3. Hysteresis and nonlinearity are not present in this experiment. There is no dependence on previous outcomes of the data and all of the data is shown in linear form and is well interpreted the same.
4. Some possibility of Extraneous Variables that could have affected the experiment are human error, electronic noise, and faulty data collection equipment.
5. As mentioned above our results seem to be reasonable and consistent. The grouping and accuracy of the data points between data sets as well as in both directions (loading and unloading the cell) show that the data is at minimum correct and the small standard error shows it is reasonable and close.

Conclusions:

Moving forward with the results of this experiment it was concluded that statistical analysis and data were reasonable as the voltage results stayed consistent when maximum weight was approached as well as the minimum.

Any possible weaknesses that would have affected this experiment would have taken place if the weights were not carefully placed on the load cell as they were stacked. Placing the in-house fabricated weight on the center of the platform and making sure it was completely free of touching its surroundings could have also affected the accuracy of our results.

Once plotted and a line of regression was found forced through the origin it was found the slope of ea original linear function was .0025. The inverse of this function is Y= 400*X and is our calibration function. Using a t-test and knowledge of the standard error from ME-345: "Lecture notes on Statistical Analysis of Experimental data" and ME-345; "Lecture Notes: Normal and t distribution tables" we can find the upper and lower bounds on this data for each data set. For each trial the data seems to be consistent as well as its analysis so we can assume there was not much error in data collection.

5. Obtain an independent set of data using only deadweight A. Place it on the Load Cell and take five readings. Unload the Load Cell to 0 N by removing deadweight A from the Load Cell. Repeat this sequence six times to generate 30 readings for this set of data.
6. Save your data to an Excel compatible file and hand an electronic copy to your TA before you leave the ME 345 Laboratory.

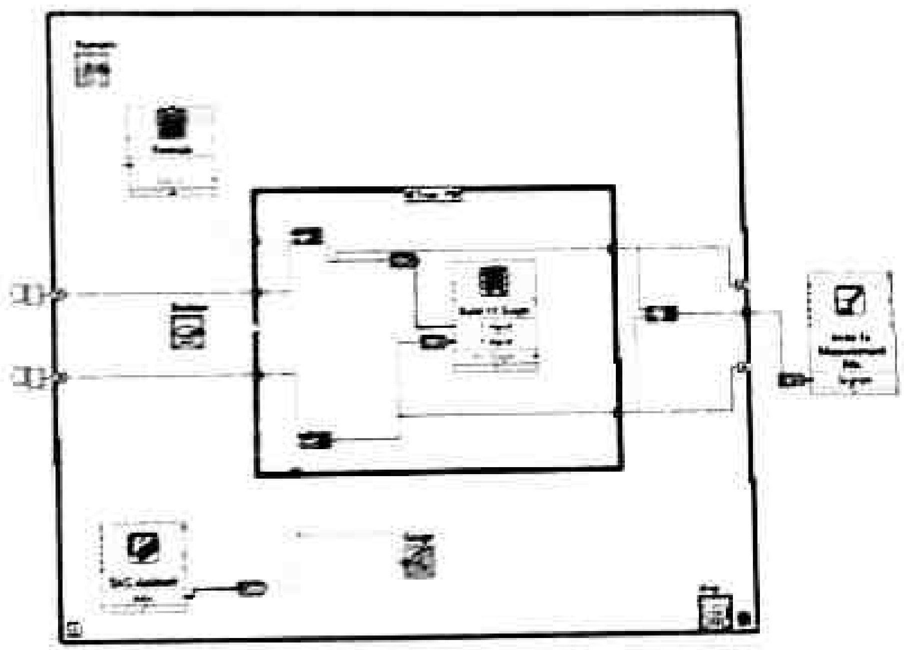

Figure 1 - VI Block Diagram Program used

Procedures:

1. Develop a LabView VI to acquire the output from the Load Cell and store it in an Excel data file following the steps listed below. Your TA will assist you in this regards.
   a. **Assemble Data Vectors and XY Plot** - Design a VI that will accept two user-defined inputs and will graph these inputs on an XY plot as each data pair is entered. As each data pair is acquired, it should appear on the plot together with the previously acquired data. You may use two numeric inputs to define data pairs, or you may use one numeric input and derive the second input from the first. Each data pair should be sampled when an "Acquire Data" button is pressed on the front panel (GUI).
   b. **Save Data to an Excel File** – Add a "Save Data" button, which when pressed causes a "Save As" dialog box to appear. Make sure you can save your data in a format that is compatible with Excel.
   c. **Access Laboratory Instruments**- Now your Y-data, which is the output voltage from the Load Cell will, be acquired from an amplifier and analog to digital converter by enabling the "Acquire Data" button. The X-data will remain a user defined numeric input, the known magnitude of the force (value of weight) applied to the Load Cell. Therefore, **each data pair should be (Value of weight in N, Output voltage of the Load Cell in V).**
   d. **Monitor Display** - It is convenient to be able to monitor the voltage output of the Load Cell on your VI as you apply forces to the Load Cell, then save data when "Acquire Data" is pressed. Add this capability to your VI.
2. Weigh each deadweight using the scale provided and note down the value of weight on a small piece of paper and tape it onto the deadweight. Set the scale to measure in *lbf* and then using the conversion factor of ***1 lbf = 4.44822 N***. To apply forces on the Load Cell simply place the weights on the Load Cell. **The first deadweight to go on the Load Cell should always be the in-house fabricated deadweight. Make sure the deadweight is completely supported by the central platform of the Load Cell and it is NOT supported in way by any screw on the peripheral of the Load Cell. Place the deadweight onto the Load Cell carefully. Please do NOT drop the deadweight onto the Load Cell.** Use your VI to calibrate the Load Cell over the range provided by the dead weights. Collect data for increasing magnitude of the applied force (deadweight) from zero up to the maximum weight (A+2B+2C+2D), then decreasing the magnitude of the applied force back to zero.
3. Obtain three sets of data, each with increasing load up to the maximum weight (A+2B+2C+2D) and back down to zero. Each data set should have seven (7) loading steps because you have seven (7) deadweights. For each loading cycle and at each step, ten readings should be taken; five on the way up to the maximum weight (A+2B+2C+2D) and five on the way down to 0 N.
4. Perform noise analysis with deadweight A on the Load Cell per TA's instruction.

Report Summary:

The purpose for conducting this experiment was to use LabView virtual instruments for a program that would be used to calibrate an electric load cell. The objects needed to complete this task were four different weights, seven of them total. One of the weights used was in-house fabricated and the rest were commercially produced, each having different weight magnitudes. The output voltage sets were obtained by placing the weights of the load cell until maximum weight was reached and back to zero as well. To make sure that the data was being properly collected throughout the procedure, it was monitored that the in-house fabricated weight was fully supported by the platform on the Load Cell device and free from touching the screws surrounding it. In addition, the voltage output of the Load Cell on the VI program was also monitored as the forces were applied correspondingly. Once all the data was collected, it was transferred into a Microsoft Excel file where the results would be summarized and analyzed using a linear regression as theory to fit the mean output voltages.