Design Assignment
On
Microwave Oven

For the partial fulfillment of the course

EEE/INSTR/ECE/CS F241 - Microprocessor Programming & Interfacing
BITS Pilani, Goa Campus

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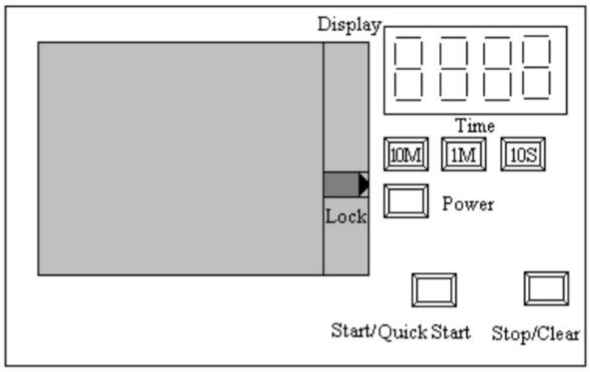
Problem Statement

Description: A Simple Microwave Oven without grill.

User Interface: Is shown in the following Figure



- User can cook at 5 different Power levels: 100%, 80%, 60%, 40 % 20%
- Ever press of the Power Button decrements the power level by 20 %
- 1 Press - 100%; 2 Presses – 80% ; 3 Presses – 60%; 4 Presses – 40 %; 5 Presses – 20%
- 6 Presses – Brings the power level back to 100 %
- The Default power level is 100%
- Power Level is varied by controlling the amount of time for which the microwave is turned on.
- Time of cooking is broken up into 10 sec slots, if power is 60% then for 6 secs the microwave is on and rest of the 4 secs the microwave is off.
- Time is set as multiples of 10 Mins, 1Min, 10 Secs. **For e.g. if the cooking time is 12 Minutes and 40 secs- the 10 Minutes button has to be pressed once, 1 Minute Button has to be pressed Twice and 10 seconds button has to be pressed four times.**
- Once Time has been set Power cannot be modified.
- When user is setting power level or Time, the value being pressed should be displayed, and when user presses the Start button, the cooking process begins and the time left for cooking to complete is displayed.
- Once the cooking begins the door gets locked and should open only when cooking process is terminated.
- User can terminate cooking anytime by pressing the STOP button.
- When Stop button is pressed once cooking is aborted, timer is stopped, not cleared; cooking can be resumed by pressing Start.
- When stop is pressed twice, cooking is aborted and timer is also cleared.
- When cooking time elapses, a buzzer is sounded; pressing the Stop Button stops the buzzer.
- A Quick Start mode is available where timer or power need not be set, just Start button needs to be pressed, the default power value is taken and time is set as 30 secs, for ever press of the start button time is incremented by 30 seconds.

Assumptions

- There is mechanism already in place whereby door will get locked if PC7 of 8255A is high and unlocked if PC7 is low.
- The heating element of microwave oven is already available which amplifies the current sent to it by 8253.
- The time required for loading the latched values into counters of 8253 after giving the gate trigger has been taken as negligible in comparison to total time.
- Maximum time for cooking user can set is 59 minutes and 59 seconds.
- Code is stored - 0000h
- Time Display format - MM-SS
- Power Display format - PPPP
- Multiple keys cannot be pressed simultaneously
- A clock frequency of 2 MHz is available to be given to TIMER 2.

List of Important Components Used

Chip Number	Chip	No. of chips used	Use
8086	Microprocessor	1	CPU
2732	ROM	2	Read Only Memory
74LS245	8 - BIT Latch	2	To latch Data Bus
74LS373	8 - BIT Latch	3	To latch Address bus
8255	Programmable Peripheral Interface	2	Connected to various I/O devices
8253	Clock Timer	2	To produce the stable frequency clock for 8086
74HC138	3:8 Decoder	1	For selecting between the various components like ROM, RAM, TIMER1
6116	RAM - 2K	2	Random Access Memory
74HC4511	BCD to 7 segment latch/decoder	4	Display

Other Components Used

- RV-MZA295WRE0 Sharp Microwave Magnetron - Heating element
- Sharp RMOTDA252WRZZ Microwave Turntable Motor
- Buzzer - To Indicate the end of cooking of time
- NOR Gates - To allow or disallow Input from Push buttons
- Resistors
- 7 Segment Display(DL707) - To Display Time and Power(4)(active high)
- AND Gates(7408)
- LOGIC NOT(7404)
- LOGIC OR(7432)
- Nand gate
- Push Buttons - To input the power, time, start and stop signals from the user.
- VCC, Ground, LED’s