Part 1 Plan

After reading the guidelines for the project, it was clear that I would have to make seven different models, all with macros that returned the user to the main menu, and four of which required macros. I decide that I would make the model for each section before I would institute the macros required. I made a new sheet labeled controls where I would place all cell links for each model. I decided to work on the models in this order:

1. Nozzle Flow Rate Calculator
2. Nozzle Selection Formula
3. Low Limit Calculator
4. Product Pump Calculator
5. Density Conversion calculator
6. Additional Conversion factors
7. Main Menu

The first model was the Nozzle Flow Rate Calculator. After looking at the example, I determined that this model was fairly straight forward. It required two spinners and a list box. I made the Gallons/Acre spinner have a minimum of 1 and max of 100, as specified. The Miles/Hour spinner has minimum of 1 and maximum of 40. The list box is referencing the range spacing in tables. To extract the value selected by the list, I used an index function referencing spacing and the row number selected in the list box. The function was =INDEX(Spacing,$C$6). I use this same formula many times throughout the project; to save time, assume that this function is used to extract the desired value from a list box. For the final calculation, I used the formula given in the operation manual, rounded to three decimal places, and concatenated GPM onto the answer. The final formula was =ROUND((C7\*C10\*E6)/5940,4)&" GPM"

The next model was the Nozzle Selection Formula. This model was more complicated. After looking at the example, this model called for three list boxes, data validation and an index function to return the desired nozzle description. I first decided to get the necessary data from the website and organize it so that it could be easily referenced. While extracting the data, I noticed that it had a few branching paths, this meant that dynamic named ranges would need to be used for the form controls. Thus, I divided the nozzle data first by systemic, contact or liquid and then by application type. After the nozzles were grouped, I decided to name the ranges based on the type of application and the row number that they would appear if the desired application type was selected. For example, Systemic\_1, Contact\_3, and Liquid\_2. I did this because it required less work and accomplished the same result.

Once the data was sorted, I made the form controls. The type of product list references the range of the same name in Tables. For the Systemic or Contact list I created a named range using the formula =IF(Controls!$D$10=Tables!$B$16,"",Systemic\_or\_Contact). The fixed cell is referencing Liquid Fertilizer in Tables. This way, the field would appear blank if liquid was chosen but systemic and contact would appear if crop protection was selected. For Type of Application I created a named range with the formula =IF(Controls!$D$10=Tables!$B$15,Tables!$E$16:$E$19,Tables!$E$24:$E$25). This way, the proper application types would appear for desired selection. For the Nozzle Options list I used the formula =IF(Controls!$D$10=Tables!$B$16,INDIRECT("Liquid\_"&Controls!$C$11),INDIRECT('Nozzle Selection'!$K$12&"\_"&Controls!$C$11)) to create a named range. This formula references the named ranges for each application type I made earlier. For Nozzle Description, I used the index function =INDEX(Nozzle\_Desc,MATCH(Controls!$D$12,Nozzle\_Desc,0)+1). When I was copying the data from the website, the description would be place in the cell below the nozzle. To save time I added the +1 to the match function instead of making another column. The final thing I did was to conditionally format the Systemic or Contact list so that is would only appear if crop protection was selected.

Next was Low Limit Calculator. From the example, the form controls I needed to make were a spinner and two list boxes. The spinner has a minimum of zero and maximum of nine because those are all the possible last digits in a sequence of numbers. The Boom and Spacing list boxes are referencing their respective ranges in Tables. For the final low limit calculation, I used the given formula in the operation manual. Since boom size is in feet and nozzle size is in inches, I converted boom size to inches to determine the number of nozzles per boom. The final formula was =(0.06\*C8\*((F8\*12)/D14))&" GPM".

The Production Pump Calculator required many of the same form controls as previous models. For form controls, I had to spinner for Gallons/Acre and Miles/Hour. I made list boxes for tank size, nozzle spacing, and boom size. For the calculations in the results section, I had to calculate number of nozzles, nozzle flow rate, the GPM per boom, the GPM for agitation and total required gallons per minute. The formulas for each were given. I decide to round all results to three decimal places to be more accurate.

The last two models were straight forward. Even though the example for Conversion Factors used a combo box to select each density, I decided to use a list box because it required less time. I the used index functions to look up specific gravity and conversion factor for each solution. For Additional conversion factors, made two list boxes. The first references all the possible units of measure. The second list box pulls the related conversion factors by using a dynamic named range defined with the formula =INDIRECT("Unit"&Controls!$C$34).

Finally, I created a main menu that would bring users to the desired model based on what button they pressed. I crated macros for this process. I then created macros that would clear the desired form and attached them to a button. I finally added buttons to every sheet that would return the user to the main menu.

While creating these models, I did not experience any unforeseen obstacles. The hardest part was creating the data tables for Nozzle Selection that was easy to reference.