



**ISY 994 Z Series  
Energy Monitoring  
Developer's Manual**  
Supporting  
**Zigbee Brultech ECM1240  
Zigbee Brultech GreenEye Monitor  
Zigbee UDI EM3**

**Web Services SDK and REST Interface**  
*Based on firmware 4.2.30*

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## 0.0 Revision History

Date/Firmware	Type	Change	Description
2013/04/06	REST	Add	Support for Brultech GEM
2012/08/06	WSDL	Add	isSEP in zigbee.xsd::ZigbeeNetwork
2012/07/31	DOC	Modify	KYZ Mode
2012/05/15	WSDL	Modify	Moved Zigbee objects to zigbee.xsd
2012/03/16 3.2.0	DOC	None	
2011/10/22 3.1.11	DOC	Initial	

## 1. Introduction

ISY994 Z Series incorporates sophisticated energy management capabilities to the base ISY platform supporting Zigbee Brultech ECM1240/GreenEye Monitor and UDI's EM3 3 Phase Energy Monitoring product. As such, all ISY interfaces, services, and events are applicable to 994Z as well.

ISY994 Z series comes equipped with an integrated high powered Zigbee radio operating on a Zigbee PRO stack. Utilizing the APIs, you can configure all parameters on Brultech ECM1240/GreenEye Monitor and EM3 wirelessly and through Zigbee.

Upon startup, ISY either establishes a PAN (as a Coordinator) or starts operating on the PAN that was already established prior to reboot. It's quite important to make sure that EM3 and ECM1240 are searching and joining the correct PAN and sending events to the correct end point. As such, there are two phases for the correct operation of the system:

1. Setup ISY for a specific PAN ID and channel mask that is known not to interfere with other RF devices such as WiFi systems.
2. ECM1240:  
Setup so that ECM can search for the PAN ID configured in ISY, set source and destination endpoints, and ensure that ECM1240 is setup with the correct network and link keys (using encryption)
3. GreenEye Monitor  
Consult GreenEye documentation to make sure GreenEye is configured for ISY Zigbee network parameters
4. EM3:  
Setup so that EM3 can search for the PAN ID configured in ISY

Upon successful configuration, ECM1240/GreenEye Monitor and EM3 automatically scan and join the PAN and starts publishing energy events.

Depending on the product, different nodes are added to the device tree representing each channel. As with the rest of ISY platform, you can use the REST interface to get properties for each node .

## 2. Getting Started

ISY994 Z Series is based on the same framework as ISY and therefore communications and event infrastructure follow the same paradigm. If you have not yet reviewed ISY's WSDK Developer's guide, please send an email to [sales@universal-devices.com](mailto:sales@universal-devices.com).

If you do not already have Energy Monitoring Module installed on ISY, please send an email to [sales@universal-devices.com](mailto:sales@universal-devices.com) with your UUID (Help | About) and your desire to have Energy Monitoring Module activated.

### 2.1 Configuring ISY

Setup Zigbee network as depicted in Figure 1 below.

The screenshot shows the ISY994 Z web interface with the following sections:

- Navigation Bar:** Main, Programs, Elk, Configuration, System, Emails/Notifications, IR, Elk, Electricity, Climate, Networking.
- Clock Section:**
  - 24 Hr. Format: ☐
  - Daylight Saving: ☒
  - Change Location [Los Angeles, CA]:
  - Synchronize the Clock with Computer's Time:
  - Manually Adjust the Clock:
  - Enable: ☒
  - NTP Server:
  - Synchronize every (Hour):
  - Save:
- Network Settings:**
  - Automatic (DHCP): ☒
  - IP Address:
  - Subnet Mask:
  - Gateway:
  - DNS:
  - Http Port:
  - Https Port:
  - Save:
- System:**
  - HTML Role:
  - Query at Restart: ☐
  - Wait while busy reading: ☒
  - Send compact notifications: ☒
  - Catch up schedules at Restart: ☐
  - Missed Schedule Grace Period (m:s):
  - Reboot:
  - Save:
- Zigbee Settings (Highlighted):**
  - Enabled: ☒
  - Power:
  - Pan ID:
  - Link Key:
  - Network Key:
  - Channels:
    - ☒ 11 ☒ 12 ☒ 13 ☒ 14 ☒ 15 ☒ 16
    - ☒ 17 ☒ 18 ☒ 19 ☒ 20 ☒ 21 ☒ 22
    - ☒ 23 ☒ 24 ☒ 25 ☒ 26
  - Compatibility:
  - Status: Established | 0000000000000345 | 12 | -7db
  - Save:

**Figure 1. Setting up Zigbee Network**

## ***2.2 Configuring ECM1240***

As mentioned before, ECM1240 needs to be configured to scan for and join ISY. Since ISY uses Zigbee PRO, it's important that the following parameters are set accurately:

1. Use Zigbee 2 Profile  
**ATZS2**
2. Enable Encryption  
**ATEE1**
3. Set Network Key  
**ATKY1**
4. Set PAN ID  
**ATID[PANID]** ... see Figure 1
5. Set Destination Endpoint  
**ATDE2**
6. Save and restart  
**ATWR**  
**ATNR**

At this point, ECM1240 should start scanning for ISY with the given PAN ID and join it if found.

## ***2.3 Configuring GreenEye Monitor***

GreenEye Monitor should already be setup for communications with ISY. Consult GreenEye documentation.

## ***2.4 Configuring UDI EM3***

UDI EM3 should automatically find ISY as long as the Network and Link Keys are set to 1 (see Figure 1).

### 3. Nodes, Properties and Events

Just like any other device in ISY, Energy Monitoring devices are represented as Nodes for each channel. Each node may have different properties (and associated events) all of which are easily retrieved using the same REST command used for other nodes in ISY:

*/rest/nodes/<node\_id>*

This said, unlike INSTEON devices – and in addition to device category/sub category – one has to inspect the *<family>* element in the node:

**7** – UDI EM3: defined in 7\_fam.xml

**8** – ECM 1240: defined in 8\_fam.xml

#### 3.1 ECM 1240/GreenEye Monitor Nodes

ECM 1240 is represented by 7 nodes for 7 channels (See Figure 2). The address for the main node ends with **1**.

For reference, the following table depicts the relationship between nodes, addresses, and properties:

Address <-> Channel	Supported Properties
1 ↔ 1	ST = Current Power TPW = Current Energy PPW = Polarized Power CV = Current Voltage CC = Current Current
2 ↔ 2	ST = Current Power TPW = Current Energy PPW = Polarized Power CC = Current Current
3 ↔ 3	ST = Current Power TPW = Current Energy
4 ↔ 4	ST = Current Power TPW = Current Energy
5 ↔ 5	ST = Current Power TPW = Current Energy
6 ↔ 6	ST = Current Power TPW = Current Energy
7 ↔ 7	ST = Current Power TPW = Current Energy

For GreenEye, there shall be 32 nodes for 32 channels.



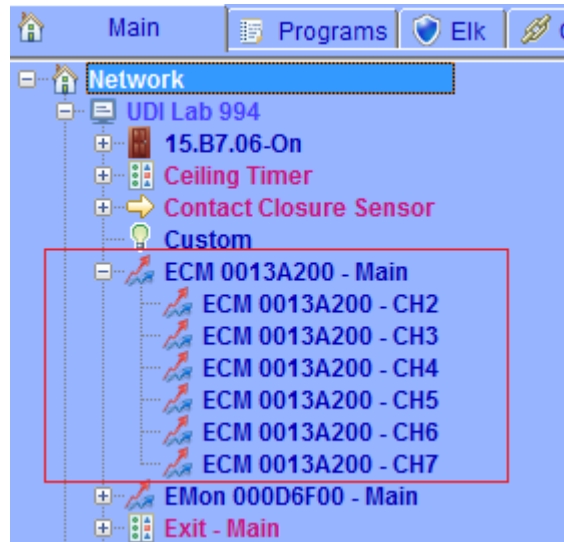


Figure 2 . ECM 1240 Nodes

### 3.2 UDI EM3 Nodes

UDI EM3 is represented by 11 nodes for 5 channels (See Figure 3), 3 temperature sensors and 2 pulse counters. The address for the main node ends with **1**.

For reference, the following table depicts the relationship between nodes, addresses, and properties:

Address <-> Channel	Supported Properties
1 ↔ Main	ST = Current Power TPW = Current Energy For all channels
5 ↔ Channel 1	ST = Current Power TPW = Current Energy PF = Power Factor CV = Current Voltage CC = Current Current
6 ↔ Channel 2	ST = Current Power TPW = Current Energy PF = Power Factor CV = Current Voltage CC = Current Current
7 ↔ Channel 3	ST = Current Power TPW = Current Energy PF = Power Factor CV = Current Voltage CC = Current Current

8 ↔ Channel 4	ST = Current Power TPW = Current Energy
9 ↔ Channel 5	ST = Current Power TPW = Current Energy
40 ↔ Local Temp.	ST
41 ↔ Remote Temp1	ST
42 ↔ Remote Temp2	ST
60 ↔ Pulse Counter1	ST
61 ↔ Pulse Counter2	ST

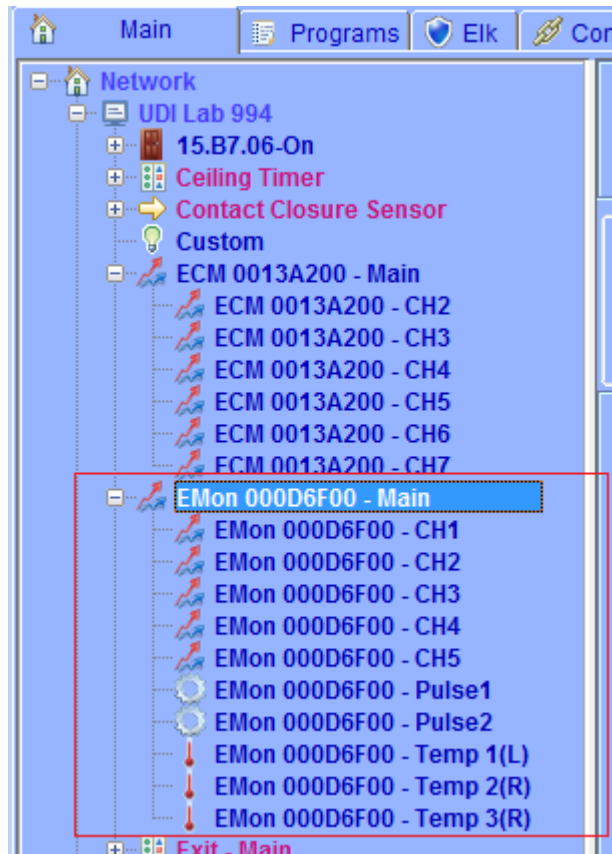


Figure 3. UDI EM3 Nodes

### 3.3 Events and Properties

The following events/controls/properties are defined for Energy Monitoring nodes. This said, not all nodes support all properties. One has to use `/rest/nodes/<node_id>` to inspect the supported controls:

**TPW:** Total Power (in kWh)

**PPW:** Polarized Power (in kWh)

**PF:** Power Factor

**CC:** Current Current (in Amps)

**CV:** Current Voltage (in Volts)

**ST:** Node dependent:

Energy Channel (in Watts)

Temp Sensor (in Degrees)

Pulse Counter (number of pulses)

### ***3.4 Raw ECM140 Packet (control = \_13 action = “7”)***

node = null

<eventInfo>

[![CDATA]

Raw binary packet directly from Brultech]

</eventInfo>

## 4. REST Interface

REST is an easy to use URL based command set which allows the developer to communicate and control ISY's Energy Management services including communications with ECM1240 and UDI EM3. Each ISY can support up to 32 Zigbee end points 16 of which can be energy monitors

### 4.1 *Zigbee Network*

**/rest/zb**

\* Consult zigbee.xsd

### 4.2 *REST Interface for ECM*

**Prefix: /rest/nodes/<nodeId>/cmd**

**/stopRT**

Stops Real Time reporting for an ECM

**/startRT**

Starts Real Time reporting for an ECM

**/reset**

Resets accumulated values for an ECM

**/cfg**

Retrieves all the configuration information for the given ECM the XML for which is as follows:

```
<EMonConfig>
  <ct1 type="167" range="4"/>
  <ct2 type="167" range="4"/>
  <pt type="131" range="6"/>
  <rtInterval>real time interval (sec) </rtInterval>
  <dlInterval>data logger interval (sec) </dlInterval>
  <firmware>1026</firmware>
  <id>unique id for the unit</id>
```

```

<serial>serial number for the unit</serial>
<aux constant="151" options="62"> (see /setAux service)
    <trim1>0</trim1>
    <trim2>0</trim2>
    <trim3>0</trim3>
    <trim4>0</trim4>
    <trim5>0</trim5>
    <trim6>0</trim6>
</aux>
<k1 h="142" l="141"/>
<k2 h="142" l="141"/>
<kv0>212</kv0>
<option>0</option>
<trigger>200</trigger>
</EMonConfig>

```

### **/setCT?type=<T>&range=<R>**

Sets CT configurations for a given channel (identified by the node). Only channels 1 and 2 are supported.

Where:

T = Types as defined by ECM (100 | 167)

R = Range as defined by ECM (3 | 4 | 5)

### **/setPT?type=<T>&range=<R>**

Sets PT configurations on the given ECM.

Where:

T = Types as defined by ECM (?)

R = Range as defined by ECM (?)

### **/setInt?value=<V>**

Sets Real Time interval (in seconds) on the given ECM.

Where:

V = The interval in seconds

### **/setTrig?value=<T>**

Sets the Trigger value (in watts) on the given ECM.

Where:

T = The trigger value in Watts

### **/setAux?value=<O>**

Sets the Aux options on the given ECM.

Where:

O = A byte bitmap as follows (Gain is X2):

Bit 0 = Aux 1 Gain

Bit 1 = Aux 2 Gain

Bit 2 = Aux 3 Gain

Bit 4 = Aux 4 Gain

Bit 5 = Aux 5 Gain

Bit 5 = Aux 5 Is used for Counting when set

Bit 6 = Aux 5 is DC bipolar

Bit 7 = ?

Please note that these options are retrieved in the configuration in the **option** attribute of the **aux** element:

<aux constant="151" *options*="62">

### **/toggPol**

Toggles the polarity for the given channel (node) on the given ECM.

### ***4.3 REST Interface for GreenEye Monitor***

**Prefix: /rest/nodes/<nodeId>/cmd**

**/stopRT**

Stops Real Time reporting for an ECM

**/startRT**

Starts Real Time reporting for an ECM

**/reset?type=<T>**

Resets certain counters based on the type.

Where T:

- 1: Reset Pulse Counter 1
- 2: Reset Pulse Counter 2
- 3: Reset Pulse Counter 3
- 4: Reset Pulse Counter 4
- 5: Reset All Pulse Counters
- 6: Reset All Counters
- 7: Reset All Seconds Counters
- 8: Reset Seconds Counter for the Node in <nodeId>

**/cfg**

Not implemented.

**/setCT?type=<T>&range=<R>**

Not Implemented

**/setPT?type=<T>&range=<R>**

Sets PT configurations on the given ECM.

Where:

T = Types as defined by ECM (?)

R = Range as defined by ECM (?)

**/setInt?value=<V>**

Sets Real Time interval (in seconds) on the given ECM.

Where:

V = The interval in seconds

**/setTrig?value=<T>**

Not Implemented

**/setAux?value=<O>**

Not Implemented

**/toggPol**

Not Implemented



## 4.4 *REST Interface for EM3*

**Prefix: /rest/nodes/<nodeId>/cmd**

**/stopRT**

Stops Real Time reporting for an EM3

**/startRT**

Starts Real Time reporting for an EM3

**/reset?type=<RT>\***

Resets various parameters in EM3.

\*<RT> can be a bitwise OR of the following:

1 = Reset accumulated values

2 = Reset configuration parameters

4 = Reset Zigbee

8 = Reset Pulse Count

**/cfg**

Retrieves all the configuration information for the given EM3 the XML for which is as follows:

```
<EM3Config debug="Boolean" realtime="Boolean" tempUnit="F|C"
kyzMode="Boolean">
  <powerReportInterval>integer (seconds)</powerReportInterval>
  <vaReportInterval>integer (seconds)</vaReportInterval>
  <tempReportInterval>integer (seconds)</tempReportInterval>
  <pulseReportInterval>integer (seconds)</pulseReportInterval>
  <powerStorageInterval>integer (seconds)</powerStorageInterval>
  <pulseStorageInterval>integer (seconds)</pulseStorageInterval>
</EM3Config>
```

**/setCT?type=<T>&range=<R>**

Currently not supported.

**/setPT?type=<T>&range=<R>**

Currently not supported.

### **/setInt?type=<T>&value=<V>**

Sets Real Time interval (in seconds) for a various parameters, defined in T, on the given EM3.

Where:

T: could be any of the following:

- 1 = Power reporting interval
- 2 = Voltage/Current/Powerfactor (va) reporting interval
- 3 = Temperature reporting interval
- 4 = Pulse reporting interval
- 5 = Energy storage interval
- 6 = Pulse storage interval

V: The interval in seconds

### **/setTrig?value=<T>**

Sets the Trigger value (in watts) on the given EM3.

Where:

T = The trigger value in Watts

### **/setOption?type=<OT>&value=<O>**

Sets operating parameters for the EM3.

Where:

OT = is an option type which could be any of the following:

1 = Temp unit

Where O could be:

0 = F

4 = C

2 = Debug

Where O could be:

0 = Debug Off

1 = Debug On

3 = KYZ Mode

Where O could be:

0 = KYZ Mode Off

1 = KYZ Mode On

Please note that these options are retrieved in the configuration in the **option** attribute of the **aux** element:

<**aux** constant="151" *options*="62">