# H8186-CB

# H8186-CB
## BACnet Communication Board
## for the H81xx Energy Meter



### Installer's Specifications

| | |
|---|---|
| Output Type | BACnet |
| Connection | 2-wire |
| Baud Rate | 9600, 19200, 38400 |
| Address Range | 1-63 |

## ⚠ DANGER ⚡

### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm power is off.
  DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION
- Only install this product on insulated conductors.

**Failure to follow these instructions will result in death or serious injury.**

## NOTICE

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.
- Mount this product inside a suitable fire and electrical enclosure.

### FCC PART 15 INFORMATION
NOTE: This equipment has been tested by the manufacturer and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications to this product without the express authorization of Veris Industries nullify this statement.

## PRODUCT IDENTIFICATION

H8186-CB  BACnet Communications Board for H81xx Energy Meter

## QUICK INSTALL

H81xxCB Series interfaces are sold as open devices. Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.

1. Turn off all power to the energy meter and the equipment in which it is installed.

2. Discharge static.

3. Slide the H8186-CB into the channels on either side of the energy meter until the male connection on the meter clicks into place.

4. Insert the communication terminal onto the RS-485 communication terminals.

5. If the demand subinterval feature is used, wire it into the end of the demand subinterval terminal.

6. Replace the voltage terminal into the energy meter.

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## OPERATION

H8186-CB energy meter communication board is an optional field-installable plug-and-play accessory board for the H81xx energy meter that allows networking the H81xx to an existing BACnet MS/TP control/data acquisition system. It features field selectable baud rate (9600, 19200, 38400).

## DATA OUTPUT SPECIFICATIONS

kWh, Consumption
kW, Real power
kVAR, Reactive power
kVA, Apparent power
Power factor
Voltage, line to line
Voltage, line to neutral
Amps, Average current
kW, Real power ØA
kW, Real power ØB
kW, Real power ØC
Power factor ØA
Power factor ØB
Power factor ØC
Voltage, ØA to ØB
Voltage, ØB to ØC
Voltage, ØA to ØC
Voltage, ØA to Neutral
Voltage, ØB to Neutral
Voltage, ØC to Neutral
Amps,  Current ØA
Amps,  Current ØB
Amps,  Current ØC

## PRODUCT DIAGRAM
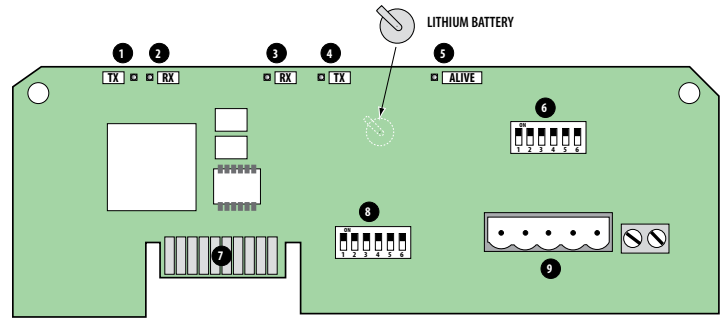


1. *RS-485 LED (TX):*  Red LED; blinks to indicate that the H8186-CB is transmitting data to the master.

2. *RS-485 LED (RX):*  Red LED; blinks to indicate that the H8186-CB is receiving data from the master.

3. *LED from Main Board (RX):*  Green LED; blinks to indicate that the H8186-CB is receiving data from the main board.

4. *LED from Main Board (TX):*  Green LED; blinks to indicate that the H8186-CB is transmitting data to the main board.

5. *"ALIVE" LED:*  Green LED; should blink once per second to indicate normal operation of the H8186-CB.

6. *Network Address DIP Switches:*  Use these DIP switches to set the network address for the H8186-CB.

7. *Connection to Energy Meter:*  Install the H8186-CB in the energy meter by inserting this connector into the connection slot at the top of the energy meter.

8. *Communication DIP Switches:*  Use these DIP switches to set the H8186-CB baud rate.

9. *RS-485 Communication Terminals:*  Insert the RS-485 connector into these terminals. See the Wiring Diagram section of this guide for instructions on wiring the connector for 2-wire communications.

⚠ **CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

# CONFIGURATION

This section describes the communications settings you must make to the H8186-CB. When daisy-chaining devices, follow these guidelines:

- Connect up to 63 H8186-CB devices on a single daisy chain.
- Each H8186-CB device on the daisy chain must have a unique address. Before connecting the H8186-CB to the RS-485 communication wires, set the address according to directions in "Selecting the Network Address DIP Switches" on this page. If you assign the same address to two devices, neither device will communicate.
- Set the baud rate according to directions in "Selecting Baud Rate — Communication DIP Switches." The settings for each H8186-CB must match the other devices on its daisy chain.
- For RS-485 cables, use shielded, twisted-pair wire (Belden Cable 1120A or equivalent).
- If the H8186-CB is the last device, terminate it per the RS-485 standard (120 Ω nominal impedence).

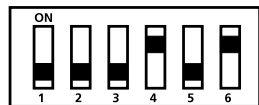### Selecting The Network Address DIP Switches

Use the Network Address DIP switches to select the network address. Each H8186-CB on a daisy chain must have a unique network address (from 0 to 63). Devices with the same address will be unable to communicate.

Always set the address before you install the H8186-CB in the energy meter and before you connect the energy meter to the daisy chain.

Each of the six DIP switches has a unique address value, page 6 lists DIP switch positions for specific addresses.

### Network Address DIP Switch Values

| Switch | Value |
|--------|-------|
| 1 | 1 |
| 2 | 2 |
| 3 | 4 |
| 4 | 8 |
| 5 | 16 |
| 6 | 32 |



In this example, the network address for the device is 40. Switch 4 and 6 offer the only combination of values that total 40.

This figure illustrates how to set the switches. Up is ON; down is OFF.

8 + 32 = 40

### Selecting Baud Rate – Communication DIP Switches

Use the communication DIP switches (pictured below) to set the H8186-CB baud rate.

The figures below list the baud rate switch settings and the location of these switches.

### Wiring and Baud Rate Settings

| Parameter | | Switch Number and Setting | | | | | |
|-----------|--|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Wire Type | 2-wire | – | ON | | | | |
| Baud Rate | 9600 | – | | OFF | OFF | | |
| | 19200 | – | | ON | OFF | | |
| | 38400 | – | | OFF | ON | | |
| | 38400 | – | | ON | ON | | |
| Parity | Not applicable to this model. | | | | | OFF | OFF |



Wiring Baud    Parity
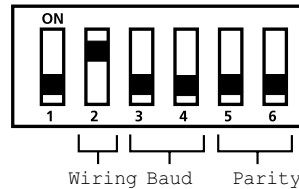
Switches 1, 5, and 6 are unused. Always leave them in the OFF position.

This example illustrates the default switch settings for a 2-wire device that uses 9600 baud rate.

Parity function is not applicable to this model; leave these switches in the OFF position.

# RS-485 COMMUNICATIONS SETUP

### Daisy Chain Maximum Distances

The maximum number of devices capable of being supported on a single daisy chain is determined based on the combination of baud rate, the length of the daisy chain, and the types of RS-485 devices on the daisy chain. The RS-485 interface will support daisy chains that fall within the specifications shown below.

### 2-Wire Daisy Chain Maximum Distances

| Baud Rate | Maximum Distances | |
|-----------|-------------------|--|
| | 1-8 Devices | 9-16 Devices |
| 9600 | 10000 ft. (3048 m) | 4000 ft. (1219 m) |
| 19200 | 5000 ft. (1,524 m) | 2500 ft. (762 m) |
| 38400 | 2500 ft. (762 m) | 1200 ft. (380 m) |

### Wiring the Connector

Remove the connector from the RS-485 communication terminals of the H8186-CB (see Wiring Diagram section). To wire RS-485 communications, follow these steps:

1. Wire the communications connector for 2-wire communication (see Wiring Diagram section). The Wire Type setting in the communication DIP switch must match this wiring type (set Switch 2 to the ON position; see Selecting Baud Rate section).

2. Use a small, flat-blade screwdriver to tighten the connector screws.

3. Replace the connector on the RS-485 communication terminals of the H8186-CB.

4. If the H8186-CB is the last device on the daisy chain, terminate it to ensure reliable communication per the RS-485 standard (120 Ω nominal impedence).

## WIRING

### 2-wire Communications Wiring
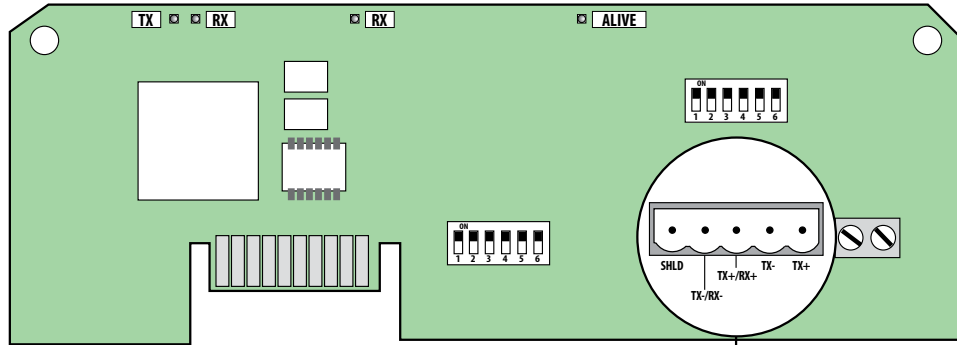


* If the H8186-CB is the last device in a daisy chain, terminate it to ensure reliable communication per the RS-485 standard (120 Ω nominal impedence).

**MASTER**                    **SLAVE**

SHIELD
(−)
(+)
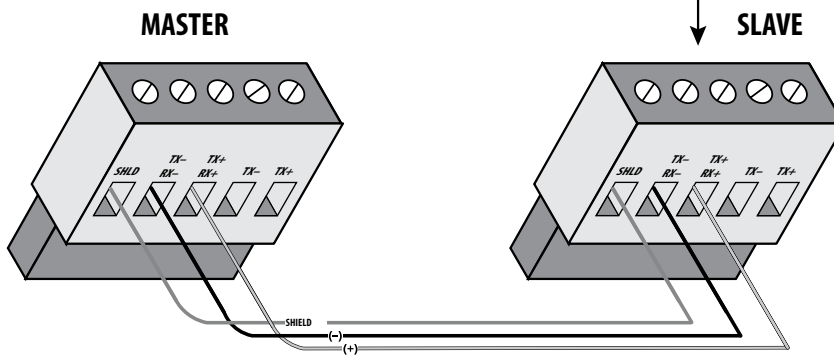
## INSTALLING THE H8186-CB IN THE ENERGY METER

Before beginning this procedure, set the baud rate using the Communication DIP switches, and set the network address using the Network Address DIP switches (see the Configuration section on page 3 of this installation guide).

1. Turn off all power to the energy meter and the equipment in which it is installed:

   a. Remove the voltage terminal from the energy meter and all fuses.

   b. Always use a properly rated voltage sensing device to confirm that power is off.

2. To discharge static, follow the instructions that come with your anti-static or grounding strap. Use an anti-static or grounding strap at all times during installation.

3. Slide the H8186-CB into the slot in the H81xx energy meter. The sides of the H8186-CB slide down into the channels on either side of the energy meter. When the male connection to the energy meter (see below) clicks into place, the H8186-CB is properly installed.

Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.
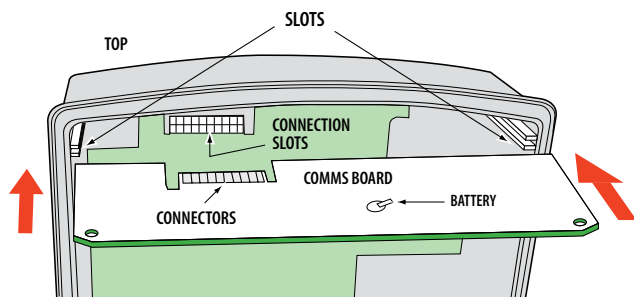


4. Insert the communication terminal onto the RS-485 communication terminals.

5. If the demand sub-interval feature is used, wire into the end of the demand sub-interval terminal.

6. Replace the voltage terminal into the energy meter.

## TROUBLESHOOTING

If communications are not working properly, first check that the board is properly seated in its slot in the energy meter, and that the connector has clicked into place in the connection slot on the meter.

There are five LEDs that indicate various types of communication.
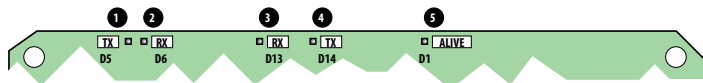


| | LED | Abnormal Operation | Solution |
|---|---|---|---|
| 1 | RS-485 LED (TX) | Not Blinking | There is no communication from the H8163 to the master. Check the wiring; TX+/TX- and RX+/RX- may be reversed. Correct the wiring. If RX is blinking, verify the DIP switch address, baud rate, and wire type. |
| 2 | RS-485 (RX) | Not Blinking | There is no communication from the master. The RX+ and RX- wires are reversed. Correct the wiring. |
| 3 | From main board (RX) | Not blinking | The main board is not responding. Contact the factory for support. |
| 4 | From main board (TX) | Not blinking but "Alive" LED is blinking | Diagnostic event detected. Contact the factory. |
| 5 | "Alive" status | Steadily lit | Diagnostic event detected. Contact the factory for support. |

## BACNET MAC ADDRESS SETUP

The figure below illustrates the switch settings, using the network address DIP switches, for each network address. See "Selecting the Network Address DIP Switches" on page 2 for instruction on setting the switches.
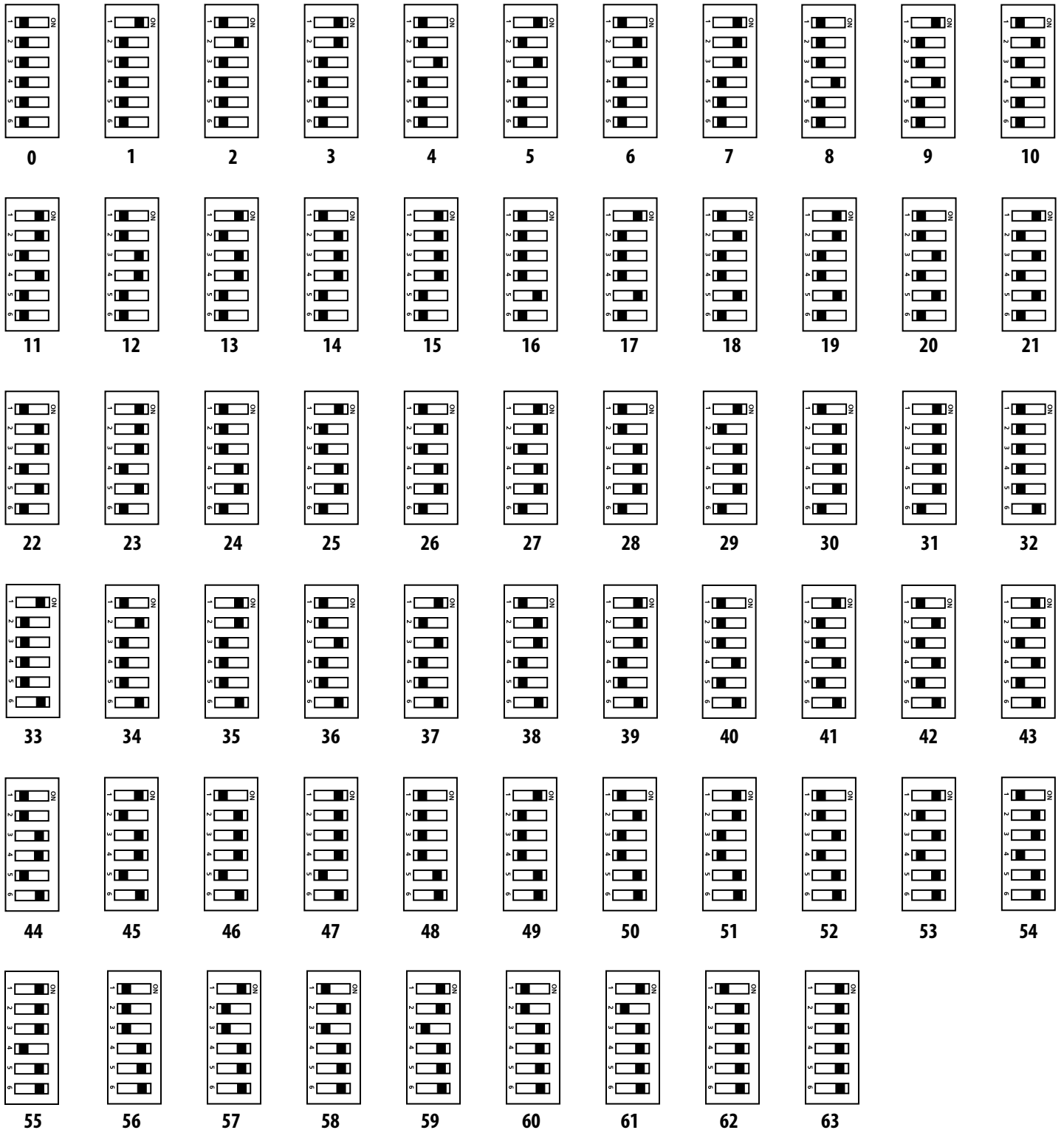
## BACNET DESCRIPTIONS

| BACnet Object | Description | Description Field | Units |
|---|---|---|---|
| Device Object | This device | Veris H81xx Energy Meter with H8186-CB BACnet Communications Board | N/A |
| Analog Value Object 1 | Accumulated Energy | kWh_Total | kWh |
| Analog Value Object 2 | Device Instance | Device_Instance | N/A |
| Analog Input Object 1 | Total Real Power | kW_Total | kW |
| Analog Input Object 2 | Total Reactive Power | kVAR_Total | kW |
| Analog Input Object 3 | Total Apparent Power | kVA_Total | kW |
| Analog Input Object 4 | Total Power Factor | PF_Total | Unitless |
| Analog Input Object 5 | Average Line-Line Voltage | Volts_LL_Avg | Volts |
| Analog Input Object 6 | Average Line-Nuetral Voltage | Volts_LN_Avg | Volts |
| Analog Input Object 7 | Average Current | Current_Avg | Amps |
| Analog Input Object 8 | Real Power: Phase A | kW_A | kW |
| Analog Input Object 9 | Real Power: Phase B | kW_B | kW |
| Analog Input Object 10 | Real Power: Phase C | kW_C | kW |
| Analog Input Object 11 | Power Factor: Phase A | PF_A | Unitless |
| Analog Input Object 12 | Power Factor: Phase B | PF_B | Unitless |
| Analog Input Object 13 | Power Factor: Phase C | PF_C | Unitless |
| Analog Input Object 14 | Voltage: Phase A-Phase B | Volts_AB | Volts |
| Analog Input Object 15 | Voltage: Phase B-Phase C | Volts_BC | Volts |
| Analog Input Object 16 | Voltage: Phase A-Phase C | Volts_AC | Volts |
| Analog Input Object 17 | Voltage: Phase A-Neutral | Volts_AN | Volts |
| Analog Input Object 18 | Voltage: Phase B-Neutral | Volts_BN | Volts |
| Analog Input Object 19 | Voltage: Phase C-Neutral | Volts_CN | Volts |
| Analog Input Object 20 | Current: Phase A | Current_A | Amps |
| Analog Input Object 21 | Current: Phase B | Current_A | Amps |
| Analog Input Object 22 | Current: Phase C | Current_A | Amps |

Clear the kWh accumulator to zero by writing 0.0 to the PRESENT_VALUE property Analog Value Object 1.

Changing the Device_Instance:
- Units are shipped with a default Device Instance of 123.
- There are 2 methods of changing the Device_Instance:
    1. Write the Object_Identifier directly. The Device's Object_Identifier contains both the Object_Type (Device = 8) and the Object_Instance (0-4194302). Write the Device's Object_Identifier with (8,Instance) to change the Device_Instance.

    2. Use Analog Value Object 2. Although a REAL (i.e. floating point) value, writing the Present_Value of AV2 is an alternative method of changing the Device_Instance. This value may be written in the range 0-4194302. Any fractional value will be truncated (e.g. 57.234 will be written as 57).

# BACNET PROTOCOL

## BACnet Protocol Implementation Conformance Statement

| | |
|---|---|
| **Date:** | August 2, 2007 |
| **Vendor Name:** | Veris Industries |
| **Product Name:** | BACnet Communications Board for H81xx Energy Meter |
| **Product Model Number:** | H8186-CB |
| **Applications Software Version:** | 1 |
| **Firmware Revision:** | 1.09 |
| **BACnet Protocol Revision:** | 2 |
| **Product Description:** | Provides BACnet MS/TP connectivity to the Veris H81xx Energy Meter |

**BACnet Standardized Device Profile (Annex L):**
BACnet Application Specific Controller (B-ASC)

**List all BACnet Interoperability Building Blocks Supported (Annex K):**
DS-RP-B, DS-RPM-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B

**Segmentation Capability:**
Segmentation not supported

**Standard Object Types Supported:**
No dynamic Creation or Deletion supported
No proprietary properties or object types

> **Device Object:**
> > **Optional Properties Supported:**
> > > Max_Master, Max_Info_Frames, Description, Location
> > **Writable Properties:**
> > > Object_Identifier, Max_Master, Location
> > **Property Range Restrictions:**
> > > Location (limited to 64 characters)

> **Analog Input Object:**
> > **Optional Properties Supported:**
> > > Description
> > **No Writable Properties.**

> **Analog Value Object:**
> > **Optional Properties Supported:**
> > > Description
> > **Writable Properties:**
> > > Only the Present_Value is writable.
> > **Property Range Restrictions:**
> > > 1) Only the value 0.0 may be written to the Present_Value of AV1. This action will clear the kWh-Accumulator in the H81xx Energy Meter.
> > > 2) Although a REAL (i.e. floating point) value, writing the Present_Value of AV2 is an alternative method of changing the Device_Instance. This value may be written in the range 0-4194302. Any fractional value will be truncated (eg. 57.234 will be written as 57).

**Data Link Layer Options:**
MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400

**Device Address Binding:**
Static device binding is not supported. (No client functionality is included).

**Networking Options:**
None

**Character Sets Supported:**
ANSI X3.4