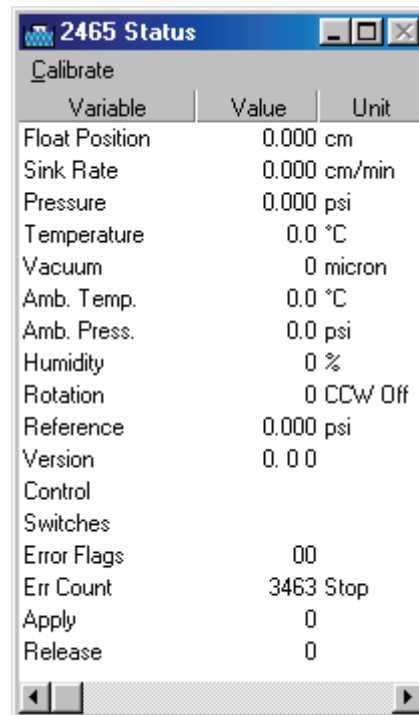controller, as well as a means to calibrate the internal sensors and associated circuitry.

D.3.6.2 2465 Status Window Layout

As shown in Figure 63, the **2465 Status** window displays the current values for the various sensors connected to the Model 2465A Auto Float Controller and 2465A Deadweight Gauge base. The values are displayed in the units selected within the WinPrompt® Software.

FIGURE 63
2465 STATIS WINDOW

D.3.7   2465 STATUS WINDOW CALIBRATION FUNCTIONS

To display the calibration coefficients or provide access to the calibrate function for each variable handled by the **2465 Status** window, select the Calibrate menu item, or double-click the item.

D.3.7.1 Float Position

Figure 64 shows a typical Float Position Calibration screen with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current calibration Coefficients and function buttons for a 5-Point Calibration and Zero offset adjustment.
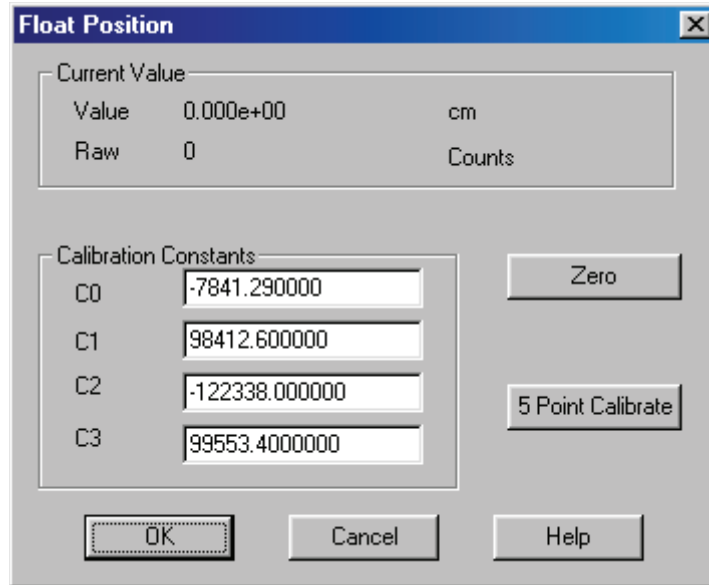
FIGURE 64
FLOAT POSITION WINDOW

The Zero offset should be performed on a weekly basis. The 5-Point calibration should be performed monthly. When the Zero or 5-Point Calibration button is selected a screen is displayed such as in Figure 65.
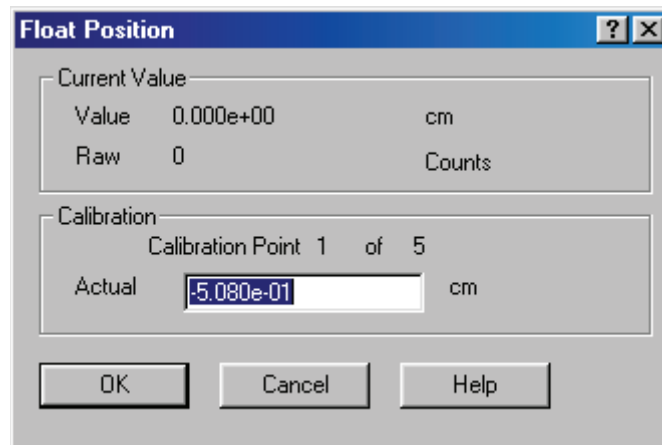

FIGURE 65
FLOAT POSITION WINDOW

The Zero and 5-Point Calibration screens show the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The entry box in the Calibration section allows the user to enter the exact value for the current float position. This value will typically be -5.080E-01 cm (or applicable value if other units are selected) for the Zero function, and will sequence through -5.080E-01 cm, -2.540E-01, 0.000E+00 cm, 2.540E-01 cm, and 5.080E-01 cm (or applicable value if other units are selected) if the 5-Point Calibrate option is selected. Although these values can be changed, it is

recommended that they are not changed and that the spacer rings provided with the unit are used to establish these positions.

D.3.7.1.1 5-Point Calibration Procedure

To perform the Float Position calibration a piston/cylinder assembly and sleeve weight assembly must be installed, and the system pressurized to slightly more than the tare pressure of that piston so that it is gently seated against the upper travel limit.

Step 1
Activate the **Calibrate** item on the 2465 Status Window menu, select **FPI**, then select the **5-Point Calibration** button.

Step 2
Verify that the value in the **Actual** field is set to -5.080E-01 cm (or other appropriate value if different engineering units are selected). Press down on the sleeve weight until it is resting against the lower stop, then click **Ok**.

Step 3
Verify that the value in the Actual field is set to -2.540E-01 cm. Remove the sleeve weight, install the 0.254 cm spacer ring around the pressure column and reinstall the sleeve weight. Press down on the sleeve until it is resting

Step 4
Verify that the value in the Actual field is set to 0.000E+00 cm. Remove the sleeve weight and the 0.254 cm spacer ring. Install the 0.508 cm spacer ring and the sleeve weight. Press down on the sleeve weight until it is resting against the spacer ring, then click **Ok**.

Step 5
Verify that the value in the Actual field is set to 2.540E-01 cm. Remove the sleeve weight, install the 0.254 cm spacer ring on top of the 0.508 cm ring, then reinstall the sleeve weight. Press down on the sleeve weight until it is resting against the spacer ring, then click **Ok**.

Step 6
Verify that the value in the Actual field is set to 5.080E-01 cm. Remove the sleeve weight and the 0.254 cm spacer ring. Install the second 0.508 cm spacer ring on top of the first 0.508 cm ring, then reinstall the sleeve weight. Press down on the sleeve weight until it is resting against the spacer ring, then click **Ok**.

Step 7
Click **Ok** on the Float Position dialog box. Verify that the FPI indication is correct within +/-0.012 cm of the calibration spacer combination. If not, repeat Steps 1 through 7.

D.3.7.1.2 Float Position Zero Procedure

If the spacer rings provided with the unit are used to perform the 5-point calibration described above, no Zero offset adjustment is required. If an alternate method is used the Zero option may be required. To perform the Float Position Zero

offset adjustment a piston/cylinder assembly and sleeve weight assembly must be installed.

Step 1   Activate the **Calibrate** item on the **2465 Status Window** menu, select **FPI**, then select the **Zero** button.

Step 2   Verify that the value in the Actual field is set to -5.080E-01 cm (or other appropriate value if different engineering units are selected). Press down on the sleeve weight until it is resting against the lower stop, then click **Ok**.

Step 3   Click **Ok** on the Float Position dialog box. Verify that the FPI indication is correct within +/-0.012 cm of the calibration spacer combination. If not, repeat Steps 1 through 3.

D.3.7.2 Sink Rate

Sink Rate is computed from the Float Position and no independent calibration is required.

D.3.7.3 Pressure

Figure 66 shows a typical **Pressure Calibration** screen with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for a 2-Point Calibration and Zero offset adjustment.
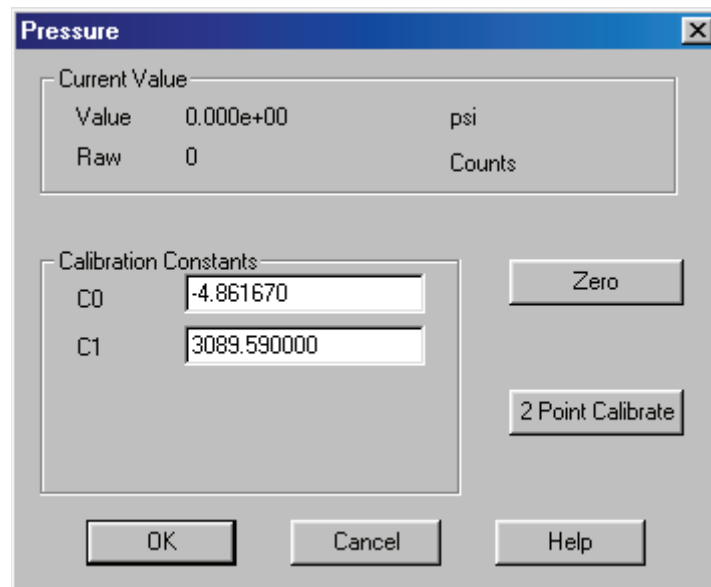

FIGURE 66
PRESSURE WINDOW

The 2-point calibration should be performed annually. The Zero offset should be performed whenever the reading at ambient pressure is more than about 3 kPa (or other appropriate value if different

engineering units are selected) off of zero, and just prior to Very Low Gauge mode operations. When the Zero or 2-Point Calibration button is selected a screen is displayed such as in Figure 67.
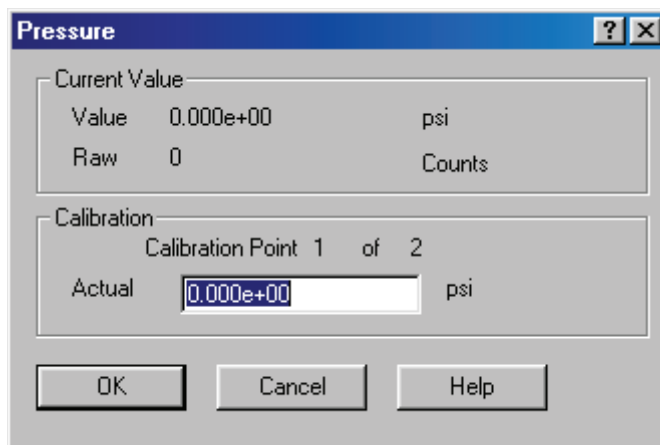

FIGURE 67
PRESSURE WINDOW

The Zero and 2-point Calibration screens show the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The entry box in the Calibration section allows the user to enter the exact value for the current pressure. If the 2-point option is selected two pressures are required. These two pressure should include zero and one pressure between 6.0 and 6.89 MPa. The pressures should be known within about 0.02%. For each pressure, type in the exact pressure applied and click **Ok**.

The Auto Float System can be used to establish the pressures needed to calibrate the Pressure sensor. The calibration screen will remain available during operation of the Auto Float System. To calibrate the pressure sensor using another means, the pressure applied to the pressure sensor must not be greater than the supply pressure connected to the Auto Float Controller or internal components can be damaged.

Perform the following steps to calibrate the Pressure sensor using the Auto Float System (see Section 8.0 and Appendix A);

Step 1   Vent the system using the functions in the WinPrompt® menu.

Step 2   In the **2465 Status** window, activate the **2-Point Calibration** option.

Step 3   Verify that the **Actual** value for Calibration Point 1 of 2 is zero, then click **Ok**.

Step 4   Use the WinPrompt® program to establish a piston pressure between 6.0 and 6.89 MPa.

Step 5   When the piston is floating properly, note the displayed **Actual** pressure.

Step 6   Switch to the **2465 Status** window, type in the **Actual** value for Calibration Point 2 of 2, then click **Ok**.

Step 7   Record the new **C0** and **C1** coefficients for future reference.

Step 8   Click **Ok**, and the calibration is complete.

D.3.7.4 Temperature

Figure 68 shows a typical Temperature calibration window with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for a 2-point Calibration and Zero offset adjustment.
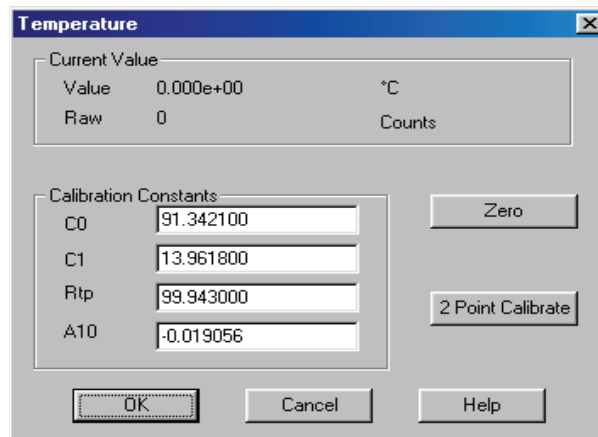

FIGURE 68
TEMPERATURE WINDOW

The 2-point calibration aligns the internal electronics to precision external calibration resistors, such as Ruska Model 2455-11-007 (107 ohm) and 2455-11-008 (111 ohm). The 2-point calibration should be performed annually. The Zero offset adjustment will compute a new C0 coefficient, however this function is not required on this model. When the zero or 2-point Calibration button is selected a screen is displayed such as in Figure 69.
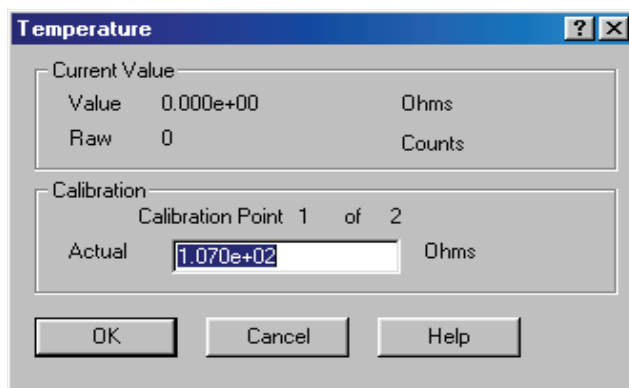
FIGURE 69
TEMPERATURE WINDOW

The Zero and 2-Point Calibration screens show the current measured value in A-to-D converter counts and in ohms. The entry box in the Calibration section allows the user to enter the exact value for the connected external resistance. If the 2-point option is selected two external resistors are required. These two resistors should be nominally 107 and 111 ohms, and the actual values should be known to 0.001 ohm. For each external resistor type in the exact value and click **Ok**. The PRT is calibrated independently and the **Rtp** and **α10** coefficients are entered in the Temperature Calibration screen shown in Figure 68.

D.3.7.5 <u>Vacuum</u>

Figure 70 shows a typical Vacuum calibration window with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for a 2-point Calibration and Zero offset adjustment.
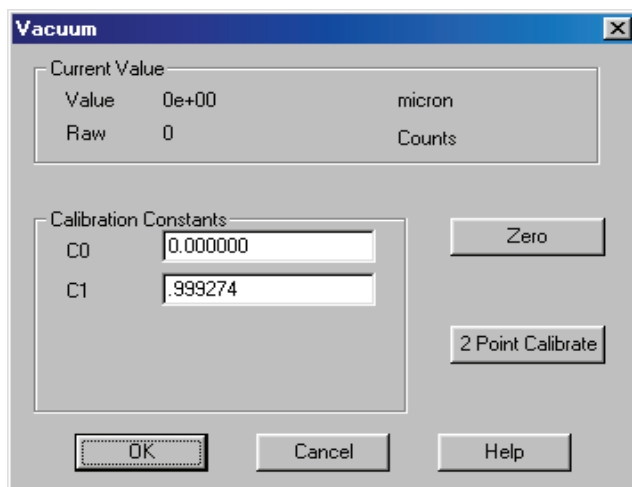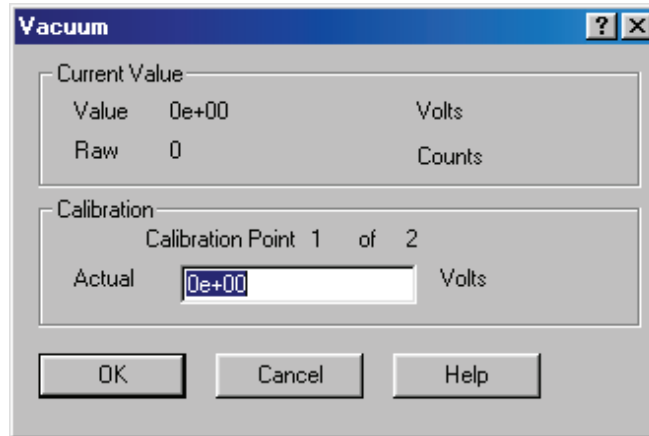

FIGURE 70
VACUUM WINDOW

The 2-Point calibration aligns the internal electronics to an external DC voltage calibration source. The 2-Point calibration should be performed annually. The Zero offset adjustment will compute a new **C0** coefficient, however, this is generally not required. When the Zero or 2-Point Calibration button is selected a screen is displayed such as in Figure 71.

FIGURE 71
VACUUM WINDOW

The Zero and 2-Point Calibration screens show the current measured value in A-to-D converter counts and in volts DC. The entry box in the Calibration section allows the user to enter the exact value for the applied voltage. If the 2-Point option is selected two voltage levels are required. These two voltages should be 0.000 and 1.000 VDC within 0.0005 VDC. For each applied voltage type in the exact value and click **Ok**.

D.3.7.6 Air Density Measurements

Ambient Temperature, **Ambient Pressure** and **Relative Humidity** are used in the determination of ambient air density. All of these measurements are acquired from the Ruska Model 2455-ADM Air Density Module or 2456-LEM Laboratory Environment Modules. The Air Density Module incorporates three environmental sensors, which must each be calibrated periodically for continued accuracy of the Auto Float System accuracy. Refer to sections 9.12 through 9.14 for information on the calibration of the Air Density Module sensors.

D.3.7.7 Ambient Temperature (applies only to 2455-ADM)

Figure 72 shows a typical **Ambient Temperature** calibration window with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for 1-Point and 2-Point Calibration and a Zero offset adjustment. The Zero and 1 Point Calibration options are not used on this model. The 2 Point calibration

is used to compute new coefficients for the Ambient Temperature sensor. For each of the two calibration points, type in the actual applied value and click **Ok**. Record the new **C0** and **C1** coefficients for future reference. If previous calibration coefficients are to be used for the Ambient Temperature sensor, enter the **C0** and **C1** coefficients for the Temperature sensor in the 2455-ADM and click **Ok**. The **Rtp** and **a10** coefficients are constants and should not be changed.
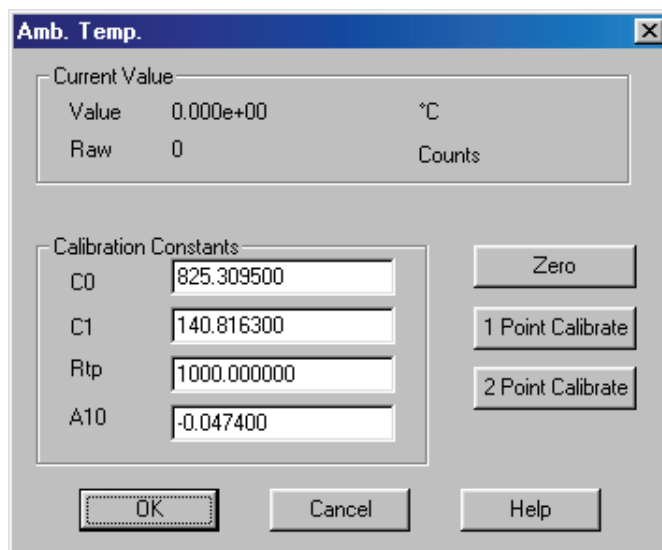

FIGURE 72
AMBIENT TEMPERATURE WINDOW

D.3.7.8 Ambient Pressure (applies only to 2455-ADM)

Figure 73 shows a typical **Ambient Pressure** calibration window with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for 1-Point and 2-Point Calibrations and a Zero offset adjustment. The Zero and 1 Point Calibration options are not used on this model. The 2 Point calibration is used to compute new coefficients for the Ambient Pressure sensor. For each of the two calibration points, type in the actual applied value and click **Ok**. Record the new **C0** and **C1** coefficients for future reference. If previous calibration coefficients are to be used for the Ambient Pressure sensor, enter the **C0** and **C1** coefficients for the Ambient Pressure sensor in the 2455-ADM and click **Ok**.
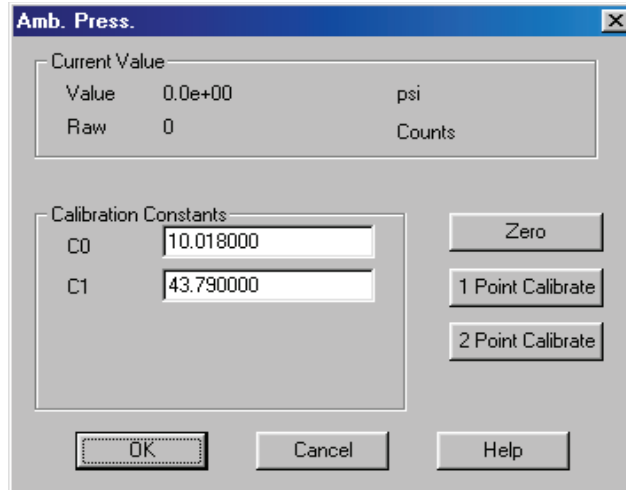
FIGURE 73
AMBIENT PRESSURE WINDOW

D.3.7.9 Humidity (applies only to 2455-ADM)

Figure 74 shows a typical **Humidity** calibration window with the current measured value in A-to-D converter counts and in %RH. The screen displays the current Calibration Coefficients and function buttons for 1-Point and 2-Point Calibrations and a Zero offset adjustment. The Zero and 2 Point Calibration options are not used on this model. The 1 Point calibration is used to compute new coefficients for the Humidity sensor. For the single humidity calibration point, type in the actual applied value and click **Ok**. Record the new **C0** and **C1** coefficients for future reference. If previous calibration coefficients are to be used for the Humidity sensor, enter the **C0** and **C1** coefficients for the Humidity sensor in the 2455-ADM and click **Ok**.
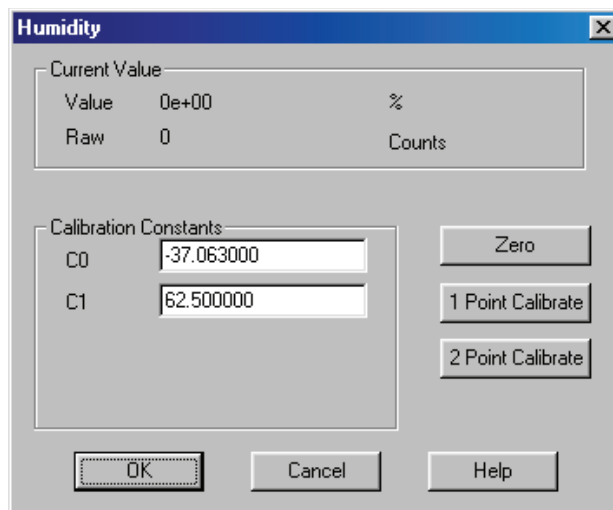

FIGURE 74
HUMIDITY WINDOW

D.3.7.10 Rotation

No independent calibration is required for the rotation sensors.

D.3.7.11 Reference

Figure 75 shows a typical **Reference** calibration window with the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The screen displays the current Calibration Coefficients and function buttons for a 2-Point Calibration and Zero offset adjustment.
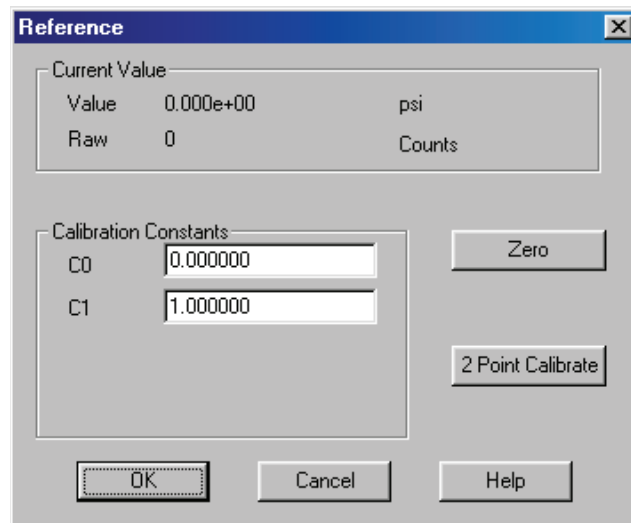

FIGURE 75
REFERENCE WINDOW

The 2-Point calibration should be performed annually. The Zero offset adjustment will compute a new **C0** coefficient, however this function is not required on this model. When the Zero or 2-Point Calibration button is selected a screen is displayed such as in Figure 76.
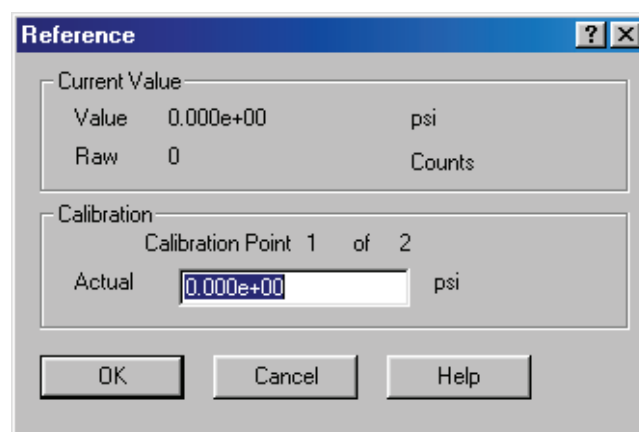

FIGURE 76
REFERENCE WINDOW

The Zero and 2-Point Calibration screens show the current measured value in A-to-D converter counts and in the units set within the WinPrompt® Software. The entry box in the Calibration section allows the user to enter the exact value for the applied pressure. If the 2-Point option is selected two pressures are required. These two pressures should be approximately 80 and 103 kPa absolute, and should be known within about 0.002%. For each pressure, type in the exact pressure applied and click **Ok**.

The Auto Float System can be used to establish the pressures needed to calibrate the Reference sensor. Perform the following steps to calibrate the Reference sensor using the Auto Float System (see to Section 8.0 and Appendix A);

Step 1   In the **2465 Status** window, activate the **2-Point Calibration** option.

Step 2   Use the WinPrompt® program to establish an absolute piston pressure of approximately 80 kPa.

Step 3   When the piston is floating properly, note the displayed **Actual** pressure.

Step 4   Switch to the **2465 Status** window, type in the **Actual** value for Calibration Point 1 of 2, then click **Ok**.

Step 5   Use the WinPrompt® program to establish an absolute piston pressure of approximately 103 kPa.

Step 6   When the piston is floating properly, note the displayed **Actual** pressure.

Step 7   Switch to the **2465 Status** window, type in the **Actual** value for Calibration Point 2 of 2, then click **Ok**.

Step 8   Record the new **C0** and **C1** coefficients for future reference.

Step 9   Click **Ok**, and the calibration is complete.

D.4   2455 FLOAT POSITION INDICATOR

D.4.1   INSTALLING 2455 DRIVER

Step 1 From the menu select **SETUP→DRIVERS**.

Step 2 Remove all drivers from **Installed Drivers** list (see 6.9.2).

Step 3 Select 2455 Serial Driver from Available Drivers list.

Step 4 Click **Install**.

Step 5 Click **Ok** when complete.