OMNIBOX
A Multi-Featured Audio Effects Module

Devon Rosner
Dylan Sherry
Overview
Overview
Design Block Diagram

Audio Source

18-bit Audio In

External Audio In

18-bit Audio In

AC97

19-bit ZBT Address, 16-bit Volume Control

36-bit Effects Out

36-bit ZBT Out

External Audio Out

36-bit Audio Out

36-bit Audio Out

External Audio Out

Audio Source

AC97

FX Control

User Inputs

External Audio Out

36-bit Audio Out

18-bit Audio In

ZBT 4 Channel Recorder/Looper

19-bit ZBT Address, 16-bit Volume Control

36-bit ZBT Out

Pan

Equalization

Delay

Tremolo

Ring Modulator

Reverb

Chorus

Manual Wah

Auto Wah

Distortion/Overdrive

Sound Effects

Speakers

Pan

Pan
Distortion/Overdrive
Auto Wah

Band Pass Filter 1
Band Pass Filter 2
Band Pass Filter 3
Band Pass Filter 4

Magnitude

Frequency
Ring Modulator

Input Signal

Generated Signal

Output Signal
Reverb/Delay

![Graphs showing the effect of Reverb/Delay on audio over time.](image)
Chorus

Time = 0

Time = \Delta

Time = 2\Delta

Frequency

Magnitude

Frequency

Magnitude

Frequency

Magnitude

Constant input frequency

Frequency shifted signal

New Frequency shifted signal

Magnitude Decreased Frequency Shifted signal
Tremolo

Input Signal

Output Signal

Stutter

Faded
Equalization

![Equalization Diagram]

Equalization Magnitude Frequency

Band Pass Filter 1
Band Pass Filter 2
Band Pass Filter 3
Band Pass Filter 4
Band Pass Filter 5
Pan

Left Speaker  Right Speaker

Ping Pong Pan

Fade Pan
4 Channel Recorder/Looper

Diagram:
- 36-bit Effects Out
  - ZBT SRAM
  - 36-bit ZBT Out
  - Post ZBT Mixer
  - 36-bit Mix Out
- 19-bit Address
- 16-bit Volume (4-bits per channel)
# Effects Menu

<table>
<thead>
<tr>
<th>Effect</th>
<th>Parameter 1</th>
<th>Parameter 2</th>
<th>Parameter Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distortion</td>
<td>Overdrive level</td>
<td>Gain</td>
<td></td>
</tr>
<tr>
<td>Wah/Auto Wah</td>
<td>Mode (auto/manual)</td>
<td>Bandpass filter width</td>
<td></td>
</tr>
<tr>
<td>Pan</td>
<td>Mode (Ping Pong/Fade)</td>
<td>Fade Speed</td>
<td></td>
</tr>
</tbody>
</table>
Timeline

Week of:
11/7 –
• Initialize all modules
• Finish basic implementations of effects such as distortion, long delay, reverb, tremolo, ring modulation, equalization, panning
• Attempt basic wah feature

11/14 –
• Fine tune distortion, long delay, reverb, tremolo, ring modulation, equalization, panning
• Implement auto wah
• Implement chorus using reverb module structure
• Start coding ZBT SRAM recorder

11/21 –
• Fine tune and debug all effects
• If potentiometer has arrived, implement manual wah with A/D converter
• Fully implement recording to ZBT SRAM
• Work on real-world instrument to FPGA
• Add additional functionality if time permits (more waves?)

11/28 –
• Debug and fine-tune all modules
• Prepare presentation