Conserve - A - Watt
Household Energy Meter

Western Washington University
Project Proposal

ETEC 471
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Abstract

The purpose of the Conserve A Watt household energy meter is to allow people to become more aware of their energy consumption through monitoring energy usage of various household appliances/electronics, such as a refrigerator, computer, T.V., etc. To achieve this, the meter will monitor RMS current draw, RMS voltage, real power, and kilo-watt hours (in real time) of any device plugged into the meter. The meter will also be capable of measuring energy characteristics of devices consuming standby power (phantom loads). Also, the Conserve A Watt will be capable of recalling and displaying kilo-watt hour usage via an LCD or OLED display so that one will be able to calculate the cost to run a certain appliance.

Description

The Conserve A Watt meter will resemble a surge strip in design. However, due to time constraints, the Conserve A Watt will only have one outlet. It will be plugged into a 120V outlet and electronics will be able to plug directly into the meter. The microcontroller and other internal analog devices will be powered through the wall outlet and will require no external power adapter. Current and voltage will be measured in real time. Once the current and voltage are measured, the data will be sent to the MCU where power and kWh will be calculated. After the kWh are calculated they will be stored so that the individual can recall their energy usage.

All measurements will be capable of being displayed via a LCD or an OLED display. When data is recalled, it will also output to the display. For typical household appliances and electronics the Conserve A Watt meter will be limited to a maximum current draw of 15-20 Amperes and will feature added circuit protection (surge protection) for the household device. Below is a basic flow chart of the described meter (Figure 1) and product prototype (Figure 2).

![Flow Chart](image)

**Figure 1**
Figure 2

Potential Features

If time permits the conserve a watt will have 2 additional outlets capable of performing all necessary metering. Each additional outlet would then be able to characterize individual electronic devices power consumption in kWh. Finally the Conserve A Watt would add and display total kWh usage from all outlets in real time. However, there are no plans to store total kWh usage from all outlets due to possible time and memory constraints. If the user would like to know total kWh usage from all outlets it would require manually adding the total kWh usage from each outlet.

Market Comparison

There are two main competitors in household power monitoring meters; P3 International and Watts Up. P3 International makes the P4400 (figure 3). It is a cordless direct plug into the wall meter capable of measuring Volts, Current, Watts, Frequency, Power Factor, and VA. The unit will start to accumulate KWH after power is applied. The voltage and amp keys are used as toggle switches for displaying RMS voltage. The Watt/VA Key is a toggle function key. Press the Watt/VA key once to display Watt meter, then press key to display VA meter. The LCD will display Watts as the active power. The device also has a Hz/PF toggle button that will display line frequency and power factor when pressed. The KWH/Hour is a toggle function key as well.
The second market competitor (figure 4) is the Watts Up Pro Power Analyzer. It is capable of outputting cost in dollars and cents, average monthly cost, power factor, true power, average monthly kWh, minimum RMS voltage, Maximum RMS voltage, cumulative power, Minimum RMS current, maximum RMS current, time, minimum wattage, maximum wattage, and duty cycle. All of the above data is stored and output via USB to a computer and displayed using a data logging program.

Figure 4

Each one of these devices displays more than necessary for the average person to understand their power consumption, which is where the Conserve A Watt meter will be different. The Conserve A Watt meter will only display measurements necessary for understanding energy usage, resulting in a more user-friendly device.

Benefits and Global/Societal Impacts

The purpose behind the Conserve A Watt is simple: To promote a “greener” lifestyle by enabling the public to become more aware of their energy consumption. For example the Conserve A Watt would help an individual determine how much power his television used while turned off which would impel the user to possibly unplug the said device if the user were to go on vacation. If more people knew how efficient their electronics were it would result in less power wasted which would mean less power being produced by power plants.

Project Development and Demonstration

The first phase in project development will be researching components to accomplish the analog portion of the project (current, voltage sensors etc.). This portion of the project will mainly take place at home. Once the components are purchased testing will occur in the ET340 lab. Firmware development will take place in the ET340 lab with some design taking place at home, where I will have access to software to allow firmware development.

The project will be demonstrated by utilizing an outlet in the ET340 lab and plugging various electronic devices such as a lap top, cell phone, and possibly a television into the Conserve A Watt energy meter where I will be able to demonstrate power usage characteristics of different devices and the recall function to display kWh usage over a time period.