

High Current Pulse Generator for the Application of Transcranial Magnetic Stimulation

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Project Objective: Over the course of 2 semesters, design, fabricate, and test a high-current pulse generation device for use in TMS research.

- Objective of Circuit

- Peak Current of 2 KA +10%

- EMF feedback must be considered

- Peak Current Sustained for 400 μ s

- Rise/fall time of 100 μ s

- Up to 36 Hz pulse frequency (Commercial Benchmark)

- Circuit Input is 120 V wall outlet.

- Range of Load - 5 micro-Henry (min) to Max(Undefined)

- 10 pulses a minute max

- Circuit shall be monophasic;

- If successfully completed then a biphasic version shall be built.

- The device shall output multiple waveforms (Square, Sawtooth, etc.)

Team Members:

Brian Kirkpatrick: Head of Circuit Design

Jon Rothfus: Head of Micro-Controllers, Team Communications Leader, Webmaster

Tania Alvarado Carias: Head of Electrical Safety

Abdul Bahashawn: Head of Rectification Circuits

Yan Wang: Head of Component Selection

Curtis Richards: Team Leader

Sub Teams:

Chassis Design: Tania, Curtis, Yan

-Meets Thursdays 2:00-2:30 p.m. Howe

Rectification Circuit: Abdul, Yan, Brian

-Meets Fridays 2:00-3:00 p.m. Marston

Power Circuit: Tania, Curtis, Abdul

-Meets Fridays 11:15-12:00 p.m. TLA

Micro Controller: Jon, Brian

-Meets Wednesdays 1:15-1:45 in TLA

Weekly Summary:

- Power Circuit:

We checked over our design, and confirmed all parts ordered were present.

- Chassis Design:

Parts were delivered, and accounted for. We began the layout of the parts on the chassis base.

- Micro-Controller (M.C.):

- Began experimenting with controlling power relays with Arduino. We will use two power relays in our circuit: 1 to control capacitor charging, and 1 to control emergency discharging of the capacitors.

- Rectification Circuit:

During this week's rectification meeting, we assigned spots on the chassis box to store our certain components. Also we wired up the transformer and used a multimeter to check the voltages flowing out of the transformer. Realizing the limits of the transformer, we are going to add some limiting resistors to fix that issue as another transformer would be costly.

Accomplishments of the Past Week:

Each member is to write up a reflection on their work throughout the week. The reflections can be found at <https://iastate.app.box.com/folder/46145323949>

Pending Issues:

- I. Due Dates
 - a. Weekly Report to be filled out by Saturday at midnight

- II. Team Reports
 - a. Update your sub team sections accordingly

New Business:

- I. Layout your parts this week, so that the chassis may be finished this weekend.

Individual Contributions:

Group Member	Accomplishments	Time Worked This Week	Total Time Worked
Abdul	Did the paper layout for the project with the team. Checked the power and rectification parts to make sure they match what we ordered. Prepared for our class presentation. Read the data sheets for relays we ordered as well as the IGBT we obtained.	3	22
Yan	Looked through our parts and made sure everything was there. Update the Gantt chart for our weekly report. Assisted in the wiring of the transformer.	2.5	22.5
Jon	Read datasheet for power relay we are intending to use to control capacitor charging and emergency discharging. Connected relay to Arduino and wrote method to switch relay on command.	2	24
Brian	Received our parts from the shop, got together with team and did a paper layout to confirm everything would fit. Discussed some aesthetics with appearance and functionality.	4	27
Tania	Checked the parts received and helped in organizing the circuit, fitting the big resistors with the rest of the components efficiently.	2	21
Chuck	I added a second current limiting resistor to the rectification design, and redid the calculations to make sure that the circuit does not overload the transformer. I also did some chassis construction and wired the transformer.	4	55

Current Progress:

