**Work Completed**

Over the last week I ran into a problem when ordering the relays for the project. Originally I had intended for the relays to be rated for 3 amps, as the actuators we are using should never draw more than this. After hours of searching catalogs, I found relays well suited for the job. However, after attempting to order them, I found they were backordered for 3 months. Further searching found similar relays but nearly twice the anticipated cost. Fortunately, our group was recently given four relays that were left over from a previous project. These relays are rated for 15 amps which is more than capable of running the actuators. In order to run all three actuators we will need 6 relays. Regardless, this has significantly reduced our expense as the remaining two relays will only cost $25-30 dollars with the mounting sockets.

Additionally, an order was placed for 2amp DC circuit breakers. These breakers will be very useful in ensuring that the actuators never draw more than 2 amps of current. They will also help to limit the amount of current that can travel through the relays, since they are capable of up to 15 amps. This will provide the ability to also reset the circuit should a short occur during testing and will also save on the cost of purchasing multiple
fuses. A picture of the circuit breakers can be seen following. They represent a large portion of the safety mechanisms built into the easel.

![Figure 1: Two Amp DC Circuit Breakers](image)

I also emailed the engineer from PQ Controls details of our design and a link to the web site. He responded to my email informing us that PQ Controls will be donating the joystick for our project free of charge. The joystick will contain microswitches, have a 10 degree range of motion and also have a toggle thumb switch. This will provide three ranges of motion that can be controlled with the joystick.

Lastly, testing of the actuators continued to determine the actual current draw that they would produce. *Excessive* force was needed to draw any more than two amps. This will work well with the 2 amp circuit breakers. Again, the actuators should never need more than 2 amps of current for the weight they will be moving.
Future Work

Over the next week, plans are to complete a purchase order for the last two relays that will be needed. Also, some initial research for an acceptable power supply will begin. The project will also require a rocker switch that our client can use to ensure that accidental movement of the joystick will not cause the easel to move while he is painting.

Also we will begin to fit the actuators into the easel frame itself. This will allow us to finalize the rest of the easel. Currently, the base is assembled, and the upper frame has been cut. Once final positioning has been established we can begin to weld the rest of the frame together. A box will be constructed which will house the electronic components (relays, circuit breakers, etc) and this will also be mounted to the back of the easel. Finally, once the joystick arrives, we can begin designing a method for it to attach to the easel and wheelchair if desired.

Project Review

The project is still currently on schedule. There was a minor incident in which a purchase order was lost and as a result some of the aluminum material did not arrive when expected. But this did not cause any significant problems and the material was reordered. Each week additional pieces of the easel are being made and it seems to be coming together well. The electrical system is almost completed and as soon as the easel can be assembled we can begin testing it with actuators.

Hours Worked

Research for the materials needed in the electrical system took a large unexpected amount of time in the range of 4-5 hours. An hour or two was dedicated to speaking with the engineer from PQ Controls. Four hours were also spent in the lab helping design
some additional aspects of the easel as well as an hour or two disassembling an actuator in order to adjust it. Total time for the week is around 12-13 hours.