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Remote Status Reporting of Freezer Temperature

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Remote Status Reporting of Freezer Temperature

Final Project Report
12/13/2013

Submitted by: Steven F. Bienz

To Fulfill B.S. Electrical Engineering Technology Degree Requirement

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ENGW 421 Technical Writing Project for Virginia Relph

Submitted to:
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ABSTRACT

If a deep freezer fails, a substantial dollar value in frozen foods may be spoiled, the value of the food may be greater than the cost of replacing the freezer. This project will greatly increase the odds of successfully salvaging the entire frozen food contents of a freezer in the event of freezer malfunction. Notification of deviation from acceptable freezer temperatures will be provided to the users via cell local alarm, cell phone text, or email notification. This project will by nature open other opportunities for remote notification and possible interaction with household devices, as well as active monitoring of household conditions. This type of interaction is commonly referred to as "Home Automation". This type of "Smart Technology" is being increasingly included in consumer and commercial products of all kinds, requiring homes and businesses to be linked through the World Wide Web or internet. This project is to be a functional product as well as an exploration of technology interfaces, taking physical measurements, making decisions based on those measurements, and communicating necessary information to the user/owner.

Keywords: Freezer, Malfunction, Remote Notification, Text, email, Home Automation, Smart Technology, World Wide Web, internet.

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EXECUTIVE SUMMARY

The purpose of this project is to investigate methods and implement a system for the remote monitoring and reporting of a deep freezer temperature status. The ultimate goal is to provide timely reporting of temperature deviation to the user, increasing the odds of successfully salvaging the entire frozen food contents in the event of a freezer malfunction or external event.

Initial research for this project indicated utilizing a multiple circuit board, microcontroller based system with a remote circuit board programmed with software capable of interpreting analog temperature sensor, outputting a local alarm, and wirelessly transmitting data and status to a Base unit. The Base unit was to receive wireless communications from the Remote unit and handle internet activity for notification of status and external user interface.

Research into the challenges involved with consistent wireless communication between individual microcontroller circuits and problems/costs associated with obtaining commercial software and development tools led to the investigation of “hobby” electronics for a learning and development platform. The Arduino system was selected due to the wide variety of prefabricated circuit boards and accessories and extensive base of software routines for experimenting with basic and advanced microcontroller functions.

Time constraints indicated usage of known good software to get the system up and running to begin testing. Research into email generation and website hosting through the Arduino system led to the discovery of the Exosite web based “Portal” system. This web service monitors registered devices, allowing the user to set up various data tracking and event structures. The event structures are used to trigger alarms, which can be set up to generate emails. Three different email alerts are currently programmed to be sent from Exosite; for loss of communication, defrost cycle/open door, and temperature over 20 degrees.

The proof of concept system is operational and currently monitoring a home freezer. Functional hand built prototypes and finalized circuit boards have yet to be implemented. The proof of concept system has been implemented without wireless communications or a “Base” unit. The Ethernet is wired directly into the microcontroller board, eliminating the cost and complexity of the additional interfaces while achieving overall project goals.