COS 10004 Computer Systems

Assignment 2 – Music Player

Student ID – 103636725

Name – John Hewitt

August 21 2021

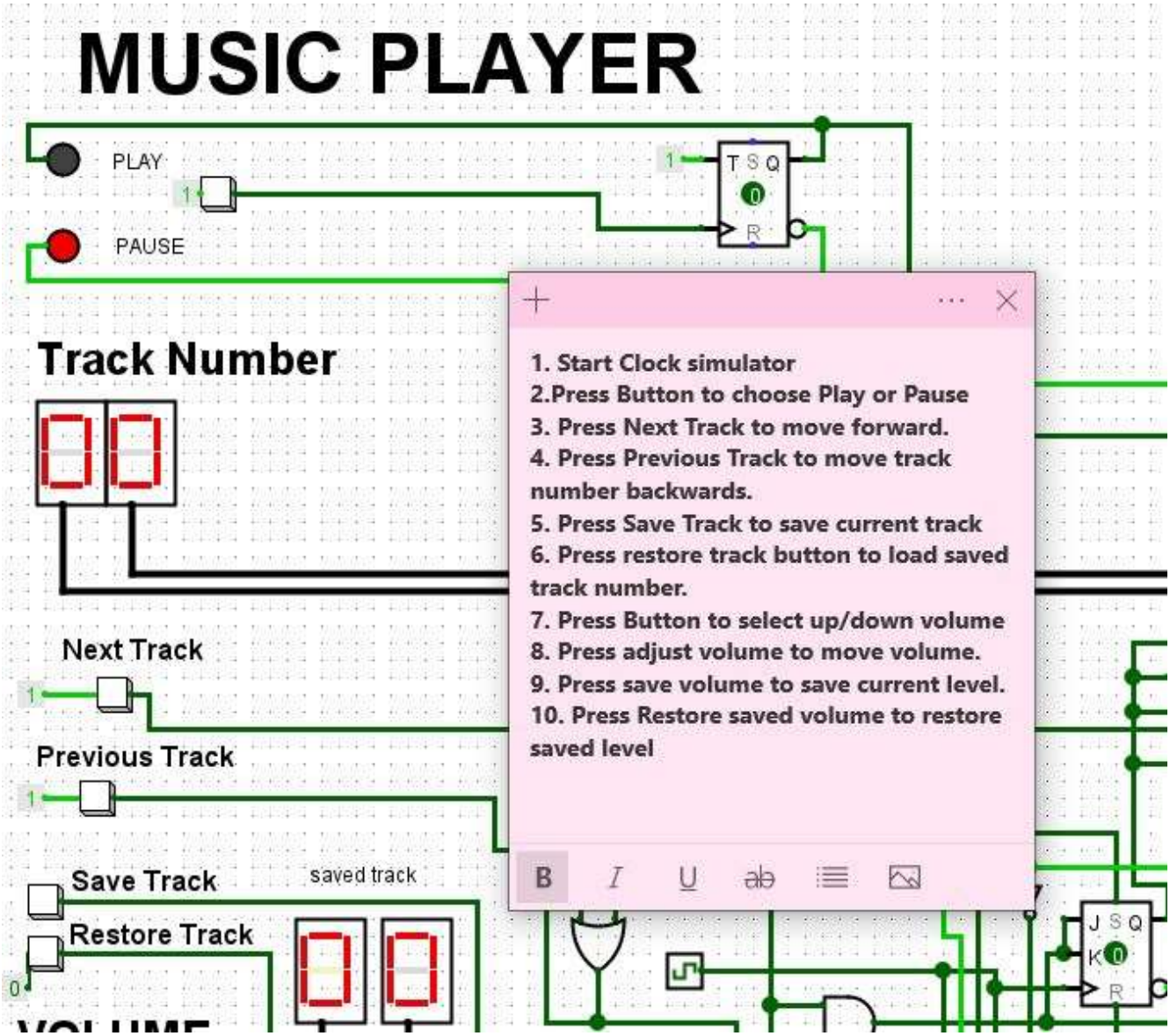
Contents

1.Description of Music Player

For this Assignment I have produced a circuit in Logisim which simulates the front panel of a Music Player. The panel includes the following modules:

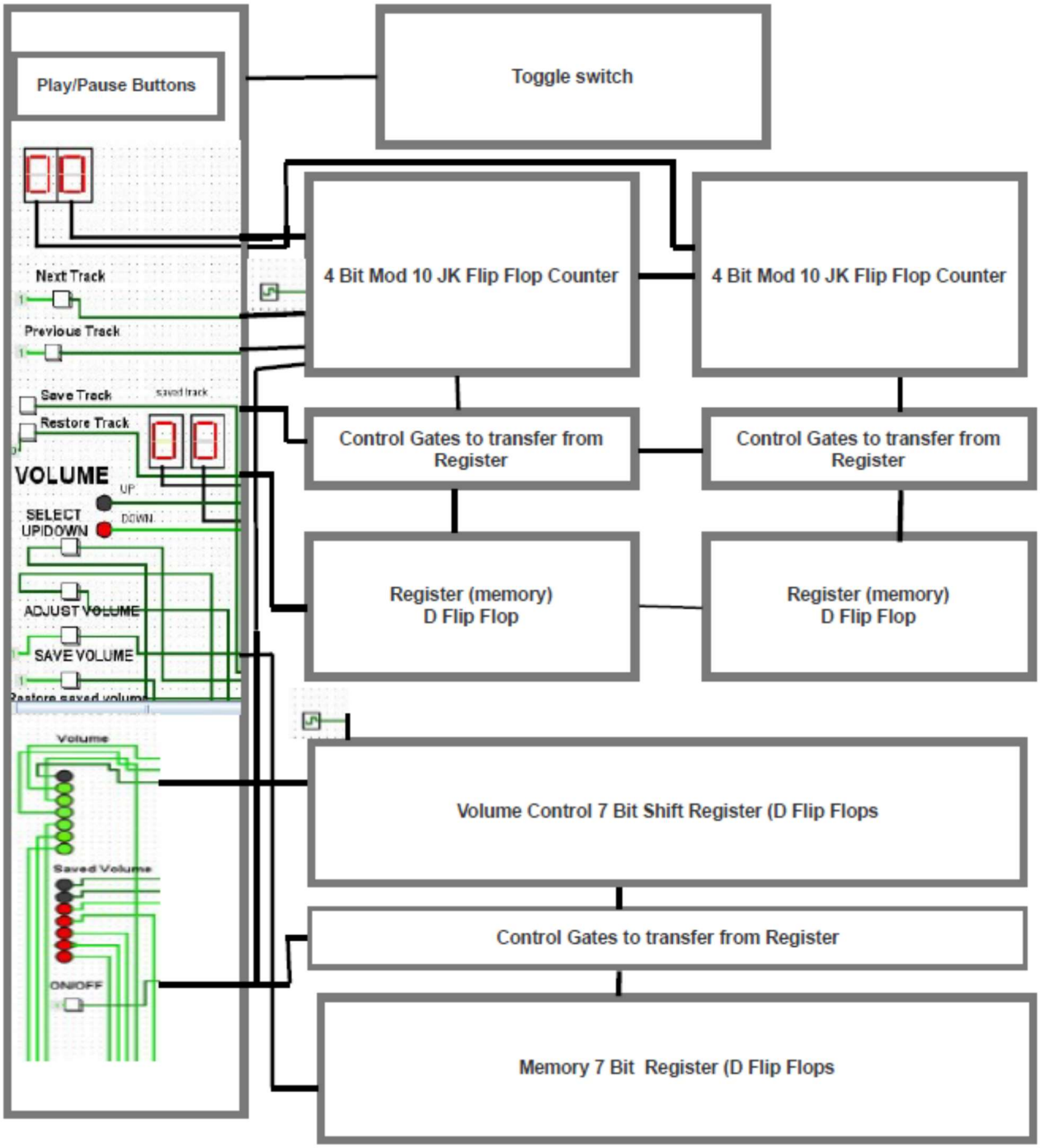
- **Play/Pause Button**
- **Track Number Display**
- **Forward/Next Track Buttons**
- **Save Existing Track Button (with separate display)**
- **Restore saved Track from Memory**
- **Button to select Up/Down Volume with lamp display.**
- **Button to Adjust Volume**
- **Save Volume Level Button**
- **Restore Saved Volume level**
- **ON and OFF Buttons (Off sets levels to 00 and ON restores to last saved state for Track Number and Volume)**

The screen Print below shows a screen print of the Panel wiring. Also I have included a short video which shows the circuit in operation.



2. Block Layout

The schematic below provides a basic block layout for the Music player but refer to the detailed circuit description below for detailed information.


Play/Pause Buttons
Toggle switch
Next Track
Previous Track
Save Track
saved track
Restore Track
VOLUME
UP
SELECT UP/DOWN
DOWN
ADJUST VOLUME
SAVE VOLUME
Volume
Saved Volume
ON/OFF
4 Bit Mod 10 JK Flip Flop Counter
4 Bit Mod 10 JK Flip Flop Counter
Control Gates to transfer from Register
Control Gates to transfer from Register
Register (memory) D Flip Flop
Register (memory) D Flip Flop
Volume Control 7 Bit Shift Register (D Flip Flops
Control Gates to transfer from Register
Memory 7 Bit Register (D Flip Flops

3..Detailed Circuit Description of Music Player.

The operation of the Play Pause button is controlled by a toggle gate and has a Led to indicate Play or Pause. When Pause is selected it also uses an AND gate to block the signal to the JK FlipFlop counter and if Play is selected the AND gate allows the signal to the JK flipflop. The Track Number display and movement is provided by two x 4 Bit Mod 10- JK Flip Flop counters. One is used for the unit counter and the other for the decimal number. The schematic diagram in section 4 shows it in Little Endian layout.

The next and previous buttons use AND/OR gates to change from an up counter to a countdown counter by changing the sequence the pulse is fed to the JK inputs.

2 x Hex displays are used to show the track number.

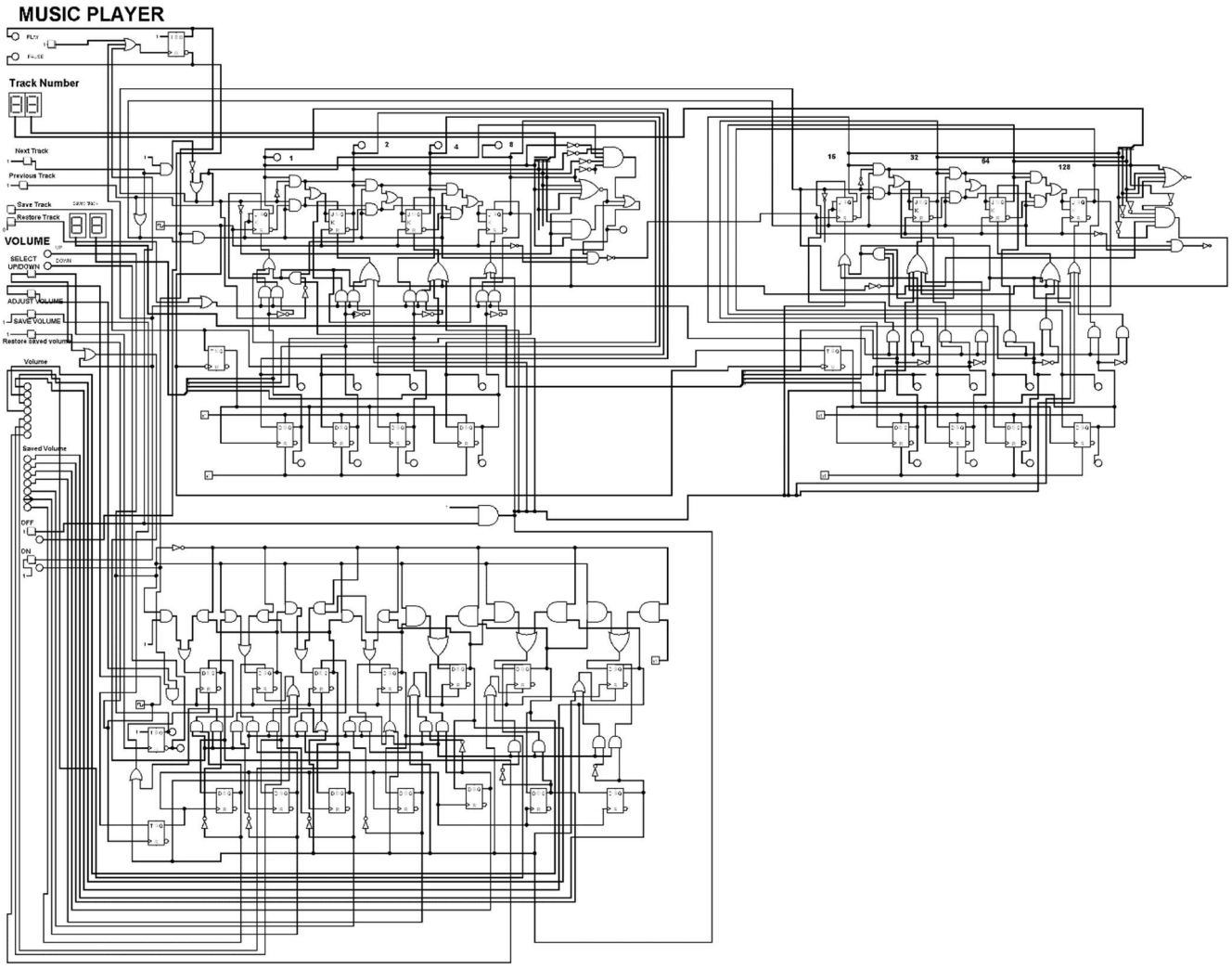
To change from a Hex to a 99 decimal counter the following points were included:

A ripple gate is active when the up count reaches 9 on the unit counter causing the decimal counter to increase by 1. Similarly, a ripple gate is active to countdown the decimal counter when the unit value equals 0. When the count reaches 99 two AND gates are active to reset both counters to 00 when in count up mode. . When in countdown mode when the counter is at 00 the flipflops are reset to 99 using NOR gate and OR gate at reset leads. To save the track number, 2 x 4BIT D flip flop registers are triggered using the save Track button and save the current Q output in parallel of all the JK Flip Flops. A separate Hex display shows the current track number saved. To restore the saved track number to the JK flip flop counter, 2 AND gates and an OR Gate are used to either SET the JK Flip flops to 1 or reset to 0, depending on the saved value in the register.

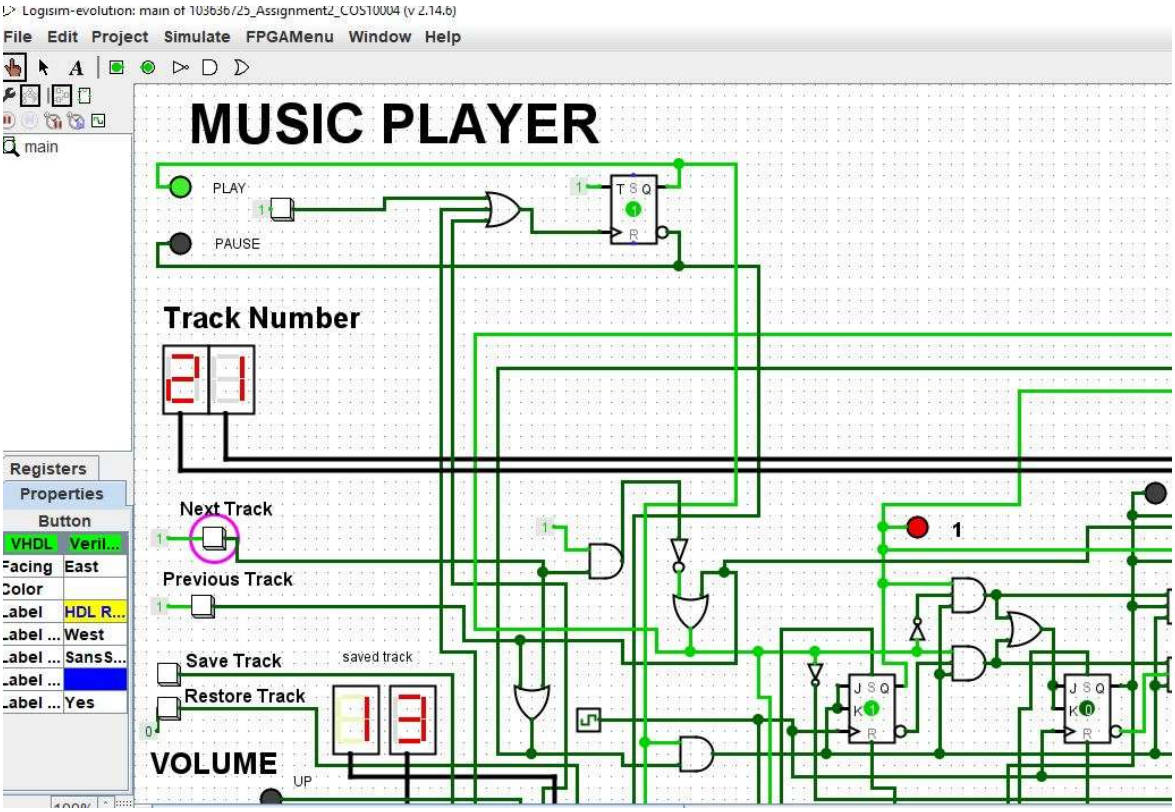
The Volume Panel first has a button to switch between up and down with a LED to indicate if up or down is the current setting. Once you select up or down the adjust button will adjust the volume using a 7 bit D flipflop parallel shift register and the outputs of each are fed to a green LED bar to indicate volume. To save the current volume to memory another button triggers another 7bit register in parallel to save the outputs of the shift register. This value is also shown on a separate LED display. To restore the saved volume level back to the control volume a button is used to trigger a number of AND gates connected to the shift register to set or reset the values to match the saved values.

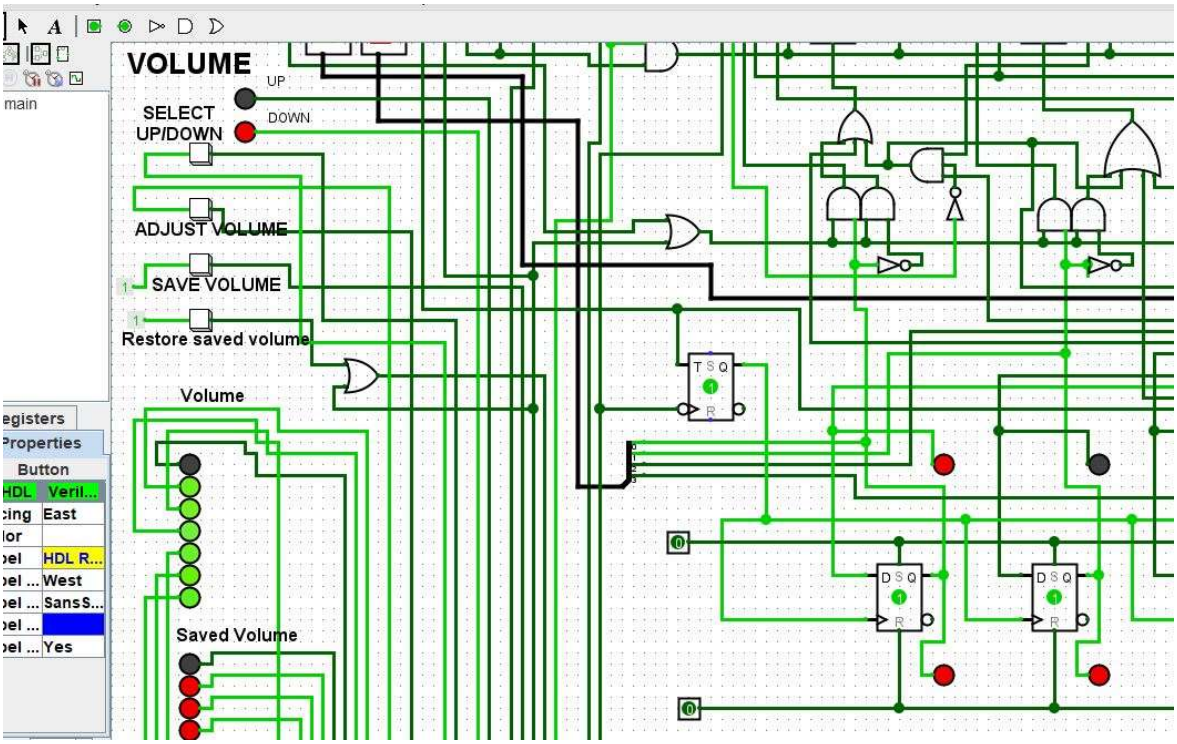
Lastly the system includes an ON and an OFF button. This is not quite doing what I wanted but at this stage when Off is pressed, will reset the track and volume back to 00 and place the player in Pause. The ON button will the put the system in Play and put the track and volume in the previous saved positions. I was a bit reluctant to try to do more because I think my circuit was getting a bit cumbersome and some changes were upsetting things I already had working, and dangers of doing a short circuit, but I think I have achieved most of the functions required. One possible flaw I think is that the system has is for the forward button which will cause the 10's counters to click over before the clock is started. The system works fine when the clock is started but may cause confusion. This happened trying to put in control gates for previous and next track button. The next button does click over the tens figure even if the clock is not working

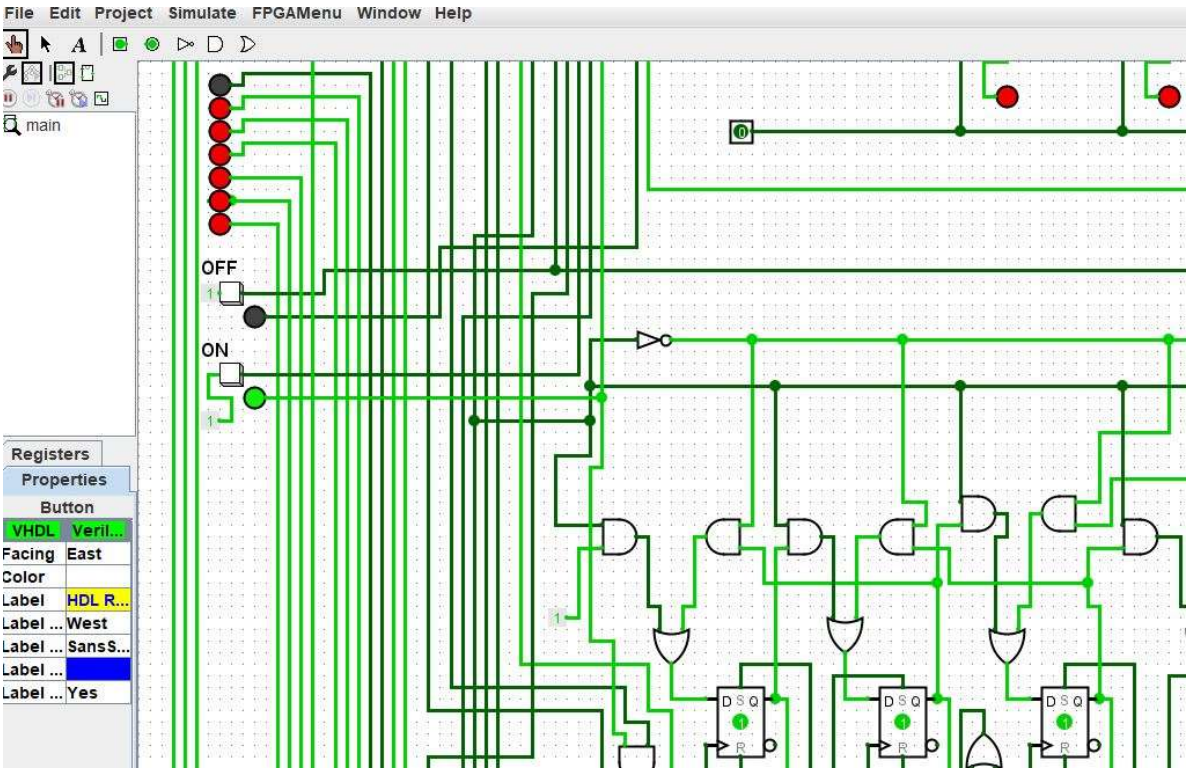
4.Circuit Diagram



5.Screen Captures







6. Appendix Supplementary Files

The submission includes the Logisim 2.14.6 source file for the music player. The file name is 103636725_Assignment2_COS10004.circ

The submission includes a 2-minute video showing a short demo of all the functions of the music player. File name is 103636725_Assignment2_COS10004.mp4.