Progress Presentation-I

e-Yantra Summer Intership-2016
Greenhouse appliance power monitoring and control

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Overview of Project

- **Project Name:** Greenhouse appliance power monitoring and control
- **Objective:** To develop a wifi enabled device which will measure and display the basic and derived inflow parameters of connected electrical appliance on the web page. Device should be capable of turning on/off the electrical appliance from web user interface.
- **Deliverables:** A system which:
  - Log and display measured electrical parameters on web server and page.
  - control appliance from web user interface.
  - schedule on/off time of appliance based on power consumption

Overview of Task

- **Week 1:**
  1. Literature Survey -
     - Find out circuit design for measuring voltage, current, phase and frequency
     - Prepare list of components - Include circuit requirement, controller board, wifi module, etc
     - Framework and software tool to be used for data representation/Visualization and device control
  2. Device control with relay
- **Week 2:**
  1. Design and test circuit for voltage and current measurement
  2. Design and test circuit for phase and frequency measurement
  3. Log data in SQL Web interface for data display and remote control of device

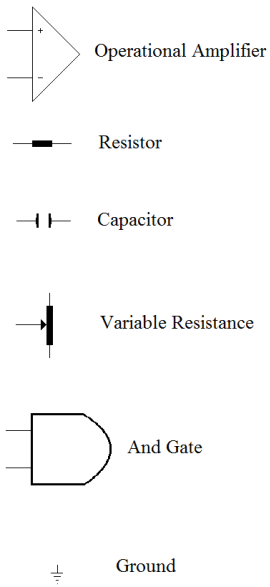
Overview of Tasks

- **Week 3:**
  1. Enhancements in feature of web interface - addition of data visualization, scheduling device on/off time
  2. Calibration of electrical parameter
- **Week 4:**
  1. System design to reduce size of circuit and fit it in switch board/spike guard
- **Week 5:**
  1. Testing and enhancement of web interface
  2. Assembling the entire project with enclosure and Testing
- **Week 6:**
  1. Testing and documentation

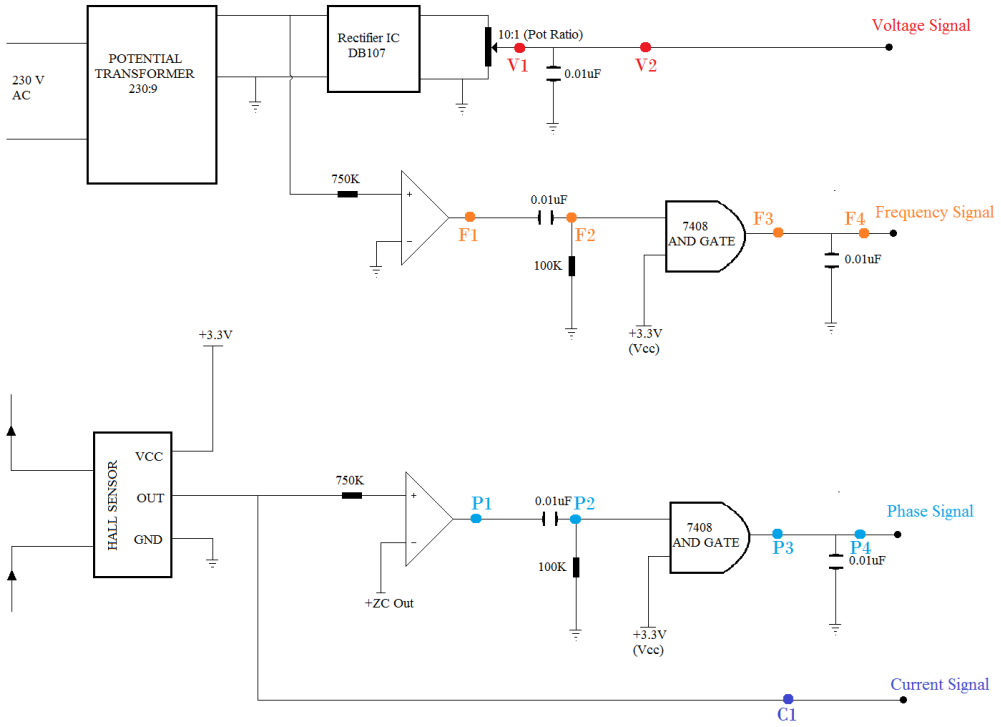
Task Accomplised

- Electrical parameter measurement circuit has been developed and component list has been made.

Component List

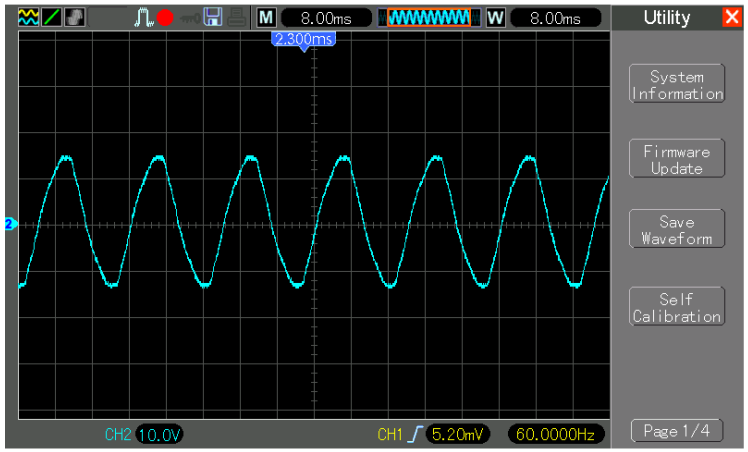


Circuit Daigram



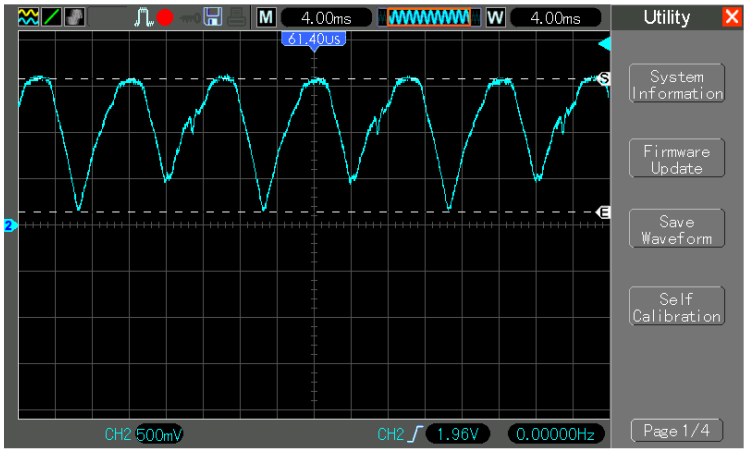
Task Accomplised

- Circuit of voltage measurement has been designed and tested.
- Current measurement circuit has been designed using **Hall Sensor** but will test in further weeks.
- Observations are as follows:-



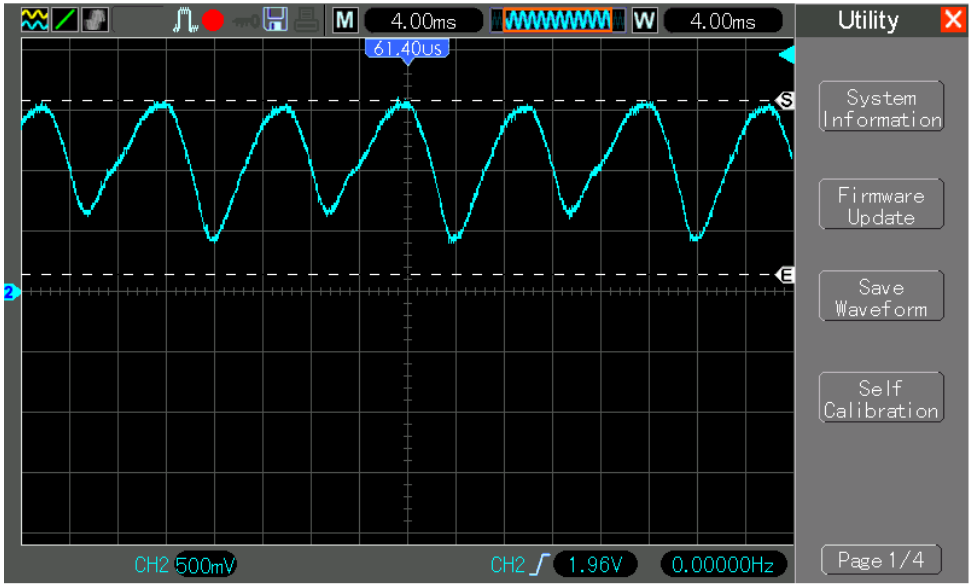
-The shown wave form is the wave form of step down potential tranformer.

-Peak value of signal in normal condition is almost 13.4V.



A0:
-Rectified output is again stepped down using 10:1 POT.
-Rectified output of step down transformer has noises in it due to saturation in potential transformer.

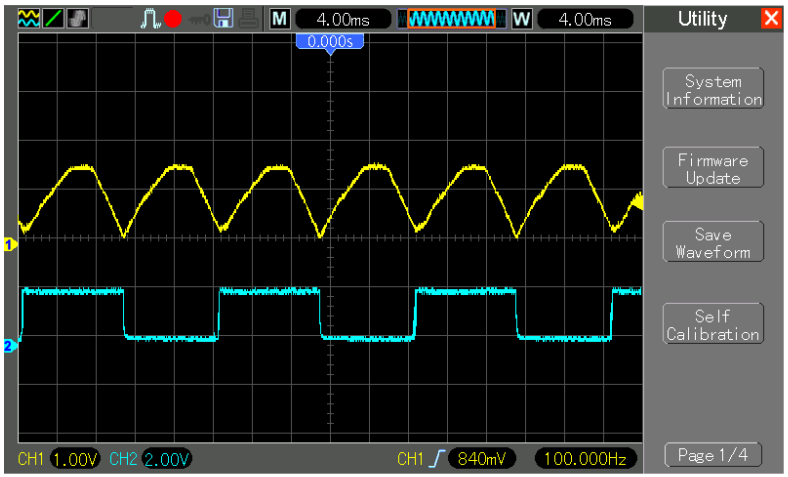
Task Accomplised



A1:
-Noises has been removed by applying a 0.01uF capacitor in parallel of A0 output.

Task Accomplised

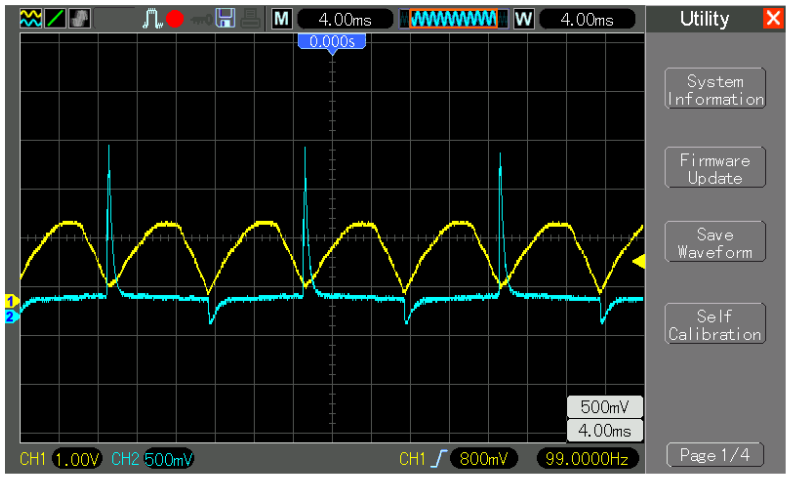
- Circuit of frequency and phase measurement has been designed and tested for different load condition.
  1. Frequency measurement circuit observations are as follows:-



F1

-Opertaional amplifier is working under comprator mode. So it will compare the Ac signal with ground(0V) and toggle accordingly.

-Output is +3.3V(HIGH) for positive cycle and 0V (LOW) for negative cycle.



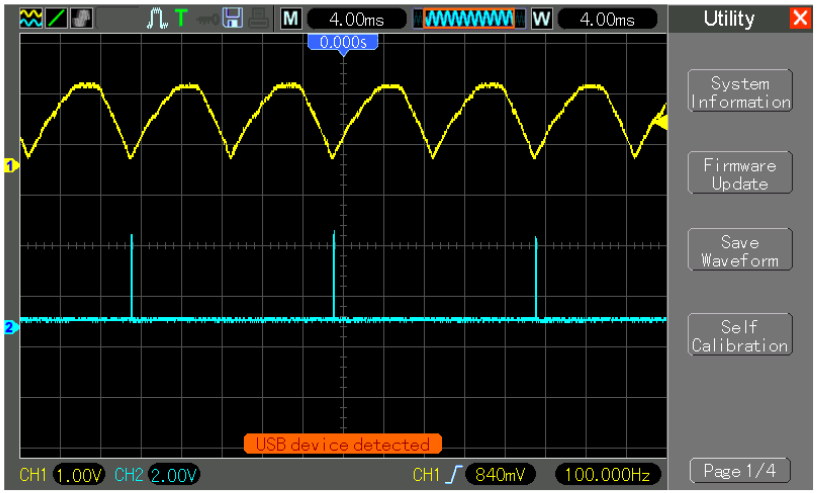
F2:

-On each zero crossing the output of simple first order RC circuit will give a pulse due to following equation

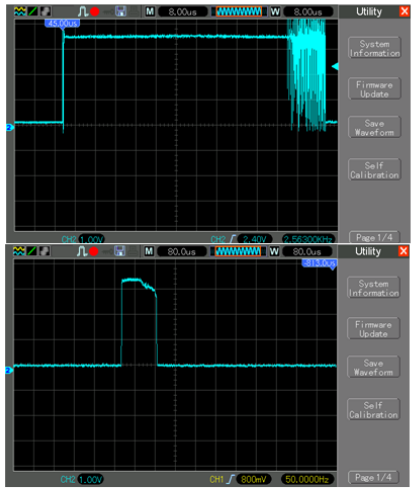
$$V_{out} = 3.3 * \exp(-t/RC)$$

Where t is the time in seconds
Vout is the output of RC network

Task Accomplised



F3:
-Analog pulse is converted into digital pulse using an AND gate with one input HIGH always.

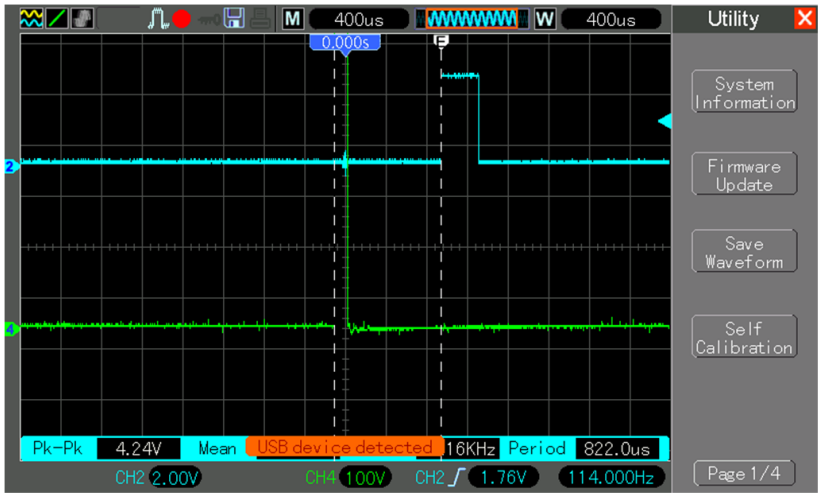


F4:
-First figure shows the output pulse of F3 node. It has higher order frequencies.

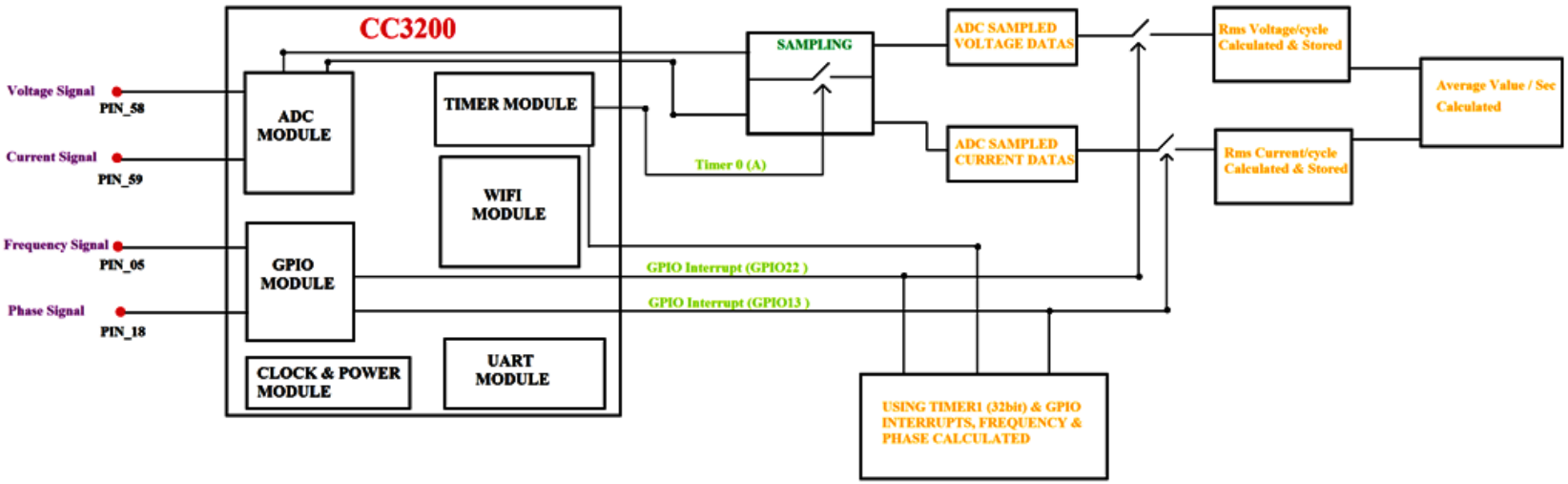
-Second figure shows the output pulse after applying a low pass filter.

Task Accomplised

- Phase measurement circuit observation are as follows:-



Task Accomplised



Task Accomplised

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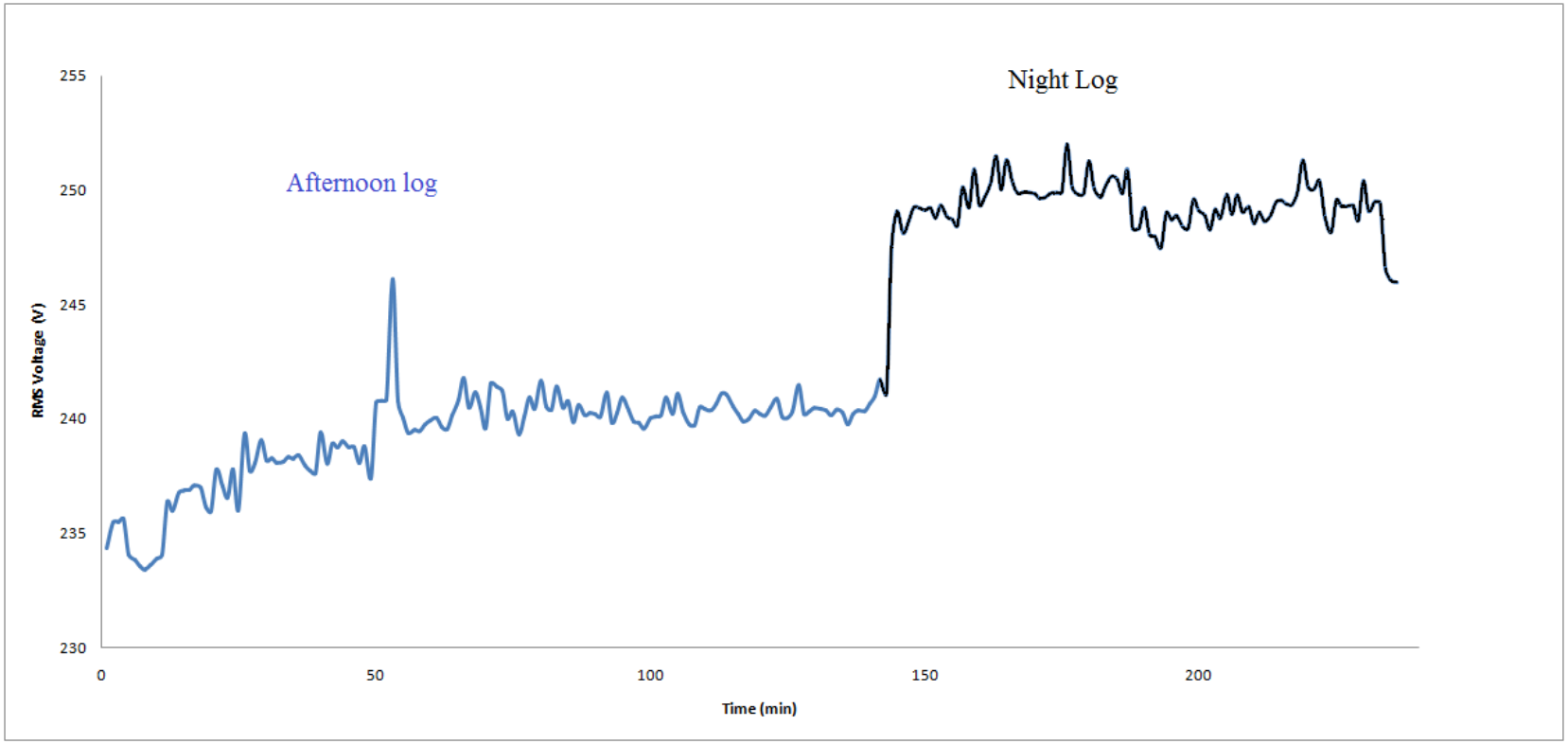
Parin Chheda



Task Accomplised

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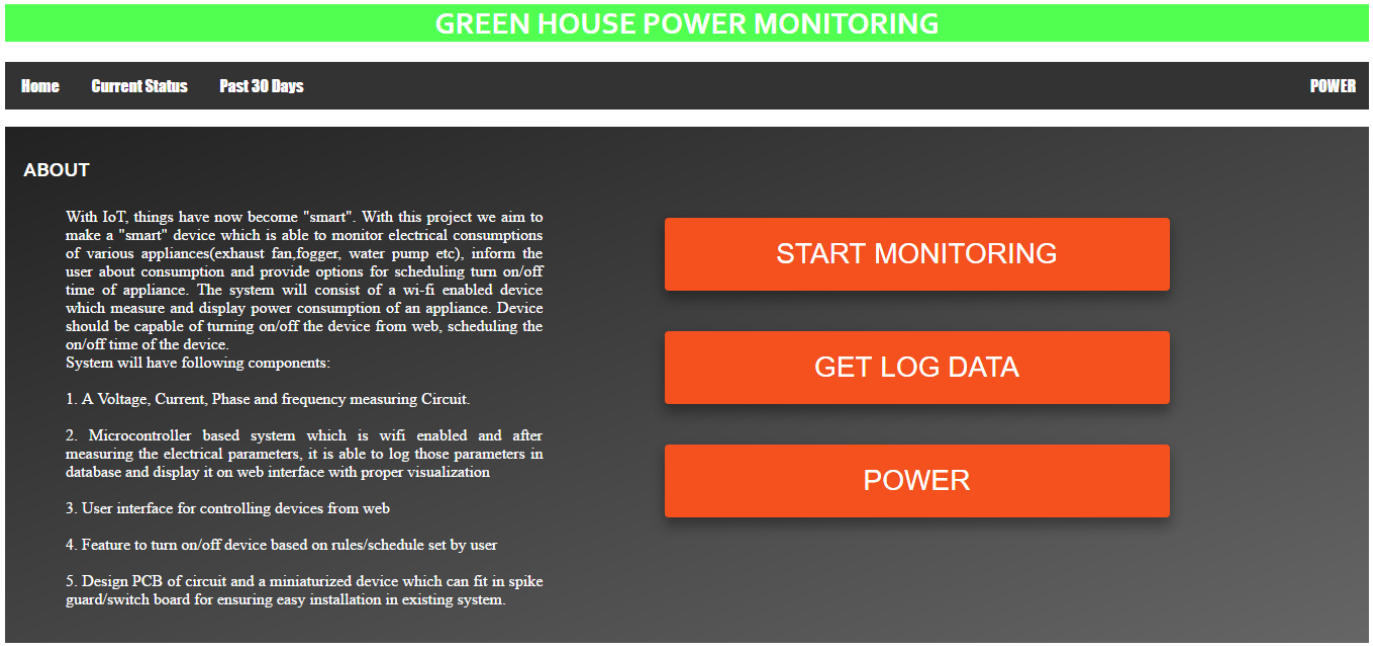
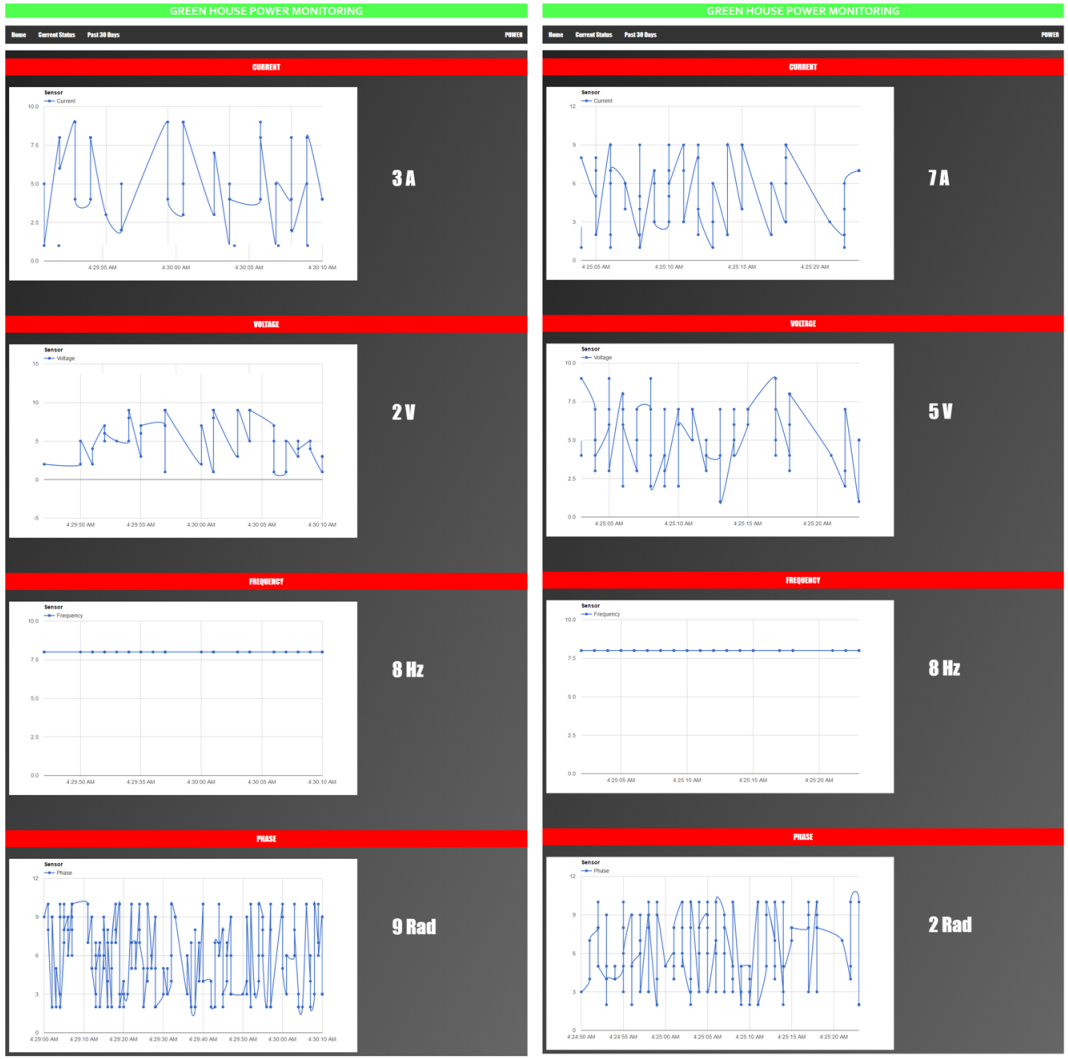
Parin Chheda

- Web user interface and web data base has been designed and tested. But till now web page has not been linked with wifi enabled device.
- Snapshot of Home page is as follows:-



Task Accomplised

- Snapshot of monitoring pages are as follows:-



Challenges Faced

- Noises arrived in the measurement circuit due to saturation of Potential Transformer.
- Learning of CC3200 microcontroller and launchpad.
- Learning of Code Composer Studio.
- Real Time Updating Graphs.
- Sending Data to Database Using CC3200 wifi launchpad.

Future Plans

- Setting up a relay in device for remote controlling.
- Logging data in database using CC3200 launchpad.
- PCB designing and creating a miniature version of device so that it can easily fit in a plug hence a **"Smart plug"**.
- Concentrating on power management of device using CC3200 inbuilt power features like Hibernate mode,sleep mode etc.

References

- stackoverflow.com
- developers.google.com/chart
- e2e.ti.com
- arduinosensors.com/index.php/tag/allegro-acs712

Thank You

THANK YOU !!!