

## CES-520 Embedded Systems

Fall 2006 – Project

Due: December 5, 2006

### *Project: A Web-Enabled Home Management System*

For this project, you will be building a combination thermostat and alarm system. This system will have a web-based interface that will allow you to monitor and operate the system remotely over the internet. Many of the lab projects that you have done during the semester are building blocks that you can use to complete this project.

#### Requirements:

- The system's IP address is to be stored in EEPROM.
- Heating/Cooling System:
  - Three relays are used to operate the furnace and air-conditioning system. The FAN relay is to be energized whenever the HEAT or COOL relays are energized. A HEAT or COOL LED is to be activated whenever the HEAT or COOL relay is energized.
  - The current temperature is obtained by reading from a temperature sensor.
  - When the current temperature rises above the high temperature set-point, the COOL relay is to be energized until the temperature is reduced a sufficient amount.
  - When the COOL relay is energized, the FAN relay is also to be energized.
  - When the current temperature falls below the low temperature set-point, the HEAT relay is to be energized until the temperature is raised a sufficient amount.
  - When the HEAT relay is de-energized, the FAN relay is to turn on and remain energized for a specified amount of time in order to dissipate the hot air still within the furnace.
  - The high and low temperature set-points are to be stored in EEPROM. The user must be able to set the desired temperature, and the system will set the high and low temperature set-points based on the desired temperature.

- Alarm System:

- The alarm system is to monitor eight zones that are simulated by dip-switches. When a dip-switch is open, the zone has been violated.
- An ALARM relay is to be energized whenever one of zones is violated.
- An ALARM LED is to be activated whenever the ALARM relay is energized.
- A pushbutton switch is used to de-activate the alarm.

- Web Interface:

- A web interface will allow the user to set the desired temperature.
- When the web-page is refreshed, the current temperature will be displayed as well as an indication of the status of each of the zones monitored by the alarm system.

### Optional Features:

- The system will support DHCP so that a static IP address is not required.
- Protect the information contained in the EEPROM with either a checksum or CRC.

- Real-Time Clock:

- The current time and date will be maintained by the system.
- The time and date will be automatically obtained from an internet time-server.
- The current time and date will be displayed on the system's web page.

- Set-Back Feature:

- The current time will be used to provide a set-back function for the thermostat.
- Four time periods, WAKE, LEAVE, RETURN, and SLEEP, will provide the system with a different temperature setting for each period.
- The starting time for each period must be set via the web interface. This information must also be stored in EEPROM.

### Please turn in the following:

1. A schematic showing how your hardware is connected.
2. Your code and any libraries that are used.
3. Please provide documentation explaining the design and operation of your code as well as an explanation of how the hardware is operated. Also include any calculations that were used in the hardware design.
4. A memory-map showing what addresses of the EEPROM contain which information.
5. Indicate which required and optional features have been implemented and are functioning correctly.