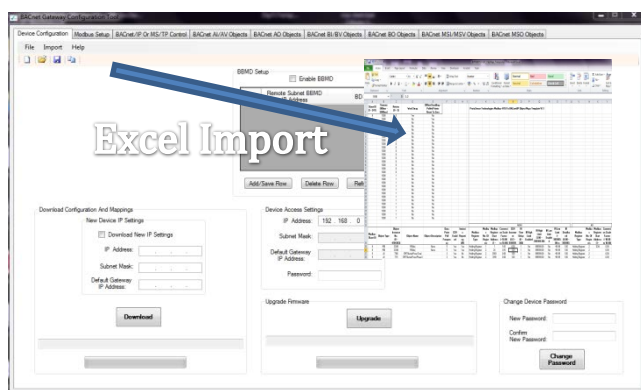
The Gateway product is supplied with a Windows PC based configuration tool called Gateway Configuration Utility(GCU). The GCU tool provides for configuring the RS-485 serial port channel parameters, setting up the BACnet Device Server instance and either manually mapping Modbus device data-points to the corresponding BACnet object instances or importing mapping & configuration details from an Excel spreadsheet template.

Some extended features provided are Bi-directional Segmentation, BBMD function, COV Notifications and Alarm Events generation. Other useful features are Bit-Unpacking for Modbus bit-packed data-points, conversion and scaling for Modbus analog data-points, Combo-Bits packed data-points binary value parsing and last but not the least Bit-Field data-points value extraction.

A bonus feature of the GCU tool is the built-in BACnet/IP Client function using which the BACnet object property values can be retrieved from the BACnet Gateway. The tool also provides for saving the configuration/mappings into a file, download the configuration/mappings into the Gateway on-the-fly, Gateway firmware remote upgrade and changing the device IP Address and Password.

Product Type	Product Code
BACnet/IP Gateway for Modbus-RTU or Modbus-TCP/IP devices with 2 isolated Modbus-RTU ports(RS-485) and 1000 points mappings.	GW-BIP-MBTCP_RTU2