Work Completed

During the lab time on February 18, I finished the purchase order for US Digital’s 24VDC 2.5A power supply. The data for this power supply is shown below, and can also be found at [www.usdigital.com/products/ps24](http://www.usdigital.com/products/ps24).

**Specifications:**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>85 to 240VAC</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>24VDC</td>
</tr>
<tr>
<td>Input Frequency</td>
<td>47 to 63Hz</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>±5%</td>
</tr>
<tr>
<td>Ripple &amp; Noise</td>
<td>200mV maximum</td>
</tr>
<tr>
<td>Operating Temp.</td>
<td>0 to 40°C</td>
</tr>
<tr>
<td>Storage Temp.</td>
<td>-20 to 60°C</td>
</tr>
<tr>
<td>Protections</td>
<td>Over voltage, current and short circuit</td>
</tr>
<tr>
<td>Certification</td>
<td>UL, CSA, TUV approved, CEmark</td>
</tr>
<tr>
<td>EMI</td>
<td>Meets FCC class “B”</td>
</tr>
<tr>
<td>Size (inches)</td>
<td>2.36 x 4.70 x 1.50 (WLH)</td>
</tr>
</tbody>
</table>

**Connector:**

- 5.5mm (0.217”)
- 9mm (0.355”)
- 2.1mm (0.83”)

**Mating Jacks:**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON-2MMJ</td>
<td>Right angle PCB mating jack.</td>
<td>$3.00</td>
</tr>
<tr>
<td>CON-2MMJV</td>
<td>Vertical PCB mating jack.</td>
<td>$3.00</td>
</tr>
<tr>
<td>CON-2MJJW*</td>
<td>Two wire 2.1mm mating jack.</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

* Required when using the PS-24 with US Digital’s Motion Control Building Block.
Our team also discussed further our options for a rechargeable battery power supply. We ran into some problems with meeting the voltage and current requirements for the device using just batteries. We found that if we cascaded several batteries in series, the voltage requirement was met but the current requirement was not. Similarly, if we arranged several batteries in parallel, the current requirement was met, but the voltage requirement was not. Based on these findings, we decided as a team that we would use only the power supply shown above for our device. We will not be incorporating batteries of any type in our design. This may make room for our device’s case to be smaller. While the device will not be completely portable without batteries, we feel that it is still very practical. Users of the device are not expected to move the device often, so this design decision will not decrease the practicality of the device.
This week Karen and I also visited Mansfield Supply to purchase more screws for the case. While we were there we spoke with an employee about a material to secure the syringe top in the actuator-syringe connector piece. We concluded that the best idea was to use a basic 100% silicone household product. Mansfield Supply sells these products for under $5. This material will offer strength, security, and flexibility in the design. A view of the case’s progress is shown below:

Also this week I worked with Gabe to produce a test code for programming the LCD display. We were able to successfully output characters to the LCD display, but our test program does not show how we will handle user input. Because of the nature of the user interface, it will be important to understand exactly how user inputs will be processed. A portion of the test code is shown below:

```c
#define LCD_RS RA5 // Register select
#define LCD_EN RB4 // Enable
#define LCD_D4 RB5 // Data bits
#define LCD_D5 RC5 // Data bits
#define LCD_D6 RC4 // Data bits
#define LCD_D7 RC3 // Data bits
#define LCD_STROBE ((LCD_EN = 1),(LCD_EN=0))
#include <pic.h>
#include <stdio.h>
#include <stdlib.h>

main()
{
    TRISB=0b00000000;
    lcd_init();
}
lcd_init(void)
```
{ LCD_RS = 0;  // write control bytes  
DelayMs(15); // power on delay

LCD_D4 = 1;  // init!  
LCD_D5 = 1;  // 
LCD_STROBE;  
DelayMs(5);

LCD_STROBE; // init!  
DelayUs(100);

LCD_STROBE; // init!  
DelayMs(5);

LCD_D4 = 0;  // set 4 bit mode  
LCD_STROBE;  
DelayUs(40);

lcd_write(0x28); // 4 bit mode, 1/16 duty, 5x8 font, 2 lines  
lcd_write(0x0C); // display on  
lcd_write(0x06); // entry mode advance cursor  
lcd_write(0x01); // clear display and reset cursor
}

The projected timeline for this week’s work is shown below.

| 44 | Continue notes for user’s manual | 2 days | Mon 2/21/05 | Tue 2/22/05 |
| 45 | Receive PC Boards | 1 day | Mon 2/21/05 | Mon 2/21/05 | 36 |
| 46 | Practice soldering as required | 2 days | Mon 2/21/05 | Tue 2/22/05 |
| 47 | Begin construction and analysis of circuit | 5 days | Mon 2/21/05 | Fri 2/25/05 | 40 |
| 48 | Continue case construction in machine shop | 5 days | Mon 2/21/05 | Fri 2/25/05 |

**Current Status**

Currently, I am continuing work on the test code in both C and assembly languages. I am working on the details of receiving user input from the keypad and LCD display, and I am also continuing work on the flow charts and code for the subroutines of the user interface program. I am also working to keep up with the documentation of the design process, including the notes for the user’s manual and the expenses spreadsheet. Occasionally, I have been assisting Karen in the machine shop with the design of the device’s case.

**Future Work**
During the coming week, I plan to help Karen continue to screw and glue the case for the syringe dosing device. I also plan to purchase a material, such as 100% silicone glue, from Mansfield Supply in order to stabilize the syringe plunger in the actuator-syringe connector piece. Aside from the case construction, I plan to continue focusing on the C code and assembly code for the user interface program. I will need to figure out the mechanics of the LCD’s input and output in order to fully code the user interface. I also plan to continue constructing flow charts for the subroutines of the user interface program. A summary of Team #1’s near-future tasks is shown below.

### Project Review

At this point in the design process, we have made significant progress. If the entire design team is able to continue its hard work on the project, we can expect to meet our goal of having a basic functioning prototype by March 5th. We are also hoping to be able to show evidence of a fully functioning circuit so that we may place our order for the PC Boards over spring break. At this time, all of our device’s components are functioning as expected.

**Total hours worked:** 20