Technical Article

BacNET and Metering Relays

Product: GreenMAX Support for BACnet **Article ID:** 101717-DB/TB-01

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Summary:

This document defines how GreenMAX interfaces with the BACnet network for energy metering capabilities.

Background*

BACnet is "a data communication protocol for building automation and control networks." A data communication protocol is a set of rules governing the exchange of data over a computer network. The rules take the form of a specification that spells out what is required to conform to the protocol. The protocol defines everything from what kind of cable to use to how to form a request or command in a standard way. What makes BACnet special is that the rules relate specifically to the needs of building automation and control equipment, i.e., they cover things like how to ask for the value of a temperature, define a fan operating schedule, send a pump status alarm, and turn lights on and off.

However, each manufacturer's system is different. How does BACnet accomplish all these control tasks in a standard way?

BACnet solves the problem of cross-manufacturer compatibility by providing a standard way of representing the functions of any device. Examples are analog and binary inputs and outputs, schedules, control loops, and alarms. This standardized model of a device represents these common functions as collections of related information called "objects," each of which has a set of "properties" that further describe it. Each analog input, for instance, is represented by a BACnet "analog input object" which has a set of standard properties like present value, sensor type, location, alarm limits, etc. Some of these properties are required while others are optional. One of the object's most important properties is its identifier, a numerical name that allows BACnet to unambiguously access it. As devices have common "appearances" on the network in terms of their objects and properties, messages can manipulate this information in a standard way.

GreenMAX Metering Relay Product Description

Seamlessly integrate into BAS/BMS systems and integrate submetering technology with the GreenMAX Relay Control System featuring metering relays. The GreenMAX Lighting Control System is designed to connect to a Building Automation System (BAS). The GreenMAX system communicates with the BAS using standard BACnet IP protocol. One dedicated communication port is provided at each Command Module for Ethernet connection. The Command Modules mount in relay cabinets and provide control of line voltage lighting control circuits. Each relay cabinet contains one Command Module that requires a unique IP address and can control up to 48 relays or dimming modules. The Command Modules provide low voltage input connections for occupancy sensors, photocells, low voltage switch buttons, and contact closures. An Emergency Mode low voltage input is provided on each Command Module to trigger an emergency cabinet override in compliance with UL924. In addition, all digital switches, Command Modules, and low voltage input boards communicate on a secondary independent communication network called LumaCan. There are dedicated data ports for LumaCan interconnectivity.

Standard Object Types Supported:

Object Type	What is it?	Creatable/ Deleteable	Property	Readable	Writeable	Values	Notes
Device	Relay Panel (MPU)	No	Name	Yes	No	GreenMAX Cabinet[x.x].DEV	Each Cabinet connected to the IP network is represented as a device, where [x.x] represents the node ID
			Description	Yes	No	GreenMAX Cabinet[x.x].DEV"	
			Location	Yes	No	GreenMAX Cabinet[x:x] location	
			Time synchronization	Yes	No	-	
			Local Time	Yes	Yes	-	
			Daylight savings status	Yes	Yes	-	
			Date	Yes	Yes	-	
Binary Output	Relay	No	Name	Yes	No	Relay[xxx]	One for each relay where [xxx] represents the relay number in the panel.
			Present Value	Yes	Yes	0(open),1(close) for each priority	Priority 3-16 of present value property is writable, value 0, 1. Changes to priority 1, 2 are rejected and used internally for emergency and panel override.
Analog Output	Dimming Relay	No	Name	Yes	No	Relay[xxx]	One for each relay where [xxx] represents the relay number in the panel.
			Present Value	Yes	Yes	0-100 for each priority	Priority 3-16 of present value property is writable, value in percentage 0-100. Changes to priority 1, 2 are rejected and used internally for emergency and panel override.
Binary Input	Input on AI Card or Digital Switch buttons	No	Name	Yes	No	Occ/Switch/Binary Sensor[xx:xx].BI	One for each binary AI where [xxx] represents the input number.
			Present Value	Yes	Yes	0,1	Represents state of connected device to analog input, commonly would be low voltage switch, contact closure, or occupancy sensor. 255=occupied/active, 0=unoccupied/inactive
Analog Input	Input on AI Card	No	Name	Yes	No	GreenMAX Photocell[x:y:z].AI	One for each photocell AI where [x:y:z] represents the node id and input number.
			Present Value	Yes	Yes	0-100	Represents relative light level of photocell, 0-100, where 0=dark and 100= max light level reported by photocell in percentage.
Multi-State Value	Behavior	No	Description	Yes	Yes	Current Schedule[x] State.MSV	Direct control of Behavior mode for each area are R/W control points
Schedule	System Schedule	No	Description	Yes	Yes	Schedule[x].SCH	Weekly schedules can be read, and, scheduled times/days can be written
Calendar	System Calendar	No	Description	Yes	Yes	Calendar[x].CAL	Exception Calendars can be read and written to

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Additional Object Types Supported when Metering Relays are used:

Object Type	What is it?	Creatable Deletable	Property	Readable	Writeable	Values	Notes
Analog Value	Total Kilowatt hours (W)	No	Name	Yes	No	Relay[xxx]:KWH	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0- 2,147,483,647	Accumulator representing total value. Rolls over when max is achieved.
Analog Value	Total Apparent Energy (VA)	No	Name	Yes	No	Relay[xxx]:KVAH	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0- 2,147,483,647	Accumulator representing total value. Rolls over when max is achieved.
Analog Value	Total Reactive Energy (KVARh)	No	Name	Yes	No	Relay[xxx]:KVARH	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0- 2,147,483,647	Accumulator representing total value. Rolls over when max is achieved.
Analog Value	Line Voltage (V_{rms})	No	Name	Yes	No	Relay[xxx]:VRMS	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0-38,2000	Voltage expressed in mili-Volts
Analog Value	Line Current (A_{rms})	No	Name	Yes	No	Relay[xxx]:ARMS	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0 – 32,767	Current expressed in mili-Amps
Analog Value	Line Frequency (Hz)	No	Name	Yes	No	Relay[xxx]:Hz	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0 – 327,670	Frequency express in mili-Herz
Analog Value	Instantaneous Power (W)	No	Name	Yes	No	Relay[xxx]:Watts	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0 - 10,410,000	Active power in mili-Watts.
Analog Value	Instantaneous Reactive Power (KVAR)	No	Name	Yes	No	Relay[xxx]:KVAR	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0 - 10,410,000	Active power in mili-VA.
Analog Value	Instantaneous Affective Power (KVA)	No	Name	Yes	No	Relay[xxx]:KVA	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0 - 10,410,000	
Analog Value	Instantaneous Power Factor	No	Name	Yes	No	Relay[xxx]:PF	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	- 1.000-1.000	Power factor in %
Analog Value	Instantaneous Line Voltage Harmonic Distortion (% THD-V)	No	Name	Yes	No	Relay[xxx]:THD-V	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0-100	Harmonic Distortion in percentage
Analog Value	Instantaneous Line Instantaneous Harmonic Distortion (% THD-I)	No	Name	Yes	No	Relay[xxx]:THD-I	One for each relay where [xxx] represents relay number.
			Present Value	Yes	No	0-100	Harmonic Distortion in percentage

For more information visit www.leviton.com/greenmax.

*Background section content originally published at http://www.bacnet.org/FAQ/HPAC-3-97.html. Although content is the same, it has been edited slightly as appropriate for use in this article.

End of Document

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