PROGRESS REPORT #2

ECE 480 - DESIGN TEAM 10

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The project continues to develop as Design Day approaches. There have been many successes and changes in the design since the last progress report. Adjustments have been needed to keep the design simple and inexpensive, and portions of the design have been completed or are near completion.

The power supply portion of the design has been completed. After numerous design considerations, the decision was made to use a switching-type power supply in our project. A step-down voltage regulator was used in conjunction with inductors, capacitors, and resistors to provide the conversion from 24 Vac to +5 Vdc. This choice of power supply was ideal because it does not require a large and expensive transformer; in fact, the cost of all components in the switching-type supply is less than the cost of just one transformer. The power supply was tested by placing an extreme load on the output and allowing the circuit to run for over 2 hours. The output voltage was steady during this burn-test, and the components never became hot. We are confident after this test that the power supply is safe and acceptable for the project.

The decision was made to discontinue use of the Cypress PSoC microcontroller in favor PIC microprocessors. The main reason for this was the lack of knowledge by the team members on PSoC use and implementation. Even though the PSoC is an acceptable chip, the team did not feel that there was adequate time to learn this system in time for the final presentation. The majority of the group felt that the PIC was easier to use, so the PSoC has been replaced in the overall design.

For communication between the interface plate and the thermostat, the I2C standard was dropped in favor of a simpler, binary-decode method. Analysis revealed that the I2C method was unnecessarily complex for the scope of this project, and that a much simpler programming method could be used with similar results. Due to the low-speed and very basic information that needs to be transmitted, it made sense to decrease the complexity of the code to save time and memory. Work has begun on this new implementation, and is near completion as of this writing.

The memory subsystem has also been altered from its original design. At first, we attempted to use a 4 Mbit parallel flash memory chip for data storage. This would have accomplished the goal of the memory system, however, this chip requires 19 address lines, 8 data I/O lines, and 3 control lines.

As our processor has a limited number of I/O ports, it was quickly realized that additional logic chips or microprocessors would be needed to handle the large number of address and I/O lines needed by the flash memory chip. This would add unnecessary complexity and cost to our project, and a new solution was found: serial flash memory. A serial flash-memory chip was recently acquired that only uses 6 total ports for data, addressing, and control. Serial flash memory is slower than parallel flash memory, but this is not an issue in our very low-speed system. We are currently working on integrating this new serial flash memory into the overall system.

Some interpretation of the ASHRAE standard has also been implemented in computer code. The charts and formulas that make up the "comfort index" are being translated into C code to be used in the thermostat. This should be finalized over the next few days.

Overall, the project has made some solid progress toward the final goal. There is still much work that needs to be done, however, and we hope to have more breakthroughs in the next week. Design Day is approaching quickly, and with solid teamwork, we are confident that a working design will be ready for presentation.