

# Sleep Network & LPM

## - Quick Start Guide

### **1. Sleep Network Settings:**

- 1) Gateway: uses DIA driver files version 3.9. Can be downloaded [here](#).
- 2) Key settings: see dia.yml file for detail.
- 3) Sleep Network Setting: Sleep = 55000 ms, Awake = 8000 ms. This setting is implemented by dia.yml.
- 4) Awake Network Setting: Sleep = 20 ms, Awake = 8000 ms. This setting is implemented by dia.yml.
- 5) Network Awake Setting (Debug Mode): Sleep = 50 ms, Awake = 20000 ms. This is the default setting for debug mode.
- 6) Gateway settings: SM = 7, SO = 5, SP = 2, ST = 20000. This setting is done during gateway programming.
- 7) SapIP radio settings: SM = 8, SO = 2, SP = 2, ST = 20000. This setting is done during SAPIP Digimesh chips programming.

### **2. SapIP Configuration:**

- 1) For non-LPM mode:
  - a. Heater voltage is on all the time.
  - b. Sap flow measurement: Logging Interval = 15 / 30 / 60.
- 2) For LPM mode:
  - a. Heater voltage is turned off periodically.
  - b. Logging Interval = 15P / 30P.
  - c. Heater ON Time can be set through START LOGGER screen.
  - d. For SAPIP-SM, Heater On Time is 2 s (FW116.012).
  - e. For SAPIP-Micro2, Heater On Time is 16 s (FW118.012).
  - f. In order to run Sap Flow in LPM mode, logging interval = 15, Heater On Time = 175 s (5 seconds less than a sample data cycle). This setting will ensure SapIP logs every 15 minutes.

## Gateway

**XBee Configuration**

Extended Address: 00:13:a2:00:40:78:40:35!  
 Product Type: X4 Gateway  
 Firmware Version: 0x8062

Basic Settings

Advanced Settings

The following are advanced settings. Use caution - modifying some sett

Broadcast radius (BH):  (0-32)  
 Coordinator enable (CE):  (0-2)  
 Node discovery timeout (NT):  x 100 msec (32-12000)  
 Encryption enable (EE):  (0-1)  
 Hopping sequence (HP):  (0-7)  
 Link encryption key (KY):   
 MAC retries (RR):  (0-15)  
 Maximum hops (NH):  (1-32)  
 Mesh network retries (MR):  (0-7)  
 Broadcast retries (MT):  (0-15)  
 Network delay slots (NN):  (1-10)  
 Node identifier (NI):  (0-20 chars)  
 PAN identifier (ID):  (0x0-0xffff)  
 Sleep mode (SM):  (0-8)  
 Sleep options (SO):  bitfield (0x0-0xffff)  
 Sleep Time (SP):  x 10 msec (1-1440000)  
 Wake Time (ST):  msec (1-3600000)

## MicroClimate/Soil Moisture

Serial interface data rate (BD):  (0-230400)  
 Peripheral sleep count (SN):  (1-65535)  
 Sleep mode (SM):  (0-8)  
 Sleep options (SO):  bitfield (0x0-0xffff)  
 Sleep Time (SP):  x 10 msec (1-1440000)  
 I/O sample from sleep rate (IF):  (1-255)  
 Wake Time (ST):  msec (1-3600000)  
 Stop bits (SB):  (0-1)  
 Wake host delay (WH):  msec (0-65535)

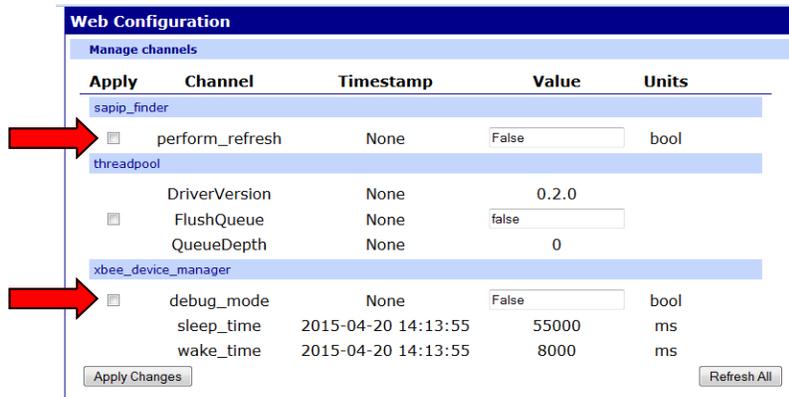
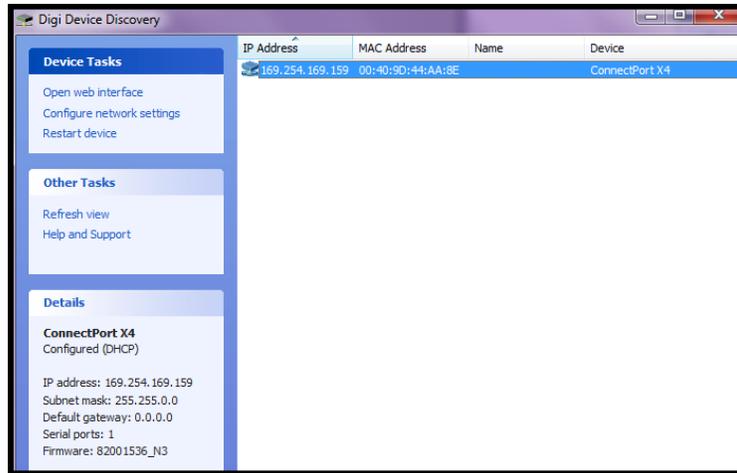
## Sap Flow

Transmit power level (PL):  (0-4)  
 Sleep mode (SM):  (0-8)  
 Sleep options (SO):  bitfield (0x0-0xffff)  
 Sleep Time (SP):  x 10 msec (1-1440000)  
 Wake Time (ST):  msec (1-3600000)



### 4. Cellular Network:

- 1) Connect Crossover cable between PC and Cellular Gateway. Wait for at least one minute.
- 2) Open "Digi Device Discovery" program, click "Refresh View". An IP address will appear in the list.
- 3) Start DIA Presentation page by typing in "http://169.254.169.159/idigi\_dia.html" in the web browser where "169.254.169.159/" is the Ethernet IP address of the gateway.
- 4) Check "debug\_mode" and change value to "TRUE". Click "Apply Changes". This is to change sleep network to awake status in order to issue commands.
- 5) Check "perform\_refresh" and change value to "TRUE". Click "Apply Changes". This is to issue awake command to the entire network in order to wake up all SAPIP nodes.
- 6) Wait for as many as 2 munites for the entire network to be awake before issuing commands.



#### **4. Cellular Network (Continued):**

- 1) Agrisensors.net webpage.
- 2) In Agrisensors.net website, verify communication status between gateway and SapIPs, Get Status, Start/Stop logging, or Channel Configuration.
- 3) Once all operations are completed, go back to DIA presentation page to enable network sleep.
- 4) Type in "http://192.168.0.44/idigi\_dia.html" in the web browser where "192.168.0.44" is the Ethernet IP address of the gateway.
- 5) Check "debug\_mode" and change value to "FALSE". Click "Apply Changes". This is to issue sleep command to the network.
- 6) Check "perform\_refresh" and change value to "TRUE". Click "Apply Changes". This is to issue sleep command to the entire network in order to enable sleep on all SAPIP nodes.
- 7) Wait for as many as 2 minutes for the entire network to synchronize sleep cycle.
- 8) Disconnect crossover cable from gateway and PC.

#### **5. Remote Operation:**

- 1) Above methods all require user to go to the field where gateway is located and directly connect PC to either gateway (cellular) or local network (LAN).
- 2) Remote operation allows user to enable/disable sleep option on SapIP network at his office.
- 3) Browse to "www.agrisensors.net" - "Ranch". Expand "Ranches" under "Ranch Components" to list all Gateways and SapIPs in the network.
- 4) Right click on desired gateway to display gateway info page.
- 5) To wake up the network from sleep, click "Start Debug Mode" button on the bottom right corner of the screen. "Debug Mode" window on the right will display "True".
- 6) Wait for 2 minutes for the entire network to wake up. If not, browse to "device.idigi.com" - "Device Management" - "XBee Networks", run a discover on the gateway then wait for 2 minutes.
- 7) Verify communication with SapIP nodes by issuing "get status" command.
- 8) To put network back to sleep, click "Stop Debug Mode" button on the bottom right corner of "www.agrisensors.net" screen. "Debug Mode" window on the right will display "False".
- 9) Wait for 2 minutes for the entire network to sleep. If not, browse to "device.idigi.com" - "Device Management" - "XBee Networks", run a discover on the gateway then wait for 2 minutes.
- 10) Check communication to sleep nodes to confirm sleep is enabled. Sleep period is 1-1.5 minutes depends on the sleep setting of the gateway.

Queue Depth:	<input type="text"/>	Flush Queue	Suspend Missing Raw Data
Debug Mode:	<input type="text"/>	Start Debug Mode	Stop Debug Mode

Release:

TEST 3.9 SapIP - agri.NET ONLY

Test the functions of the sensors in the sleep mode for all 4 sapIP in the sleep mode.

The original file ONLY support the Agrisensors.NET

Test for the file:

Yml file:

#Test 3.9 for agrisensors.NET ONLY ; ZIP File SIZE= 530156

# Has Changes to disable errors if asking for example during Logging by RCI.

#Test Sleeping in the long sleep mode with previous settings 2012

#Test with no file logger

#

devices:

- name: xbee\_device\_manager

driver: devices.xbee.xbee\_device\_manager.debug\_digimesh\_device\_manager:DebugDigiMeshDeviceManager

settings:

sleep\_time: 48000

wake\_time: 9000

dh\_dl\_force: false

- name: sapip\_finder

driver: custom\_devices.sapip\_autoenum:XBeeAutoEnum

settings:

discover\_rate: 1860

xbee\_device\_manager: "xbee\_device\_manager"

devices:

- driver: "custom\_devices.SapIP:SapIP"

name: "prototype"

settings:

idigi\_db\_name: "idigi\_db"

start\_logger\_delay: 37

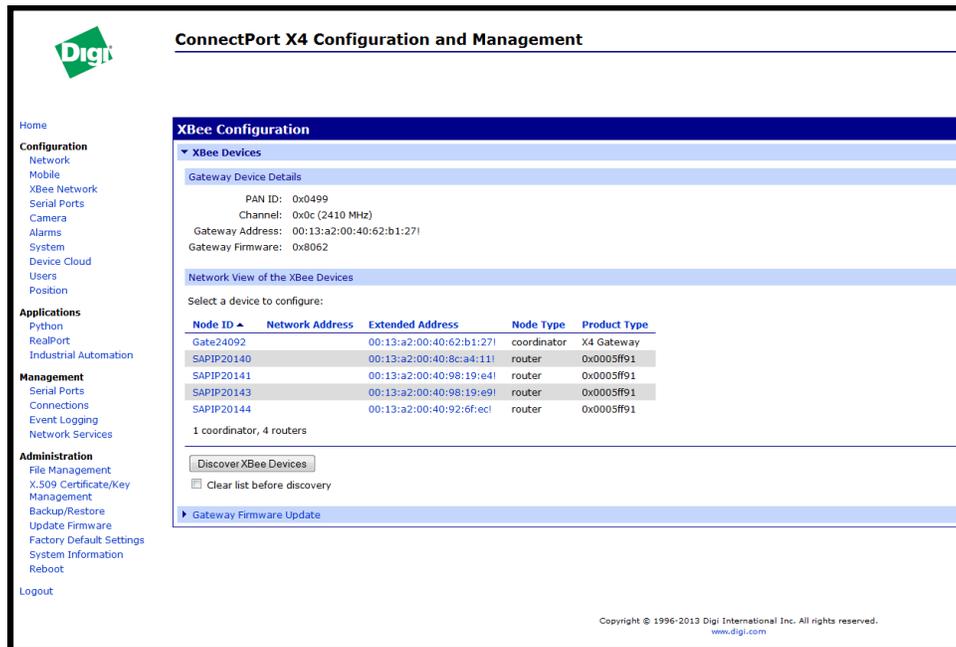
command\_wait\_time: 134

data\_recovery\_delay: 43

maximum\_missed\_requested: 10

disable\_data\_service: true

## Switch Between Sleep network and Awake network:



All the loggers have, when awake:

Operating sleep time (OS): 5 x 10 msecs

Supply voltage (%V): 3942 mvolts

Temperature (TP): 57 degrees C

Bytes transmitted (BC): 0

Transmission errors (TR): 0

Operating wake time (OW): 20000 msecs

All the loggers have, when asleep

Operating sleep time (OS): 4800 x 10 msecs

Supply voltage (%V): 3942 mvolts

Temperature (TP): 57 degrees C

Bytes transmitted (BC): 0

Transmission errors (TR): 0

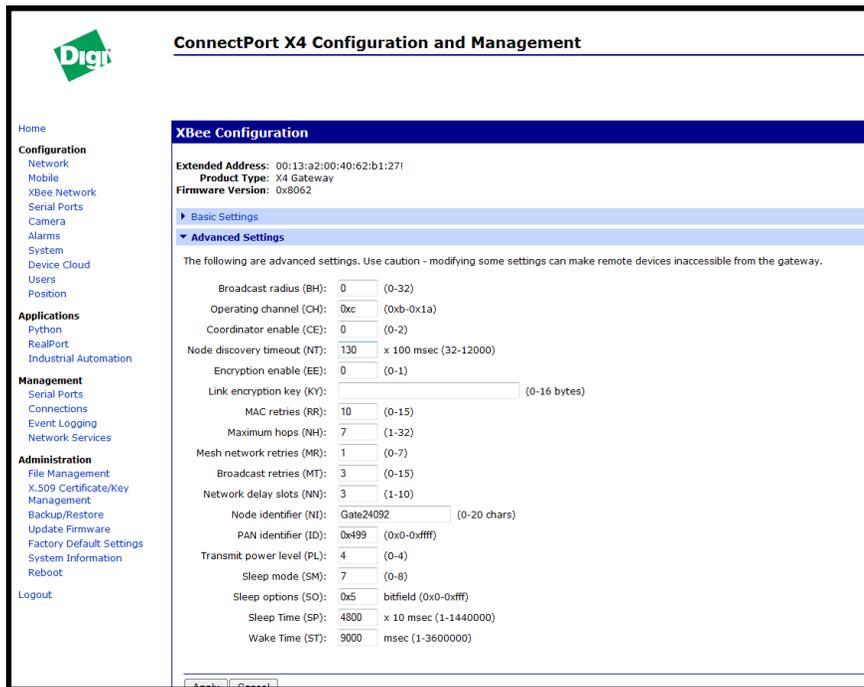
Operating wake time (OW): 9000 msecs

All Devices are default to be authorized in sleep network (SM=8, SO=2) with non-sleep setting (SP=2x10ms, ST=20000ms). In a sleep network, OS and OW are actually controlling the sleep cycle (adapted from gateway setting).

Serial interface data rate (BD):  (0-230400)  
 Peripheral sleep count (SN):  (1-65535)  
 Sleep mode (SM):  (0-8)  
 Sleep options (SO):  bitfield (0x0-0xffff)  
 Sleep Time (SP):  x 10 msec (1-1440000)  
 I/O sample from sleep rate (IF):  (1-255)  
 Wake Time (ST):  msec (1-3600000)  
 Stop bits (SB):  (0-1)  
 Wake host delay (WH):  msec (0-65535)

Operating sleep time (OS): 4800 x 10 msecs  
 Bytes transmitted (BC): 4697710  
 Transmission errors (TR): 175  
 Operating wake time (OW): 9000 msecs

The Gateway has sleep authorized:



**ConnectPort X4 Configuration and Management**

**XBee Configuration**

Extended Address: 00:13:a2:00:40:62:b1:27f  
 Product Type: X4 Gateway  
 Firmware Version: 0x8062

Basic Settings

Advanced Settings

The following are advanced settings. Use caution - modifying some settings can make remote devices inaccessible from the gateway.

Broadcast radius (BH):	<input type="text" value="0"/>	(0-32)
Operating channel (CH):	<input type="text" value="0xc"/>	(0xb-0x1a)
Coordinator enable (CE):	<input type="text" value="0"/>	(0-2)
Node discovery timeout (NT):	<input type="text" value="130"/>	x 100 msec (32-12000)
Encryption enable (EE):	<input type="text" value="0"/>	(0-1)
Link encryption key (KY):	<input type="text" value=""/>	(0-16 bytes)
MAC retries (RR):	<input type="text" value="10"/>	(0-15)
Maximum hops (NH):	<input type="text" value="7"/>	(1-32)
Mesh network retries (MR):	<input type="text" value="1"/>	(0-7)
Broadcast retries (MT):	<input type="text" value="3"/>	(0-15)
Network delay slots (NW):	<input type="text" value="3"/>	(1-10)
Node identifier (NI):	<input type="text" value="Gate24092"/>	(0-20 chars)
PAN identifier (ID):	<input type="text" value="0x499"/>	(0x0-0xffff)
Transmit power level (PL):	<input type="text" value="4"/>	(0-4)
Sleep mode (SM):	<input type="text" value="7"/>	(0-8)
Sleep options (SO):	<input type="text" value="0x5"/>	bitfield (0x0-0xffff)
Sleep Time (SP):	<input type="text" value="4900"/>	x 10 msec (1-1440000)
Wake Time (ST):	<input type="text" value="9000"/>	msec (1-3600000)

ALL LOGGERS MUST ENABLE LPM MODE

321LPM = 1

AVRS = xxxx 0175 (For Sapflow ONLY, Inter=15, 5 samples readings of 3 minutes, 180 seconds, each)

AVRS = 5500 0002 (For Soil Moisture ONLY, Inter=15 (recommended), 15p, 30, 30p)

AVRS = 5500 0016 (For Micro Climate ONLY, Inter=15 (recommended), 15p, 30, 30p)

FOR LPM, SAPFLOW set to required heater voltage according to sensor specs, and set warmup time to 175 to ensure sensor will be continuously heated during sapflow reading of every 3 minutes using 15 logging interval. Soil Moisture sensors don't require continuous power so minimum of 2 seconds works. Micro Climate's wind Speed sensor requires 16 seconds to read RPM, so heater warmup time set to 16 seconds.

Then reboot all the loggers to read the new settings, and relog-into gateway.

## Steps to Configure Individual SapIP to LPM mode:

1. Connect your laptop to SapIP's USB connector, wait for COM port number to be generated.
2. Open TeraTerm program, choose "Serial" – new COM port, click "OK".
3. Go to menu "Setup" – "Restore Setup", select file name "SapIP-TeraTerm.ini" and click "Open". If you don't have this file on your laptop, you may download it from our public FTP server at, <ftp://ftp.dynamax.com/SapIP-Support/Teraterm/SAPIP-TeraTerm.ini>.
4. Type " \*\*\* " in three quick and consecutive strokes. A " \$ " will appear on the screen in a new line.
5. Type "STOP" and hit "ENTER" key to stop logging, then type "STAT" and hit "ENTER" key to make sure the logging is stopped. A "-----K" at the end of the status response indicates logging has been stopped.
6. Type "321LPM 1" (there is a space between LPM and 1) and hit "ENTER" key to set to LPM mode. To check if it's in LPM mode, type "321LPM" and hit "ENTER" key.
7. Type "AVRS 5500 16" (there are spaces between AVRS, 5500 and 16) and hit "ENTER" key to enable heater voltage. Type "AVRS" and hit "ENTER" key to confirm the setting. **NOTE:** for SM, type "AVRS 5500 2"; for Micro, type "AVRS 5500 16"; for SapFlow, type "AVRS xxxx 175" (where xxxx is the heater voltage based on sensor size).
8. Type "INTER 15" and hit "ENTER" to set logging interval to 15 minute. **NOTE:** 15 minutes logging interval is recommended for all SapIPs unless otherwise specified.
9. Type "START" and hit "ENTER" key to start logging.
10. Now you can safely disconnect your laptop from SapIP.
11. Move to the next SapIP and repeat steps 1-10.
12. After all SapIPs have been changed to LPM mode, go to agrisensors.net and change gateway Awake mode to "FALSE" by clicking on "STOP AWAKE MODE" button (note: gateway must be running with awake dia.yml python driver with 20ms sleep and 8000ms awake).

After setup, wake up gateway by going into debug mode. Then check the logging data on the Gateway devices:

Gateway IP address with idigi\_dia as follows:

192.168.0.31/idigi\_dia.html

pVersion	None	?
<b>SAPP20140</b>		
DriverVersion	None	0.2.1
MissedPackets	2015-07-16 11:20:02	166
pChannelConfig	None	?
pComplete	2015-07-27 15:03:49	SN07041007272015150435YY412100000160085500N1708 5003000311886XXXXXXXXXXKUK,#,07040,07/27/2015,15:00,11.8,+0.4535,+0.4535,+0.4535,+0.0215,+0.4535,8,07040,+0.4534,+0.4534,+0.0216,05.0030,00003,+20.5,5.09,0000,0000,0,07040,07/27/2015,15:00,11.8,+0.4535,+0.4535,+0.4535,+0.0215,+0.4535,8,07040,+0.4534,+0.4534,+0.0216,05.0030,00003,+20.5,5.09,0000,0000,0,07040,07/27/2015,15:00,T,T,11.8,XXXXXXXXXXKUK
pData0	2015-07-27 15:03:48	
pData1	2015-07-27 15:03:48	
pData2	2015-07-27 15:03:49	
pStatus	2015-07-27 15:03:48	SN07041007272015150435YY412100000160085500N1708 5003000311886XXXXXXXXXXKUK,
pVersion	None	?
<b>SAPP20141</b>		
DriverVersion	None	0.2.1
MissedPackets	2015-07-17 16:53:40	233
pChannelConfig	None	?
pComplete	2015-07-27 15:07:36	SN04204007272015150754YY412100000175085500N1708 5446000511785XXXXXXXXXXKUK,#,04203,07/27/2015,15:00,11.9,+0.4980,+0.4980,+0.0237,+0.4980,8,04203,+0.4980,+0.4980,+0.0237,+0.4980,8,04203,07/27/2015,15:00,11.9,+0.4980,+0.4980,+0.0237,+0.4980,8,04203,+0.4980,+0.4979,+0.0237,05.4460,00005,+19.8,5.06,0000,0000,0,04203,07/27/2015,15:00,T,T,11.9,XXXXXXXXXXKUK
pData0	2015-07-27 15:07:36	
pData1	2015-07-27 15:07:36	
pData2	2015-07-27 15:07:36	
pStatus	2015-07-27 15:07:35	SN04204007272015150754YY412100000175085500N1708 5446000511785XXXXXXXXXXKUK,
pVersion	None	?
<b>SAPP20143</b>		
DriverVersion	None	0.2.1
MissedPackets	2015-07-16 16:03:06	245
pChannelConfig	None	?
pComplete	2015-07-27 15:03:48	SN05269007272015150338YY4121000001600854500N1708 4432000411953XXXXXXXXXXKUK,#,05268,07/27/2015,15:00,11.9,+0.4062,+0.4062,+0.0193,+0.4062,8,05268,+0.4062,+0.4062,+0.0193,04.4450,00004,+22.4,5.07,0000,0000,0,05268,07/27/2015,15:00,11.9,+0.4062,+0.4062,+0.4062,+0.0193,+0.4062,8,05268,+0.4062,+0.4062,+0.0193,04.4450,00004,+22.4,5.07,0000,0000,0,05268,07/27/2015,15:00,T,T,11.9,XXXXXXXXXXKUK
pData0	2015-07-27 15:03:48	
pData1	2015-07-27 15:03:48	
pData2	2015-07-27 15:03:48	
pStatus	2015-07-27 15:03:48	SN05269007272015150338YY4121000001600854500N1708 4432000411953XXXXXXXXXXKUK,
pVersion	None	?
<b>SAPP20144</b>		
DriverVersion	None	0.2.1
MissedPackets	2015-07-16 16:38:16	227
pChannelConfig	None	?
pComplete	2015-07-27 15:07:36	SN03935007272015150732YY4121000001700854000N1708 3827000311631XXXXXXXXXXKUK,#,03934,07/27/2015,15:00,11.6,+0.3536,+0.3536,+0.3535,+0.0168,+0.3536,8,03934,+0.3536,+0.3536,+0.0168,03.8270,00003,+20.0,4.99,0000,0000,0,03934,07/27/2015,15:00,11.6,+0.3536,+0.3536,+0.3535,+0.0168,+0.3536,8,03934,+0.3536,+0.3536,+0.0168,03.8270,00003,+20.0,4.99,0000,0000,0,03934,07/27/2015,15:00,T,T,11.6,XXXXXXXXXXKUK
pData0	2015-07-27 15:07:36	
pData1	2015-07-27 15:07:36	
pData2	2015-07-27 15:07:36	
pStatus	2015-07-27 15:07:36	SN03935007272015150732YY4121000001700854000N1708 3827000311631XXXXXXXXXXKUK,
pVersion	None	?

Due to the delay, and waiting time up to 15 minutes, for the data to appear in the window:

Now all the sensors are registered.

Important to delete all the older records from the Agrisensors data base.

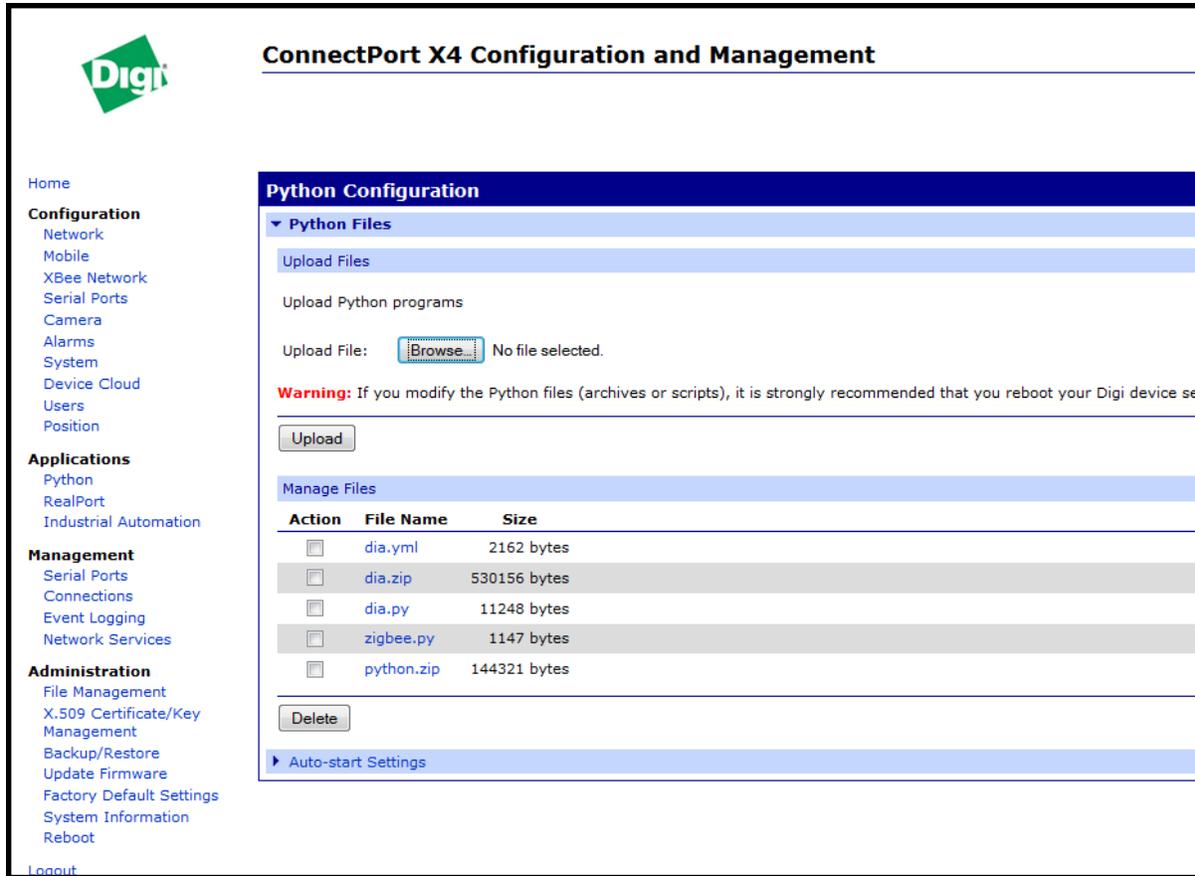
Once all the data is reporting, you can get the sensors to go to sleep. That is to use the idigi html to set it to sleep.

sapp_finder		
<input type="checkbox"/>	perform_refresh	2015-07-02 13:48:27 <input type="text" value="False"/>
threadpool		
	DriverVersion	None 0.2.0
<input type="checkbox"/>	FlushQueue	None <input type="text" value="false"/>
	QueueDepth	2015-06-30 12:18:27 <input type="text" value="0"/>
xbee_device_manager		
<input type="checkbox"/>	debug_mode	2015-07-02 13:48:20 <input type="text" value="False"/>
	sleep_time	2015-07-02 13:48:20 <input type="text" value="48000"/>
	wake_time	2015-07-02 13:48:20 <input type="text" value="9000"/>
<input type="button" value="Apply Changes"/>		<input type="button" value="Refresh All"/>

Always run the Debug Mode when working with gateway or SapIPs! The starting mode of gateway should always with sleep on, this makes starting up much more time. Then go to Debug Mode to wake up the gateway and network.

If you are in the same LAN – use the idigi\_dia page.

If you are on the IP, you can use the Agrisensors to reset the debug mode.



**Digi**

## ConnectPort X4 Configuration and Management

Home

**Configuration**

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- Update Firmware
- Factory Default Settings
- System Information
- Reboot

Logout

### Python Configuration

**Python Files**

Upload Files

Upload Python programs

Upload File:  No file selected.

**Warning:** If you modify the Python files (archives or scripts), it is strongly recommended that you reboot your Digi device se

**Manage Files**

Action	File Name	Size
<input type="checkbox"/>	dia.yml	2162 bytes
<input type="checkbox"/>	dia.zip	530156 bytes
<input type="checkbox"/>	dia.py	11248 bytes
<input type="checkbox"/>	zigbee.py	1147 bytes
<input type="checkbox"/>	python.zip	144321 bytes

**Auto-start Settings**