

ISY 994 Series Energy Monitoring Configuration Guide supporting Zigbee Brultech ECM1240 Zigbee UDI EM3

Based on firmware 3.3.1

TABLE OF CONTENTS

0.0	REVISION HISTORY	3
1.	INTRODUCTION	4
2.	GETTING STARTED	5
2.1	Configuring ISY	5
2.2 2. 2.	Configuring ECM1240 .2.1 Connecting ECM to your Computer .2.2 Configuring ECM	6 6 7
2.3	Configuring UDI EM3	9
3.	NODES, PROPERTIES AND EVENTS	10
3.1	ECM 1240 Nodes	10
3.2	UDI EM3 Nodes	11
3.3	Events and Properties	12
3.4	Raw ECM140 Packet (control = _13 action = "7")	13

0.0 Revision History			
Date/Firmware	Туре	Change	Description
2012/09/13	DOC	Initial	
3.1.11			

1. Introduction

ISY994 Z Series incorporates sophisticated energy management capabilities to the base ISY platform supporting Zigbee Brultech ECM1240 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 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.
- 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. EM3: Setup so that EM3 can search for the PAN ID configured in ISY

Upon successful configuration, ECM1240 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 Series is based on the same framework as ISY and therefore communications and event infrastructure follow the same paradigm.

ISY994 Z Series comes equipped with the energy monitoring module (MOD21011). If you have ISY994 Series, you will need to purchase this module through the Admin Console | Help | Purchase Modules.

2.1 Configuring ISY

🟠 Main 🛛 🔂 Programs 🔍 Elk 🖉 Con	iguration					
🚫 System 📲 Emails/Notifications 📝 IR 😥 Elk 🐓 Electricity 🛸 Climate 📦 Networking						
Clock						
24 H	. Format 🔽 Daylight Saving 🛛 Change Lo	cation [Los Angeles, CA]	Synchronize the Clock wit	h Computer's Time Ma	nually Adjust the Clock	
C Enable NTP Server pool.ntp.org			chronize every (Hour): 24	Save Synchr	onize Now	
Network Se	Network Settings		System			
✓ Autom	atic (DHCP)		-1-			
IP Addres	192.168.0.145	HIML R	Die Restart	Advanced -		
Subnet Ma	sk	Wait whi	le busy reading			
Gateway		Send co	mpact notifications	V		
DNS Hito Port	80	Catch up	schedules at Restart			
Https Port	443	Missed :	Schedule Grace Period (m:s)	10 🚽 0 👻		
	Save			Reboot Save		
Zigbee Set	ings					
[✔] Enabl	ed					
Power	0345	-7 👳				
Link Key	000000000000000000000000000000000000000					
Network K	ey 000000000000000000000000000000000000					
		E 40				
		o ⊻ 16				
	▼ 17 ▼ 18 ▼ 19 ▼ 20 ▼ 21	1 🗹 22				
Channels						
		, 				
	Compatibility All Clea	ar				
Status	Established 000000000000345 12 -7db					
	Save Configure Routers Dia	agnostics				

Setup Zigbee network as depicted in Figure 1 below.

Figure 1. Setting up Zigbee Network

Note: If you are trying to communicate with ECM, make sure you click on the *Compatibility* button otherwise ECM may not find ISY.

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.

You will need to configure ECM, through a serial port connected to your computer, to be able to communicate with ISY.

2.2.1 Connecting ECM to your Computer

- 1. You will need to make a serial cable as shown in Figures 2A and 2B
- 2. Depending on your computer, you may need a USB to Serial converter
- 3. Download/Install ECM Config Util: http://www.etherbee.com/home/files/setup%20ECM-1240%20IA.exe
- 4. Download/Install XCTU: XCTU 32-bit ver. 5.2.7.5 installer. More info on XCTU http://www.digi.com/support/kbase/kbaseresultdetl.jsp?kb=2125
- 5.



Figure 2A – Serial Cable



Figure 2B – Connect Serial Cable to ECM

2.2.2 Configuring ECM

- 1. Open ECM Configuration Utility (Figure 2C)
 - a. On the Communications tab, enter the port number and then click Open Port ... if everything is working you will see number of received packets right below
 - b. Go to XBee Commands tab, and then
 - i. Click on Stop Real Time button
 - ii. Click on **Serial to Xbee** button (this will allow you to configure the Digi module using XCTU)
 - iii. Click on **ECM-1240** setup tab (at the top) and make sure **Binary** is chosen for the Packet Format (see Brultech.jpg)
 - c. Close the application

Communication	View Data XBee	Commands ECM-1240	Setup Factory Only
enfigure ECM 1040 December			
- CH1 CT Setting	18	PT Setting	Read Settings
Type: Range:	? Look-up Table	Туре: 230	CT1 Type: 167 CT1 Bange: 3
CH1 167 3	Accept CH1	Range: 3	CT2 Type: 100
cup 100 4	Accept CH2	- 1-	PT Type: 230
		Accept	PT Range: 3 Data Logger Storage Interval: 12
Packet Format			PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2
Packet Format Requires Firmware version	1.024 or better. Packet Format	Start Real-Time	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Declet Tricere Threshold, 201/201
Packet Format Requires Firmware version XBee Port Bau	1.024 or better. Packet d Format	Start Real-Time	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10
Packet Format Requires Firmware version XBee Port Bau	1.024 or better. Packet d G Binary HTTP	Start Real-Time	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149
Packet Format Requires Firmware version XBee Port Bau	1.024 or better. Packet G Binary C HTTP C ASCII	Start Real-Time	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0
Packet Format Requires Firmware version XBee Port Bau	1.024 or better. Packet d G Binary C HTTP C ASCII	Start Real-Time Stop Real-Time	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0 Aux Trim 2 0 Aux Trim 3 0
Packet Format Requires Firmware version XBee Port Bau Accept	AUX 5	Accept Start Real-Time Stop Real-Time Packet Trigger Power Accept 80 W	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0 Aux Trim 2 0 Aux Trim 3 0 Aux Trim 5 0
Packet Format Requires Firmware version XBee Port Bau Accept Number Of MicroCTs Gain X2	AUX 5	Accept Start Real-Time Stop Real-Time Packet Trigger Power Accept 80 W	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0 Aux Trim 2 0 Aux Trim 3 0 Aux Trim 3 0 Aux Trim 5 0 Aux Trim 5 0 Aux Trim 5 0 Aux Trim 6 0
Packet Format Requires Firmware version XBee Port Bau Accept Number Of MicroCTs Gain X2 AUX 1 1 or 2 1 AUX 2 1 or 2 1	AUX 5 AUX 5 C T input C DC Input UniPolar	Accept Start Real-Time Stop Real-Time Packet Trigger Power Accept 80 W Device Serial Number 2:21386	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0 Aux Trim 2 0 Aux Trim 2 0 Aux Trim 3 0 Aux Trim 5 0 Aux Trim 5 0 Aux Trim 6 0 K1H Constant: 140
Packet Format Requires Firmware version XBee Port Bau Accept Number Of MicroCTs Gain X2 AUX 1 1 or 2 1 AUX 2 1 or 2 1	AUX 5 C T input C DC Input UniPolar	Accept Start Real-Time Stop Real-Time Packet Trigger Power Accept 80 W Device Serial Number 2-21386	PT Range: 3 Data Logger Storage Interval: 12 Firmware version: 1.026 Unit ID: 2 Unit serial number: 21386 Packet Trigger Threshold: 80 Watts Packet Send Frequency: 10 Aux Ver: 5 Aux Constant: 149 Aux Options:0 AC Power or Unipolar Aux Trim 1 0 Aux Trim 2 0 Aux Trim 3 0 Aux Trim 3 0 Aux Trim 5 0 K1H Constant: 141 K1L Constant: 141 K2H Constant: 142 K2L Constant: 141

Figure 2C – ECM Configuration Utility

- 2. Open XCTU
 - a. Choose the port ensuring that you have valid parameters (19200, None, 8, None, 1)
 - b. Click on the Test/Query button ... this should bring you a dialog with Digi XB information
 - c. Click on the **Terminal** tab
 - i. Type: +++ This should give you an OK prompt; please note that each command you send to Digi is followed by an OK. If you do not see the OK, then enter +++ again. Timeout is about 10 seconds
 - ii. Type: **ATZS2** ... followed by Enter; this tells Digi to use Zigbee PRO profile
 - iii. Type: ATEE1 ... followed by Enter; this tells Digi to use security
 - iv. Type: **ATKY1** ... followed by Enter; this tells Digi to use Link Key of 1

- v. Type: **ATID345** Followed by Enter; this tells Digi to use PAN ID of 345 (this should be the same as PAN id in Admin Console | Configuration | Zigbee)
- vi. Type: **ATDE2** ... followed by Enter; this tells Digi to send events to our Endpoint #2
- vii. Type: ATWR ... followed by Enter; this writes the configuration
- viii. Type: ATNR ... followed by Enter; this restarts the network
- d. Close application
- e. Unplug Brultech, wait for a second, plug it back in

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

2.3 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 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
$1 \leftrightarrow 1$	ST = Current Power
	TPW = Current Energy
	PPW = Polarized Power
	CV = Current Voltage
	CC = Current Current
$2 \leftrightarrow 2$	ST = Current Power
	TPW = Current Energy
	PPW = Polarized Power
	CC = Current Current
3 ←→3	ST = Current Power
	TPW = Current Energy
$4 \leftarrow \rightarrow 4$	ST = Current Power
	TPW = Current Energy
$5 \leftrightarrow \rightarrow 5$	ST = Current Power
	TPW = Current Energy
$6 \leftrightarrow \rightarrow 6$	ST = Current Power
	TPW = Current Energy
7 ←→7	ST = Current Power
	TPW = Current Energy



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
$1 \leftarrow \rightarrow Main$	ST = Current Power
	TPW = Current Energy
	For all channels
$5 \leftarrow \rightarrow$ Channel 1	ST = Current Power
	TPW = Current Energy
	PF = Power Factor
	CV = Current Voltage
	CC = Current Current
$6 \leftarrow \rightarrow$ Channel 2	ST = Current Power
	TPW = Current Energy
	PF = Power Factor
	CV = Current Voltage
	CC = Current Current
$7 \leftarrow \rightarrow$ Channel 3	ST = Current Power
	TPW = Current Energy
	PF = Power Factor
	CV = Current Voltage
	CC = Current Current

Universal Devices, Inc. Page - 11 -

$8 \leftarrow \rightarrow$ Channel 4	ST = Current Power
	TPW = Current Energy
9 ←→Channel 5	ST = Current Power
	TPW = Current Energy
$40 \leftarrow \rightarrow$ Local Temp.	ST
$41 \leftarrow \rightarrow \text{Remote Temp1}$	ST
$42 \leftarrow \rightarrow \text{Remote Temp2}$	ST
$60 \leftarrow \rightarrow$ 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**>

> Universal Devices, Inc. Page - 13 -