

ADASEED

Automated Data Acquisition System for Energy and Environmental Data

User's Manual

Center for Smart Building and Community Design
University of Hawai'i at Manoa
2525 Correa Road, HIG 205
Honolulu, HI 96822
(808) 956-2861

July 24, 2014

1 Introduction

Thank you for taking interest in the Automated Data Acquisition System for Energy and Environment Data (ADASEED). When properly installed with Hoboware Pro, eGauge2, and PostgreSQL, you will be able to record energy and environmental data which is saved to a database for a third party software such as Tableau for visualization.

The first section of this manual describes the installation of ADASEED. The second section provides operating instructions. The appendices provided will contain respective proprietary documentation for the Hoboware Pro, eGauge2, and PostgreSQL components of the system as well as an explanation of the data flow within the code of ADASEED in Appendix E.

Please note that ADASEED is only operable on MS Windows 7 and above. ADASEED does NOT operate on Apple OS or Linux distributions at this time. The recommended computer hardware configuration are: Intel i3/AMD A-6 or equivalent, 4 gigabytes of RAM, 3 gigabytes of HDD space.

2 Installation

Installation is broken up into four sections which does not have to be performed in any particular order. However, all components must be installed for you to use ADASEED. Please refer to Appendix A for a list of known compatible versions of Hoboware Pro, eGauge2, and PostgreSQL as well as web links to their respective installation files.

2.1 Installation of Hoboware Pro

Installation instructions for the Hoboware Pro Software are located in the Hoboware Pro Manual found in Appendix B. Follow the steps for installing the Hoboware Pro on the Microsoft Windows operating system starting on page 6 in the Hoboware Pro Manual. After the initial installation, check for online software updates which will be prompted automatically after the initial installation. Attach the device(s) that will be used with Hoboware Pro and check that the device(s) are recognized. Also update any drivers for the device(s) that will be used.

Configuration of the Hoboware ZW network requires accessing the "HOBOnode Manager". Refer to page 153 of the Hoboware Pro manual for more details on the settings and configuration. The data can be exported and plotted from the "HOBOnode Manager". It can also be set to periodically export data, refer to page 162 of the Hoboware Pro manual. The general setup of the Hoboware Pro ZW network is outlined below:

- 1) Connect the receiver.
- 2) Form the network and add nodes to the network.
 - a. Open the "HOBOnode Manager".
 - b. Press "Form network" after re-checking that the receiver (usually ZW-RCVR) is "CONNECTED".

- c. If the nodes and receiver intend to be powered from an outlet, the batteries must not be installed until after the network is formed. Also connect all the sensors before continuing to d.
 - i. NOTE: It is a good idea to notate which receiver is which
 - d. In order to connect the node to the network, reset the node by pressing and holding the button with an object that can fit in the pin-hole. The red led will rapidly flash and stop indicating the node has been reset.
 - e. Now re-press the same button without holding down the button for more than a couple of seconds. The green and red leds will alternate between each other. If the alternating stops and the red led flickers, then the node did not see a network. If the node continues alternating or both leds are on, then the node has seen a network.
 - f. Repeat d and e, for the required amount of nodes. Once all the nodes see the network go back to the "HOBOnode Manager".
 - g. Press the "X" to stop forming the network.
 - h. Check to see that all the nodes are in the "HOBOnode Manager" and that their "Status" is "ACTIVE".
- 3) Configure the nodes.
- a. Double-click on the node or sensor s/n and set the Logging Interval and Connection Interval.
 - i. Logging Interval: This will determine the resolution of the network.
 - ii. Connection Interval: This will determine when the data is updated in the "HOBOnode Manager".
 - b. Edit the "Meas. Type" for each port that is used according to the type of sensor attached.
 - i. Check the sensor installed on the Hoboware website if unsure of the appropriate type.
 - c. Repeat a and b until all the nodes are configured.
 - d. Wait for all the node "Reading"(s) to update at least once to check if the "Reading" is accurate (sometimes the sensor is loose and will read sporadic measurements).
- 4) Create a Setting.
- a. Press "Plot/Export Data".
 - b. In "Step 1: ", Choose the appropriate "Depl #" (usually with the "Label", "First Deployment").
 - c. In "Step 2:", Choose the sensors to show (usually press "All").
 - d. In "Step 4:", Choose "Preset".
 - e. Custom will only export between a set period.
 - f. Preset will export based on relevance to the current time (this setting is used for automated exports).
 - g. In "Step 3:", Choose all the sensors to include (usually "Include all sensors").
 - h. In "Step 4:", Choose the sensors to remove ("Step 4" is usually skipped).
 - i. Go to "Save Settings", in "<new saved settings>", type in the name of the setting and Press Enter.
 - j. Now exit the "Plot/Export Wireless Data" Window and Goto "Actions".
 - k. In "Actions", Choose "Edit HOBO Data Node Preferences ...".

- l. In "Data Nodes", Choose "Alarms".
- m. In "Alarms", Setup the required information.
 - i. Ex. For a google account:
 1. Server: smtp.gmail.com
 2. Port: 465
 3. Check "This server requires a secure connection (SSL)"
 4. Check "This server requires authentication"
 5. Username: <username>.gmail.com
 6. Password: <password_for_gmail>
 7. From: <username>.gmail.com
 8. To: <another_or_same_username>.gmail.com
- n. Find "Sharing", in "Sharing", go to "Data Delivery".
 - i. Check "Every <time_frame> extract wireless data using the saved settings <saved_setting>"
 - ii. NOTE: The time_frame should match the "Preset" in the saved_setting.
 - iii. Check "Place the file in the following location on the local filesystem or network:"
 - iv. Find the appropriate path to the <hobo_data_bin> that will be used by the "HobowareUtility.py" script (usually "hobo" in the same directory of "HobowareUtility.py").
- o. Press "OK"

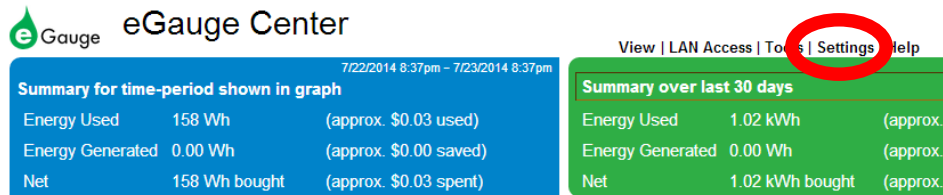
2.2 Installation of the eGauge2 device

Installation of the eGauge2 component of the system is implemented in two main steps. First you will install the eGauge2 device by connecting the current transducers to the wires that you want to monitor. Next you will set your laptop to directly connect to your eGauge2 device so that your laptop can query the device.

- 1) Refer to the eGauge2 User's manual for step by step instructions on how to install the eGauge2 device. The latest version of the eGauge2 User's Manual can be found in Appendix C1.
 - a. Please notice the following:
 - i. It is imperative to set the Current Transducers (CT's) in the correct direction on the wire. If it is not installed correctly, the data that ADASEED collects will show the opposite values in the database. Therefore one of two things must be done:
 1. You must go back into the distribution panel and physically set the CT in question correctly.
 2. When viewing the data in the database, set your viewing software to take this issue into account.
- 2) Refer to the eGauge2 documentation "Tutorial 6: Directly connecting to the eGauge" found in Appendix C2 in order to establish communication between the laptop and your eGauge2 device.

Please note the following:

- a. Sync the eGauge2 device clock to the clock on your laptop. You can do this from the device's dashboard.
 - i. Point your browser to "192.168.1.88".
 - ii. At the top of the device's dashboard click on "Settings".



- iii. At the left of the settings dashboard click on "Date & Time".

eGauge Settings

Home | Monthly Summary | Alerts

Warning: Every time the settings are saved by clicking "Save", eGauge may need to reboot, which means about recording will be missed.

Preferences

- General Settings
- Network Settings
- HomePlug
- BACnet
- Access Control
- Installation
- Alerts
- Date & Time**

Date & time when recording started [?]: 7/18/2014 1:00pm

Geographic location [?]: Latitude 21.298126 Longitude -157.816528 (map, address lookup)

Geographic region [?]: North Americas

Min. interval for public usage data [?]: No restriction

Proxy-server hostname [?]: d.egauge.net

Data Sharing [?]: disabled

- iv. At the Date & Time screen change the Date & Time field. Please note that ADASEED is designed to have NO connection to the internet, therefore the device will not be able to update its clock automatically.

eGauge Settings

Home | Monthly Summary | Alerts | Status | LAN Access | Tools

Warning: When eGauge is connected to the Internet, it should pick up the correct time automatically from ntp.org. Without Internet-connectivity it may be necessary to correct the date and time occasionally.

Time-server (NTP) hostname [?]: [0, 3] pool.ntp.org

Date & Time [?]: 7/23/2014 8:40pm Current Time: 7/23/2014 8:40:23pm

Time Zone [?]: US/Hawaii Detect

Save Reset

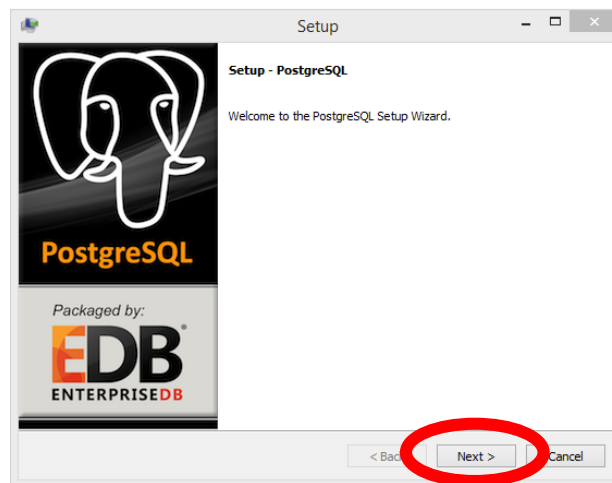
Even after all this time, the Sun never says to the Earth "you owe me" --- Hafiz, Persian Poet of the 1300s

- v. Click on “Save” and allow the device to reboot. Note that the reboot may take approximately five minutes. Please refer to the eGauge2 User’s Manual in the event the device does not reboot correctly.

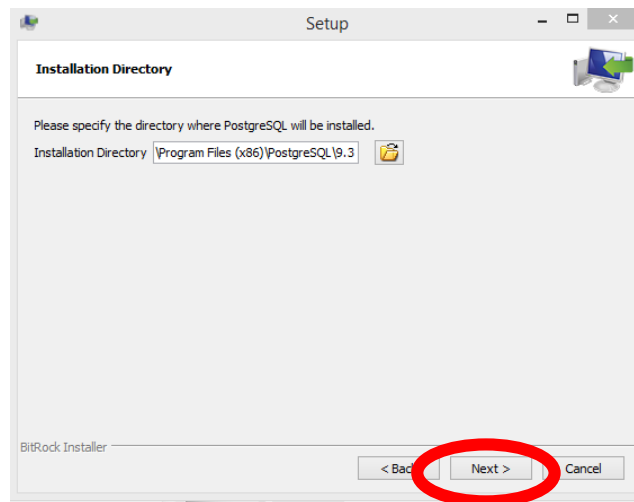
2.3 Installation of PostgreSQL

The PostgreSQL database component will hold your data collected. PostgreSQL is NOT a data viewing tool. A third party software such as Tableau must be configured to access the database. Installation of PostgreSQL to use with ADASEED occurs in two parts. First you will install PostgreSQL, then you will configure PostgreSQL specifically to work with ADASEED. These steps are covered in detail below. Pictures are captured from installing PostgreSQL 9.3 Win x86-32bit.:

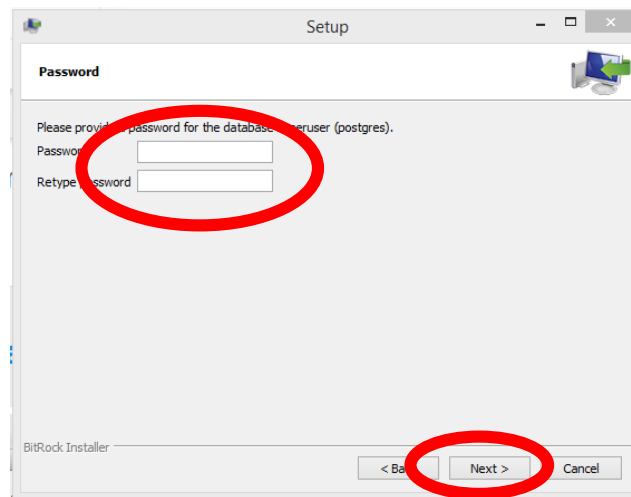
- 1) Install PostgreSQL onto your laptop.
 - a. Download the PostgreSQL 9.3 Win x86-32 installation file at <http://www.enterprisedb.com/products-services-training/pgdownload#windows> .
 - i. NOTE: It is suggested to install the latest PostgreSQL version listed in appendix A of this manual.
 - b. Run the installation file and click “Next” as shown below.



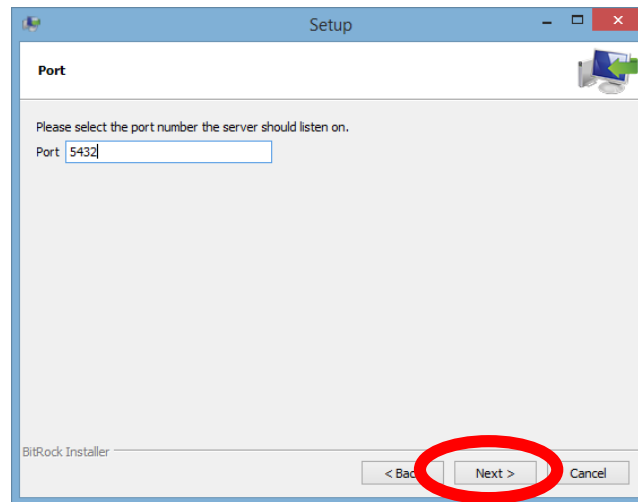
- c. Accept the default installation directory by clicking “Next” as shown below.



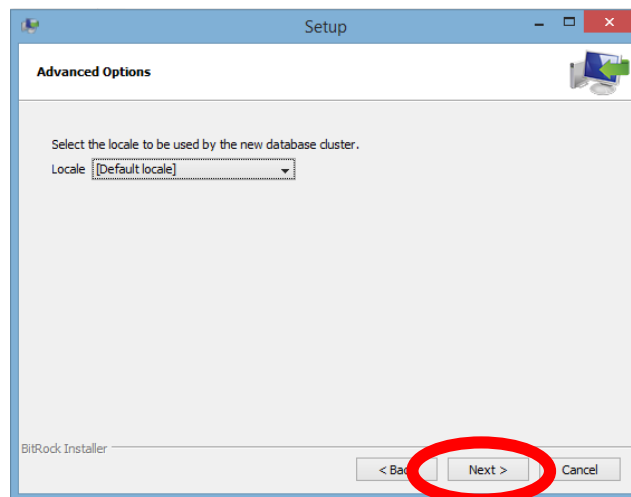
- d. Accept the default data directory by clicking “Next”.
- e. At the “Password” screen type “postgres” without the quotes for the password in both fields, then click “Next”.



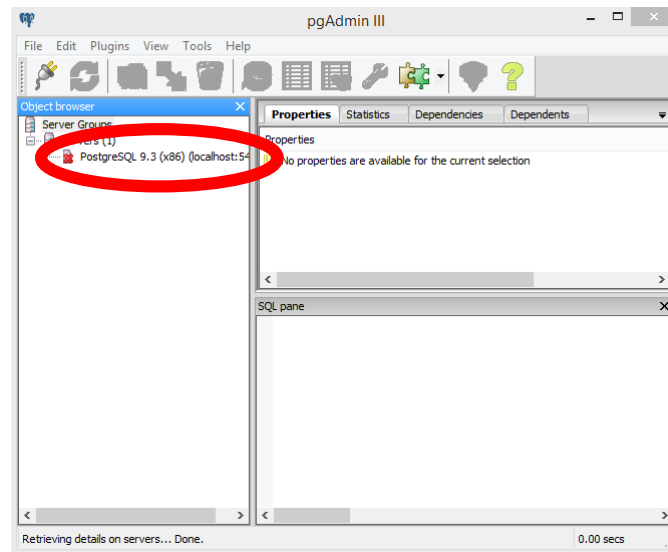
- f. Accept the “Port” value as “5432” by clicking “Next”.



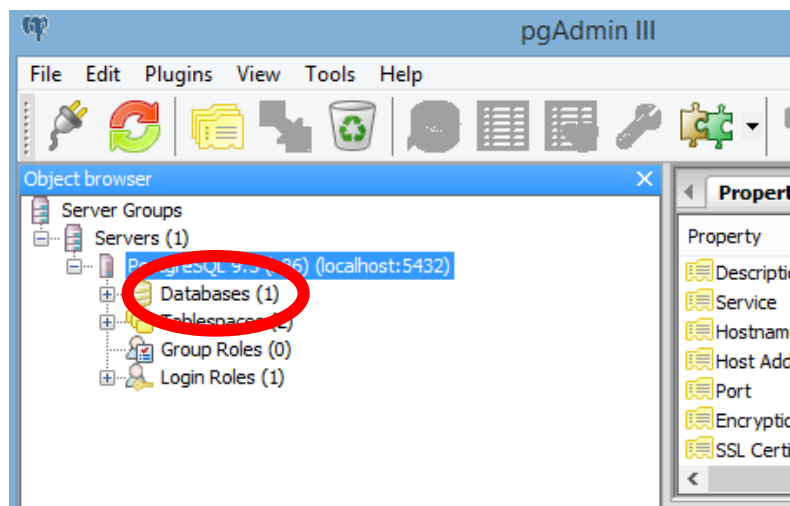
- g. Accept the “Locale” as the “[Default locale]” by clicking on “Next”.



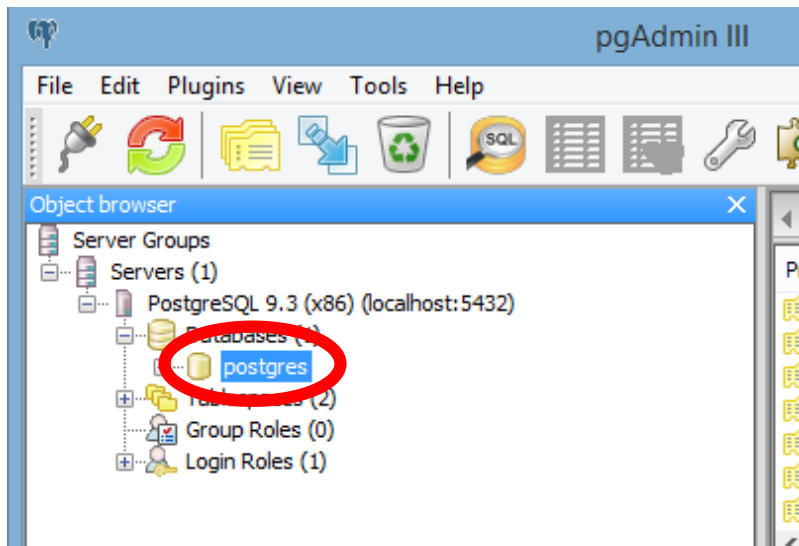
- h. Click “Next” to install PostgreSQL on your computer.
i. Click “Finish” to end your PostgreSQL setup.
- 2) Configure PostgreSQL specifically for ADASEED.
- a. Start “pgAdmin III” and you will see the “pgAdmin III” GUI as shown below.



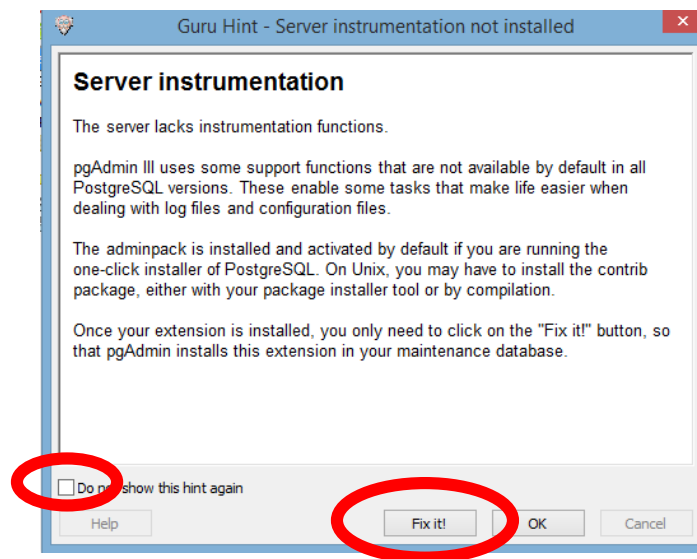
- b. Double-click on “PostgreSQL 9.3 (x86) (localhost:5432)” and supply the password from step 1 above which is “postgres” without the quotes. Check the box labeled “Store password” and click “OK”.
- c. Check the box labeled “Do not show this hint again” and hit “OK”.
- d. Double-Click on “Database” in the tree as shown below.



- e. Click on “postgres”



- f. Check the box labeled “Do not show this hint again” and hit “Fix It!”



2.4 Installation of ADASEED

Installation of the ADASEED software has been written and compiled as a stand-alone software in the Windows environment. Essentially, this means that the software sits in a directory and does not affect the registry or background processes of the Windows OS. Installation can be carried out in one of two ways, a) using the compiled executable files, and b) using the python source code. Installation of these two versions are as follows:

- 1) Installing the compiled executable files.

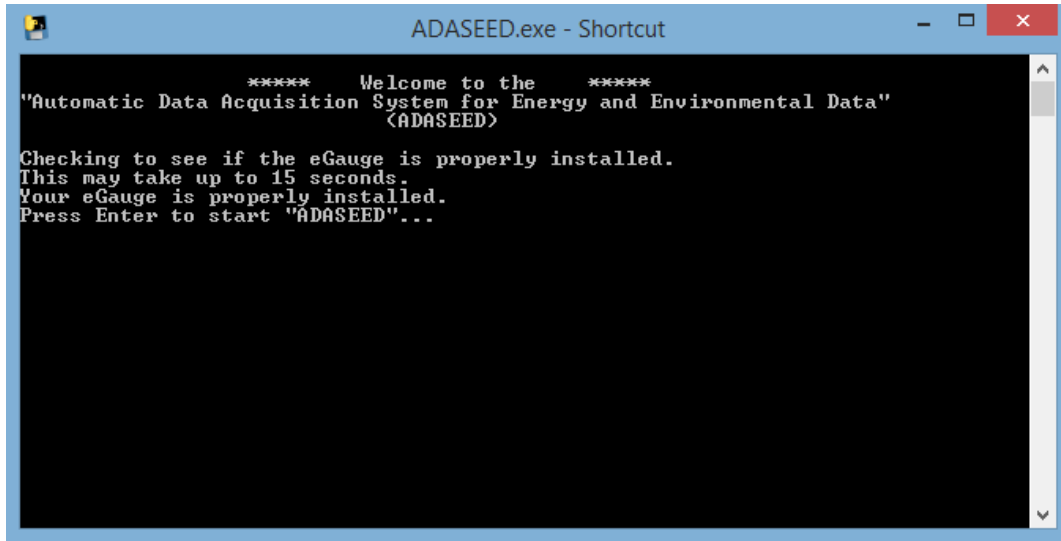
- a. Obtain a compressed .zip file of ADASEED.
 - i. Follow the link found in appendix A of this manual.
 - b. Uncompress the file into any desired folder.
 - i. Note: For ease of use, right-click on the “ADASEED.exe” file and select “create shortcut”, then transfer the shortcut to the windows desktop or taskbar.
- 2) Installing the python source code.
- a. Download the installation files for “Anaconda” and the “psycopg2” package with the links found in appendix A.
 - b. Download the ADASEED source file using the link found in appendix A.

3 Usage

The usage of the ADASEED system is very simple. The following are outlines of a typical session using either the a) executable file, or b) source code of ADASEED. It will walk you through what internal processes occurs during each stage of the session. The outlines is as follows:

3.1 Usage of ADASEED: executable file

- 1) Double-click on the ADASEED.exe file in the ADASEED folder that was installed from the .zip file, or if you had created a shortcut, double-click on the shortcut instead.
 - a. This action will open a windows command window as shown below.



```
***** Welcome to the *****
"Automatic Data Acquisition System for Energy and Environmental Data"
      (ADASEED)

Checking to see if the eGauge is properly installed.
This may take up to 15 seconds.
Your eGauge is properly installed.
Press Enter to start "ADASEED"...
```

- b. When ADASEED is launched it does the following:
 - i. Checks to see if the eGauge device is connected. In the event it is NOT connected, ADASEED will return a message stating that it is not connected and will exit the program.

- ii. Checks to see if the eGauge device's onboard clock is synced to the clock on the local computer. If it is NOT within 45 seconds, ADASEED will prompt that the device and computer are out of sync and continue to exit the program.
 - iii. Checks to see if PostgreSQL is properly installed.
 - iv. Checks to see if the "hobo" and "egauge" tables exist in the postgres database. If either of them do not exist, it automatically creates one.
 - v. In the event you come across any of the scenarios listed above, refer to appendix D for troubleshooting ideas, then relaunch ADASEED as stated in step 1 in section 3.1.
- 2) Before pressing "Enter" to begin your ADASEED session, review the following notes.
 - a. Confirm that your Hobo ZW network is operational AND saving files to the "ADASEED > hobo" folder.
 - b. Confirmation that the eGauge device and PostgreSQL components are installed has been included in the ADASEED software.
- 3) Once you press "Enter", you will be given the time at which your session has started. At this point, you can now allow ADASEED to run in the background.
 - a. DO NOT close ADASEED by clicking on the "x" in the upper right corner of the window or by hitting "Alt+F4". Data will be lost.
 - b. While ADASEED is running, it pings the eGauge device every 2 hours and stores the data in the egauge table in postgres.
 - c. While ADASEED is running, it checks the "ADASEED > hobo" folder for any files that your Hobo ZW network has saved every 2 hours and stores the data in the hobo table of the postgres database.
 - d. Every 2 hours, ADASEED will display the following:
 - i. Whether or not there was a Hobo ZW network data file found, if there was, it will display a time that it was inserted into the database table and how many errors may have occurred.
 - ii. Displays if the eGauge device was not reachable. If it was reachable, it will display a time that the data was inserted into the database table and how many errors may have occurred.
- 4) At any time after starting your session you can hit "control-c" to end it.
 - a. ADASEED pings the eGauge one last time to gather any data before the last ping and enters the data into the table.
 - b. ADASEED check the "ADASEED > hobo" folder one last time to gather any last files placed there by the Hobo ZW network.
 - c. If the Hobo ZW network was set to 1 hour intervals, you may lose, at most, 1 hour's worth of data. However, you can recuperate this data by doing the following:
 - i. waiting for the last 1 hour file has been saved to the "ADASEED > hobo" folder, before ending your ADASEED session, OR re-launching ADASEED and instantly end your session.

- 5) Access your third party software such as Tableau to view the data stored in the “hobo” and “egauge” tables found in the “postgres” database.
 - a. The shape of the data has three fields: “timestamp”, “sensor_id”, and “value”.
 - i. Please note that the eGauge “value” data are in kWh units.

A Known Compatible Software

This is a list of the known software compatible with ADASEED and how to acquire them to setup the components necessary to utilize ADASEED.

1. Hoboware Pro 3.7 and above:
 - a. Installation of Hoboware Pro requires the installation disk that accompanies the purchase of the ZW Receiver.
 - b. Updates to 3.7 can be found at the following link:
 - i. <http://www.onsetcomp.com/support/updates>
2. eGauge firmware 2.11 and above:
 - a. Connect to the eGauge2 device through your web browser at “192.168.1.88/tools.html” then click on “Firmware Upgrade” found on the left hand side.
 - b. Click on the “Upgrade Firmware” button.
3. pgAdminIII and PostgreSQL 9.3 and above:
 - a. Links for the installation files and a wiki for the software are below:
 - i. <http://www.postgresql.org/download/windows/>
 - ii. https://wiki.postgresql.org/wiki/Detailed_installation_guides
4. Python 2.7 32-bit and psycopg2 32-bit:
 - a. Follow the link below to install “Anaconda”. Anaconda is a distribution of python that includes a lot of libraries that are commonly used. This way you don’t have to continually install more and more packages.
 - i. <http://continuum.io/downloads>
 - b. Follow the link below to install the “psycopg2” package. This package is an adapter for python to connect to a PostgreSQL database.
 - i. <http://www.stickpeople.com/projects/python/win-psycopg/>
5. ADASEED 0.1:
 - a. Links to the github repository as well as contact information of the Maintainer are below:
 - i. <https://github.com/csbcdAdmin/2014JulyDeliverable>
 - ii. Eileen Peppard

Center for Smart Building and Community Design
University of Hawai'i at Manoa
2525 Correa Road, HIG 205
Honolulu, HI 96822

epeppard@hawaii.edu

(808) 956-2861

B Hoboware Pro Software Manual

The manual can be found attached to the end of this document or at the link below:

http://wpc.306e.edgecastcdn.net/80306E/onsetcomp_com/files/manual_pdfs/12730-MAN-BHW-UG.pdf

C1 eGauge2 User's Manual

The manual can be found attached to the end of this document or at the link below:

<http://egauge.net/docs/egauge2b-manual.pdf>

C2 eGauge2 User's Manual

The manual can be found attached to the end of this document or at the link below:

<http://egauge.net/docs/egauge-tutorial-article-6-directcon.pdf>

D Troubleshooting

Most of the manual's above have their own troubleshooting sections, however the following are a list of the most common problems that may happen when implementing ADASEED.

1. eGauge connectivity
 - a. Make sure that the ethernet cable between the computer and PLC is not damaged. Try to replace the cable with another cable.
 - b. Make sure that the PLC is working. These commonly fail due to the voltage that it interfaces as well as it's propensity to overheat.
 - c. Make sure that you followed "Tutorial 6: Directly connecting to the eGauge" properly.
 - d. Try to disable the wifi on the computer so that it is forced to communicate through the ethernet adapter.
 - e. Don't forget that it takes the eGauge2 about 5 minutes to default to its "192.168.1.88" ip address.
2. PostgreSQL setup

- a. Make sure that you have properly set the user to “postgres” and password to “postgres” on the “postgres” database.
 - b. Make sure you have a compatible PostgreSQL version installed.
3. Hoboware Pro
 - a. Make sure you have the files set to be saved in the “ADASEED > hobo” folder.