This report will discuss the design and development of a burglar alarm as a part of the Electronics and Embedded Hardware module. The module was constructed on a foundation of groupwork and therefore the report will reflect the individual contributions of two authors. For the purpose of this assignment, the contributors will be referred to as Author 1 and Author 2. An analysis of the technologies used to create a fully functioning burglar alarm using the QL-200 Development Board, will be presented, and will incorporate an examination of the driver code employed to control the devices. A critical evaluation will highlight the individual contributions and challenges faced. A reflection of these challenges and resolutions will then be discussed.

The overall project aim was to utilise a QL-200 development board and PIC16F877A microcontroller to create a burglar alarm which allowed for user input. The device monitors four separate security zones which can be activated or deactivated manually. Zone four contains a temperature based sensor which activates the alarm if the temperature rises above a threshold for a predetermined amount of time. The temperature threshold, activation time and alert time can be set using the 4x4 matrix buttons when the devices is first powered. An LCD panel would be employed to display information pertinent to the user such as the temperature of Zone 0, the current date and time and the activation status of each zone.

The DS18B20 temperature sensor was used in the development of the alarm to provide an accurate temperature measurement in degrees Celsius. Displaying the current temperature requires the user to select the designated button specified in the driver code (first row, second column), this will output the temperature onto the 1602 LCD to one decimal place. As this continuously calls the update temperature method located in the temperature class, the temperature value shown on the LCD will always be the update value and show the correct temperature for the room. The alarm must also determine whether the current temperature of the room is above a specific threshold set by the user. When the alarm is powered on, the trigger temperature value must be set. To set the trigger temperature, the user must first enter change temp mode by selecting a pre-defined button (row one column two). When in this mode, there are three buttons which can be used; button one (row one column three) increments the trigger value one degree at a time. Button one only has to be pressed once as the value will continue to increase until the value is saved. Saving the desired trigger value can be achieved by selecting the ‘save’ button (row one, column four). When the value has risen to the desired temperature threshold, holding the save button down for two seconds saves the value. Decreasing the trigger value is achieved by the user selecting the designated button (row two column three). Selecting the button will decrease the threshold one degree at a time and can be stopped by pressing the save button.

Altering the trigger temperature can be achieved at any time while the alarm is in operation. The user simply needs to enter into check temperature mode and increase or decrease the value to their desired preference.

The real-time clock was used to provide time based features for the burglar alarm. Setting the time was achieved by storing the individual time values in an array which is then output onto the 1602 LCD. To view the current time, the user must select the designated show time button located on row four of column two. This will allow the user to view the time in a 24-hour format. The date can be viewed by pressing the show date button located on row three of column two which is printed out in the following format dd/mm/yy.

The alarm should only detect intrusions and sound the alarm inside a specific set of pre-defined hours. The alarm will detect instructions between the hours of 8:00 in the morning and 7:30 at night, outside of these hours, the alarm will be deactivated and will not sound. These values are pre-set meaning they cannot be change by the user.

The buzzer is a simple method which is called when the alarm detects an intrusion. The user must first enable the alarm by selecting the ‘alarm on’ button located on row four column four, the LCD should then Display ‘Alarm On’ indicated the armed status. If an intruder is then detected, the buzzer will sound. In the case of the temperature sensor, the buzzer will remain active until the room temperature has dropped below the trigger value set by the user.

The class diagram below showcases the relationship and dependences between the different classes implemented by Author 1 and Author 2.

