

Microprocessors Project 2024

Server Temperature Control System with Atmega32:

This document outlines a project for a server temperature control system using two Atmega32 microcontrollers:

- **Master (Front-End):** This unit interacts with the user and displays information. It has an LCD screen, keypad, and LED for status display.
- **Slave (Control Unit):** This unit controls the server temperature. It has a temperature sensor, three motors, and communicates with the Master.

System Functionality:

1. **Lock and Unlock:** The system is initially locked. The Master's LCD displays a message prompting the user to enter a password.
2. **Password Entry and Verification:** The user enters the password on the keypad. The Master transmits the password to the Slave. The Slave verifies the password and sends a response back.
3. **System Start:** Upon successful password verification, the system unlocks, and the Slave starts sending proper data to the Master to be shown.

Motor Control based on Temperature:

- The duty cycle of each motor increases proportionally to the temperature (10% per 10°C).
- The overall duty cycle will increase 30% per 10°C so in case of a motor short circuit:
 - If one motor fails: The remaining two motors distribute the total duty cycle (5% each per 10°C).
 - If two motors fail: The remaining motor distributes the total duty cycle (20% per 10°C).
 - If all motors fail: An error message is displayed.

It is likely that the remaining motor(s) cannot handle full load, an error message is displayed in this case.

	Motor 1	Motor 2	Motor 3	Overall
At 30°C	30%	30%	30%	90%
At 30°C	30% + 15%	30% + 15%	Failed	90%
At 30°C	30% + 60%	Failed	Failed	90%
At 50°C	50%	50%	50%	150%
At 50°C	100%	Failed	Failed	ERROR (100% != 150%)

A single motor fails to cool down the system even if it works full power.

User Interface:

- The LCD displays various menus:
 - Main menu with options for checking motor status and temperature and selectable via the keypad.
 - Motor status menu showing individual motor information (working status and duty cycle).
 - Temperature menu displaying the current temperature.
- LED indicates system status:
 - Green: Everything is functioning normally.
 - Yellow: One or two motors failed.
 - Red: Critical error (all motors failed or insufficient cooling capacity).

Bonus Features:

- **Password Attempts:** After three consecutive incorrect password entries, the system locks the user out for 30 seconds, displaying an appropriate message on the LCD.
- **Encrypted Communication:** AES encryption is used to secure password transmission between Master and Slave.
- **Alarm:** Use an speaker to play an alarm when Critical error occurs.
- **Documentation:** Precise documentation is a bonus.