

## Homework 4: Packaging Specifications and Design

Team Code Name: The Drink Mixer

Group No. 2

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### Evaluation:

SCORE	DESCRIPTION
10	<b>Excellent</b> – among the best papers submitted for this assignment. Very few corrections needed for version submitted in Final Report.
9	<b>Very good</b> – all requirements aptly met. Minor additions/corrections needed for version submitted in Final Report.
8	<b>Good</b> – all requirements considered and addressed. Several noteworthy additions/corrections needed for version submitted in Final Report.
7	<b>Average</b> – all requirements basically met, but some revisions in content should be made for the version submitted in the Final Report.
6	<b>Marginal</b> – all requirements met at a nominal level. Significant revisions in content should be made for the version submitted in the Final Report.
*	<b>Below the passing threshold</b> – major revisions required to meet report requirements at a nominal level. <b>Revise and resubmit.</b>

\* Resubmissions are due within **one week** of the date of return, and will be awarded a score of “6” provided all report requirements have been met at a nominal level.

### Comments:

## 1.0 Introduction

The Drink Mixer is a digital mixer board for audio. There are 8 mono input channels, each with its own set of equalization, gain, and pan controls, as well as independent fader control for the main and auxiliary mixes. The product packaging is designed to be functional and portable, yet still maintain an aesthetic appeal.

## 2.0 Commercial Product Packaging

There are many commercially available products that are similar to the Drink Mixer, but the two below have some particular characteristics that we either wanted to improve upon, or that gave us motivation for some of our ideas. The two products are the Soundcraft Si Series, of which the Si2 [1] is shown below, and the Korg Zero8 [2]. Many of our inspirations came from Soundcraft, while many of the things that we wanted to eliminate came from the Korg. Ultimately, we wanted to recreate the functionality of the Soundcraft, but in the packaging size and shape of the Korg.

### 2.1 Product #1

The first product to compare to is the Soundcraft Si Series Mixers. The first thing to notice is the shape of the mixer. Instead of being a flat surface, there is a flat surface for the fader, and an upright surface for the display and EQ control knobs. We are utilizing a flat surface overall because it is easier to move quickly from faders to control knobs on a flat surface than going between different surfaces. Another thing to notice is the number of channels. Due to the simplicity



needed in order to complete the project within 1 semester, we are only doing 8 channels. The commercial products offered by Soundcraft have varieties from 16 – 64 channels and beyond. The Si series also has input channels on both the left and right sides, with the master controls in the center. Our design will have the inputs on the left side, with the masters on the right side. The touch screen display on the Si Series is fairly small, as seen in the picture. This is mostly because of the purpose of the touch screen on the Soundcraft. The touch screen is not used for much more than typing names for storage, and navigation of the display itself. There are many push buttons on

the commercial mixer to do functions which we have incorporated into the touch screen in our design of the Drink Mixer. While we are utilizing a touchscreen as well, ours is much bigger and used more functionally. Instead of having a panel full of buttons and a small screen, we will have a large screen with the buttons incorporated into the screen. One feature of the Si series console that we are trying to somewhat duplicate is the individual display on each channel. The



Soundcraft board uses a full color display to show which mode the RPG is in, and the exact level.

While we are not displaying all of this information directly on the channel, we are displaying an approximate level of the current parameter being adjusted on an LED bar graph. This will allow for

quick adjustments without having to look back at the main screen unless a precision adjustment is needed. Another important thing to note is the location of the XLR and 1/4" input and output jacks. On the Soundcraft they are on the back, while on the Drink Mixer they are on the top. We chose to put them on the top because it makes access to the interior of the board easier, while being able to integrate each individual channel separately on its own PCB. The final thing to note about the packaging here is that the commercial product is made of a combination of sheet metal surfaces and molded plastic ends and corners. Due to the highly custom nature and high cost of molded plastic parts, our design will not incorporate this.

## 2.2 Product #2

The second product to compare is the Korg Zero8 8 channel digital mixing console. The first thing to note is that this mixer has 8 channels, which we are duplicating in our design. It is also a single flat surface with the individual channels on the left and the masters on the right, which we are also mimicking. The Korg also has a small touch screen like the Soundcraft, and we will be replacing the small one and the buttons surrounding it with a large touch screen with incorporated buttons. Probably the biggest difference between the Korg and the Drink Mixer is individual channel controls. The Korg has



individual knobs for each level of EQ and each auxiliary “monitor” mix on each input channel. The Drink Mixer is incorporating all of the EQ controls and pan into a single RPG on each channel. The auxiliary mixes will also be incorporated into the same fader as the main mix by selecting which auxiliary channel to mix on the touch screen. The individual faders will then all move to the preset locations for that auxiliary mix, and the Main Mix faders will now control the master volume of the auxiliary mix. The input and output jacks on the Korg are also on the back like the Soundcraft, whereas we will be putting them on the top of the console on the Drink Mixer. The final thing to note about the Korg is the size and shape of the faders and the plastic knobs. The Korg uses 60mm faders with short, stubby knobs. We will be using 100mm faders with tall, skinny knobs. Also, the Korg does not have master faders, but instead has a single master volume knob on the top right of the console. We feel that it is imperative that a good mixing console have master faders, which we have incorporated on the Drink Mixer.

### **3.0 Project Packaging Specifications**

The packaging of the Drink Mixer is fairly straightforward. The primary piece of the packaging is the case. It will be constructed of folded sheet metal, either aluminum or steel. The top of the case will be hinged at the front, and screwed together at the back. This will allow for easy access to the interior of the case should it be necessary to modify anything.

There will be eight individual channels on the left side of the board, all identical. At the top, there is an XLR balanced input jack and an unbalanced ¼” input jack, followed by a red LED clip light and a rotary potentiometer to control the level of the preamp. Beneath this is a 10 segment LED bar graph and a rotary pulse generator (RPG). The LED bar graph displays the approximate level of the parameter being adjusted by the RPG. Next is the channel on/off button with integrated G/R LED followed by the solo button and red “solo active” LED. Finally, there is a motorized K-fader which is used to adjust the mix volume of the channel in either the main mix, or one of the auxiliary “monitor” mixes.

On the right half of the board, there are several key functional components. Along the top are balanced XLR outputs for the main stereo mix and the mono auxiliary mixes. Beneath that is a 7.8” color touch screen display. This display will show which mode the RPGs are in for each

channel and the exact value for the mode, as well as show the current mode of the faders. The display will be the user interface for storing and loading presets, as well as selecting effects. To the right of the screen is an LED sound level indicator for the main mix, as well as a ¼” headphone jack. Beneath the display are the effects and master left and right faders.

There is a master power switch on the rear of the console, along with a polarized plug for transformed AC power input. That being said, there will be an external “wall wart” AC transformer which will feed the console with AC power. This will then be converted to several different DC voltages internally.

#### **4.0 PCB Footprint Layout**

The drink mixer will use multiple PCBs linked together to make the final product. Every two input channels will share a PCB containing two ATMELs, motorized K-Fader, LED bar graph, RPG, Clip LED, Solo button and LED, and On/Off Button. There will also be a single PCB containing one stereo ATD for every two channels, the preamp circuitry for every channel, and the XLR connector for each input channel. This will be done by using a stereo ATD and passing one channel as the right and the second channel as the left. The last user interface PCB will be on the right side of the touch screen and will contain 40 LEDs for the main mix level indication and the DTA for the headphone mix. Finally, there will be two PCBs in the bottom of the case. The first one will contain the ARM9, the SHARC, and an ATMEL to control the master faders, and a second containing the AC to DC circuitry.

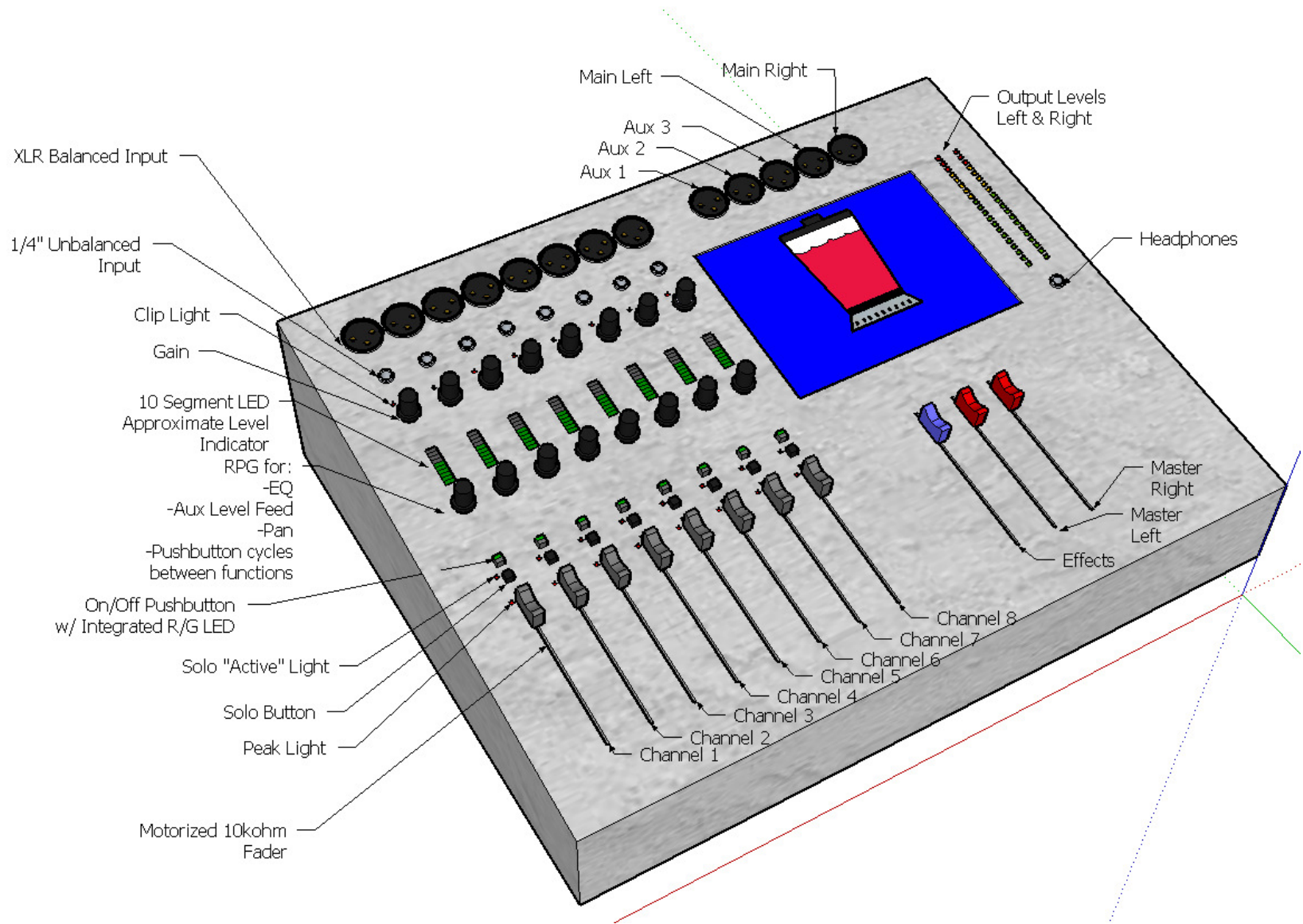
#### **5.0 Summary**

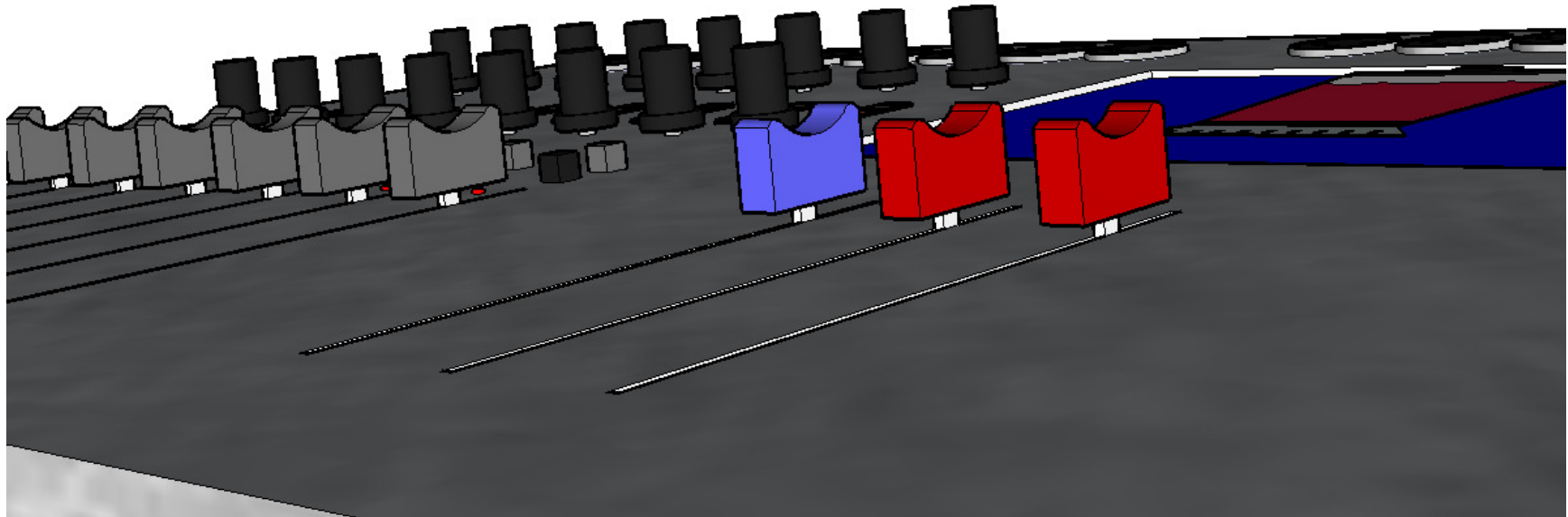
In this report, the packaging design for the Drink Mixer was discussed. Several other products that had similar packaging were shown to give insight into the considerations that were taken into account when designing this project. There are several drawings in the Appendices to show the packaging design in a more descriptive way. The initial PCB footprints are also provided to show how the project will be put together.

**List of References**

- [1] "Soundcraft Si2 Digital Console," [Online], Available:  
<http://www.prosoundweb.com/photos/category/C28>. [Accessed: Sept. 22, 2009].
  
- [2] "Korg Zero8 8-channel Digital Firewire Mixer," [Online], Available:  
[http://www.banasmusic.com/productdetail.asp/pid\\_10963/productname\\_Korg-Zero8-8-channel-Digital-Firewire-Mixer](http://www.banasmusic.com/productdetail.asp/pid_10963/productname_Korg-Zero8-8-channel-Digital-Firewire-Mixer). [Accessed: Sept. 22, 2009].

### Appendix A: Project Packaging Illustrations







**Appendix B: Project Packaging Specifications**

- The case will have an 18"x14" footprint. It will be 2.5" tall in front, and 4.5" tall in the back.
- The bulk of the weight comes from the case, but components do add weight as well. Final weight: < 30 lbs
- Materials Needed: solder, shrink tubing, rivets, screws, sheet metal 1/8" thick, brackets
- Tools Required: drill, rivet gun, sheet metal bending tool, mill/dremel

**Appendix C: PCB Footprint Layout**

