Program Description

The goal is to learn the concepts of controlling and generating interrupts interrupt service routines using UART and timer. We should be able to use interrupts to create and display timer.

Requirements

Requirements, Assumption and Limitations

Program should not enable and disable interrupts.

Interrupts should continue running even after the program exits.

Program should not do polling type I/O in ISR.

UART interrupts should be used to read the input characters.

Auto vector mode should be used

There are seven interrupt levels.

CPU SR should mask all interrupt levels when interrupt is initialized in a subroutine.

Set SR to the appropriate level to allow the interrupts

Program Design

In order to implement clock display and enter clock mode, two options are needed in the main menu. For the “Enter clock mode”, it should allow a user to enter time from keyboard in the format of HH:MM:SS in one line. It is also necessary to have error checking to ensure for the proper input range and format. For the “Clock Display mode”, if time is already set, it should update and display clock every second in the format of (hh:mm:ss). Otherwise, it should display an error message to warn to set the time first. The carriage return character is needed to return the cursor to the beginning of the line to display the time again. It should continue updating clock even though when user exits display clock mode. When the time reaches 11L59:59, it should reset to be 00:00:00 in the next second. A key is needed to exit from the mode. Three hot keys should be implemented as follows: P (pause the clock), S (Start the clock) and R (Reset the clock). Reset hotkey reset the clock to 11:59:55 and start it.

Debugging and Testing Strategy

It is necessary to add a break point at the beginning of the ISR of the interrupt. If the break is reached, then an interrupt is generated. If not, no interrupt is generated. The SR and IMR should not mask interrupts. ISR should use RTE to check the end of ISR.

**Main Menu**

1. The “Enter Clock Mode” is selected
2. Enter time from keyboard in the format of HH:MM:SS in one line
3. Error checking to ensure for the proper input range and format.

1. The “Clock Display mode” is selected

2. Check if time is already set.

3. Update and display clock every second in the hh:mm:ss format.

4. Use the hot keys to handle the clock

5. Take a user input

6. Determine which hot key is pressed.

A. P (pause the clock)

B. S (Start the clock

C. R (Reset the clock).

5. Ask if a user wants to exit the clock mode.

6. Continue updating the clock

7. Check if time reaches 11:59:59

8. If it does, reset to be 00:00:00:

9. If user presses a defined key for exiting this mode, return to the main menu.