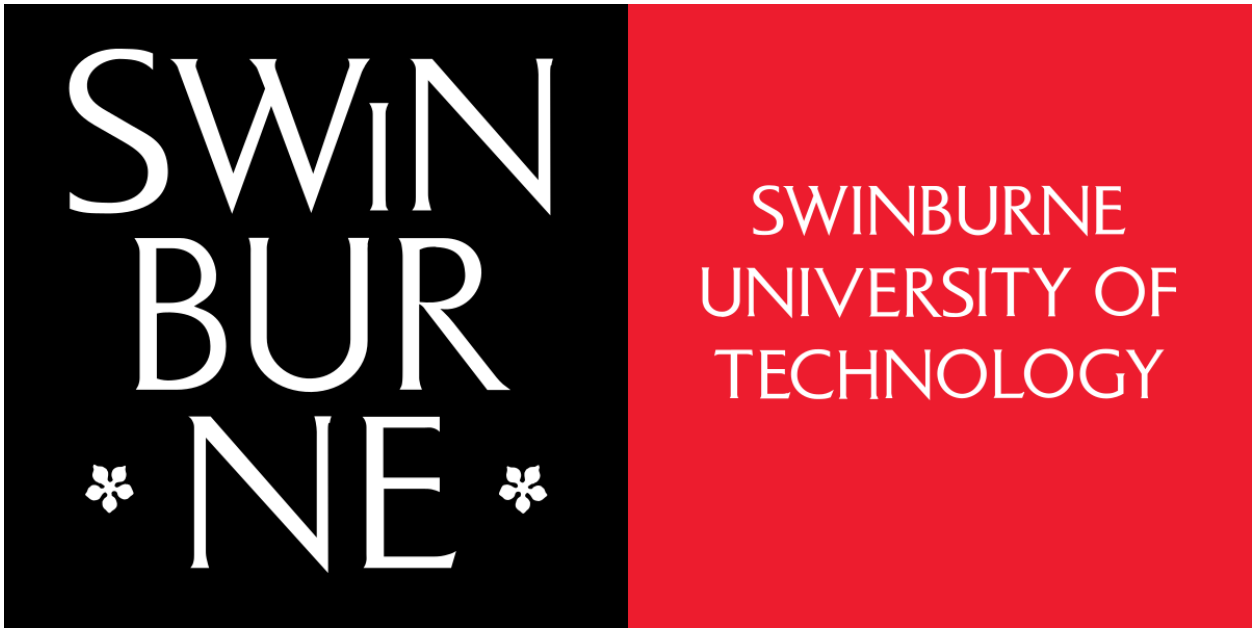
COS10004 - Computer Systems
Due date: 20 September 2021



Assignment 1 - Music Player

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Introduction

The following report describes and outlines the logic circuit for a user interface of a music player. The circuit has following buttons buttons:

- On / Off
- Play / Pause
- Volume Increase / Decrease
- Next / Previous Track

The logic circuit uses various components such as gates, wires, LEDs, hex displays, buttons, splitters and flip flops in order to produce the desired output.

Circuit Description and Design Outline

The On / Off buttons are at the top of the logic circuit and this button ensures that all the LED lights in the circuit are turned off when the music player is in the Off state. They are also connected to the HEX digits display to ensure that it is also turned off when the player is in the Off state.

Additionally, there are also two distinct Play and Pause buttons with two unique Play and Pause LEDs:

- When the PLAY button is set to on, the system enters the PLAY state:
    - The Play LED is turned on
    - The Pause LED is turned off.
    -
- When the PAUSE button is set to on, the system enters the PAUSED state:
    - The Play LED is turned off
    - The Pause LED is turned on.

- When the Play button is set to off
    - The Pause button has no effect on the system state.

The **Volume +** and **Volume -** buttons are used to increase and decrease the volume of the music player. These buttons are using a 3-bit adder in order to output the increased/decreased volume.

When the user clicks the **Volume +** button, the volume LED can be increased from 1 to 8. There is a NAND gate next to the **Volume +** button which ensures that nothing happens when the user clicks the The **Volume +** button when the volume is set to 8 (maximum volume).

When the user clicks the **Volume -** button, the volume LEDs can go from 8 to 1. There is an OR gate which ensures that nothing happens when the user clicks the **Volume -** button after all of the LEDs have been turned off.

Next to the Volume buttons there are two AND buttons labelled AND1 and AND2. AND1 ensures that if the volume is not 8, clicking Volume + sends 1 and increases the volume by 1 whilst also adding 001 to the volume, and hence turning on the next output LED, whereas the AND2 gate ensures that when the volume is not one, it transmits one and reduces the volume by one while adding 111 to the volume and turns off one output LED.

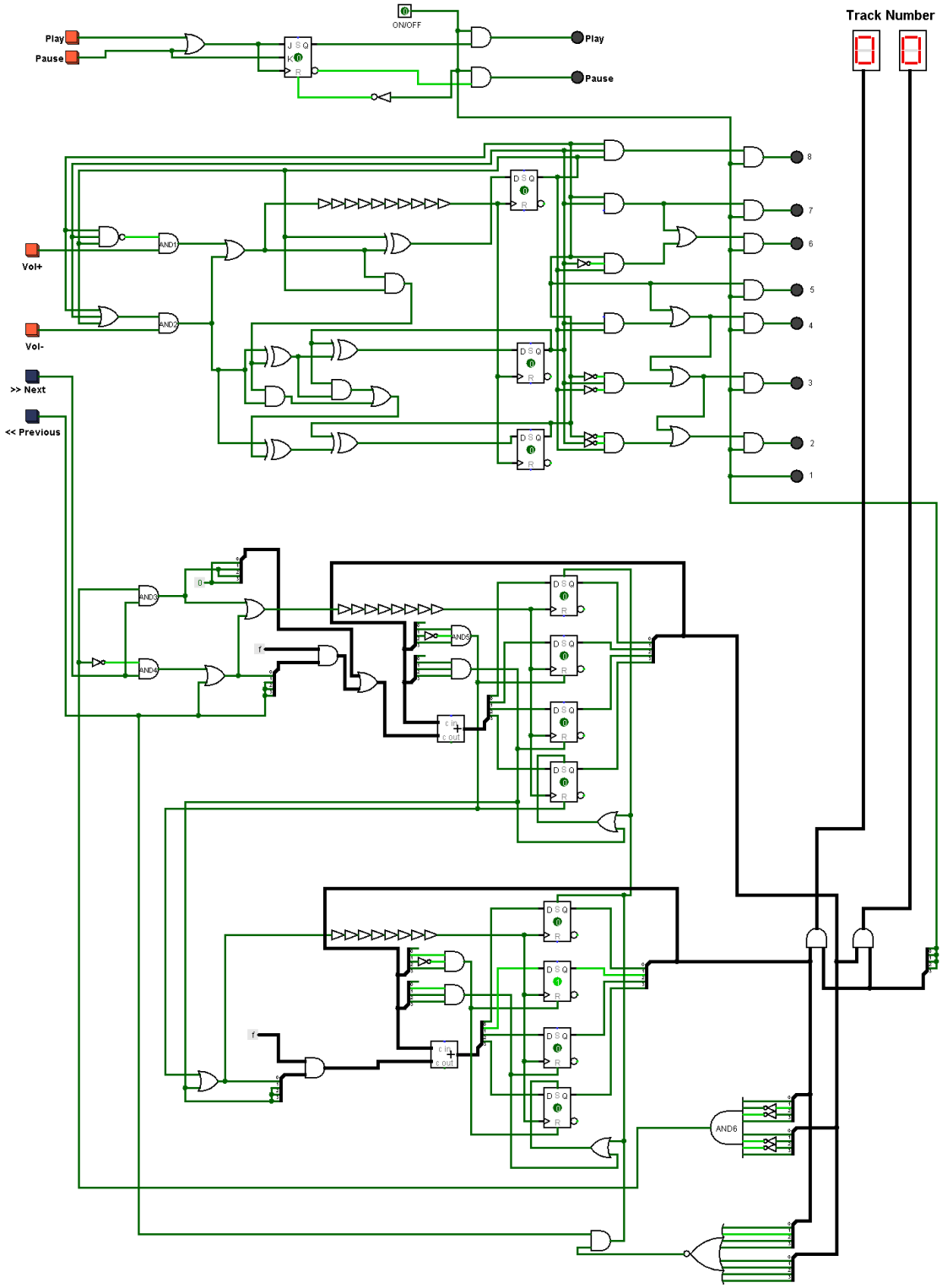
The last two buttons are the **Next** and **Previous** track buttons which are used to go to the next and previous track on the hex display.

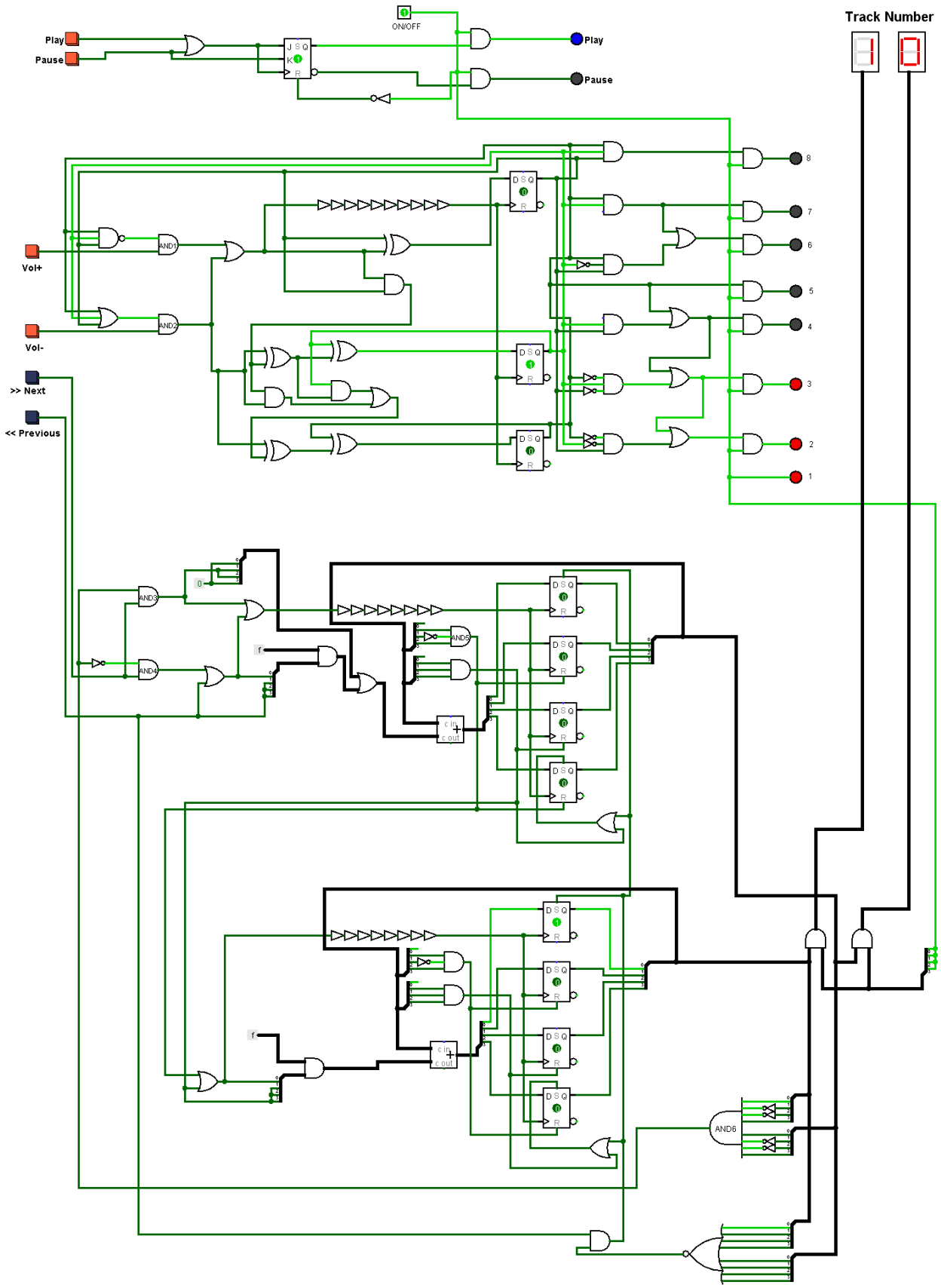
The AND4 gate adds 0001 to the track number. The AND5 gate ensures when Next track is clicked and the track number is 09, the adder's output is 0A. The output of AND5 will then be 1 and will reset a couple of D-flip-flops, as well as 0001 to the other flip-flop, resulting in a result of 10. When adder 1 hits F, the lower adder decreases by 1111.

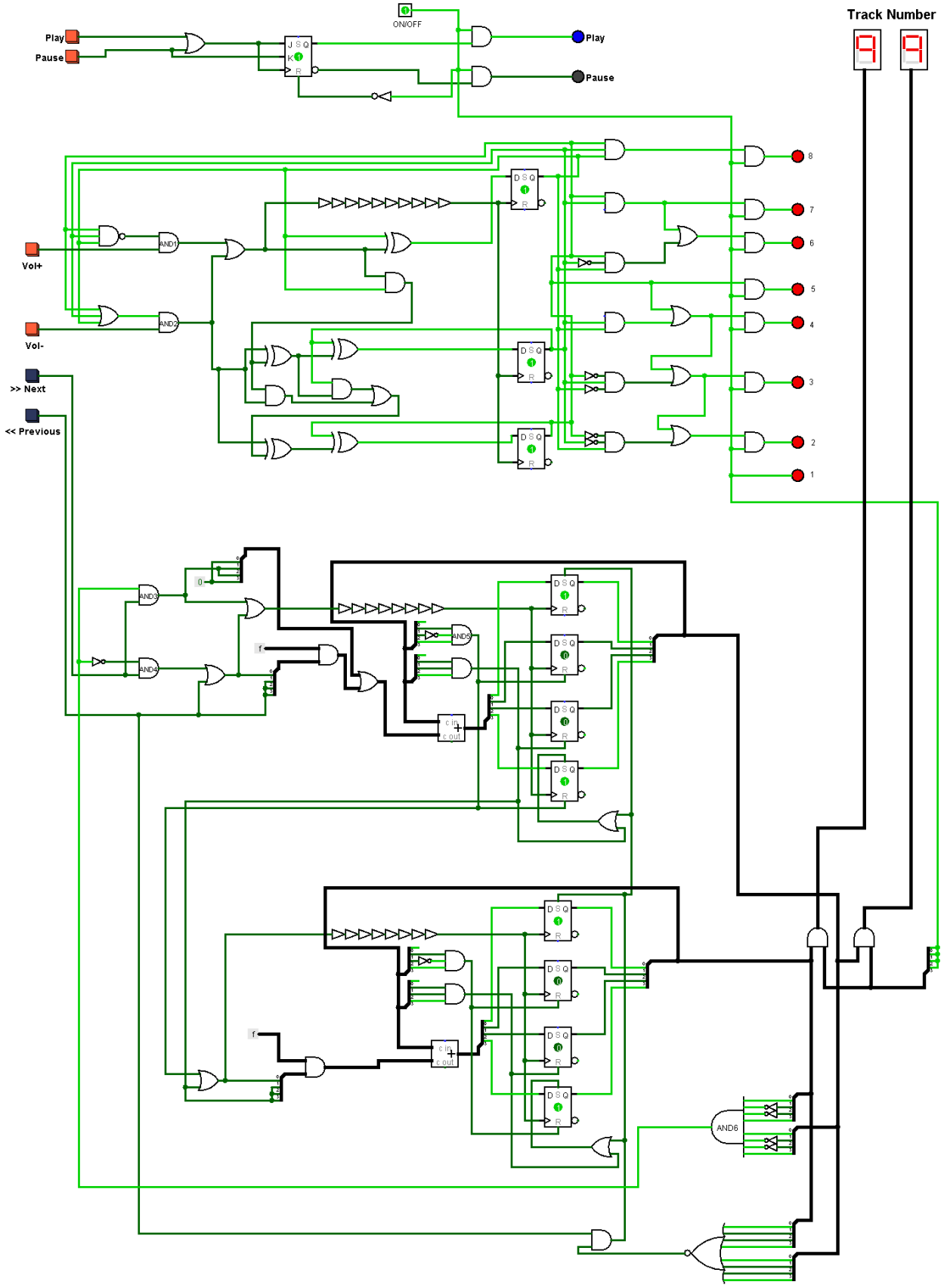
This part of the circuit also includes two four bit adders. When the next track is clicked, one input to each adder will be the same as the input to each HEX display, and the other input to the adder will be 0001 when the previous track is clicked and 1111 when the next track is clicked.

Overall, the logic circuit for a music player works as intended and produces all the desired output without any unsolved problems.

Screenshots




Track Number
ON/OFF
Play
Pause
Play
Pause
Vol+
Vol-
>> Next
<< Previous
AND1
AND2
AND3
AND4
AND5
AND6
8
7
6
5
4
3
2
1


Track Number
ON/OFF
Play
Pause
Play
Pause
Vol+
Vol-
>> Next
<< Previous
AND1
AND2
AND3
AND4
AND5
AND6
8
7
6
5
4
3
2
1