

Microwave Oven Controller Project

Aim: This project simulates the embedded controller in a microwave oven.

Assumptions and Requirements:

- All cooking times are sped up to make debugging and demonstration times more reasonable.
- Input occurs via the keypad (0 - F), the 4 push buttons, and the 8 dip switches.
- Displays on LCD, 4 digits, 8 LEDs.
- The system should allow for a cooking time of up to 30 minutes to be entered by the user.
- The entered and remaining cooking time counts down and is displayed on the four seven segment digits as minutes and seconds. For example: 27:11.
- When not cooking, the clock time should be displayed on the seven segment digits as hours and minutes. For example: 02:30.

Procedure Details:

While not cooking (stopped), enter a choice to begin cooking:

- If A is pushed on the keypad (for popcorn), the LCD should show “Popcorn” and then cook for 1 minute while the remaining cook time counts down on the digits, then clear the LCD after cooking completes.
- If B (for Beef) or C (for chicken) is pushed on the keypad, the words “Beef weight?” or “Chicken weight?” (respectively) should appear on the LCD. After that, the user must enter an integer value between 1 and 9 on the keypad to indicate how many pounds are there to be defrosted. Note that only whole pound values are to be entered. After a valid number is entered, clear the LCD display and show the value of the weight on the seven segment digits for 2 seconds, and then start cooking while the remaining cook time counts down on the digits.
 - Beef is defrosted at a rate of 0.5 minutes per pound.
 - Chicken is defrosted at a rate of 0.2 minutes per pound.
 - If an illegal number is entered, then the LCD should show “Err” for 2 seconds, then show previous message.

- If D is pushed on the keypad, the words “Cooking Time?” should appear on the LCD. After that the user can enter a value between 1 and 30:00 to indicate the cooking time required in minutes and seconds. This value is displayed on the seven segment digits as it is entered, right to left. For example, pressing 1 displays 00:01, then pressing 2 displays 00:12, then pressing 4 displays 01:24, then pressing 5 displays 12:45. Press pushbuttons SW2 and SW3 to clear the LCD display and start cooking and counting down the cooking time on the digits.

Start/Stop/Pause cooking conditions:

- Switch SW1, position 1, will simulate the microwave oven door latch, where the switch being up would be simulating the open door situation and the switch being down would be simulating the door closed situation. Only when the latch is closed should the oven be able to be started.
 - When both SW2 and SW3 are pushed, the oven starts operation.
 - When both SW4 and SW5 are pushed, the oven operation pauses (keeping remaining time on the display).
 - When both SW4 and SW5 are pushed again the time is cleared and the cooking stops.
 - If SW2 and SW3 are pushed after the oven is paused and the door is closed, then cooking must resume from the time it was paused.
- If it is cooking, opening the door should pause the cooking and keep the remaining time on display.
- When the microwave is running, the array of LEDs should be on. When it is stopped, they should go off. If paused, the array of LEDs should blink (0.5 sec on and 0.5 sec off) till the cooking is resumed or stopped.
- When the microwave completes its function and timer has counted down to zero (regular timed cooking or defrosting), the array of LEDs should flash 3 times (0.5 sec on and 0.5 sec off), and the speaker should produce an audible tone during this 3 second time period.