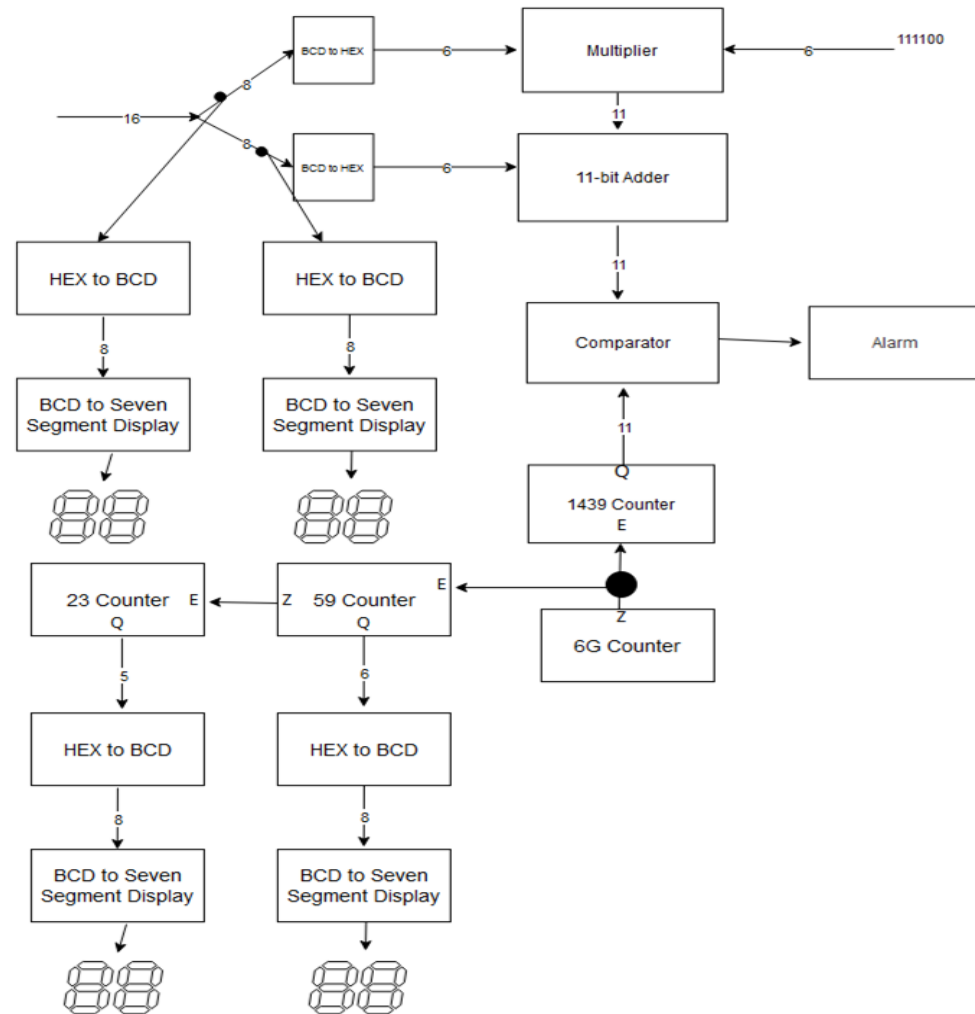# Settable Audio Alarm Clock

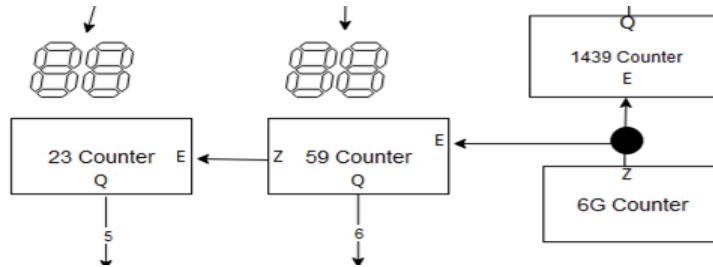Robert Brown, Jacob Feldpausch, Jacob McCarthy, Nicholas Mojares

Circuit Overview

- The alarm time is set in BCD using the switches on the board.
- The alarm time and current time are both displayed on the seven segment displays
- Once the current time reaches the alarm time a buzzer is activated
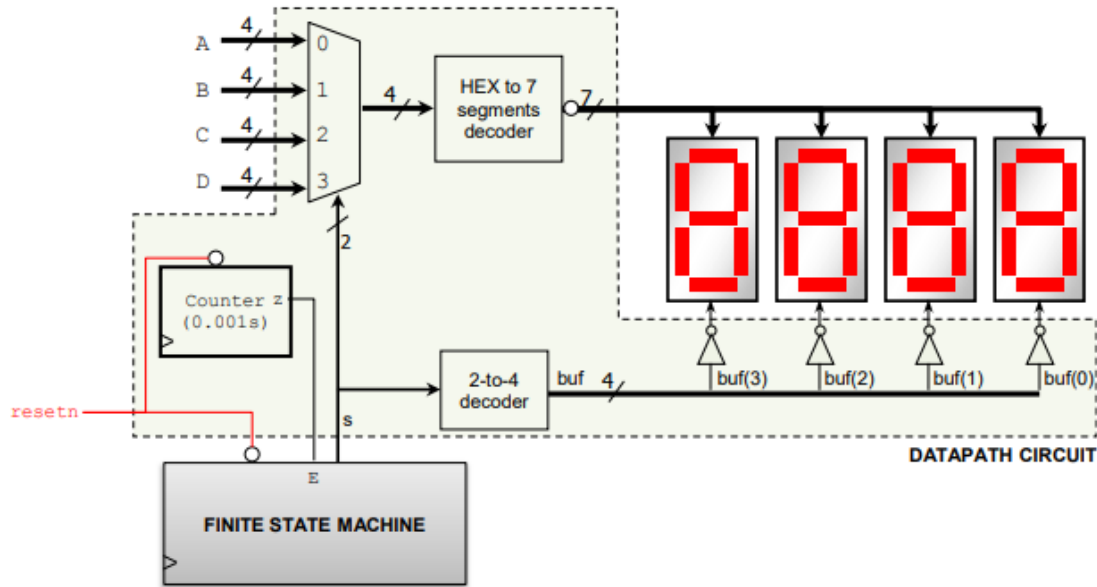- The buzzer deactivates either after a minute or when a button is pressed

Counters

The counters are used both to keep track of the current time in total minutes and also in hours/minutes to be displayed on the board

-The enables are driven by the other counters in order to achieve a slower frequency activation

7 Segment Display

- In order to use all 8 of the 7 segment displays we needed to serialize it.

This is the basic circuit we used, however since ours used 8 displays the following was modified; the MUX was 8 to 1 with a 3 bit selector, the decoder would be a 3 to 8, and the FSM was modified to have 8 states.

7 Segment Display; with BCD

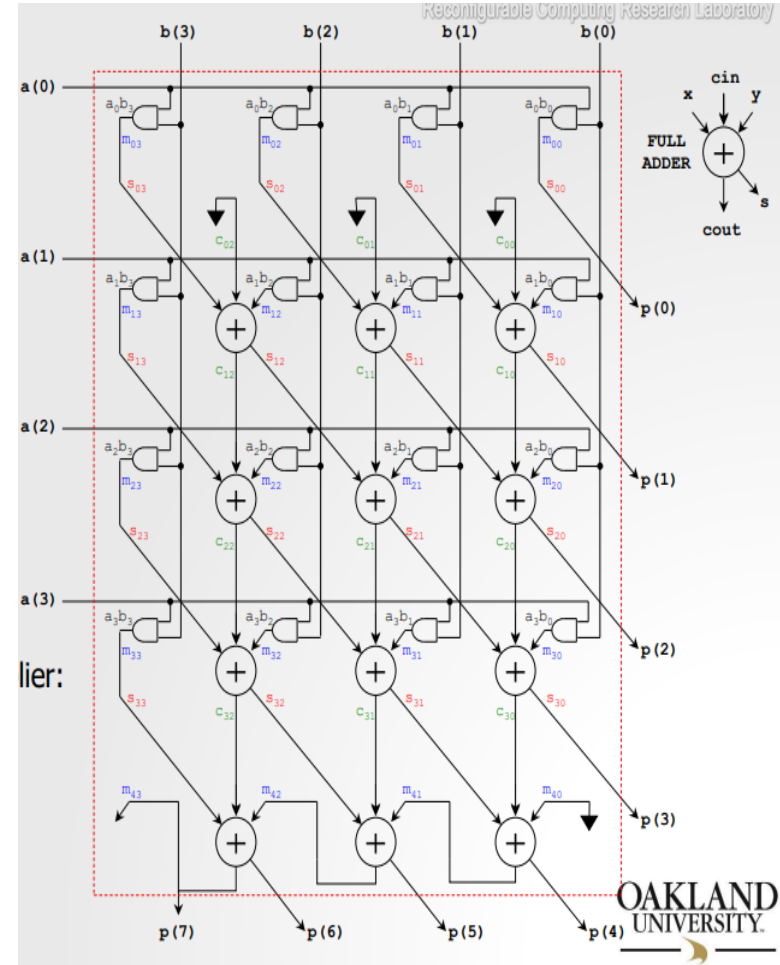Since our signal from the switches came in BCD, we made the Hex to 7 seg component a BCD to 7 seg instead.

However this came with the problem of part of the signal from the comparator was a binary signal so we needed to convert that part of the signal into BCD.

6X6 Bit Multiplier

The multiplier takes the value from the hour

counter and multiplies it by 60 in order

to convert it to minutes.

For the multiplier we used an array multiplier

that looks similar to this:

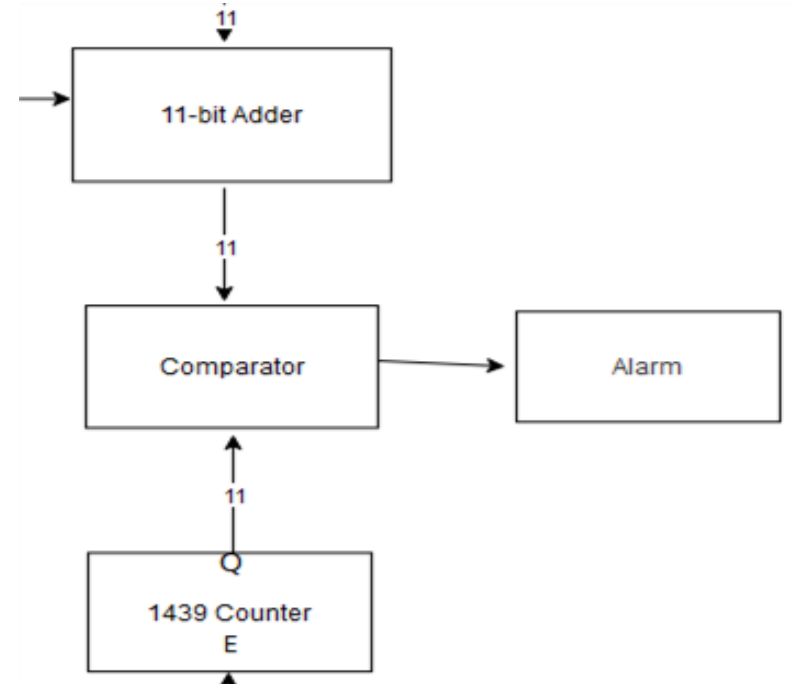This value is passed to the 11-Bit Adder.

11-Bit Adder

The adder is used to add the minutes to the hours value received from the multiplier which represents the hours converted to minutes. This is to represent the total amount of minutes.

This value is passed to comparator in order to determine if the if the clock is equal to the alarm.

Comparator

- The comparator is used to activate the alarm. The comparator checks to see if the current time and the alarm time are equal values, then sets the output to high when this is the case
- The output of the comparator is fed to the alarm

11

11-bit Adder

11

Comparator

Alarm

11

Q

1439 Counter

E

Alarm

- In order to create a sound on the buzzer, a PWM signal is needed
- A 50% duty cycle is created using two counters in series
- An FSM is used to ensure that once the button is pressed, the alarm does not reactivate