ECE 322 Lab
Week 3
Rectifier Design
AC-DC Conversion

Block Diagram

Schematic
<table>
<thead>
<tr>
<th>Week#</th>
<th>Lab Manual Section Title</th>
<th>To Turn In</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Section 1 – Lab Equipment: Using Your Tools</td>
<td>Nothing</td>
</tr>
<tr>
<td>2</td>
<td>Section 2 – Rectifier and Filter Design</td>
<td>Prelab for section 2, Section 1 report</td>
</tr>
<tr>
<td>3</td>
<td>Section 2 – Rectifier and Filter Design</td>
<td>Nothing</td>
</tr>
<tr>
<td>4</td>
<td>Section 3 – Voltage Regulators&lt;br&gt;<strong>Checkpoint 1: Rectifier Demo</strong></td>
<td>Prelab parts: 1,2,3,4 for section 3, Section 2 report, TURN-IN sheet from section 2</td>
</tr>
<tr>
<td>5</td>
<td>Section 3 – Voltage Regulators</td>
<td>Prelab parts: 5,6,7 for section 3</td>
</tr>
<tr>
<td>6</td>
<td>Section 3 – Voltage Regulators</td>
<td>Prelab part 8 for section 3</td>
</tr>
<tr>
<td>7</td>
<td>Section 4 – Temperature Controlled Fan&lt;br&gt;<strong>Checkpoint 2: Regulator Demo</strong></td>
<td>Prelab for section 4, Section 3 report, TURN-IN sheet from section 3</td>
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<tr>
<td>8</td>
<td>Section 4 – Temperature Controlled Fan</td>
<td>Nothing</td>
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<tr>
<td>9</td>
<td>Section 5 – MOSFET Design&lt;br&gt;<strong>Checkpoint 3: Fan Control Demo</strong></td>
<td>Prelab for section 5, Section 4 report, TURN-IN sheet from section 4</td>
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<tr>
<td>10</td>
<td>Section 6 – Power Supply (Final Assembly and Testing)&lt;br&gt;<strong>Checkpoint 4: Final Demo</strong></td>
<td>Section 5 report, TURN-IN sheet from section 5, Final Design Specification Report, Final Presentation</td>
</tr>
</tbody>
</table>
Lab 2 Constraints

- Two channels, one positive and one negative when referenced to ground (about ±17V)
- Each channel must be able to supply at least 900mA to a resistive load
- Voltage ripple should be less than 0.75V_{pk-pk} for each channel when fully loaded to 900mA
- Must feature a power switch, power indication light, and a safety fuse
Rectifier Block Diagram
Half Wave Rectifier

![Diagram of a half wave rectifier circuit]
Full Wave Rectifier

Resultant Output Waveform
Rectifier Schematic

1A Fuse

Switch

Transformer

Rectifier

Earth Ground
connect to chassis via transformer bolt

Circuit Board Components

Filter

LED Circuit

V+

V−

120 Vrms
60 Hz

Green

White

Black

Black

White

White

Black

Black

Cf

Rled

LED

GND
Layout of The Power Supply Components
<table>
<thead>
<tr>
<th>Test (from Project Specification)</th>
<th>Measurements</th>
<th>TA Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1.1 - AC Rectifier - Two channels, one positive and the other negative when referenced to ground</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>7.1.2 - AC Rectifier - Rectify 60Hz, 120 VACrms to DC</td>
<td>✓</td>
<td></td>
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<tr>
<td>7.1.3 - AC Rectifier - Capable of supplying at least 900mA Amp per channel continuously</td>
<td>✓</td>
<td></td>
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<tr>
<td>7.1.4 - AC Rectifier - Voltage ripple out of the filter is less than 0.75Vp-p per channel with both channels fully loaded to 900mA</td>
<td>✓</td>
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<tr>
<td>7.1.5 - AC Rectifier - Easily accessible AC power switch</td>
<td>✓</td>
<td></td>
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<tr>
<td>7.1.6 - AC Rectifier - A clearly visible power indication light</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>7.1.7 - AC Rectifier - Assembled safely and with no electrical hazards and utilizes a safety fuse</td>
<td>✓</td>
<td></td>
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</table>
To Do coming week

• Build your own rectifier and filter for your power supply
• Add your power indicator LED to your circuit

Due coming week

• Nothing handed in

Lab handout errors

• Lab equipment does not allow FWR prototype unless you have 2 scope probes. You can get the data from simulation if you prefer
• Figure 6 is clearly not accurate. The high voltage side should have 2 black wires
• Skip Part Four. Do NOT attempt to measure the output resistance of the wall outlets