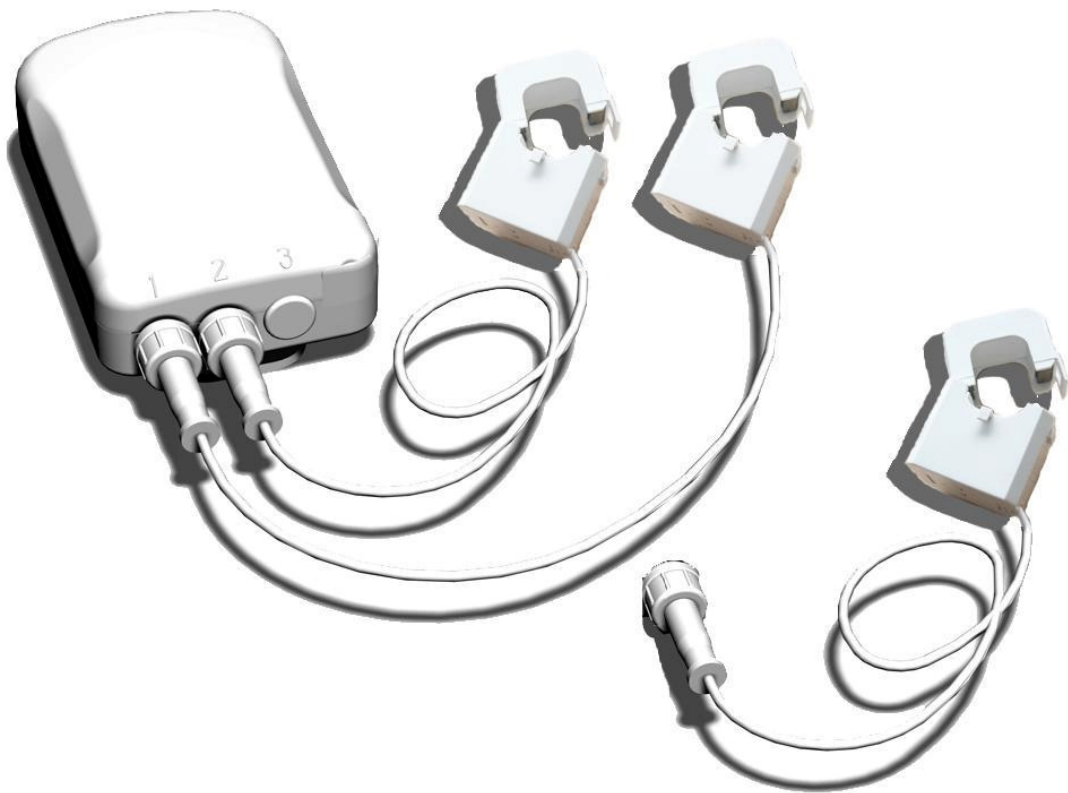




# Aeon Labs Home Energy Meter

(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	Enable selective reporting only when power change reaches a certain threshold or percentage set in 4-11 below. This is used to reduce network traffic. (0 == disable, 1 == enable)	0	1
4	Threshold change in wattage to induce a automatic report (Whole HEM). (Valid values 0-60000)	50	2

5	Threshold change in wattage to induce a automatic report (Clamp 1). (Valid values 0-60000)	50	2
6	Threshold change in wattage to induce a automatic report (Clamp 2). (Valid values 0-60000)	50	2
7	Threshold change in wattage to induce a automatic report (Clamp 3). (Valid values 0-60000)	50	2
8	Percentage change in wattage to induce a automatic report (Whole HEM). (Valid values 0-100)	10	1
9	Percentage change in wattage to induce a automatic report (Clamp 1). (Valid values 0-100)	10	1
10	Percentage change in wattage to induce a automatic report (Clamp 2). (Valid values 0-100)	10	1
11	Percentage change in wattage to induce a automatic report (Clamp 3). (Valid values 0-100)	10	1
12	Accumulate kWh energy when Battery Powered. By default this is disabled to assist saving battery power. (0 == disable, 1 == enable)	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	Define which reports need to send in group1. (see flags in table below)	0	4
102	Define which reports need to send in group2. (see flags in table below)	0	4
103	Define which reports need to send in group3. (see flags in table below)	0	4
110	Reset to default parameters number 111-113. Any value other than 0 will initiate this reset.	0	4
111( <i>note 1</i> )	The interval of sending report group 1(seconds)  (Valid values 0x01-0xFFFFFFFF)	720	4

112( <i>note 1</i> )	The interval of sending report group 2(seconds) (Valid values 0x01-0xFFFFFFFF)	720	4
113( <i>note 1</i> )	The interval of sending report group 3(seconds) (Valid values 0x01-0xFFFFFFFF)	720	4
253	Re-Calibrate (Will destroy factory calibration). CONTACT AEON LABS before using.	0	4
254	Device Tag which will mark an ID number which will persist across device resets. (Valid values 0-60000)	0	2
255	Reset to the default Configuration	0	4

**Note1:**

*If HEM is using USB power, the minimum wake up interval is 1 second.*

*If HEM is using batteries, the minimum wake up interval is 4 minutes. The wake up is rounded up to the nearest 4 minute interval*

*For example: On Battery power, if parameter 111 (or 112, 113) is set to a value between 1 and 240, the HEM will wake at intervals of 240 seconds. If 111(or 112, 113) is set to a value between 241 and 480, the HEM will wake at intervals of 480 seconds.*

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.