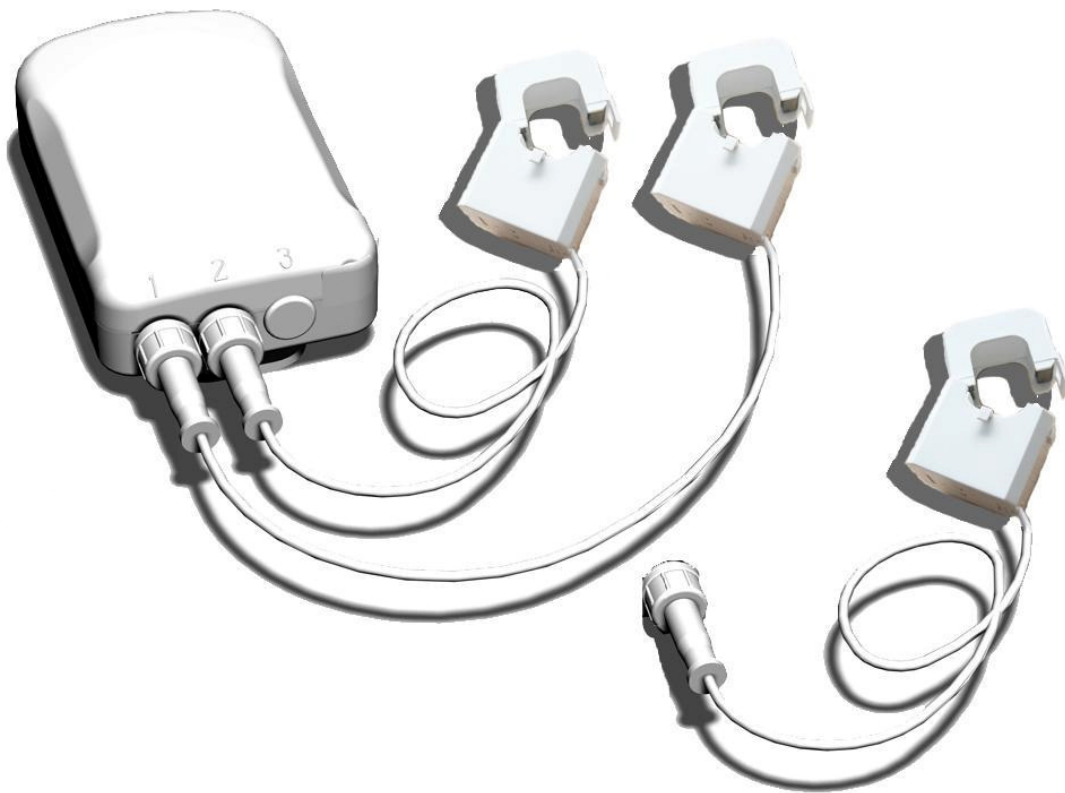




Aeon Labs Home Energy Meter

(Z-Wave Whole Home Energy Meter)



Aeon Labs HEM – Advanced Functions for Developers (SW Version: 3.58+)

Overview:

The Aeon Labs Home Energy Meter is energy meter for the entire home. It can wirelessly report immediate wattage and kWh usage of the AC mains to a Z-Wave gateway. It can send Z-Wave REPORTS (Meter v2 Command Class and Multilevel Sensor Command Class) from Z-Wave GETs any time as long as the requesting node can do Wake-Up Beaming.

The HEM can also be setup to automatically REPORT to any given node within its own network via the Association Command Class (one association group). The sent REPORTs can be set to various intervals (rounded up to the nearest 4 minutes when battery powered).

The HEM can also report separate instances/channels of its individual current clamps via the Multi Channel Command Class encapsulation.

The HEM also has the ability to reduce network traffic by reporting only when there is a significant change in wattage draw (configurable either by percentage or wattage increase).

The HEM can be powered via USB cable, or from 4AA batteries (used primarily as back up).

NOTE: The HEM can read amperage, and must calculate the wattage based off a configurable voltage value.

Association:

The HEM can also be setup to automatically REPORT to any given node within its own network via the Association Command Class. There is only 1 group with a maximum of 5 associations within that group (group 1). Automatic REPORTs coming from the HEM will be sent via singlecast to all the 5 devices within the association group. The type of REPORTS (meter, battery, etc.) can be configured via Configuration Command Class (see below section).

Configuration:

We can configure the HEM to REPORT various command classes automatically at different timing intervals via the Configuration Command Class. These REPORTs will be sent to the association group.

Also the Configuration Command Class can be used to setup the voltage of the electrical system for the HEM to calculate the appropriate wattage.

Configuration Set Command Format:

| | | | | | | | |
|---|----------|---|---|---|---|------|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Command Class = COMMAND_CLASS_CONFIGURATION | | | | | | | |
| Command = CONFIGURATION_SET | | | | | | | |
| Parameter Number | | | | | | | |
| Default | Reserved | | | | | Size | |
| Configuration Value 1(MSB) | | | | | | | |
| Configuration Value 2 | | | | | | | |
| | | | | | | | |
| Configuration Value (LSB) | | | | | | | |

Parameter Number Definitions(8 bit):

| Parameter Number | Description | Default Value | Size |
|------------------|---|--|------|
| 1 | Voltage to calculate wattage from amperage. Values represent voltage. | 120(country:US) 240(country:EU,ANZ) | 2 |
| 3 | Automatic report only when power is changed. | 0 | 1 |
| 4 | Threshold change in wattage to induce a automatic report (Whole HEM) | 50 | 2 |
| 5 | Threshold change in wattage to induce a automatic report (Clamp 1) | 50 | 2 |

| | | | |
|-----|--|-----|---|
| 6 | Threshold change in wattage to induce a automatic report (Clamp 2) | 50 | 2 |
| 7 | Threshold change in wattage to induce a automatic report (Clamp 3) | 50 | 2 |
| 8 | Percentage change in wattage to induce a automatic report (Whole HEM) | 10 | 1 |
| 9 | Percentage change in wattage to induce a automatic report (Clamp 1) | 10 | 1 |
| 10 | Percentage change in wattage to induce a automatic report (Clamp 2) | 10 | 1 |
| 11 | Percentage change in wattage to induce a automatic report (Clamp 3) | 10 | 1 |
| 12 | Accumulate energy when Battery Powered | 0 | 1 |
| 20 | This byte denotes whether the product is using batteries (value == 0) or using USB power (value == 1). | NA | 1 |
| 100 | Reset to default parameters number 101-103. Any value other than 0 will initiate this reset. | 0 | 4 |
| 101 | Which reports need to send in group1 | 0 | 4 |
| 102 | Which reports need to send in group2 | 0 | 4 |
| 103 | Which reports need to send in group3 | 0 | 4 |
| 110 | Reset to default parameters number 111-113. Any value other than 0 will initiate this reset. | 0 | 4 |
| 111 | The interval of sending report group 1(seconds) | 720 | 4 |
| 112 | The interval of sending report group 2(seconds) | 720 | 4 |
| 113 | The interval of sending report group 3(seconds) | 720 | 4 |
| 253 | Re-Calibrate (Will destroy factory calibration). CONTACT AEON LABS before using. | 0 | 4 |
| 254 | Device Tag | 0 | 2 |
| 255 | Reset to the default Configuration | 0 | 4 |

Configuration Flags for parameters 101-103:

| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------|----------|---|---|---|---|---|--|---|
| Configuration Value 1(MSB) | Reserved | | | | | | | |
| Configuration Value 2 | Reserved | | | | | | | |
| Configuration Value 3 | Reserved | Auto send Meter REPORT (for kWh) at the group time interval (Clamp 3) | Auto send Meter REPORT (for kWh) at the group time interval (Clamp 2) | Auto send Meter REPORT (for kWh) at the group time interval (Clamp 1) | Auto send Meter REPORT (for Watt) at the group time interval (Clamp 3) | Auto send Meter REPORT (for Watt) at the group time interval (Clamp 2) | Auto send Meter REPORT (for Watt) at the group time interval (Clamp 1) | |
| Configuration Value 4 (LSB) | Reserved | | | Auto send Meter REPORT (for kWh) at the group time interval (Whole HEM) | Auto send Meter REPORT (for wattage) at the group time interval (Whole HEM) | Auto send Multilevel Sensor REPORT (for wattage) at the group time interval (Whole HEM) | Auto send Battery REPORT at the group time interval (Whole HEM) | |

Device Firmware Upgrades (DFU):

When upgrading software via DFU programs, remove the batteries from the HEM and plug in the USB cable from your computer to the HEM. Follow the on-screen instructions from the DFU software program to complete the upgrade. After a successful upgrade, remove all power from the HEM (USB and batteries) and exclude/remove the HEM from the old network.

Auto Report Every 30 seconds for Clamp 1 and Clamp 2

1.have report group 3 send Multi Channel Meter CC(Watts) and MultiChannel Meter CC (KWH) of clamp 1 and clamp 2 automatically

ZW_SendData(0x70, 0x04, 0x67, 0x04, 0x00,0x00,0x1b,0x00); //Configuration Set

2.set the interval of sending report group 3

ZW_SendData(0x70, 0x04, 0x71, 0x04, 0x00,0x00,0x00,0x1E); //Configuration Set

3.associate to node "1"

ZW_SendData(0x85, 0x01, 0x01, 0x01); //Assoc

note:Meter CC(Watts) and Meter CC (KWH) is of clamp 1 and clamp 2 is packaged in Multi Channel Command. end point 1 is clamp 1,end point 2 is clamp 2.

How to use delta function?

1.Turn on Delta function of the whole HEM and clamp 1 and clamp 2 and clamp 3:

ZW_SendData(0x70, 0x04, 0x03, 0x01, 0x0F); //Configuration set

about value 0x0F: 00001111

LSB

bit 1: Switch of delta function of whole hem (1 on,0 off)

bit 2: Switch of delta function of clamp 1 (1 on,0 off)

bit 3: Switch of delta function of clamp 2 (1 on,0 off)

bit 4: Switch of delta function of clamp 3 (1 on,0 off)

MSB

2.Change the wattage value of Delta function of the whole HEM to 255 watts (default:50 watts)

ZW_SendData(0x70, 0x04, 0x04,0x02, 0x00, 0xFF); //Configuration set

3.Change the wattage value of Delta function of clamp 1 to 255 watts (default:50 watts)

ZW_SendData(0x70, 0x04, 0x05,0x02, 0x00, 0xFF); //Configuration set

4.Change the wattage value of Delta function of clamp 2 to 255 watts (default:50 watts)

ZW_SendData(0x70, 0x04, 0x06,0x02, 0x00, 0xFF); //Configuration set

5.Change the wattage value of Delta function of clamp 3 to 255 watts (default:50 watts)

ZW_SendData(0x70, 0x04, 0x07,0x02, 0x00, 0xFF); //Configuration set

6.Change the percent of Delta function of the whole HEM to 15% (default:10%)

ZW_SendData(0x70, 0x04, 0x08, 0x01,0x0F); //Configuration set

7.Change the percent of Delta function of clamp 1 to 15% (default:10%)

ZW_SendData(0x70, 0x04, 0x09, 0x01,0x0F); //Configuration set

8.Change the percent of Delta function of clamp 2 to 15% (default:10%)

```
ZW_SendData(0x70, 0x04, 0x0A, 0x01,0x0F); //Configuration set
```

9.Change the percent of Delta function of clamp 3 to 15% (default:10%)

```
ZW_SendData(0x70, 0x04, 0x0B, 0x01,0x0F); //Configuration set
```

Other Examples:

a. automatically report Meter CC (Watts) to node "1" every 5 seconds

1.have report group 1 send Meter CC (Watts) automatically

```
ZW_SendData(0x70, 0x04, 0x65, 0x04, 0x00,0x00,0x00,0x04); //Configuration Set
```

2.set the interval of sending report group 1

```
ZW_SendData(0x70, 0x04, 0x6F, 0x04, 0x00,0x00,0x00,0x05); //Configuration Set
```

3.associate to node "1"

```
ZW_SendData(0x85, 0x01, 0x01, 0x01); //Association Set
```

a. (alternative) automatically report Meter CC (Watts) to node "1" every 12 minutes

1.have report group 1 send Meter CC (Watts) automatically

```
ZW_SendData(0x70, 0x04, 0x65, 0x04, 0x00,0x00,0x00,0x04); //Configuration Set
```

2.set the interval of sending report group 1

```
ZW_SendData(0x70, 0x04, 0x6F, 0x04, 0x00,0x00,0x02,0xd0); //Configuration Set
```

3.associate to node "1"

```
ZW_SendData(0x85, 0x01, 0x01, 0x01); //Association Set
```

b. Set default values

```
ZW_SendData(0x70, 0x04, 0xFF,0x01,0x00);
```

c. pull energy readings (SENSOR_MULTILEVEL_REPORT) for individual clamps

clamps 1:ZW_SendData(0x60,0x06,1,0x31,0x04);

clamps 2:ZW_SendData(0x60,0x06,2,0x31,0x04);

d. pull energy readings (METER_REPORT) for individual clamps

clamps 1:ZW_SendData(0x60,0x06,1,0x32,0x01);

clamps 2:ZW_SendData(0x60,0x06,2,0x32,0x01);

d. pull energy readings (SENSOR_MULTILEVEL_REPORT) for the entire unit

ZW_SendData(0x31,0x04);

e. pull energy readings (METER_REPORT) for the entire unit

ZW_SendData(0x32,0x01);

Example Note:

- If we reset the HEM to the default Configuration, tag will reset to 0.
- If report group1 and report group2 are set sending same report. The latest setted will re-write the old setted.
For example:

set following command:

ZW_SendData(0x70, 0x04, 101, 4, 0,0,0,6);

ZW_SendData(0x70, 0x04, 102, 4, 0,0,0,6);

The Multilevel Sensor Report Command will be sent in report group2. we need to use 112(parameter number) to set the Multilevel Sensor Report interval time.