Police Siren Design

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Abstract

The purpose of this project was to design and create an operational police siren that uses two timers and an 8 ohm speaker. A potentiometer would then be added to adjust the pitch of the siren. Utilizing the design program DipTrace, I was able to design a circuit 3x3 inch circuit board with two LM555 timers and a potentiometer to adjust the oscillation frequency of the second timer. After installing all components using lead-free solder and using a 12V power source supplied by an IME 156 project, the project became operational and the potentiometer was able to change the pitch.

Description

The main components in creating the Police Siren are two LM155 timers, a potentiometer, and an 8 Ohm Piezo buzzer. One timer is used to control the frequency (time between high and low points of the siren wave) and the other is used to control the tone (actual sound given off by buzzer). The potentiometer is then used to adjust the second timer to alter the pitch of the buzzer.

When the push button is depressed (enters a closed position), the circuit will be powered ON and Timer U1 will start to oscillate at a frequency of .8 Hz through the connection of 10k and 82k Ohm resistor as well as a 10uF Electrolytic Capacitor.

This output frequency from pin 3 (output pin) of Timer U1 is fed into pin 5 (control pin) of Timer U2 where the frequency becomes adjusted by a 10K Ohm resistor. The tone generated can be varied by changing the values of potentiometer VR1 (turning the potentiometer CCW lowers the tone and turning it CW increases the tone). The output of Timer U2 is used to drive a power transistor Q1 which in turn powers the 8 ohm buzzer. Diode D2 is used to prevent the damage of transistor Q1 from an EMF generated by the speaker during the ON/OFF driving of the speaker.

Conclusion

I was able to successfully create a police Siren that used a 12V power source supplied by an IME156-created Power Source. By turning the potentiometer, the tone output by the 8Ohm buzzer was successfully changed. In making the board, I had 3 surface mount pieces that I had to add to the board. Because of their size (and recommendation from Dr. Pan) I was able to use standard lead-solder and soldering iron rather than having to use solder paste and a reflow oven.

Comments

I liked this project because it allowed me to work in an area of Engineering where I had limited knowledge. I also liked the fact that our projects were allowed to arrange from somewhat simplistic to quite complicated. The fact that we could either work individually or with a partner was a good idea because it allowed some people to work on projects that would not be suitable for only one person. Another thing that I liked was the fact that our projects were not based on whether our final product actually worked or not (I have had my grade ruined before from an F for having a project not work as fully specified). Even though I had three surface mount components, I was told it would be easy to simply use solder and a soldering iron to attach the pieces. Even though we learned about the solder paste applicator, the pick and place machine, and the reflow oven, we did not have to use it. I believe that in future the projects need to incorporate SMT and should be put through both processes. I had the opportunity to spend my time sitting next to a group that used Allegro instead of DipTrace, seeing the struggles that they seemed to be having, I think it would be easier if only DipTrace was used to create these projects. I was glad that Dr. Pan would purchase the PWB's for all the projects, but I believe some sort of system should be set up for purchase of components as well. I like the idea that we could combine to purchase parts for multiple groups, but I think it would be easier if Dr. pan could set up a program where we could purchase all of the components in future products (whether that is through Dr. Pan himself or through an outside supplier).

Bill of Materials

Project: McCune Alarm Siren

Date: May 4, 2011

Item	Quantity	Reference designator	Description	Value/Part #	Package	Manufacturer	Manufacturer Part #
1	2	D1,D2	Diode	1N4003	Through-Hole	NTE Electronics	1N4003
2	3	R1,R3,R4	Resistor	10 KΩ, 1/4W, ±5%	Through-Hole	Multicomp	std
3	1	R2	Resistor	82 KΩ, 1/4W, ±5%	Through-Hole	Multicomp	Std
4	1	R5	Resistor	200 Ω, 1/4W, ±5%	Through-Hole	Multicomp	Std
5	1	VR1	Potentiometer	220KΩ 1/4W, ±5%	Through-Hole	TE Connectivity	CB10LV224M
6	2	C1,C2	Capacitor	.01uF/25V Ceramic	Surface Mount	AVX	08053C103KAT2A
7	1	C3	Capacitor	10uF/25V Electrolytic	Through-Hole	Multicomp	MCGPR25V106M5X11-RH
8	1	C4	Capacitor	220uF/25V Electrolytic	Through-Hole	Illinois Capacitor	227CKR025M
9	1	S1	Switch	SPST	Surface Mount	Alps	SKQYAAE010
10	2	U1,U2	IC	LM555CN	8-THIC	Fairchild Semiconductor	LM555CN
11	1	Q1	Transistor	TIP41A	Through-Hole	Multicomp	TIP41A
12	1	SPKR	Piezo Buzzer	8Ω		Multicomp	MCKPI-G3740-3990
13	1		Power Supply	12V		std	Std