TEXAS STATE UNIVERSITY

E2.06 - Guitar Effects Stompbox

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Project Overview

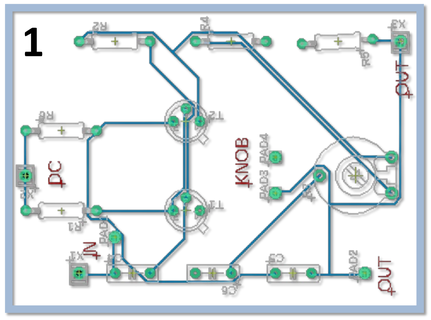
Our project is a dual-effect guitar pedal consisting of a transistor-based distortion circuit called the Hornet, and an op amp-based distortion circuit called the DOD Overdrive. The Hornet and DOD Overdrive will operate concurrently with Tone Control and Noise filter circuits inside a single shielded enclosure!

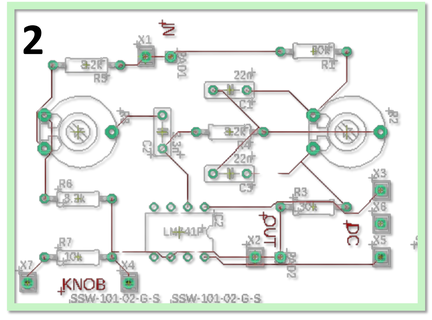
Features

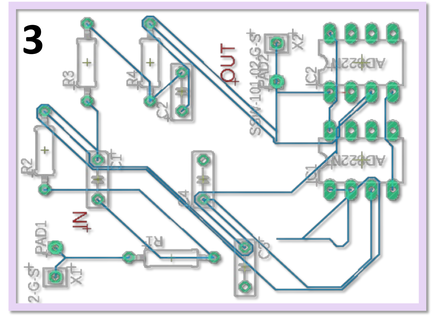
- Custom PCBs
- Shielded enclosure
- Automatic power switching mechanism
- True bypass implemented via footswitch
- Boost/cut of frequencies via control knobs
- Passive noise filter
- Gain and volume control knobs
- Inputs and outputs ¼" monoaural

Results of D2 Semester

- **Stretch Goals Implemented:** Tone Control, Noise Filter, Automatic Power Switching Mechanism
- Fully characterized subsystems
- Full function capabilities with combined systems
- Custom PCB for Hornet, Tone Control, and Noise Filter
- Shielded enclosure to fit all circuits
- Integrated subsystem demonstration with guitar and amplifier



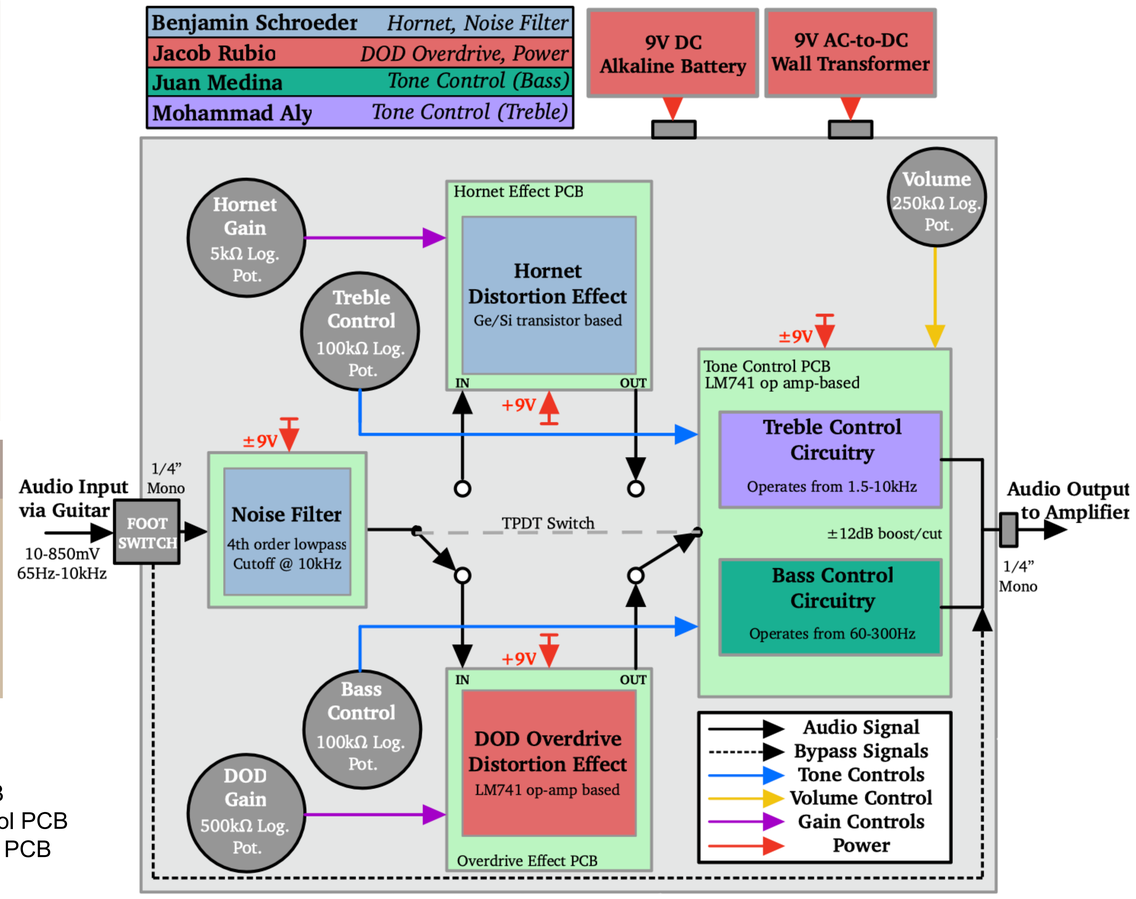




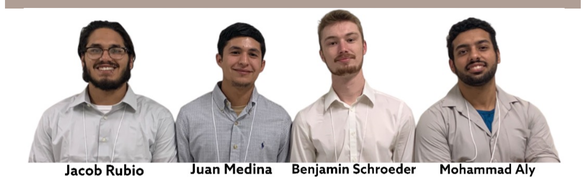
1. Custom Hornet PCB
2. Custom Tone Control PCB
3. Custom Noise Filter PCB

Top Level Block Diagram

Benjamin Schroeder	*Hornet, Noise Filter*
Jacob Rubio	*DOD Overdrive, Power*
Juan Medina	*Tone Control (Bass)*
Mohammad Aly	*Tone Control (Treble)*



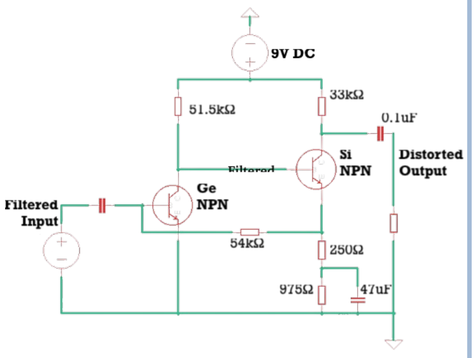
Meet the Team



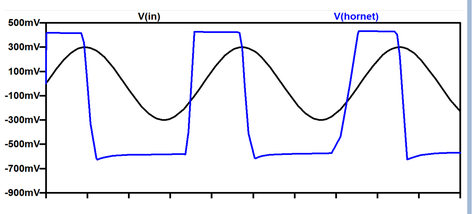
Characterizations Data

DUT	Test	Expected	Actual	
Hornet Distortion Effect Circuit	Current Draw	<10 mA	7.3 mA	●
	Input Impedance	>2.4 kΩ	4.4 kΩ	●
	Output Impedance	>10 kΩ	15.1 kΩ	●
	Signal to Noise Ratio	>20 dB	45.5 dB	●
	Total Harmonic Distortion	>0%	59.3% @ max 55.4% @ min	● ●
	% of Harmonics	>80% odd	94% odd	●
DOD Overdrive Distortion Effect Circuit	Current Draw	<10 mA	7.5 mA	●
	Input Impedance	>500 kΩ	964.8 kΩ	●
	Output Impedance	>5 kΩ	9.3 kΩ	●
	Signal to Noise Ratio	>20 dB	34.2 dB	●
	Total Harmonic Distortion	>0%	46.6% @ max 11.8% @ min	● ●
	% of Harmonics	>50% even	73% even	●
Tone Control Circuit	Current Draw	<10 mA	1.4 mA	●
	Cutoff Frequency (B)	300 ± 50 Hz	251 Hz	●
	Cutoff Frequency (T)	1.5 ± 0.1 kHz	1.61 kHz	●
	Input Impedance	>6.43 kΩ	17.6 kΩ	●
	Output Impedance	>10 kΩ	29 kΩ	●
	Signal to Noise Ratio	>20 dB	49.8 dB	●
Noise Filter	Current Draw	<10 mA	1.3 mA	●
	Cutoff Frequency	10 ± 1 kHz	10.1 kHz	●
	Signal to Noise Ratio	>20 dB	45.5 dB	●

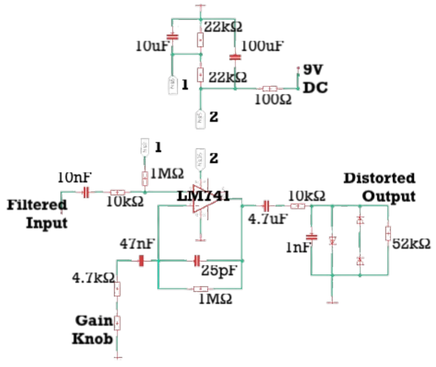
Hornet Fuzz



Output Waveform @ 300mV • 659.3Hz



DOD Overdrive



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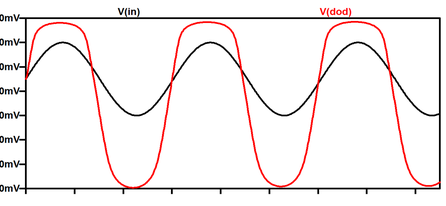
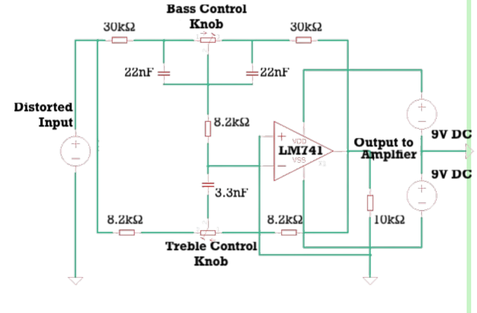
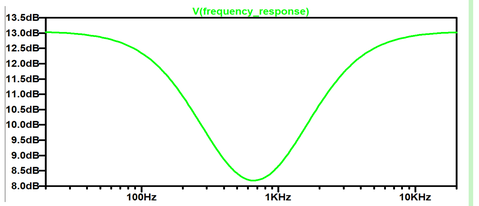


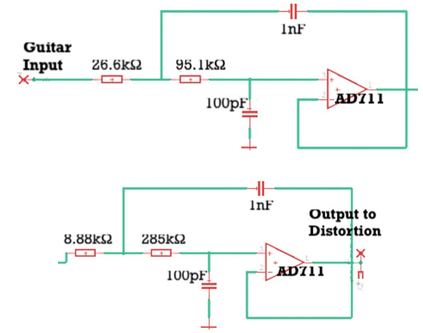
Tone Control



Full Bass and Treble Boost



Noise Filter



Frequency Analysis