Name: Ta Quang Tung

Student number: 104222196

Title: COS10004 Assignment 1 Report

1. **Circuit description:**

This circuit can simulate the play/pause, track skipping, and volume control behaviors of a real music player and store the user’s settings in memory.

1. **Circuit outline:**

The circuit can be divided into 6 main sections:

Section 1 is the user interface, which includes buttons to alter the states of the music player (on/off, play/pause, volume, current track) as well as LEDs and HEX digit displays to show these states.

Section 2 is the ON/OFF controller, which comprises an RS flip-flop.

Section 3 is the PLAY/PAUSE controller, which comprises a gated RS flip-flop with two JK flip-flop additions so that the state of the system can be set to ON (PAUSED) when the circuit is turned on.

Section 4 is the volume controller, which is made from a 4-bit bidirectional counter for increasing/decreasing volume, a 4-bit register for storing volume, and a block of AND gates for controlling the state of the output LEDs.

Section 5 is the track controller, which features two 4-bit bidirectional counters for incrementing/decrementing the track count, two 4-bit registers for storing the track count, and a few logic gates for wrapping digits around and skipping the illegal track state of 00.

Section 6 is the timer, which simulates music playing. It consists of four 4-bit counters for counting up the seconds and minutes as well as four 4-bit registers for storing time. Two counters are for the seconds, counting from 00 to 59, while two counters are for the minutes, counting from 00 to 99.

1. **Assumptions:**

This circuit assumes that before the track number is changed for the first time, it is allowed to start at 00. It also assumes that the longest duration of a track is 99 minutes and 59 seconds, exceeding which the timer will loop back to 00:00.

1. **Unresolved issues:**

None.

1. **Screenshots of the circuit:**

Diagram, schematic

Description automatically generated

*Overview of circuit*

*Chart, bar chart

Description automatically generated*

*The music player in action. Once the OFF button is pressed, all LEDs will dim and all HEX displays will show 0. Pressing ON will put the player in the PAUSED state and restore the previous states of all LEDs and HEX displays.*