SECTION SIX
Power Supply (Final Assembly and Testing)

SECTION OVERVIEW

This section is basically for adding the finishing touches to your design, completing the assembly, and having it tested. Modify your case to make it uniquely yours, if there is time. Other modifications to improve safety, performance, or features are encouraged.

Objectives

- Add protection from external voltage sources.
- Complete the process of building the power supply.
- Test the power supply to ensure compliance with design constraints.
- Add creative modifications to the power supply.

Materials

- Your lab kit and power supply.
- Test leads and oscilloscope probes.

Design Constraints

Refer to Box 1 (in Section One) for the design constraints that your power supply must meet.

Testing Procedure

Your TA will test your power supply, by following the System tests from the project specification (section 7.2). You may want to run some of these tests on your own, in order to ensure that you will pass them during the official test.

PRE-LAB

For the pre-lab in this section, bring the following:

1. One printed copy of your final presentation.
2. One printed copy of your finished *Project Specification Document*.

LAB

There are four parts for the lab portion in Section Six: **protect the external voltage source, finish building the power supply, test the power supply, and creative additions to the power supply**.

Part One (Optional) – Protect the external voltage source (Optional)

It can be difficult to actually test that your circuit is working, since this involves using dangerous voltages in the lab. However, your simulation results should have let you determine whether the external voltage source was able to discharge to ground, without damaging your power supply.

You may want to show your design to your TA before you begin soldering.

Build the circuit into your power supply (on both channels).

Part Two – Finish building the power supply

Now is the time to wrap up any loose ends and fix any circuits that do not work like you want them to. You should use this time to make sure that the power supply is meeting all design constraints and that it will be able to past the testing phase.

Part Three – Test the power supply

Your TA will test your power supply when you are ready. You must have your power supply tested for full credit. If your design fails to pass this testing phase, then you may either accept partial credit, or fix your design and have it re-tested.

Part Four – Creative additions to the power supply

Part of the fun of designing and building your own circuits and projects is that they are unique and distinctly yours. This section will give you suggestions and ideas on how to improve or customize your power supply. You are encouraged, but not required to make creative modifications. Following are some of the creative modification suggestions to the power supply:

1. Paint your case to make it look cool or interesting. Show off your painting skills and artistic abilities.
2. Mount the cooling fan in a way that improves air flow. You can even use a fan with built-in LED lights or other features.
3. Add interior lighting. Case lighting is not just restricted to computers!
4. Use Plexiglas to allow people to see the circuits and inner workings of your power supply.
5. Add a receptacle to the back of the case, so that you can use a detachable power cord.
6. Add analog gauges to indicate output voltage and current. You can use a switch to select the channel being displayed on each gauge. See Figure for an example of a power supply that uses an analog voltage gauge.
7. The power supplies in the lab use seven-segment displays to indicate voltage and current digitally. Use your digital logic board and a four-digit, seven-segment display to indicate voltage and current. You will probably want to use a 3.5-digit A/D converter, rather than a simple serial or parallel output A/D converter. Output from a 3.5-digit A/D converter is already formatted for a base-ten number system, and is intended for this type of application. See Figure 14 for an example of a power supply that uses a digital display.

Figure 13: Analog voltage gauge

Figure 14: Digital voltage display

PRESENTATION

For the presentations:

- Each group of students will have one person present their design.
- The presenter will be chosen randomly.
- The **maximum time limit** for each presentation is: 12 minutes. (Up to 9 minutes for presentation, remaining for questions).
- The TAs will have tested the power supplies prior to the presentations.
- The presentation will be scheduled for the last 1.5 hours of the lab.
- Laptop, blackboard and overhead presentations will be acceptable.
- A room with a white or blackboard/ screen will be reserved and announced.
- Attendance by all the groups registered in the lab section is mandatory. (1% of the presentation grade is deducted for absentees).

The presenter (and the team indirectly) will be evaluated based on the following key elements of the presentation:

1. The presenter demonstrates a clear understanding of the design implemented.
2. If the design did not work for the team, the presentation highlights the steps that were taken to identify and fix the situation. If the "fix" did not work, the presenter provides an explanation of what the team would do next to troubleshoot, and why?
3. If the design was a departure from the standard schematic in the manual, the presenter is well-prepared with an explanation of how it works, and why it was chosen over the given schematic.
4. If the design specifications were changed, (by prior consent from the TA), then this is explicitly stated, and the altered design is discussed in the presentation.
5. The slides/ transparencies are clear and complete, and without grammatical errors in the text.
6. The presenter exhibits good speech delivery (such as: not looking at the floor, not talking to him/herself instead of to the audience, etc). For tips on how to present well, read *Appendix C: Presentation Pointers in this document*.
7. The presenter keeps to the time limit.
8. The presenter has the ability to answer questions from instructors, TAs and other peers present in the room.

TURN-IN

Student Name: _____ Lab Section Time: _____

Test (from Project Specification)	Measurements	TA Signature
7.2.1 - EACH CHANNEL MUST BE CAPABLE OF SUPPLYING AT LEAST 900MA PER CHANNEL CONTINUOUSLY		✓ _____
7.2.2 - VOLTAGE OUTPUT BETWEEN ±2 AND ±12 VOLTS UNDER 900MA LOAD		✓ _____
7.2.3 - AN OVERLOAD TO LIMIT CURRENT TO ±1A ±10%		✓ _____
7.2.4 - SAFELY EQUIPPED WITH A COOLING FAN THAT SHOULD NOT NORMALLY BE RUNNING AT 70OF, BUT SHOULD REACH RATED SPEED AROUND 95OF		✓ _____
7.2.5 - DISCHARGES THE FILTER CAPACITOR ON EACH CHANNEL TO UNDER 3 VOLTS IN 5 SECONDS OR LESS WHEN THE MAIN POWER SWITCH IS TURNED TO OFF AND THERE IS NO LOAD PRESENT ON THE OUTPUT OF THE SUPPLY.		✓ _____
7.2.6 - EXTERNAL CONNECTIONS FOR LEADS AND VOLTAGE ADJUSTMENT		✓ _____
7.2.7 - ASSEMBLED SAFELY AND WITH NO ELECTRICAL HAZARDS		✓ _____
7.2.8 - VOLTAGE RIPPLE OUT OF EACH CHANNEL LESS THAN 0.75V PER CHANNEL WITH BOTH CHANNELS FULLY LOADED TO 900MA		✓ _____

7.2.9 - UTILIZES A SAFETY FUSE		✓ _____
7.2.10 - EASILY ACCESSIBLE AC POWER SWITCH		✓ _____
7.2.11 - A CLEARLY VISIBLE POWER INDICATION LIGHT		✓ _____