Page 1 of 20

CALCULATION COVER SHEET

Title *Instrument Drift Analysis, Barksdale B2T-A12SS Pressure Switches*

CA- *03* - *055* Add. *N/A*

Vendor No. *N/A*

Associated Ref. N/A

10CFR50.59 Screening or Evaluation No: SCR-03-0394

Assigned Personnel

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Record of Issues

Rev	Description	Total No. of Sheets	Last Sheet No.	Preparer	Verifier	Verifier	Approval	Approval Date
0	Original	71	Attach. 5 Page 2	DAW KRM	RDW		MJL	12/1/3

☐ Vendor Verification/Approval in Document

Verification Method(s)

☒ Review ☐ Alternate Calculation ☐ Test ☐ Other

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Approved (Signatures available in Master File)

Page 2 of 20

CA-03 - 055

Design Basis Tracking (Calculation Preparer completes this section).

Does this calculation:

Supercede another calculation? Yes ☐ No ☒ : Calc. No(s):

Augment another calculation? Yes ☒ No ☐ : Calc. No(s): *CA-96-054, Rev 4; CA-96-152, Rev 1*

Affect the Fire Protection Program (Form 3765)? Yes ☐ No ☒

What documents/procedures will be based on this calculation:

Documents/Procedures (include revision):

What plant procedures will be/are used to ensure inputs/assumptions/outputs are maintained:

Procedures (include revision): N/A

What Systems or components are affected?

System(s): TRB, RPV

Component ID's (CHAMPS Equip) PS-5-14A, B, C, D; PS-2-3-51A, B, C, D

DBD Section (if any): B.05.06

Topic Code (eg. ASME Section XI etc): Instrument Setpoints

Other Comments:

Approved (Signatures available in Master File)

1.0 PURPOSE

This calculation performs a drift analysis of Barksdale B2T-A12SS pressure switches using past calibration history data. This drift analysis is being performed to support extended calibration and surveillance intervals as part of the 24-Month Fuel Cycle Extension project. This calculation will extrapolate the calculated drift value from the existing 18-month (+25%) calibration interval to a maximum interval of 30 months (24 months +25%).

Instruments included in this drift analysis are:

Equipment ID	Function
PS-2-3-51A	Low Reactor Pressure - Low VAC/MSIV SCRAM Bypass
PS-2-3-51B	Low Reactor Pressure - Low VAC/MSIV SCRAM Bypass
PS-2-3-51C	Low Reactor Pressure - Low VAC/MSIV SCRAM Bypass
PS-2-3-51D	Low Reactor Pressure - Low VAC/MSIV SCRAM Bypass
PS-5-14A	Turbine Stop Valve Closure / Generator Load Reject SCRAM Bypass
PS-5-14B	Turbine Stop Valve Closure / Generator Load Reject SCRAM Bypass
PS-5-14C	Turbine Stop Valve Closure / Generator Load Reject SCRAM Bypass
PS-5-14D	Turbine Stop Valve Closure / Generator Load Reject SCRAM Bypass

The results of this analysis are limited to Barksdale B2T-A12SS pressure switches. Use of this analysis for B2T-A12SS pressure switches in functions other than those listed above must be evaluated to ensure that they are exposed to similar operating and environmental conditions.

2.0 METHODOLOGY

This drift analysis follows the methodology presented in ESM-03.02-APP-III (Input 4.1). The instructions in the ESM are based on the as-found as-left (AFAL) analysis methodology described in EPRI Document TR-103335R1 (Reference 10.1).

The methodology for determining instrument drift values is not described in the USAR or its references.

3.0 ACCEPTANCE CRITERIA

An Analyzed Drift (AD) value will be established with a 95%/95% tolerance interval for a 30 month calibration frequency. That is, there is a 95% probability that the constructed limits contain 95% of the population of interest for a 30-month calibration interval.

4.0 INPUTS

4.1 ESM-03.02-APP-III, Revision 3, Drift Analysis (Instrumentation and Controls). The ESM provides plant specific guidance on the implementation of the EPRI guidelines on drift analysis (Reference 10.1).

4.2 Monticello Component Master List (CML). The CML provides the recent calibration records and maintenance history for the instruments included in this calculation.

4.3 Form 7702, Instrument Calibration and Maintenance Record, PS-2-3-51A, Sheets 1 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.4 Form 7702, Instrument Calibration and Maintenance Record, PS-2-3-51B, Sheets 1 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.5 Form 7702, Instrument Calibration and Maintenance Record, PS-2-3-51C, Sheets 1 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.6 Form 7702, Instrument Calibration and Maintenance Record, PS-2-3-51D, Sheets 1 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.7 Form 7702, Instrument Calibration and Maintenance Record, PS-5-14A, Sheets 0 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.8 Form 7702, Instrument Calibration and Maintenance Record, PS-5-14B, Sheets 0 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.9 Form 7702, Instrument Calibration and Maintenance Record, PS-5-14C, Sheets 0 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.10 Form 7702, Instrument Calibration and Maintenance Record, PS-5-14D, Sheets 0 through 3. Form 7702 provides the calibration records and maintenance history prior to the existence of the CML database.

4.11 CA-96-054, Revision 3, "Turbine Stop Valve Closure/Generator Load Reject Scram Bypass Setpoint Calculation." This calculation provides the existing setpoint and instrument information listed in Attachment 1.

4.12 CA-96-152, Revision 0, "Instrument Setpoint Calculation - Low Reactor Pressure - Low Vacuum/MSIV Scram Bypass." This calculation provides the existing setpoint and instrument information listed in Attachment 1.

5.0 ASSUMPTIONS

5.1 None.

6.0 ANALYSIS

6.1 Data Grouping

The following Barksdale B2T-A12SS pressure switches are included in this calculation:

Equipment ID	Range	Setpoint
PS-2-3-51A	50 to 1200 psig	582 psig
PS-2-3-51B	50 to 1200 psig	582 psig
PS-2-3-51C	50 to 1200 psig	582 psig
PS-2-3-51D	50 to 1200 psig	582 psig
PS-5-14A	50 to 1200 psig	125 psig
PS-5-14B	50 to 1200 psig	125 psig
PS-5-14C	50 to 1200 psig	125 psig
PS-5-14D	50 to 1200 psig	125 psig

As shown in Attachment 1, the pressure switches are exposed to similar environmental conditions. However, the switches are exposed to different service conditions. A t-Test (Two Sample Assuming Unequal Variances) and a F-distribution test will be performed on the data from the two instrument groups to verify that the switches may be combined for the drift analysis.

6.2 Populating the Spreadsheet

Calibration data for the pressure switches was obtained from the Monticello CML (Input 4.2) and Instrument Calibration and Maintenance Records (Inputs 4.3 through 4.10). This information was input into a Microsoft Excel spreadsheet, see Attachment 2, Sheets 1 through 16. Note that data is available for switches PS-2-3-51A, B, C, and D prior to commercial operation of the plant. However, because of probable differences in process and environmental conditions, the test data prior to commercial operation is eliminated from the analysis, except for the As Left data for the latest test preceding commercial operation.

One pressure switch (PS-5-14D) was replaced in 1991 due to failure of the installed switch. The As Found data for this switch is removed from the analysis on 4/8/91, and the As Found and As Left data for 4/2/91 is removed from the analysis, since the replacement was performed on 4/8/91 and since the malfunctioning switch was observed on 4/2/91. Additionally, the As Found and As Left data for the prior calibration, 8/22/89, is removed because from the very large drift observed for these calibrations in relation to the other drift values, the switch had obviously failed prior to the 8/22/89 calibration. Inclusion of this drift data would not accurately represent drift of these switches. An improved drift-monitoring program, as will be implemented at the end of this project, would have detected this failure earlier and required switch replacement or repair.

Finally, the As Found data for PS-5-14D for the calibration on 1/22/1972 is illegible, and therefore not included in this analysis. Since the data from only one calibration was available prior to this one, the data from the calibration on 1/6/71 is also removed.

The time interval between calibrations was calculated for each drift point by taking the difference between the current calibration date and the date of the previous calibration.

The Drift value for each calibration checkpoint was calculated by taking the difference between the current calibration As-Found value and the previous calibration As-Left value.

6.3 Spreadsheet Performance of Basic Statistics

The following information was determined for each instrument:

The average ($\bar{x}$) for the drift data for each instrument was determined by using the "AVERAGE" function.

The standard deviation (s) for each instrument was determined by using the "STDEV" function. The Standard Deviation function returns the measure of how widely values are dispersed from the mean of the data.

Formula used by Microsoft Excel to determine the standard deviation:

$$s = \sqrt{\frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}}$$

where:
x - Sample data values (x_1, x_2, x_3, ...)
s - Standard deviation of all sample data points
n - Total number of data points

The variance (s^2) for each instrument was determined by using the "VAR" function. The variance function returns the measure of how widely values are dispersed from the mean of the data. The variance can also be determined by taking the square of the standard deviation.

Formula used by Microsoft Excel to determine the variance:

$$s^2 = \frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}$$

where:
x - Sample data values (x_1, x_2, x_3, ...)
s^2 - Variance of sample population
n - Total number of data points

The number of data points (n) for each instrument was determined by using the "COUNT" function.

The largest positive drift value each instrument was determined by using the "MAX" function.

The largest negative drift value each instrument was determined by using the "MIN" function.

The psi values for average, standard deviation, and largest drift values were converted to percent of span using the following formula:

$$\%\ \text{Span} = \frac{\text{psi}}{\text{psi Span}} \times 100\%$$

A Drift Trend Plot was developed for each instrument by plotting the drift value versus calibration date. Bounds corresponding to ±2 Sigma (2 Standard Deviations) are shown on the plot.

Page 17 of Attachment 2 presents the combined drift data statistics for the subject pressure switches. The combined statistics were determined following the methods described above.

6.4 Outlier Detection and Expulsion

The calibration interval and drift data were copied to the spreadsheet shown on Pages 18 through 22 of Attachment 2. The average, standard deviation, largest positive drift, largest negative drift, and sample count for the data set is recalculated for use in the outlier detection portion of the calculation.

The Critical Values for t-Test is utilized to detect the presence of outliers in the final data set. The value used for the Critical Values of t-Test is obtained from Table 9.2 of Input 4.1. Since there are over 150 sample points for this calculation, a value of 4.00 is used.

t-Test Outlier Detection Equation:

$$T = \frac{|x_i - \bar{x}|}{s}$$

where:

x_i - An individual sample data point

$\bar{x}$ - Mean of all sample data points

s - Standard deviation of all sample data points

T - Calculated value of extreme studentized deviate that is compared to the critical value of t for the sample size.

If the calculated value of T exceeds the critical value for the sample size and desired significance level, then the evaluated data point is identified as an outlier. The spreadsheet is setup so a blank is displayed in the Outlier Test column if the calculated T exceeds the critical value.

No outliers are detected for this calculation.

6.5 Verification of Data Grouping

Since the pressure switches perform different functions and are located in different buildings, a t-Test (two samples assuming unequal variances) was performed on the proposed grouping to determine whether the two samples are likely to have come from the same two underlying populations that have unequal variances. Note that although different functions are performed the applications are similar. Also note that the buildings are different, but the environments are similar.

Pages 23 through 25 of Attachment 2 present the results of the t-Test performed using the t-Test: Two-Sample Assuming Unequal Variances analysis tool within Microsoft Excel for the data.

The following formula is used to determine the test statistic value t:

$$t = \frac{\bar{x} - \bar{y} - \Delta_0}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}}$$

where:

- t - test statistic
- m - Number of data points in sample 1
- n - Number of data points in sample 2
- $\bar{x}$ - Mean of sample 1
- $\bar{y}$ - Mean of sample 2
- s^2 - Variance of the two samples
- Δ_0 - Hypothesized mean difference (0 if testing for equal means)

The following formula is used to estimate the degrees of freedom for the test statistic:

$$df = \frac{\left(\frac{s_1^2}{m} + \frac{s_2^2}{n}\right)^2}{\frac{\left(\frac{s_1^2}{m}\right)^2}{m-1} + \frac{\left(\frac{s_2^2}{n}\right)^2}{n-1}}$$

Per the t-Test, combining the two data sets is acceptable since the absolute value of the Test Statistic (t Stat) is less than the t Critical two-tail value.

F-distribution Test: The F-distribution test is used to determine if the two sample variances are likely to have come from the same underlying population. The F value is determined by the ratio of the smallest and largest variances:

$$F_{calc} = \frac{s_1^2}{s_2^2}$$

where:
s_1^2 - largest drift variance value
s_1^2 - smallest drift variance value

The critical value of the F-distribution is found using the FINV function in Microsoft EXCEL:

$$F_{crit} = FINV(0.05, \nu_1, \nu_2)$$

Where:
ν_1 - number of samples minus 1 associated with largest variance
ν_2 - number of samples minus 1 associated with smallest variance

The F-distribution tests barely fails, with the calculated F value being approximately equal to 1.40, when F_{crit} is 1.38. Analysis of the mean and standard deviation of the two groups of data shows them to be very similar. The data passed the t-Test, and barely failed the F test. The switches are located in similar ambient environments, have the same adjustable range, same manufacturer and model number, and similar settings. Therefore, per Section 4.5.4.C of Input 4.1, there is no plausible engineering explanation for the two sets of data being incompatible, and the groups are combined for this analysis.

6.6 Normality Tests

Chi-Squared, χ^2, Goodness of Fit Test -The χ^2 test compares the actual distribution of sample values to the expected distribution. The expected values are calculated by using the normal mean and standard deviation for the sample. If the distribution is normally or approximately normally distributed, the difference between the actual versus expected values should be very small. And, if the distribution is not normally distributed, the differences should be significant.

The Chi-Squared test is included on page 26 of Attachment 2. The Chi-Squared test is performed with 12 bins of data, starting from $-\infty$ to (mean-2.5σ), with bin increments of 0.5σ, ending at (mean+2.5σ) to $+\infty$.

The Chi-Squared test is performed using the Histogram function within Microsoft Excel. Excel counts the number of data points between the current bin value and the adjoining higher bin value. All values below the first bin are counted together, as are the values above the last bin value.

To establish the upper limit for each bin, the Standard Deviation of the final data set is multiplied by the Multiples of the Standard Deviation and added to the Average. The Excel Histogram function is performed with the drift data set used as the Input Range and the Bin Upper Limit used as the Bin Range. The result of the Histogram function is shown under the Bin and Observed Frequency columns.

The expected frequency percentage for each bin is taken from Table 9.3 of Input 4.1. The total number of samples is multiplied by the expected frequency percentage to obtain the Expected Frequency. The deviation between the expected frequency and the observed frequency is calculated for each bin and for the total sample:

$$\text{Deviation} = \frac{(O_i - E_i)^2}{E_i}$$

where:

E_i - Number of sample items expected in a bin
O_i - Observed number of sample items in a bin

and:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where:

χ^2 - Chi-squared result

Computing the chi-squared per degree of freedom term:

$$\chi_o{}^2 = \frac{\chi^2}{d}$$

where:

d - degrees of freedom

The degrees of freedom term is computed as the number of bins used for the chi-squared computation minus the constraints. For these drift calculations, the count, mean, and standard deviation are computed. Therefore, the constraints term is equal to 3 and the degrees of freedom term is equal to 9.

Since χ_o^2 is greater than 1, another check is made. The degrees of freedom and obtained chi-squared value are used to look up the probability that the observed χ_o^2 will exceed the expected value. The degrees of freedom and the calculated χ_o^2 are used with Table 9.4 of Input 4.1 to determine the probability that the observed χ_o^2 will exceed the expected value. If the lookup value is greater than or equal to 5%, then the assumption of normality will not be rejected.

Since the lookup value is less than 5%, the assumption of normality is rejected.

The D-Prime (D') Test - The D' Test calculates a test statistic value for the sample population and compares the calculated value to the values for the D' percentage points of the distribution, which are tabulated in Table 9.7 of Input 4.1. The D' Test is two-sided, which means that the two-sided percentage limits at the stated level of significance must bound the calculated D' value. For the given sample size, the calculated value of D' must lie within the two values provided in Table 9.7 in order to accept the hypothesis of normality.

The D' Test is included on pages 27 through 31 of Attachment 2.

To perform a D' Test, the data set with the outlier removed is sorted and numbered in ascending order from smallest to largest.

Calculate the estimated Variance of the sample:

$$s^2 = \frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}$$

Where:

s^2 - Unbiased estimate of the sample population variance
n - Total number of data points
x - Sample data point

Calculate the S^2 for the group:

$$S^2 = (n-1) \times s^2$$

where:

S^2 - Sum of the Squares about the mean
s^2 - Unbiased estimate of the sample population variance
n - Total number of data points

Calculate the linear combination (T) of the sample group:

$$t_i = \left(i - \frac{n+1}{2}\right) \times x_i$$

$$T = \sum t_i$$

where:

i - The number of the sample point
n - Total number of data points
x_i - An individual sample data point

Calculate the D' value for the sample group:

$$D' = \frac{T}{S}$$

Determine the critical D' values from Table 9.7 of Input 4.1. The calculated D' value is within the critical value limits, and the assumption of normality is not rejected.

Histogram - Since the D' Test does not reject the assumption of normality; a coverage analysis is unnecessary for this data set. For information only, the histogram is plotted for this data set on page 26 of Attachment 2, and the NAF is set equal to 1. The histogram graphically shows the difference between the expected normal distribution and the observed distribution, based on the results of the Chi-Squared analysis.

Tolerance Interval Determination - A 95%/95% tolerance interval is determined for the data set, which is shown on page 26 of Attachment 2.

$$TI_{95/95} = s \times TIF_{95/95} \times NAF$$

Where:

$TI_{95/95}$	- 95%/95% Tolerance Interval
s	- drift standard deviation
$TIF_{95/95}$	- 95%/95% Tolerance Interval Factor from Table 9.1 of Input 4.1
NAF	- Normality Adjustment Factor (1 for this data set)

6.7 Time Dependency Testing

Drift Interval Plot - A drift interval plot, showing the drift data plotted against the time interval between tests for the data points, is included on page 32 of Attachment 2. A prediction line is included on the chart, along with the equation of the prediction line. This plot provides visual indication of the trend of the mean and of any increases in the scatter of the data over time.

The tolerance interval calculated in Section 6.6 is added to the plot as a plus/minus band, centered around zero. The 30-month analyzed drift value (determined in Section 6.9) is also shown on the plot.

Binning Analysis - The binning analysis is included on pages 33 through 38 of Attachment 2. The data set is copied onto the worksheet and then split by bins per the bin divisions given in Section 4.8.3.A of Input 4.1. The standard deviation, mean, average time interval, count of the data in each time bin, and percentage of data in each time bin are calculated.

There are 4 valid bins containing data for 0 to 1.25 months (Bin 1), 7.5 to 15 months (Bin 4), 15 to 22.5 months (Bin 5), and 22.5 to 30 months (Bin 6). The standard deviations and average drift for these four bins are shown graphically on page 38.

The binning analysis shows that the standard deviation of the drift generally increases with the increased calibration time interval. The magnitude of the mean of the drift varies with the increased calibration time interval.

For evaluation of the binning method, the critical value of the F-distribution is compared to the ratio of the largest to smallest variances for the evaluated bins:

$$F_{calc} = \frac{s_1^2}{s_2^2}$$

where:

s_1 - largest drift standard deviation value
s_2 - smallest drift standard deviation value

The critical value of F-distribution is found using the FINV function in Microsoft Excel:

$$F_{crit} = \text{FINV}(0.05, \nu_1, \nu_2)$$

where:

ν_1 - number of samples minus 1 in bin with the largest standard deviation
ν_2 - number of samples minus 1 in bin with the smallest standard deviation

Since F_{calc} is larger than F_{crit}, the standard deviations of the drift uncertainty for the two bins appear to be different, which is indicative of time-dependent behavior.

Drift Regression – A drift analysis is performed using the regression option within the "Data Analysis" package under "Tools" in Microsoft EXCEL. The Y range is established as the drift data range from the final data set, and the X range is the corresponding calibration time intervals. The output of the regression routine is a list of residuals, an Analysis of Variance (ANOVA) table listing, and a plot of the drift versus the calibration interval. The output of the regression analysis (without the list of residuals) is included on page 39 of Attachment 2.

The Excel FINV function is used to return the critical value of F using the significance level (in this case 0.05 or 5%) as a probability argument to FINV, 2 as the numerator degrees of freedom, and the data count minus two as the denominator.

Absolute Value of Drift Regression – The Absolute Value of Drift Regression analysis is performed as described above except the absolute value of drift is used instead of the drift values. The output of this Absolute Value of Drift Regression analysis (without the list of residuals) is included on page 40 of Attachment 2.

R Squared Test (Regression Analyses) – The R Squared value, printed out in the ANOVA table, is used as a relatively good indicator as to how drift may behave with respect to time. If the value is greater than 0.09, then it appears that the drift data closely conforms to a linear function and may be time dependent. The R Squared value for the Drift Regression is less than 0.09, thus not supporting an indication of time dependency in the mean of drift. The R Squared value for the Absolute Value of Drift Regression is also less than 0.09, thus not supporting an indication of time dependency in the standard deviation of drift.

P Value Test (Regression Analyses) - A P Value for X Variable 1 less than 0.05 is indicative of time dependency. The P Values for X Variable 1 for both the Drift Regression analysis and the Absolute Value of Drift Regression analysis are less than 0.05, thus indicating possible time dependency for the mean and standard deviation of the drift.

Significance of F Test (Regression Analyses) - An ANOVA table F value greater than the critical value of F determined using the FINV function of Microsoft EXCEL is indicative of possible time dependency. The F Values for the Drift Regression analysis and for the Absolute Value of Drift Regression analysis are greater than the critical F-table value, thus indicating possible time dependency for the mean and standard deviation of drift.

Results of Time Dependency Analysis

Evaluation of the Mean for Time Dependency – The trend line in the binning analysis plot shows that the average (mean) varies over time, and crosses the zero axis; which is not indicative of time dependent behavior for the bias term of drift. The Drift Regression Analysis R-Squared, P Value, and Significance of F Tests indicate time dependent behavior, but once again, the trend line crosses zero near the middle of the analyzed surveillance intervals. This demonstrates that time-dependant behavior is not indicated in the mean.

Evaluation of the Standard Deviation for Time Dependency – The trend line in the binning analysis plot shows that the standard deviation has a positive slope from Bin 1 to Bin 4, a slightly decreased slope from the Bin 4 to Bin 5, and an even more pronounced decrease from the Bin 5 to Bin 6. However, when looking at the plot as a whole, all of the last three bins have larger standard deviations than the first bin. Therefore, it is difficult to tell if significant time dependent behavior exists from the binning plot alone.

The binning analysis F_{calc} value is larger than the F_{crit} value; thus the standard deviations of drift for Bin 1 compared to Bin 4 appear to be dissimilar; therefore, time-dependent behavior is possibly indicated by this test. The absolute value regression analysis shows a positive slope. The absolute value regression analysis P Value, and Significance of F Tests also support an indication of time dependency; however the R-Squared test does not support an indication of time dependency.

Based on the F and P tests from the absolute value regression analysis and the F test from the binning analysis, the standard deviation of the drift is conservatively determined to be strongly time dependent for the purposes of extrapolation.

6.8 Drift Bias Determination

The absolute value of the calculated average for the final data set is 0.59 psi or 0.0512% of span. This is less than 0.1% of span and insignificant when compared to the standard deviation of 8.22 psi (0.7148% of span). (See page 22 of Attachment 2.) Therefore, per Section 4.9 of Input 4.1, a significant drift bias does not appear to exist for these pressure switches, and is not considered in this analysis.

6.9 Calculate Analyzed Drift Value

Based on the results of the time dependency tests discussed above, the drift will be conservatively treated as if it were strongly time dependent. A maximum observed calibration time interval of 23.9 months (average calibration interval of Bin 6 on page 37 of Attachment 2) is used:

Bias Term

From Section 6.8, there is no bias term.

$$AD_{E.bias} = 0$$

Random Term

The random portion of the Analyzed Drift is calculated by multiplying the Standard Deviation (s) of the data set by the 95%/95% Tolerance Interval Factor ($TIF_{95/95}$) and by the normality adjustment factor (NAF):

$$AD = s \times TIF_{95/95} \times NAF$$
$$AD = 8.2207 \times 2.143 \times 1$$
$$AD = 17.6170 \text{ psi or } 1.6\% \text{ of span}$$

30-Month Predicted Drift (Random Term)

The analyzed drift is extended to a predicted 30-month drift:

$$AD_{E.random} = AD \times \frac{CI_E}{CI_O}$$

where:

$AD_{E.random}$ - random drift term for the extended calibration interval
CI_E - extended calibration interval (surveillance interval +25%)
CI_O - Average calibration time interval of Bin 6 (longest valid bin)

$$AD_{E.random} = 17.6170 \times \frac{30}{23.9}$$
$$AD_{E.random} = 22.2 \text{ psi or } 2.0\% \text{ of span}$$

This result is checked against the uncertainty calculated with the 99%/95% tolerance factor:

$$AD_{99/95} = AD \times \frac{TIF_{99/95}}{TIF_{95/95}}$$
$$AD_{99/95} = 17.6170 \times \frac{2.222}{2.143}$$
$$AD_{99/95} = 18.3 \text{ psi}$$

The calculated $AD_{E.random}$ is more conservative than the $AD_{99/95}$ value. Therefore the predicted drift 95%/95% tolerance interval for a 30-month maximum calibration frequency is:

$$AD_E = \pm 22.2 \text{ psi or } 2.0\% \text{ of span } (\leq 30 \text{ Months})$$

6.10 Comparison to Existing Setpoint Calculations

Attachment 1 lists the drift allowances currently used within the setpoint calculations that use these pressure switches as inputs.

The setpoint calculations use drift allowances of 24.5 psi (2.13% of span) and 23.0 psi (2% of span) which bounds both the 95%/95% AD of 1.6% of span and the predicted 30-Month drift uncertainty of 2.0% of span.

7.0 CONCLUSIONS

No outliers were identified by the T-test.

The assumption that the data is normally distributed is supported by the results of the D-Prime test.

A time dependency analysis was performed to detect any changes in drift values due to changes in calibration intervals. The analysis supports a conclusion of treating the drift value as strongly time dependent.

The results of this calculation are summarized below:

	psi	
Standard Deviation (s)	8.2207	
Mean	-0.59	
$TIF_{95/95}$	2.143	
NAF	1.0	
AD_{bias}	0	
AD_{random}	17.6170	1.6% of span
$AD_{E.bias}$	0	
$AD_{E.random}$	22.2	2.0% of span

Therefore the predicted drift 95%/95% tolerance interval for a 30-month maximum calibration frequency is:

$AD_E = \pm 22.2$ psi or 2.0% of span ($\leq$30 Months)

Calculations CA-96-054 and CA-96-152 use a drift allowance which bounds both the calculated 95%/95% AD and the projected 30-Month drift uncertainty. These calculations do not require revision for the 2-year fuel cycle project.

8.0 FUTURE NEEDS

None.

9.0 ATTACHMENTS

1. Instrument Information
2. Drift Analysis Spreadsheets
3. Form 3765, Fire Protection Program Checklist
4. Fire Protection Program Disposition
5. Form 3495, Calculation/Analysis Verification Checklist

10.0 REFERENCES

10.1 "Guidelines for Instrument Calibration Extension/Reduction – Revision 1: Statistical Analysis of Instrument Calibration Data," EPRI, Palo Alto, CA: 1998. TR-103335R1.

10.2 NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle."

10.3 User's Manual: IPASS (Rev. 2), Instrument Performance Analysis Software System for As-Found-As-Left (AFAL) Data, Final Report, July 1999.

10.4 Calculation CA-96-054, Revision 3, Turbine Stop Valve Closure/Generator Load Reject Scram Bypass Setpoint Calculation.

10.5 Calculation CA-96-152, Revision 0, Instrument Setpoint Calculation - Low Reactor Pressure - Low Vacuum/MSIV Scram Bypass.

10.6 USNRC Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," December 1999.

MONTICELLO NUCLEAR GENERATING PLANT		CA-03-055
TITLE:	Instrument Drift Analysis Barksdale B2T-A12SS Pressure Switches	Revision 0
		Attachment 1 Page 1 of 1

Instrument ID	PS-2-3-51A PS-2-3-51B PS-2-3-51C PS-2-3-51D	PS-5-14A PS-5-14B PS-5-14C PS-5-14D
Function	Low Reactor Pressure - Low VAC/MSIV Scram Bypass	Turbine Stop Valve Closure / Generator Load Reject Scram Bypass
Span	50 to 1200 psig	50 to 1200 psig
Location	Reactor Bldg 962' C-55 (A&B) Reactor Bldg 962' C-56 (C&D)	Turbine Bldg 951' East Shield Wall
Temperature	60 - 104°F	60 - 104°F
Radiation	Background	Background
Pressure	Atmospheric	Atmospheric
Humidity	20 - 100%	20 - 100%
Static Pressure	Reactor Pressure	Turbine 1st Stage Pressure
Setpoint Calc.	CA-96-152	CA-96-054
Drift Allowance	24.5 psi (2.13% span)	23.0 psi (2% span)
Setpoint	582 psig (46.3% span)	125 psig (6.5% span)

Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/6/2003	17.1	585.0	585.0	2.0
11/30/2001	21.8	583.0	583.0	2.0
2/3/2000	21.8	593.0	581.0	-5.0
4/9/1998	23.0	598.0	598.0	2.0
5/9/1996	18.9	582.0	596.0	-14.0
10/12/1994	18.8	608.0	596.0	12.0
3/18/1993	22.0	588.0	596.0	-11.0
5/16/1991	6.5	599.0	599.0	3.0
10/31/1990	11.8	596.0	596.0	-3.0
11/5/1989	22.9	607.0	599.0	7.0
12/9/1987	17.4	587.0	600.0	-13.0
6/26/1986	18.7	605.0	600.0	8.0
12/4/1984	23.9	585.0	597.0	-14.5
12/5/1982	10.9	599.5	599.5	3.5
1/8/1982	19.9	596.0	596.0	-1.0
5/12/1980	1.9	608.0	597.0	8.0
3/14/1980	16.4	583.0	600.0	-15.0
10/30/1978	12.2	606.0	598.0	6.0
10/24/1977	24.9	592.0	600.0	-7.0
9/25/1975	8.3	618.0	599.0	18.0
1/15/1975	9.0	593.0	600.0	-5.0
4/16/1974	11.1	592.0	598.0	-8.0
5/12/1973	0.8	612.0	600.0	12.0
4/18/1973	1.1	598.0	600.0	-2.0
3/16/1973	15.0	610.0	600.0	-2.0
12/13/1971	0.8	614.0	612.0	2.0
11/19/1971	5.5	606.0	612.0	-6.0
6/5/1971			612.0	

Average	$\bar{x}$ (psi)	-0.778
Standard Deviation	s (psi)	8.736
Variance	s^2 (psi)	76.31
Largest Positive Drift	(psi)	18.0
Largest Negative Drift	(psi)	-15.0
Number of Samples	n	27

Average	$\bar{x}$ (%)	-0.0676
Standard Deviation	s (%)	0.7596
Largest Positive Drift	(%)	1.5652
Largest Negative Drift	(%)	-1.3043

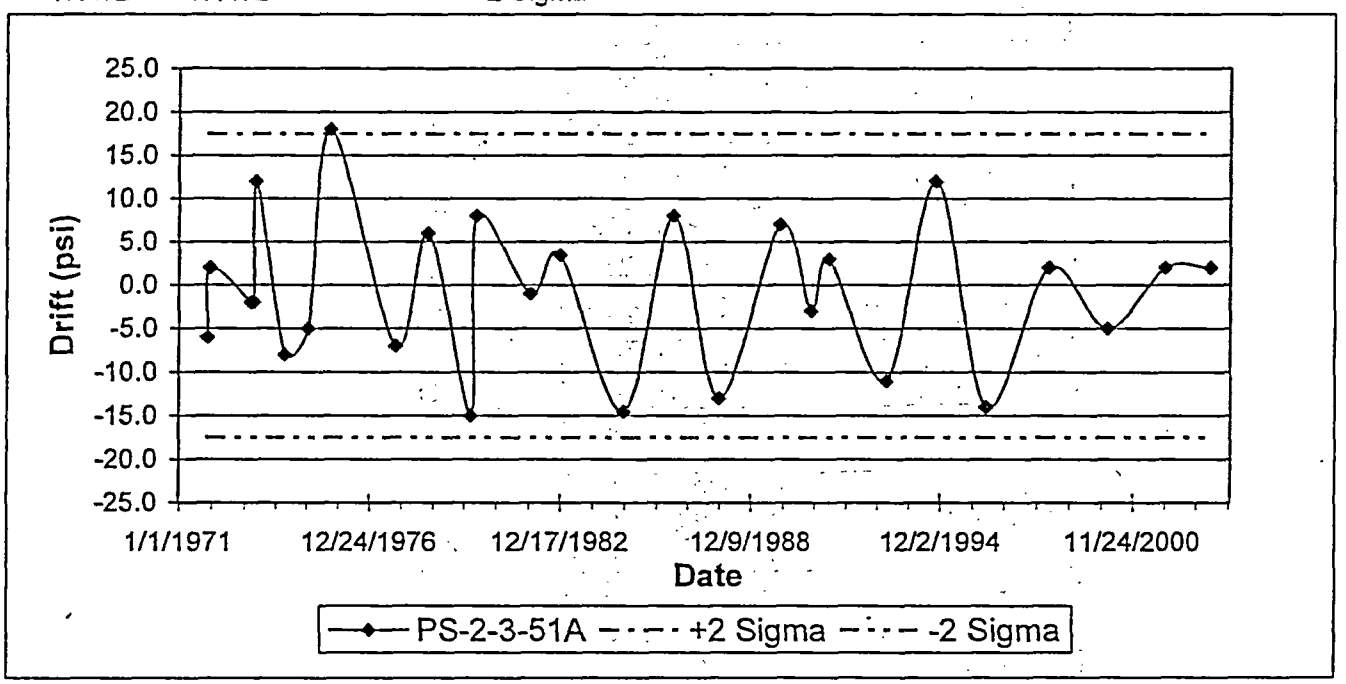
Notes:

4/18/73	C.1	Poor Calibration Techniques - Two entries recorded for the same date. Used As Found from first entry, As Left from second entry.
3/23/93	C.1	Poor Calibration Techniques - CML entry for this date is a duplicate of data listed for 3/18/93. No performance of 0007-B was found in ARMS for this date.

Data for Trend Plot

Standard Deviation (s): 8.736

11/19/71	5/6/03	
17.472	17.472	+2 Sigma
-17.472	-17.472	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/6/2003	17.1	581.0	581.0	-2.0
11/30/2001	21.8	587.0	583.0	4.0
2/3/2000	21.8	593.0	583.0	-5.0
4/9/1998	23.0	598.0	598.0	2.0
5/9/1996	18.9	585.0	596.0	-12.0
10/12/1994	18.8	609.0	597.0	13.0
3/18/1993	22.0	586.0	596.0	-11.0
5/16/1991	18.3	597.0	597.0	3.0
11/5/1989	22.9	607.0	594.0	7.0
12/9/1987	17.4	587.0	600.0	-13.0
6/26/1986	18.7	607.0	600.0	7.0
12/4/1984	23.9	592.0	600.0	-6.5
12/5/1982	10.9	602.5	598.5	4.5
1/8/1982	19.9	598.0	598.0	1.0
5/12/1980	1.9	603.0	597.0	3.0
3/14/1980	16.4	592.0	600.0	-7.0
10/30/1978	12.2	599.0	599.0	-1.0
10/24/1977	24.9	586.0	600.0	-13.0
9/25/1975	8.3	610.0	599.0	11.0
1/15/1975	9.0	602.0	599.0	5.0
4/16/1974	11.1	592.0	597.0	-8.0
5/12/1973	0.8	601.0	600.0	1.0
4/18/1973	1.1	600.0	600.0	0.0
3/16/1973	3.4	612.0	600.0	2.0
12/1/1972	11.6	620.0	610.0	8.0
12/13/1971	0.8	612.0	612.0	0.0
11/19/1971	5.5	608.0	612.0	-4.0
6/5/1971			612.0	

Average	$\bar{x}$ (psi)	-0.407
Standard Deviation	s (psi)	7.182
Variance	s^2 (psi)	51.58
Largest Positive Drift	(psi)	13.0
Largest Negative Drift	(psi)	-13.0
Number of Samples	n	27

Average	$\bar{x}$ (%)	-0.0354
Standard Deviation	s (%)	0.6245
Largest Positive Drift	(%)	1.1304
Largest Negative Drift	(%)	-1.1304

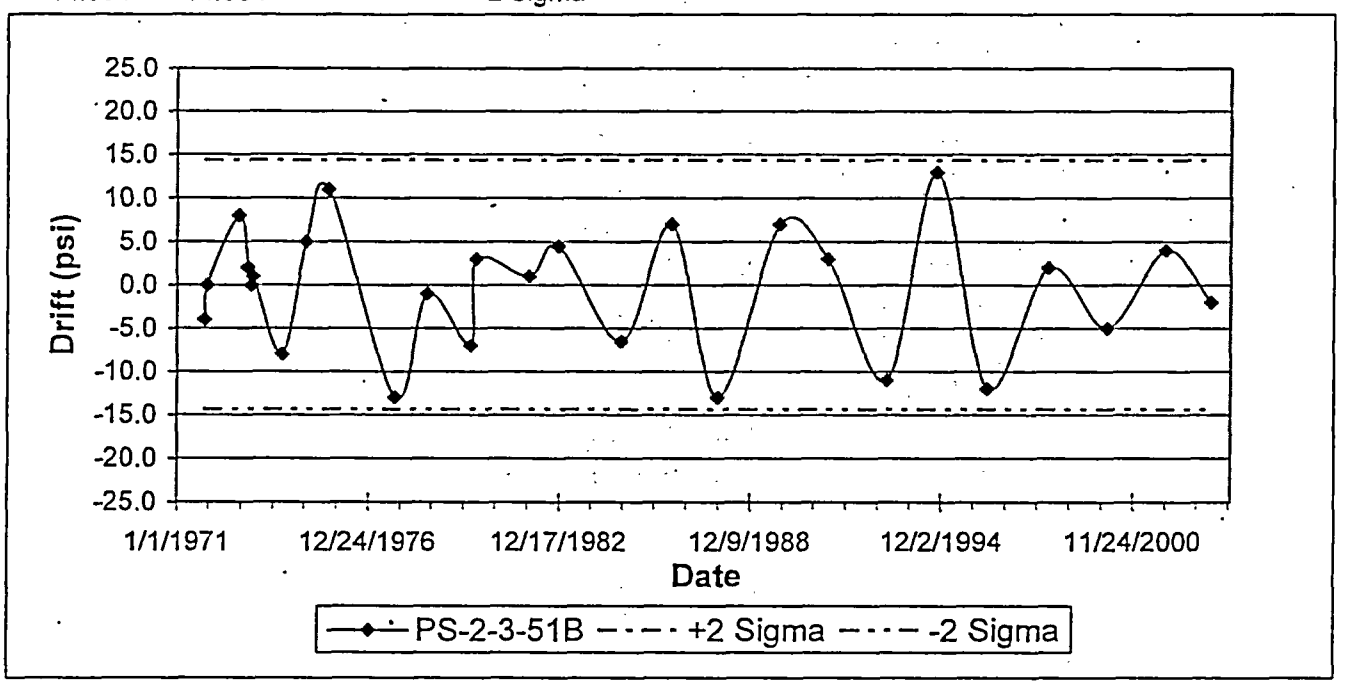
Notes:

3/23/93 C.1 Poor Calibration Techniques - CML entry for this date is a duplicate of data listed for 3/18/93. No CML entry for this date is a duplicate of data listed for 3/18/93.

Data for Trend Plot

Standard Deviation (s): 7.182

11/19/71	5/6/03	
14.364	14.364	+2 Sigma
-14.364	-14.364	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/6/2003	17.1	580.0	580.0	1.0
11/30/2001	21.8	579.0	579.0	-3.0
2/3/2000	21.8	595.0	582.0	0.0
4/9/1998	23.0	590.0	595.0	-6.0
5/9/1996	18.9	596.0	596.0	0.0
10/12/1994	18.8	605.0	596.0	6.0
3/18/1993	22.0	592.0	599.0	-6.0
5/16/1991	18.3	587.0	598.0	-11.0
11/5/1989	22.9	598.0	598.0	-2.0
12/9/1987	17.4	600.0	600.0	0.0
6/26/1986	18.7	600.0	600.0	0.0
12/4/1984	23.9	603.0	600.0	5.0
12/5/1982	10.9	602.5	598.0	3.5
1/8/1982	19.9	599.0	599.0	5.0
5/12/1980	1.9	594.0	594.0	-4.0
3/14/1980	16.4	590.0	598.0	-10.0
10/30/1978	12.2	600.0	600.0	1.0
10/24/1977	24.9	592.0	599.0	-6.0
9/25/1975	8.3	610.0	598.0	11.0
1/15/1975	9.0	599.0	599.0	0.0
4/16/1974	11.1	599.0	599.0	-1.0
5/12/1973	0.8	604.0	600.0	4.0
4/18/1973	1.1	619.0	600.0	19.0
3/16/1973	15.0	608.0	600.0	-4.0
12/13/1971	0.8	606.0	612.0	-6.0
11/19/1971	5.5	614.0	612.0	2.0
6/5/1971			612.0	

Average	$\bar{x}$ (psi)	-0.058
Standard Deviation	s (psi)	6.366
Variance	s^2 (psi)	40.53
Largest Positive Drift	(psi)	19.0
Largest Negative Drift	(psi)	-11.0
Number of Samples	n	26

Average	$\bar{x}$ (%)	-0.0050
Standard Deviation	s (%)	0.5536
Largest Positive Drift	(%)	1.6522
Largest Negative Drift	(%)	-0.9565

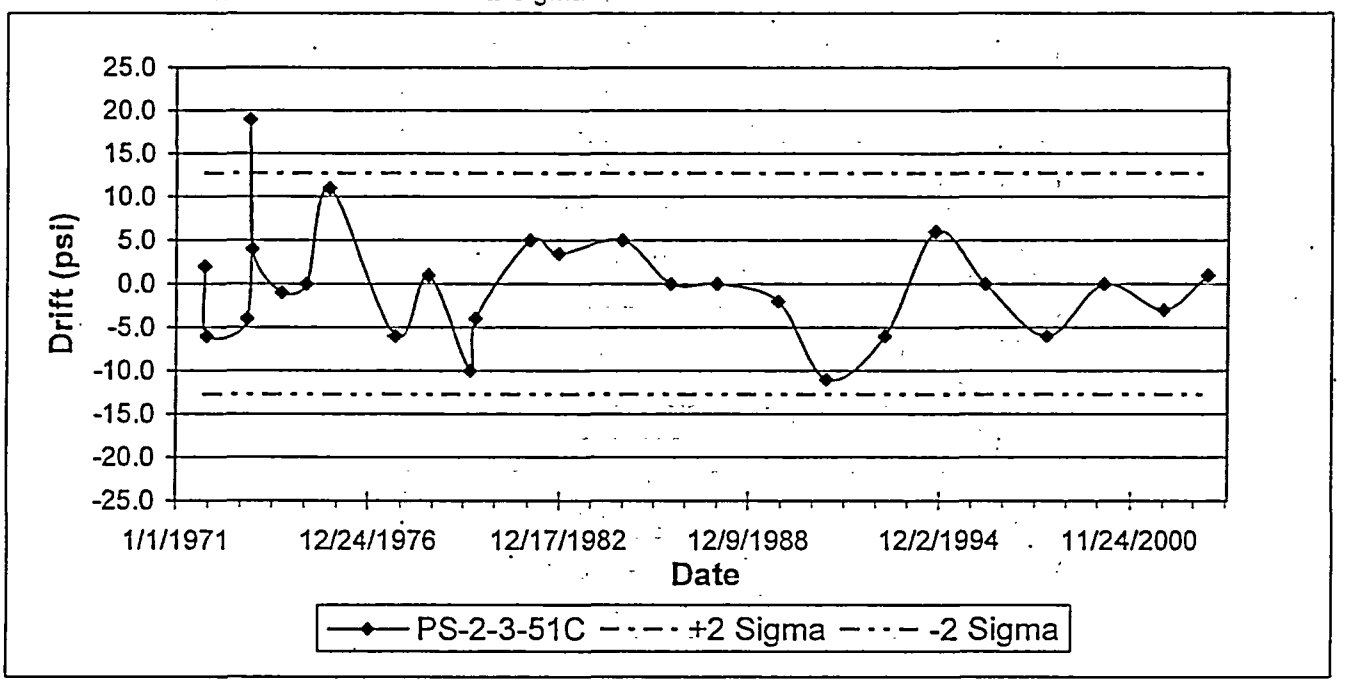
Notes:

3/23/93 C.1 Poor Calibration Techniques - CML entry for this date is a duplicate of data listed for 3/18/93. No CML entry for this date is a duplicate of data listed for 3/18/93.

Data for Trend Plot

Standard Deviation (s): 6.366

11/19/71	5/6/03	
12.732	12.732	+2 Sigma
-12.732	-12.732	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/6/2003	17.1	582.0	582.0	-1.0
11/30/2001	21.8	583.0	583.0	3.0
2/3/2000	21.8	588.0	580.0	-11.0
4/9/1998	23.0	590.0	599.0	-8.0
5/9/1996	18.9	590.0	598.0	-6.0
10/12/1994	18.8	608.0	596.0	10.0
3/18/1993	22.0	580.0	598.0	-15.0
5/16/1991	18.3	595.0	595.0	1.0
11/5/1989	22.9	604.0	594.0	4.0
12/9/1987	17.4	590.0	600.0	-9.0
6/26/1986	18.7	609.0	599.0	9.0
12/4/1984	23.9	592.0	600.0	-8.0
12/5/1982	10.9	601.0	600.0	5.0
1/8/1982	19.9	596.0	596.0	-3.0
5/12/1980	1.9	599.0	599.0	1.0
3/14/1980	16.4	580.0	598.0	-17.0
10/30/1978	12.2	597.0	597.0	-2.0
10/24/1977	24.9	588.0	599.0	-10.0
9/25/1975	8.2	605.0	598.0	9.0
1/18/1975	9.1	596.0	596.0	-4.0
4/16/1974	11.1	588.0	600.0	-7.0
5/12/1973	0.8	595.0	595.0	-5.0
4/18/1973	1.1	604.0	600.0	4.0
3/16/1973	15.0	598.0	600.0	-14.0
12/13/1971	0.8	611.0	612.0	-1.0
11/19/1971	5.5	620.0	612.0	8.0
6/5/1971			612.0	

Average	$\bar{x}$ (psi)	-2.577
Standard Deviation	s (psi)	7.752
Variance	s^2 (psi)	60.09
Largest Positive Drift	(psi)	10.0
Largest Negative Drift	(psi)	-17.0
Number of Samples	n	26

Average	$\bar{x}$ (%)	-0.2241
Standard Deviation	s (%)	0.6741
Largest Positive Drift	(%)	0.8696
Largest Negative Drift	(%)	-1.4783

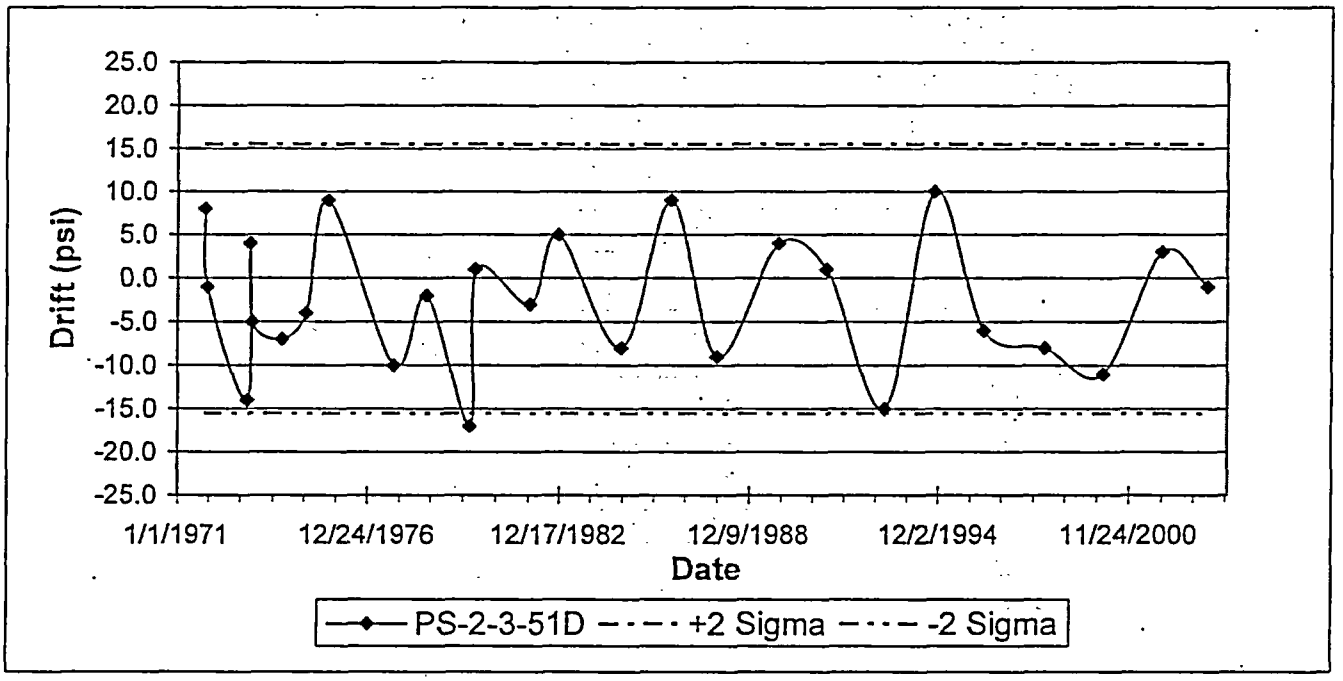
Notes:

3/23/93 C.1 Poor Calibration Techniques - CML entry for this date is a duplicate of data listed for 3/18/93. No CML entry for this date is a duplicate of data listed for 3/18/93.

Data for Trend Plot

Standard Deviation (s): 7.752

11/19/71	5/6/03	
15.504	15.504	+2 Sigma
-15.504	-15.504	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/14/2003	17.3	120.5	126.5	-5.0
12/2/2001	21.8	134.5	125.5	10.5
2/5/2000	16.1	114.0	124.0	-11.0
10/1/1998	4.4	120.0	125.0	5.5
5/21/1998	1.1	139.5	114.5	0.0
4/16/1998	22.1	139.5	139.5	1.5
6/11/1996	1.0	137.0	138.0	7.0
5/12/1996	18.7	166.0	130.0	-9.0
10/20/1994	19.9	191.0	175.0	16.5
2/20/1993	22.3	174.5	174.5	-0.5
4/11/1991	0.3	175.0	175.0	0.0
4/2/1991	19.3	169.0	175.0	-6.0
8/22/1989	21.9	184.0	175.0	9.0
10/23/1987	17.1	194.0	175.0	-6.0
5/19/1986	24.8	208.0	200.0	8.5
4/23/1984	19.5	199.5	199.5	0.5
9/5/1982	16.5	201.0	199.0	3.0
4/21/1981	13.9	203.0	198.0	4.0
2/23/1980	15.6	188.0	199.0	-11.0
11/4/1978	13.3	204.0	199.0	5.0
9/23/1977	23.9	205.0	199.0	5.0
9/25/1975	8.3	200.0	200.0	1.0
1/15/1975	8.7	204.0	199.0	4.0
4/26/1974	11.6	194.5	200.0	-5.5
5/7/1973	13.4	215.0	200.0	15.0
3/24/1972	2.0	230.0	200.0	-5.0
1/22/1972	12.5	223.0	235.0	-12.0
1/6/1971			235.0	

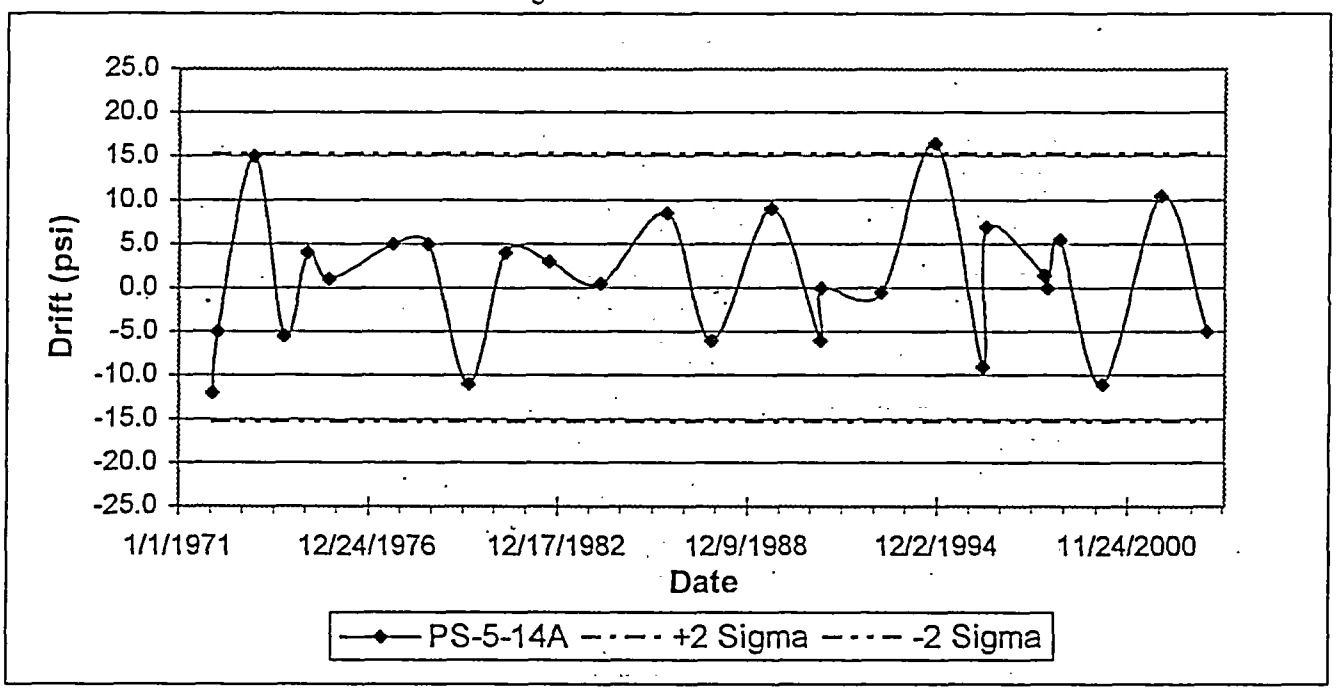
Average	x (psi)	0.926
Standard Deviation	s (psi)	7.673
Variance	s^2 (psi)	58.88
Largest Positive Drift	(psi)	16.5
Largest Negative Drift	(psi)	-12.0
Number of Samples	n	27

Average	x (%)	0.0805
Standard Deviation	s (%)	0.6672
Largest Positive Drift	(%)	1.4348
Largest Negative Drift	(%)	-1.0435

Data for Trend Plot

Standard Deviation (s):	7.673

1/22/72	5/14/03	
15.347	15.347	+2 Sigma
-15.347	-15.347	-2 Sigma



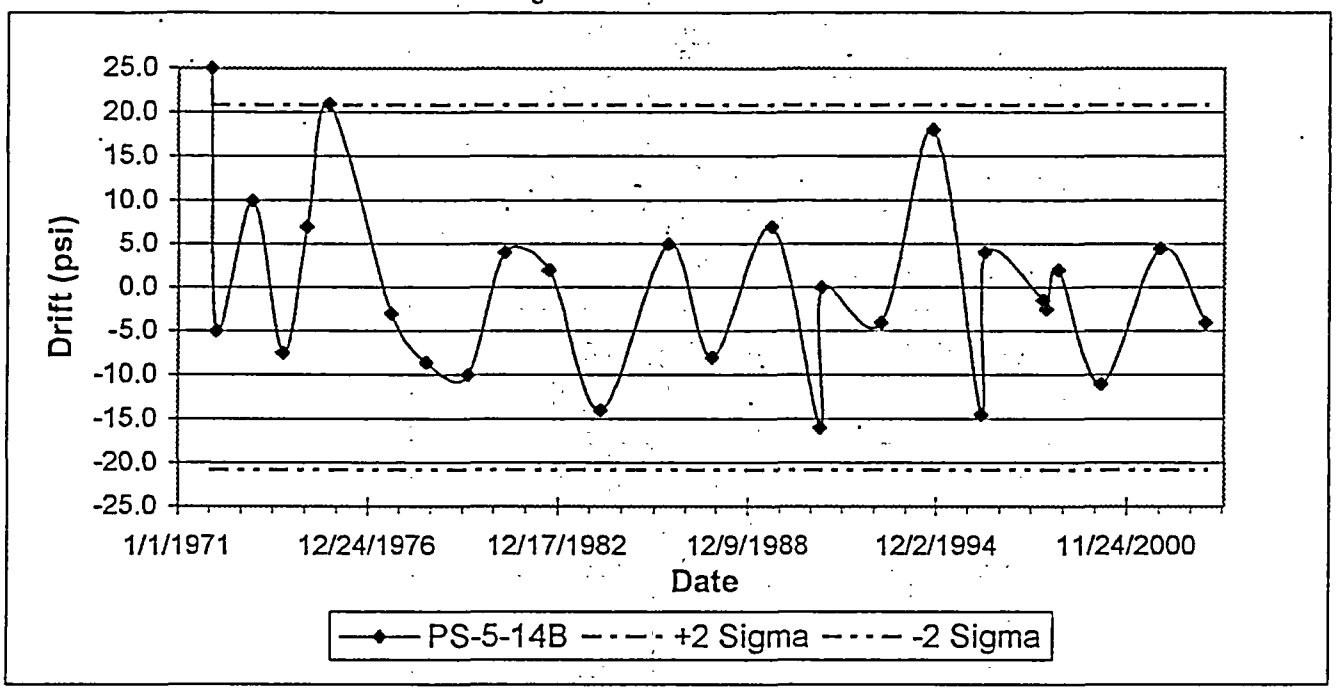
Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/14/2003	17.3	122.0	124.0	-4.0
12/2/2001	21.8	129.5	126.0	4.5
2/5/2000	16.1	114.0	125.0	-11.0
10/1/1998	4.4	118.0	125.0	2.0
5/21/1998	1.1	134.0	116.0	-2.5
4/16/1998	22.1	136.5	136.5	-1.5
6/11/1996	1.0	134.0	138.0	4.0
5/12/1996	18.7	160.5	130.0	-14.5
10/20/1994	19.9	193.0	175.0	18.0
2/20/1993	22.3	171.0	175.0	-4.0
4/11/1991	0.3	175.0	175.0	0.0
4/2/1991	19.3	159.0	175.0	-16.0
8/22/1989	21.9	182.0	175.0	7.0
10/23/1987	17.1	192.0	175.0	-8.0
5/19/1986	24.8	205.0	200.0	5.0
4/23/1984	19.5	185.0	200.0	-14.0
9/5/1982	16.5	201.0	199.0	2.0
4/21/1981	13.9	203.0	199.0	4.0
2/23/1980	15.6	188.0	199.0	-10.0
11/4/1978	13.3	191.0	198.0	-8.6
9/23/1977	23.9	196.0	199.6	-3.0
9/25/1975	8.3	220.0	199.0	21.0
1/15/1975	8.7	206.0	199.0	7.0
4/26/1974	11.6	192.5	199.0	-7.5
5/7/1973	13.4	210.0	200.0	10.0
3/24/1972	2.0	229.0	200.0	-5.0
1/22/1972	12.5	260.0	234.0	25.0
1/7/1971			235.0	

Average	x (psi)	-0.004
Standard Deviation	s (psi)	10.424
Variance	s^2 (psi)	108.66
Largest Positive Drift	(psi)	25.0
Largest Negative Drift	(psi)	-16.0
Number of Samples	n	27

Average	x (%)	-0.0003
Standard Deviation	s (%)	0.9064
Largest Positive Drift	(%)	2.1739
Largest Negative Drift	(%)	-1.3913

Data for Trend Plot

Standard Deviation (s):	10.424	
1/22/72	5/14/03	
20.848	20.848	+2 Sigma
-20.848	-20.848	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/14/2003	17.3	119.0	125.5	-6.0
12/2/2001	21.8	134.0	125.0	10.0
2/5/2000	16.1	119.0	124.0	-7.0
10/1/1998	4.4	119.0	126.0	4.0
5/21/1998	1.1	137.8	115.0	1.3
4/16/1998	22.1	136.5	136.5	-1.6
6/11/1996	1.0	129.5	138.1	0.0
5/12/1996	18.7	167.5	129.5	-8.0
10/20/1994	19.9	187.0	175.5	12.0
2/20/1993	22.3	166.0	175.0	-9.0
4/11/1991	0.3	175.0	175.0	0.0
4/2/1991	19.3	161.0	175.0	-14.0
8/22/1989	21.9	170.0	175.0	-4.5
10/23/1987	17.1	203.0	174.5	4.0
5/19/1986	24.8	202.0	199.0	3.0
4/23/1984	19.5	197.0	199.0	-3.0
9/5/1982	16.5	200.0	200.0	2.0
4/21/1981	13.9	198.0	198.0	-1.0
2/23/1980	15.6	188.0	199.0	-10.0
11/4/1978	13.3	193.0	198.0	-6.0
9/23/1977	23.9	195.0	199.0	-4.0
9/25/1975	8.3	217.0	199.0	18.0
1/15/1975	8.7	193.0	199.0	-8.0
4/26/1974	11.6	201.0	201.0	1.0
5/7/1973	13.4	211.0	200.0	11.0
3/24/1972	2.0	237.0	200.0	2.0
1/22/1972	12.5	220.0	235.0	-15.0
1/6/1971			235.0	

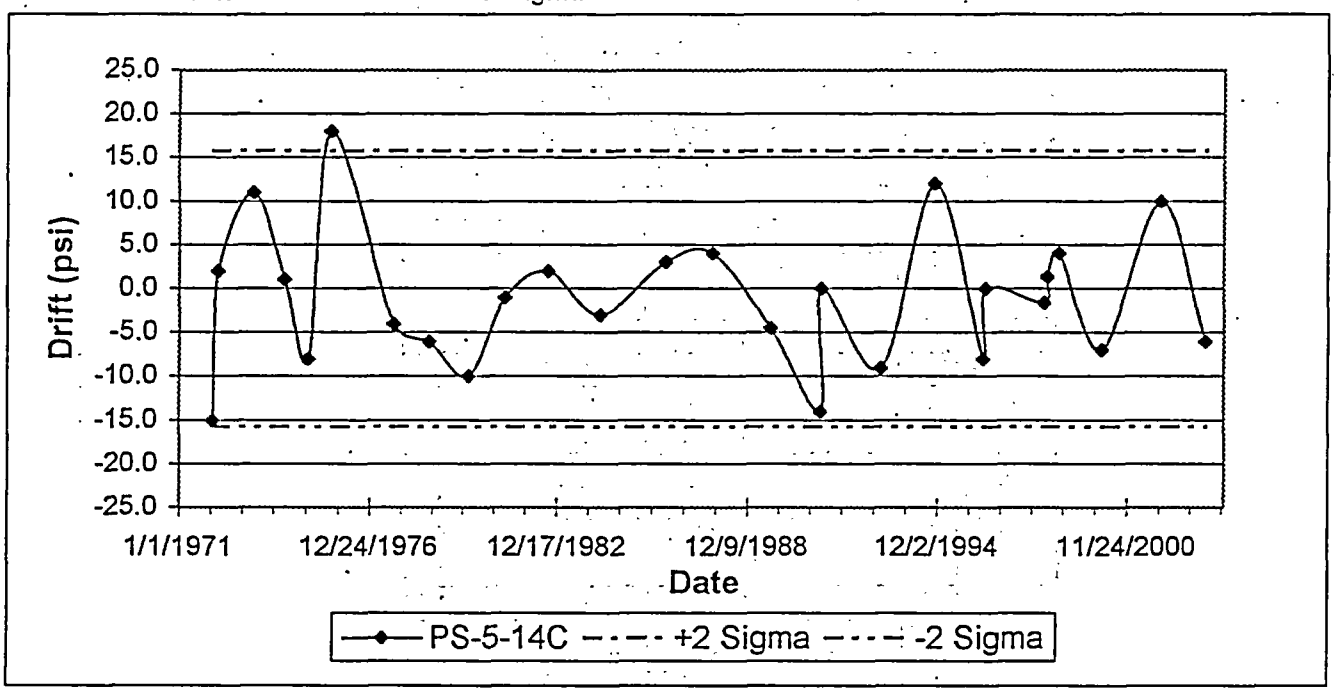
Average	x (psi)	-1.067
Standard Deviation	s (psi)	7.869
Variance	s^2 (psi)	61.91
Largest Positive Drift	(psi)	18.0
Largest Negative Drift	(psi)	-15.0
Number of Samples	n	27

Average	x (%)	-0.0928
Standard Deviation	s (%)	0.6842
Largest Positive Drift	(%)	1.5652
Largest Negative Drift	(%)	-1.3043

Data for Trend Plot

Standard Deviation (s):	7.869

1/22/72	5/14/03	
15.737	15.737	+2 Sigma
-15.737	-15.737	-2 Sigma



Calibration Interval				
Date	CI (Months)	AF	AL	Drift
5/14/2003	17.3	119.5	125.5	-6.0
12/2/2001	21.8	133.8	125.5	8.8
2/5/2000	16.1	110.0	125.0	-14.0
10/1/1998	4.4	118.0	124.0	4.5
5/21/1998	1.1	145.0	113.5	7.5
4/16/1998	22.1	127.0	137.5	-10.0
6/11/1996	1.0	135.0	137.0	5.5
5/12/1996	18.7	156.0	129.5	-18.0
10/20/1994	19.9	193.5	174.0	17.5
2/20/1993	22.4	169.0	176.0	-6.0
4/8/1991	0.2		175.0	
4/2/1991	19.3			
8/22/1989	21.9			
10/23/1987	17.1	203.0	174.5	3.0
5/19/1986	24.8	200.0	200.0	0.5
4/23/1984	19.5	189.0	199.5	-11.0
9/5/1982	16.5	203.0	200.0	4.0
4/21/1981	13.9	204.0	199.0	5.0
2/23/1980	15.6	185.0	199.0	-14.0
11/4/1978	13.3	194.0	199.0	-5.5
9/23/1977	23.9	194.0	199.5	-5.0
9/25/1975	8.3	220.0	199.0	21.0
1/15/1975	8.7	196.0	199.0	-4.0
4/26/1974	11.6	197.0	200.0	-3.0
5/7/1973	13.4	206.0	200.0	6.0
3/24/1972	2.0	228.0	200.0	-6.0
1/22/1972			234.0	

Average	$\bar{x}$ (psi)	-0.835
Standard Deviation	s (psi)	9.832
Variance	s^2 (psi)	96.68
Largest Positive Drift	(psi)	21.0
Largest Negative Drift	(psi)	-18.0
Number of Samples	n	23

Average	$\bar{x}$ (%)	-0.0726
Standard Deviation	s (%)	0.8550
Largest Positive Drift	(%)	1.8261
Largest Negative Drift	(%)	-1.5652

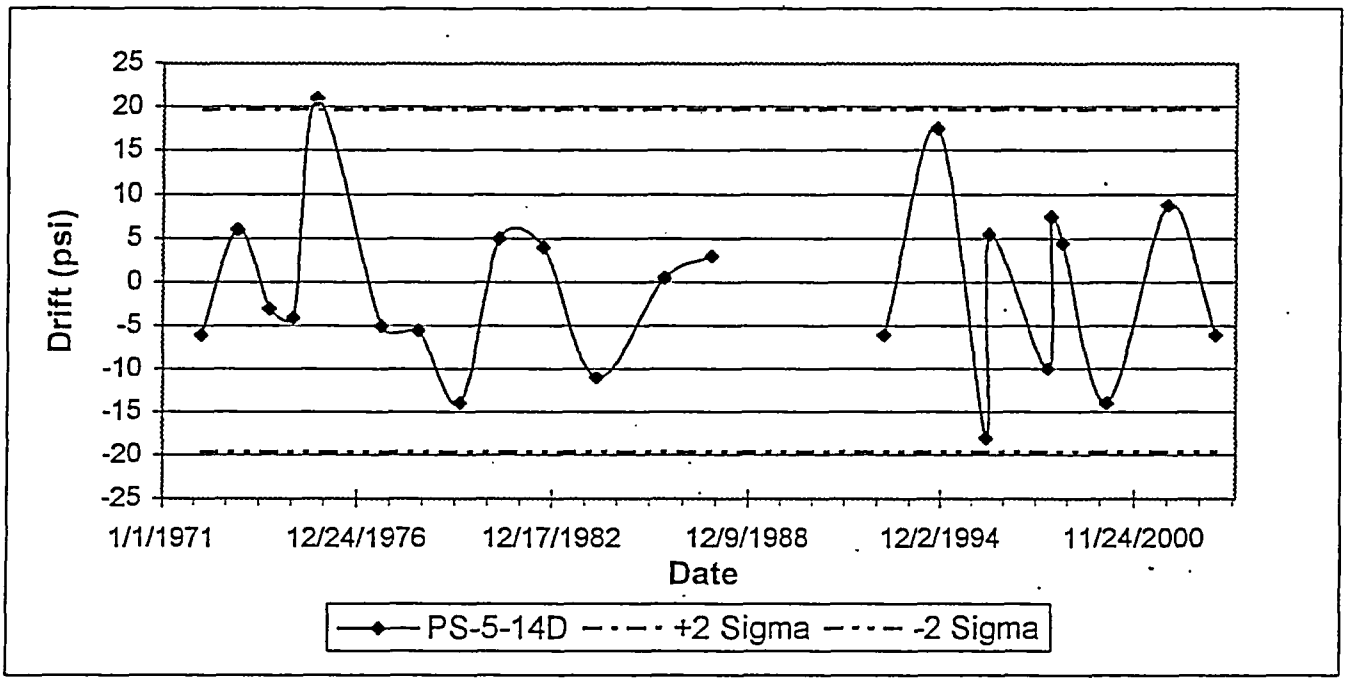
Notes:

4/2-4/8/91	B.1	Equipment Replacement - Switch replaced on 4/8/91 due to failure of the installed switch. Large drift observed on 4/2 (AF=121), which prompted the replacement, so AF and AL data for 4/2 also removed since it detected malfulction of the switch.
8/22/89	B.1	Equipment Replacement - From the large magnitude drift observed on this calibration (77.5 psi) and the subsequent calibration, described above, it is obvious that the switch had failed prior to this calibration. Inclusion of this data point would not accurately represent the drift of the device. An improved drift monitoring program, as will be implemented at the end of this project, would have detected the failure earlier and required switch replacement or repair. The AF and AL data for the 8/22/89 calibration is removed.
1/22/72	A.2	The As Found data for 1/22/1972 was illegible, and not included in this analysis. Only one calibration was available prior to this, so the AL data for 1/6/71 is removed.

Data for Trend Plot

Standard Deviation (s): 9.832

3/24/72	5/14/03	
19.665	19.665	+2 Sigma
-19.665	-19.665	-2 Sigma



		Drift
Average	$\bar{x}$ (psi)	-0.59
Standard Deviation	s (psi)	8.2207
Variance	s^2 (psi)	67.58
Largest Positive Drift	(psi)	25.0
Largest Negative Drift	(psi)	-18.0
Number of Samples	n	210

Average	$\bar{x}$ (%)	-0.0512
Standard Deviation	s (%)	0.7148
Largest Positive Drift	(%)	2.1739
Largest Negative Drift	(%)	-1.5652

	(CI) Cal Interval	Raw Drift	$\frac{\lvert x_i - \bar{x} \rvert}{s}$	Outlier Test	Absolute Value of Drift
PS-2-3-51A	17.1	2.0	0.31	2.0	2.0
	21.8	2.0	0.31	2.0	2.0
	21.8	-5.0	0.54	-5.0	5.0
	23.0	2.0	0.31	2.0	2.0
	18.9	-14.0	1.63	-14.0	14.0
	18.8	12.0	1.53	12.0	12.0
	22.0	-11.0	1.27	-11.0	11.0
	6.5	3.0	0.44	3.0	3.0
	11.8	-3.0	0.29	-3.0	3.0
	22.9	7.0	0.92	7.0	7.0
	17.4	-13.0	1.51	-13.0	13.0
	18.7	8.0	1.04	8.0	8.0
	23.9	-14.5	1.69	-14.5	14.5
	10.9	3.5	0.50	3.5	3.5
	19.9	-1.0	0.05	-1.0	1.0
	1.9	8.0	1.04	8.0	8.0
	16.4	-15.0	1.75	-15.0	15.0
	12.2	6.0	0.80	6.0	6.0
	24.9	-7.0	0.78	-7.0	7.0
	8.3	18.0	2.26	18.0	18.0
	9.0	-5.0	0.54	-5.0	5.0
	11.1	-8.0	0.90	-8.0	8.0
	0.8	12.0	1.53	12.0	12.0
	1.1	-2.0	0.17	-2.0	2.0
	15.0	-2.0	0.17	-2.0	2.0
	0.8	2.0	0.31	2.0	2.0
	5.5	-6.0	0.66	-6.0	6.0
PS-2-3-51B	17.1	-2.0	0.17	-2.0	2.0
	21.8	4.0	0.56	4.0	4.0
	21.8	-5.0	0.54	-5.0	5.0
	23.0	2.0	0.31	2.0	2.0
	18.9	-12.0	1.39	-12.0	12.0
	18.8	13.0	1.65	13.0	13.0
	22.0	-11.0	1.27	-11.0	11.0
	18.3	3.0	0.44	3.0	3.0
	22.9	7.0	0.92	7.0	7.0
	17.4	-13.0	1.51	-13.0	13.0
	18.7	7.0	0.92	7.0	7.0
	23.9	-6.5	0.72	-6.5	6.5
	10.9	4.5	0.62	4.5	4.5
	19.9	1.0	0.19	1.0	1.0
	1.9	3.0	0.44	3.0	3.0
	16.4	-7.0	0.78	-7.0	7.0
	12.2	-1.0	0.05	-1.0	1.0
	24.9	-13.0	1.51	-13.0	13.0
	8.3	11.0	1.41	11.0	11.0
	9.0	5.0	0.68	5.0	5.0

	(CI) Cal Interval	Raw Drift	$\frac{\lvert x_i - \bar{x} \rvert}{s}$	Outlier Test	Absolute Value of Drift
	11.1	-8.0	0.90	-8.0	8.0
	0.8	1.0	0.19	1.0	1.0
	1.1	0.0	0.07	0.0	0.0
	3.4	2.0	0.31	2.0	2.0
	11.6	8.0	1.04	8.0	8.0
	0.8	0.0	0.07	0.0	0.0
	5.5	-4.0	0.41	-4.0	4.0
PS-2-3-51C	17.1	1.0	0.19	1.0	1.0
	21.8	-3.0	0.29	-3.0	3.0
	21.8	0.0	0.07	0.0	0.0
	23.0	-6.0	0.66	-6.0	6.0
	18.9	0.0	0.07	0.0	0.0
	18.8	6.0	0.80	6.0	6.0
	22.0	-6.0	0.66	-6.0	6.0
	18.3	-11.0	1.27	-11.0	11.0
	22.9	-2.0	0.17	-2.0	2.0
	17.4	0.0	0.07	0.0	0.0
	18.7	0.0	0.07	0.0	0.0
	23.9	5.0	0.68	5.0	5.0
	10.9	3.5	0.50	3.5	3.5
	19.9	5.0	0.68	5.0	5.0
	1.9	-4.0	0.41	-4.0	4.0
	16.4	-10.0	1.14	-10.0	10.0
	12.2	1.0	0.19	1.0	1.0
	24.9	-6.0	0.66	-6.0	6.0
	8.3	11.0	1.41	11.0	11.0
	9.0	0.0	0.07	0.0	0.0
	11.1	-1.0	0.05	-1.0	1.0
	0.8	4.0	0.56	4.0	4.0
	1.1	19.0	2.38	19.0	19.0
	15.0	-4.0	0.41	-4.0	4.0
	0.8	-6.0	0.66	-6.0	6.0
	5.5	2.0	0.31	2.0	2.0
PS-2-3-51D	17.1	-1.0	0.05	-1.0	1.0
	21.8	3.0	0.44	3.0	3.0
	21.8	-11.0	1.27	-11.0	11.0
	23.0	-8.0	0.90	-8.0	8.0
	18.9	-6.0	0.66	-6.0	6.0
	18.8	10.0	1.29	10.0	10.0
	22.0	-15.0	1.75	-15.0	15.0
	18.3	1.0	0.19	1.0	1.0
	22.9	4.0	0.56	4.0	4.0
	17.4	-9.0	1.02	-9.0	9.0
	18.7	9.0	1.17	9.0	9.0
	23.9	-8.0	0.90	-8.0	8.0
	10.9	5.0	0.68	5.0	5.0
	19.9	-3.0	0.29	-3.0	3.0

	(CI) Cal Interval	Raw Drift	$\frac{\lvert x_i - \bar{x} \rvert}{s}$	Outlier Test	Absolute Value of Drift
	1.9	1.0	0.19	1.0	1.0
	16.4	-17.0	2.00	-17.0	17.0
	12.2	-2.0	0.17	-2.0	2.0
	24.9	-10.0	1.14	-10.0	10.0
	8.2	9.0	1.17	9.0	9.0
	9.1	-4.0	0.41	-4.0	4.0
	11.1	-7.0	0.78	-7.0	7.0
	0.8	-5.0	0.54	-5.0	5.0
	1.1	4.0	0.56	4.0	4.0
	15.0	-14.0	1.63	-14.0	14.0
	0.8	-1.0	0.05	-1.0	1.0
	5.5	8.0	1.04	8.0	8.0
PS-5-14A	17.3	-5.0	0.54	-5.0	5.0
	21.8	10.5	1.35	10.5	10.5
	16.1	-11.0	1.27	-11.0	11.0
	4.4	5.5	0.74	5.5	5.5
	1.1	0.0	0.07	0.0	0.0
	22.1	1.5	0.25	1.5	1.5
	1.0	7.0	0.92	7.0	7.0
	18.7	-9.0	1.02	-9.0	9.0
	19.9	16.5	2.08	16.5	16.5
	22.3	-0.5	0.01	-0.5	0.5
	0.3	0.0	0.07	0.0	0.0
	19.3	-6.0	0.66	-6.0	6.0
	21.9	9.0	1.17	9.0	9.0
	17.1	-6.0	0.66	-6.0	6.0
	24.8	8.5	1.11	8.5	8.5
	19.5	0.5	0.13	0.5	0.5
	16.5	3.0	0.44	3.0	3.0
	13.9	4.0	0.56	4.0	4.0
	15.6	-11.0	1.27	-11.0	11.0
	13.3	5.0	0.68	5.0	5.0
	23.9	5.0	0.68	5.0	5.0
	8.3	1.0	0.19	1.0	1.0
	8.7	4.0	0.56	4.0	4.0
	11.6	-5.5	0.60	-5.5	5.5
	13.4	15.0	1.90	15.0	15.0
	2.0	-5.0	0.54	-5.0	5.0
	12.5	-12.0	1.39	-12.0	12.0
PS-5-14B	17.3	-4.0	0.41	-4.0	4.0
	21.8	4.5	0.62	4.5	4.5
	16.1	-11.0	1.27	-11.0	11.0
	4.4	2.0	0.31	2.0	2.0
	1.1	-2.5	0.23	-2.5	2.5
	22.1	-1.5	0.11	-1.5	1.5
	1.0	4.0	0.56	4.0	4.0
	18.7	-14.5	1.69	-14.5	14.5

	(Cl) Cal Interval	Raw Drift	$\frac{\lvert x_i - \bar{x} \rvert}{s}$	Outlier Test	Absolute Value of Drift
	19.9	18.0	2.26	18.0	18.0
	22.3	-4.0	0.41	-4.0	4.0
	0.3	0.0	0.07	0.0	0.0
	19.3	-16.0	1.87	-16.0	16.0
	21.9	7.0	0.92	7.0	7.0
	17.1	-8.0	0.90	-8.0	8.0
	24.8	5.0	0.68	5.0	5.0
	19.5	-14.0	1.63	-14.0	14.0
	16.5	2.0	0.31	2.0	2.0
	13.9	4.0	0.56	4.0	4.0
	15.6	-10.0	1.14	-10.0	10.0
	13.3	-8.6	0.97	-8.6	8.6
	23.9	-3.0	0.29	-3.0	3.0
	8.3	21.0	2.63	21.0	21.0
	8.7	7.0	0.92	7.0	7.0
	11.6	-7.5	0.84	-7.5	7.5
	13.4	10.0	1.29	10.0	10.0
	2.0	-5.0	0.54	-5.0	5.0
	12.5	25.0	3.11	25.0	25.0
PS-5-14C	17.3	-6.0	0.66	-6.0	6.0
	21.8	10.0	1.29	10.0	10.0
	16.1	-7.0	0.78	-7.0	7.0
	4.4	4.0	0.56	4.0	4.0
	1.1	1.3	0.23	1.3	1.3
	22.1	-1.6	0.12	-1.6	1.6
	1.0	0.0	0.07	0.0	0.0
	18.7	-8.0	0.90	-8.0	8.0
	19.9	12.0	1.53	12.0	12.0
	22.3	-9.0	1.02	-9.0	9.0
	0.3	0.0	0.07	0.0	0.0
	19.3	-14.0	1.63	-14.0	14.0
	21.9	-4.5	0.48	-4.5	4.5
	17.1	4.0	0.56	4.0	4.0
	24.8	3.0	0.44	3.0	3.0
	19.5	-3.0	0.29	-3.0	3.0
	16.5	2.0	0.31	2.0	2.0
	13.9	-1.0	0.05	-1.0	1.0
	15.6	-10.0	1.14	-10.0	10.0
	13.3	-6.0	0.66	-6.0	6.0
	23.9	-4.0	0.41	-4.0	4.0
	8.3	18.0	2.26	18.0	18.0
	8.7	-8.0	0.90	-8.0	8.0
	11.6	1.0	0.19	1.0	1.0
	13.4	11.0	1.41	11.0	11.0
	2.0	2.0	0.31	2.0	2.0
	12.5	-15.0	1.75	-15.0	15.0
PS-5-14D	17.3	-6.0	0.66	-6.0	6.0

	(CI) Cal Interval	Raw Drift	$\frac{\lvert x_i - \bar{x} \rvert}{s}$	Outlier Test	Absolute Value of Drift
	21.8	8.8	1.14	8.8	8.8
	16.1	-14.0	1.63	-14.0	14.0
	4.4	4.5	0.62	4.5	4.5
	1.1	7.5	0.98	7.5	7.5
	22.1	-10.0	1.14	-10.0	10.0
	1.0	5.5	0.74	5.5	5.5
	18.7	-18.0	2.12	-18.0	18.0
	19.9	17.5	2.20	17.5	17.5
	22.4	-6.0	0.66	-6.0	6.0
	17.1	3.0	0.44	3.0	3.0
	24.8	0.5	0.13	0.5	0.5
	19.5	-11.0	1.27	-11.0	11.0
	16.5	4.0	0.56	4.0	4.0
	13.9	5.0	0.68	5.0	5.0
	15.6	-14.0	1.63	-14.0	14.0
	13.3	-5.5	0.60	-5.5	5.5
	23.9	-5.0	0.54	-5.0	5.0
	8.3	21.0	2.63	21.0	21.0
	8.7	-4.0	0.41	-4.0	4.0
	11.6	-3.0	0.29	-3.0	3.0
	13.4	6.0	0.80	6.0	6.0
	2.0	-6.0	0.66	-6.0	6.0
Average	14.4	-0.59		-0.59	
Standard Deviation		8.2207		8.2207	
Variance		67.58		67.58	
Maximum	24.9	25		25	
Minimum	0.3	-18		-18	
Count		210		210	
T-Test Critical Value		4.00			
95%/95% TIF		2.143		2.143	
STDEV x TIF		17.617		17.617	

Average	x (%)	-0.0512
Standard Deviation	s (%)	0.7148
Largest Positive Drift	(%)	2.1739
Largest Negative Drift	(%)	-1.5652

PS-2-3-51 Data Set		
CI	Drift	% Span
17.1	2.0	0.1739
21.8	2.0	0.1739
21.8	-5.0	-0.4348
23.0	2.0	0.1739
18.9	-14.0	-1.2174
18.8	12.0	1.0435
22.0	-11.0	-0.9565
6.5	3.0	0.2609
11.8	-3.0	-0.2609
22.9	7.0	0.6087
17.4	-13.0	-1.1304
18.7	8.0	0.6957
23.9	-14.5	-1.2609
10.9	3.5	0.3043
19.9	-1.0	-0.0870
1.9	8.0	0.6957
16.4	-15.0	-1.3043
12.2	6.0	0.5217
24.9	-7.0	-0.6087
8.3	18.0	1.5652
9.0	-5.0	-0.4348
11.1	-8.0	-0.6957
0.8	12.0	1.0435
1.1	-2.0	-0.1739
15.0	-2.0	-0.1739
0.8	2.0	0.1739
5.5	-6.0	-0.5217
17.1	-2.0	-0.1739
21.8	4.0	0.3478
21.8	-5.0	-0.4348
23.0	2.0	0.1739
18.9	-12.0	-1.0435
18.8	13.0	1.1304
22.0	-11.0	-0.9565
18.3	3.0	0.2609
22.9	7.0	0.6087
17.4	-13.0	-1.1304
18.7	7.0	0.6087
23.9	-6.5	-0.5652
10.9	4.5	0.3913
19.9	1.0	0.0870
1.9	3.0	0.2609
16.4	-7.0	-0.6087
12.2	-1.0	-0.0870
24.9	-13.0	-1.1304
8.3	11.0	0.9565
9.0	5.0	0.4348
11.1	-8.0	-0.6957
0.8	1.0	0.0870
1.1	0.0	0.0000

PS-5-14 Data Set		
CI	Drift	% Span
17.3	-5.0	-0.4348
21.8	10.5	0.9130
16.1	-11.0	-0.9565
4.4	5.5	0.4783
1.1	0.0	0.0000
22.1	1.5	0.1304
1.0	7.0	0.6087
18.7	-9.0	-0.7826
19.9	16.5	1.4348
22.3	-0.5	-0.0435
0.3	0.0	0.0000
19.3	-6.0	-0.5217
21.9	9.0	0.7826
17.1	-6.0	-0.5217
24.8	8.5	0.7391
19.5	0.5	0.0435
16.5	3.0	0.2609
13.9	4.0	0.3478
15.6	-11.0	-0.9565
13.3	5.0	0.4348
23.9	5.0	0.4348
8.3	1.0	0.0870
8.7	4.0	0.3478
11.6	-5.5	-0.4783
13.4	15.0	1.3043
2.0	-5.0	-0.4348
12.5	-12.0	-1.0435
17.3	-4.0	-0.3478
21.8	4.5	0.3913
16.1	-11.0	-0.9565
4.4	2.0	0.1739
1.1	-2.5	-0.2174
22.1	-1.5	-0.1304
1.0	4.0	0.3478
18.7	-14.5	-1.2609
19.9	18.0	1.5652
22.3	-4.0	-0.3478
0.3	0.0	0.0000
19.3	-16.0	-1.3913
21.9	7.0	0.6087
17.1	-8.0	-0.6957
24.8	5.0	0.4348
19.5	-14.0	-1.2174
16.5	2.0	0.1739
13.9	4.0	0.3478
15.6	-10.0	-0.8696
13.3	-8.6	-0.7478
23.9	-3.0	-0.2609
8.3	21.0	1.8261
8.7	7.0	0.6087

CI	Drift	% Span
3.4	2.0	0.1739
11.6	8.0	0.6957
0.8	0.0	0.0000
5.5	-4.0	-0.3478
17.1	1.0	0.0870
21.8	-3.0	-0.2609
21.8	0.0	0.0000
23.0	-6.0	-0.5217
18.9	0.0	0.0000
18.8	6.0	0.5217
22.0	-6.0	-0.5217
18.3	-11.0	-0.9565
22.9	-2.0	-0.1739
17.4	0.0	0.0000
18.7	0.0	0.0000
23.9	5.0	0.4348
10.9	3.5	0.3043
19.9	5.0	0.4348
1.9	-4.0	-0.3478
16.4	-10.0	-0.8696
12.2	1.0	0.0870
24.9	-6.0	-0.5217
8.3	11.0	0.9565
9.0	0.0	0.0000
11.1	-1.0	-0.0870
0.8	4.0	0.3478
1.1	19.0	1.6522
15.0	-4.0	-0.3478
0.8	-6.0	-0.5217
5.5	2.0	0.1739
17.1	-1.0	-0.0870
21.8	3.0	0.2609
21.8	-11.0	-0.9565
23.0	-8.0	-0.6957
18.9	-6.0	-0.5217
18.8	10.0	0.8696
22.0	-15.0	-1.3043
18.3	1.0	0.0870
22.9	4.0	0.3478
17.4	-9.0	-0.7826
18.7	9.0	0.7826
23.9	-8.0	-0.6957
10.9	5.0	0.4348
19.9	-3.0	-0.2609
1.9	1.0	0.0870
16.4	-17.0	-1.4783
12.2	-2.0	-0.1739
24.9	-10.0	-0.8696
8.2	9.0	0.7826
9.1	-4.0	-0.3478
11.1	-7.0	-0.6087
0.8	-5.0	-0.4348
1.1	4.0	0.3478

CI	Drift	% Span
11.6	-7.5	-0.6522
13.4	10.0	0.8696
2.0	-5.0	-0.4348
12.5	25.0	2.1739
17.3	-6.0	-0.5217
21.8	10.0	0.8696
16.1	-7.0	-0.6087
4.4	4.0	0.3478
1.1	1.3	0.1130
22.1	-1.6	-0.1391
1.0	0.0	0.0000
18.7	-8.0	-0.6957
19.9	12.0	1.0435
22.3	-9.0	-0.7826
0.3	0.0	0.0000
19.3	-14.0	-1.2174
21.9	-4.5	-0.3913
17.1	4.0	0.3478
24.8	3.0	0.2609
19.5	-3.0	-0.2609
16.5	2.0	0.1739
13.9	-1.0	-0.0870
15.6	-10.0	-0.8696
13.3	-6.0	-0.5217
23.9	-4.0	-0.3478
8.3	18.0	1.5652
8.7	-8.0	-0.6957
11.6	1.0	0.0870
13.4	11.0	0.9565
2.0	2.0	0.1739
12.5	-15.0	-1.3043
17.3	-6.0	-0.5217
21.8	8.8	0.7652
16.1	-14.0	-1.2174
4.4	4.5	0.3913
1.1	7.5	0.6522
22.1	-10.0	-0.8696
1.0	5.5	0.4783
18.7	-18.0	-1.5652
19.9	17.5	1.5217
22.4	-6.0	-0.5217
17.1	3.0	0.2609
24.8	0.5	0.0435
19.5	-11.0	-0.9565
16.5	4.0	0.3478
13.9	5.0	0.4348
15.6	-14.0	-1.2174
13.3	-5.5	-0.4783
23.9	-5.0	-0.4348
8.3	21.0	1.8261
8.7	-4.0	-0.3478
11.6	-3.0	-0.2609
13.4	6.0	0.5217

	CI	Drift	% Span
	15.0	-14.0	-1.2174
	0.8	-1.0	-0.0870
	5.5	8.0	0.6957
Average (x)	14.4	-0.948	-0.082
Standard Deviation (s)		7.5207	0.6540
Variance (s^2)		56.5616	0.4277
Largest Positive Drift		19.00	1.65
Largest Negative Drift		-17.00	-1.48
Count		106	106

CI	Drift	% Span
2.0	-6.0	-0.5217
14.4	-0.222	-0.019
	8.8994	0.7739
	79.1992	0.5989
	25.00	2.17
	-18.00	-1.57
	104	104

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	*Variable 2*
Mean	-0.08244	-0.01931
Variance	0.427687	0.59886
Observations	106	104
Hypothesized Mean Difference	0	
df	201	
t Stat	-0.63794	
P(T<=t) one-tail	0.26212	
t Critical one-tail	1.65247	
P(T<=t) two-tail	0.52424	
t Critical two-tail	1.971835	
Standard Deviation	0.653978	0.77386

t Stat < t Critical two-tail?	Yes
Combining data sets acceptable?	Yes

$F_{calc} = s_1^2 / s_2^2 =$	1.400230
F_{crit} = FINV(0.05, 103,105) =	1.382350
Is $F_{calc} \leq F_{crit}$?	No
Variances from same sample pool?	No
Combining data sets acceptable?	No

Note: Although data failed the F test, it is combined for analysis. See Section 6.5.

Chi-Squared Anavlsis:

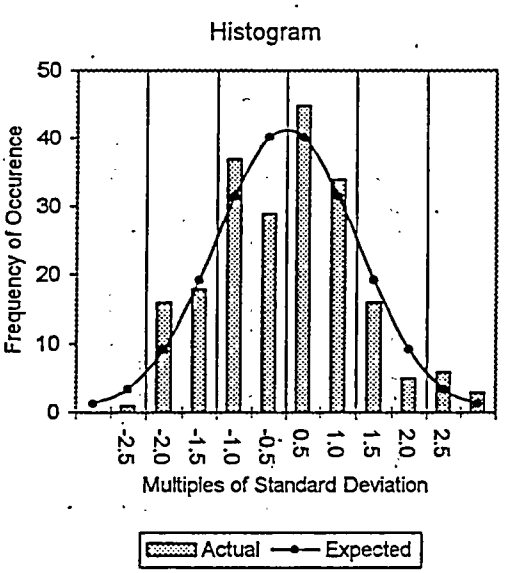
Standard Deviation (s): 8.2207 Average ($\bar{x}$): -0.589

Multiples of s (σ)	Bin Upper Limt	Bin Number	Bin	(O_i) Observed Frequency	Expected Frequency %	(E_i) Expected Frequency	Deviation
-2.50	-21.140	1	-21.140	0	0.621	1.304	1.30
-2.00	-17.030	2	-17.030	1	1.659	3.484	1.77
-1.50	-12.920	3	-12.920	16	4.400	9.240	4.95
-1.00	-8.809	4	-8.809	18	9.190	19.299	0.09
-0.50	-4.699	5	-4.699	37	14.980	31.458	0.98
0.00	-0.589	6	-0.589	29	19.150	40.215	3.13
0.50	3.522	7	3.522	45	19.150	40.215	0.57
1.00	7.632	8	7.632	34	14.980	31.458	0.21
1.50	11.742	9	11.742	16	9.190	19.299	0.56
2.00	15.853	10	15.853	5	4.400	9.240	1.95
2.50	19.963	11	19.963	6	1.659	3.484	1.82
		12	More	3	0.621	1.304	2.21
	Totals:		n:	210	100.000	210.000	X^2: 19.52

Degress of Freedom (d): 9
Chi-Squared per Degree of Freedom ($X_o^2 = X^2/d$): 2.17
Chi-Squared Probability (from Table 9.4): 1.9
Chi-Squared Probability ≥ 5%?: No
Normality Assumption Rejected?: Yes
Normality Assumption Rejected by D-Prime Test?: No

NAF: 1.000

n: 210
$TIF_{95/95}$ (from Table 9.1): 2.143
$TI_{95/95}$ (s x TIF x NAF): 17.617



i	x	t
1	-18.0	1881
2	-17.0	1759.5
3	-16.0	1640
4	-15.0	1522.5
5	-15.0	1507.5
6	-15.0	1492.5
7	-14.5	1428.25
8	-14.5	1413.75
9	-14.0	1351
10	-14.0	1337
11	-14.0	1323
12	-14.0	1309
13	-14.0	1295
14	-14.0	1281
15	-13.0	1176.5
16	-13.0	1163.5
17	-13.0	1150.5
18	-12.0	1050
19	-12.0	1038
20	-11.0	940.5
21	-11.0	929.5
22	-11.0	918.5
23	-11.0	907.5
24	-11.0	896.5
25	-11.0	885.5
26	-11.0	874.5
27	-11.0	863.5
28	-10.0	775
29	-10.0	765
30	-10.0	755
31	-10.0	745
32	-10.0	735
33	-9.0	652.5
34	-9.0	643.5
35	-9.0	634.5
36	-8.6	597.7
37	-8.0	548
38	-8.0	540
39	-8.0	532
40	-8.0	524
41	-8.0	516
42	-8.0	508
43	-8.0	500
44	-7.5	461.25
45	-7.0	423.5
46	-7.0	416.5
47	-7.0	409.5
48	-7.0	402.5
49	-6.5	367.25

Number of Data Points (n): 210

Variance (s^2): 67.5796774

Sum of Squares about the Mean (S^2): 14124.1526

T: 101684.10

D': 855.60

Critical D' Values

Minimum ($P_{0.025}$): 844.3

Maximum ($P_{0.975}$): 868.7

Is $P_{0.025} \le D' \le P_{0.975}$? : Yes

Normality Assumption Rejected?: No

Formulas:

$$t = \left(i - \frac{n+1}{2}\right) \times x$$

$$S^2 = (n-1) \times s^2$$

$$T = \sum t$$

$$D' = \frac{T}{S}$$

i	x	t
50	-6.0	333
51	-6.0	327
52	-6.0	321
53	-6.0	315
54	-6.0	309
55	-6.0	303
56	-6.0	297
57	-6.0	291
58	-6.0	285
59	-6.0	279
60	-6.0	273
61	-6.0	267
62	-6.0	261
63	-5.5	233.75
64	-5.5	228.25
65	-5.0	202.5
66	-5.0	197.5
67	-5.0	192.5
68	-5.0	187.5
69	-5.0	182.5
70	-5.0	177.5
71	-5.0	172.5
72	-5.0	167.5
73	-4.5	146.25
74	-4.0	126
75	-4.0	122
76	-4.0	118
77	-4.0	114
78	-4.0	110
79	-4.0	106
80	-4.0	102
81	-4.0	98
82	-3.0	70.5
83	-3.0	67.5
84	-3.0	64.5
85	-3.0	61.5
86	-3.0	58.5
87	-3.0	55.5
88	-2.5	43.75
89	-2.0	33
90	-2.0	31
91	-2.0	29
92	-2.0	27
93	-2.0	25
94	-1.6	18.4
95	-1.5	15.75
96	-1.0	9.5
97	-1.0	8.5
98	-1.0	7.5
99	-1.0	6.5

i	x	t
100	-1.0	5.5
101	-1.0	4.5
102	-0.5	1.75
103	0.0	0
104	0.0	0
105	0.0	0
106	0.0	0
107	0.0	0
108	0.0	0
109	0.0	0
110	0.0	0
111	0.0	0
112	0.0	0
113	0.0	0
114	0.0	0
115	0.5	4.75
116	0.5	5.25
117	1.0	11.5
118	1.0	12.5
119	1.0	13.5
120	1.0	14.5
121	1.0	15.5
122	1.0	16.5
123	1.0	17.5
124	1.0	18.5
125	1.3	25.35
126	1.5	30.75
127	2.0	43
128	2.0	45
129	2.0	47
130	2.0	49
131	2.0	51
132	2.0	53
133	2.0	55
134	2.0	57
135	2.0	59
136	2.0	61
137	2.0	63
138	3.0	97.5
139	3.0	100.5
140	3.0	103.5
141	3.0	106.5
142	3.0	109.5
143	3.0	112.5
144	3.0	115.5
145	3.5	138.25
146	3.5	141.75
147	4.0	166
148	4.0	170
149	4.0	174

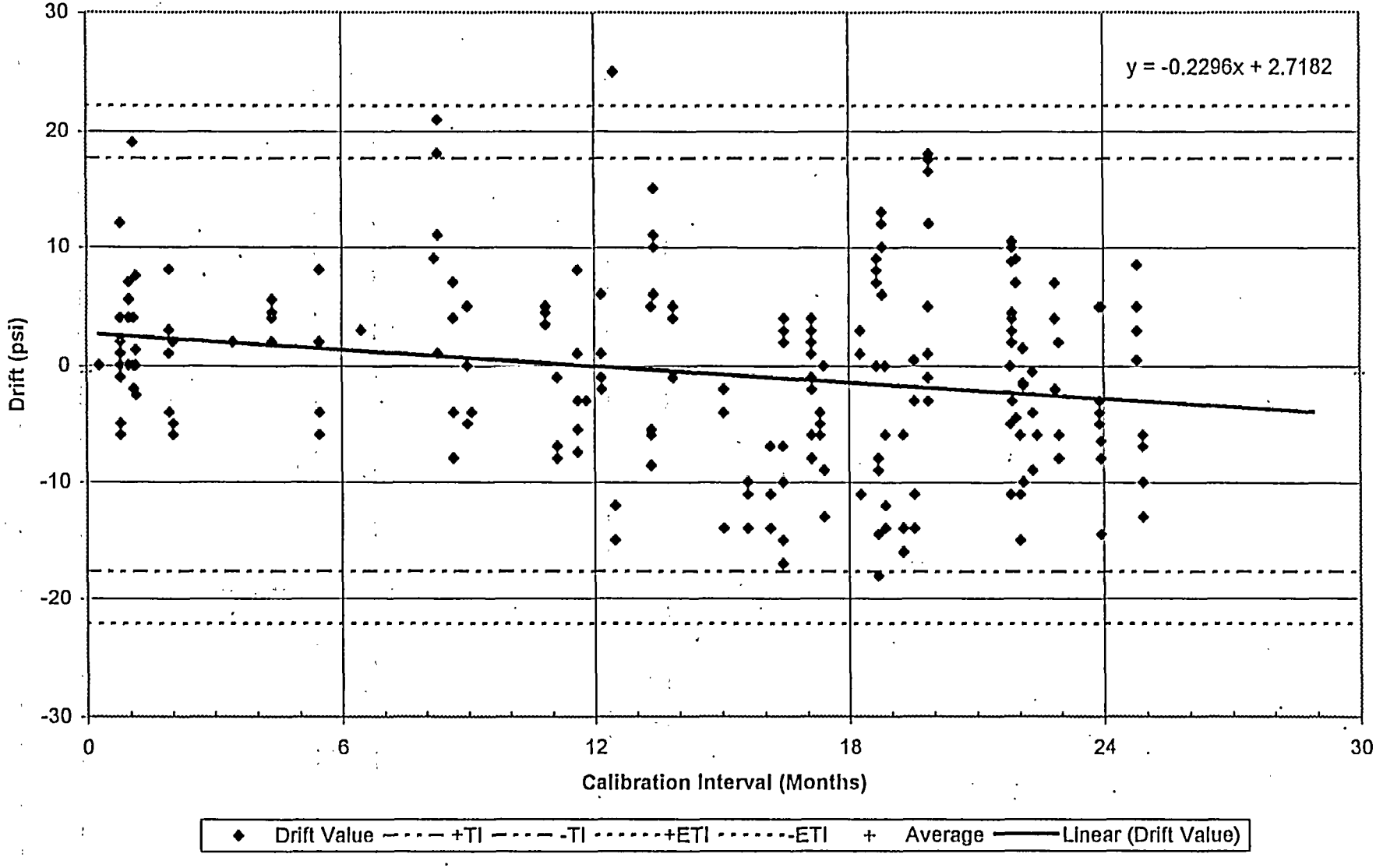
i	x	t
150	4.0	178
151	4.0	182
152	4.0	186
153	4.0	190
154	4.0	194
155	4.0	198
156	4.0	202
157	4.0	206
158	4.5	236.25
159	4.5	240.75
160	4.5	245.25
161	5.0	277.5
162	5.0	282.5
163	5.0	287.5
164	5.0	292.5
165	5.0	297.5
166	5.0	302.5
167	5.0	307.5
168	5.0	312.5
169	5.5	349.25
170	5.5	354.75
171	6.0	393
172	6.0	399
173	6.0	405
174	7.0	479.5
175	7.0	486.5
176	7.0	493.5
177	7.0	500.5
178	7.0	507.5
179	7.0	514.5
180	7.5	558.75
181	8.0	604
182	8.0	612
183	8.0	620
184	8.0	628
185	8.5	675.75
186	8.8	708.4
187	9.0	733.5
188	9.0	742.5
189	9.0	751.5
190	10.0	845
191	10.0	855
192	10.0	865
193	10.5	918.75
194	11.0	973.5
195	11.0	984.5
196	11.0	995.5
197	12.0	1098
198	12.0	1110
199	12.0	1122

i	x	t
200	13.0	1228.5
201	15.0	1432.5
202	16.5	1592.25
203	17.5	1706.25
204	18.0	1773
205	18.0	1791
206	18.0	1809
207	19.0	1928.5
208	21.0	2152.5
209	21.0	2173.5
210	25.0	2612.5

Tolerance Interval Data for Drift Interval Plot

Months (CI):	0	30
Average:	-0.5886	-0.5886
Upper Tolerance Value (+TI):	17.617	17.617
Lower Tolerance Value (-TI):	-17.617	-17.617
Extended Tolerance Value (+ETI):	22.2	22.2
Extended Tolerance Value (-ETI):	-22.2	-22.2

Drift Interval Plot



	Interval	Drift (psi)	Total:	210
Bin 1 (Valid)	0.3	0.0		
	0.3	0.0		
	0.3	0.0		
	0.8	12.0		
	0.8	2.0		
	0.8	1.0		
	0.8	0.0		
	0.8	4.0		
	0.8	-6.0		
	0.8	-5.0		
	0.8	-1.0		
	1.0	7.0		
	1.0	4.0		
	1.0	0.0		
	1.0	5.5		
	1.1	-2.0		
	1.1	0.0		
	1.1	19.0		
	1.1	4.0		
	1.1	0.0		
	1.1	-2.5		
	1.1	1.3		
	1.1	7.5		
Average:	0.9	2.2	Count:	23
Standard Deviation (s_2):		5.457	%:	11.0
Bin 2 (Not Valid)	1.9	8.0		
	1.9	3.0		
	1.9	-4.0		
	1.9	1.0		
	2.0	-5.0		
	2.0	-5.0		
	2.0	2.0		
	2.0	-6.0		
	3.4	2.0		
Average:	2.1	-0.4	Count:	9
Standard Deviation (s_2):		4.773	%:	4.3
Bin 3 (Not Valid)	4.4	5.5		
	4.4	2.0		
	4.4	4.0		
	4.4	4.5		
	5.5	-6.0		
	5.5	-4.0		
	5.5	2.0		
	5.5	8.0		
	6.5	3.0		
Average:	5.1	2.1	Count:	9
Standard Deviation (s_2):		4.464	%:	4.3

Total: 210

	Interval	Drift (psi)
Bin 4 (Valid)	8.2	9.0
	8.3	18.0
	8.3	11.0
	8.3	11.0
	8.3	1.0
	8.3	21.0
	8.3	18.0
	8.3	21.0
	8.7	4.0
	8.7	7.0
	8.7	-8.0
	8.7	-4.0
	9.0	-5.0
	9.0	5.0
	9.0	0.0
	9.1	-4.0
	10.9	3.5
	10.9	4.5
	10.9	3.5
	10.9	5.0
	11.1	-8.0
	11.1	-8.0
	11.1	-1.0
	11.1	-7.0
	11.6	8.0
	11.6	-5.5
	11.6	-7.5
	11.6	1.0
	11.6	-3.0
	11.8	-3.0
	12.2	6.0
	12.2	-1.0
	12.2	1.0
	12.2	-2.0
	12.5	25.0
	12.5	-12.0
	12.5	-15.0
	13.3	5.0
	13.3	-8.6
	13.3	-6.0
	13.3	-5.5
	13.4	15.0
	13.4	10.0
	13.4	11.0
	13.4	6.0
	13.9	4.0
	13.9	4.0
	13.9	-1.0

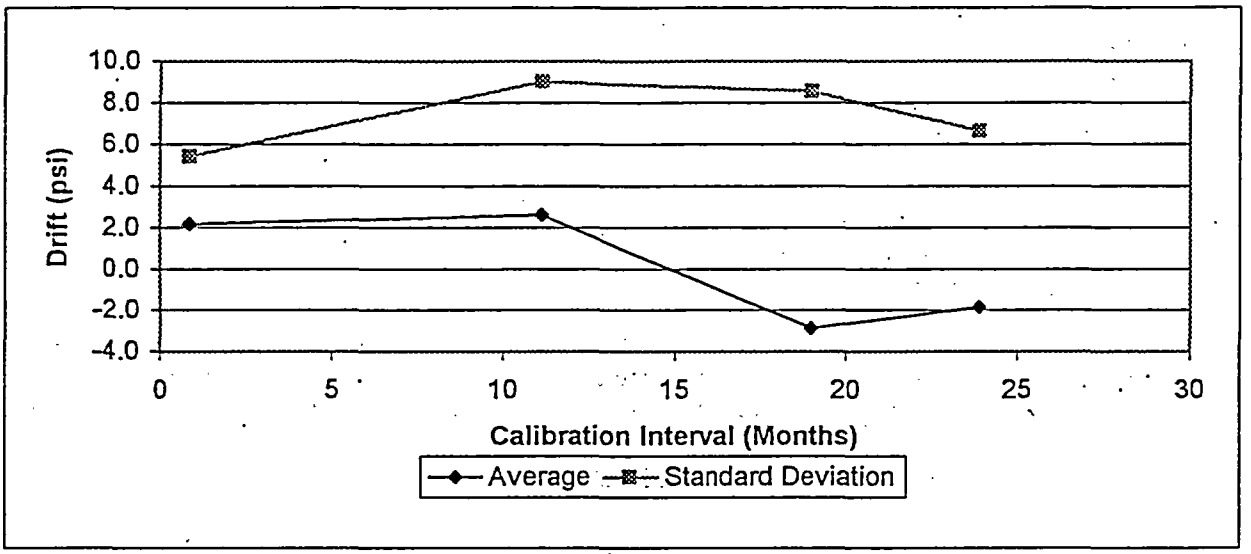
	Interval	Drift (psi)	Total:	210
	13.9	5.0		
Average:	11.1	2.6	Count:	49
Standard Deviation (s):		8.999	%:	23.3
Bin 5 (Valid)	15.0	-2.0		
	15.0	-4.0		
	15.0	-14.0		
	15.6	-11.0		
	15.6	-10.0		
	15.6	-10.0		
	15.6	-14.0		
	16.1	-11.0		
	16.1	-11.0		
	16.1	-7.0		
	16.1	-14.0		
	16.4	-15.0		
	16.4	-7.0		
	16.4	-10.0		
	16.4	-17.0		
	16.5	3.0		
	16.5	2.0		
	16.5	2.0		
	16.5	4.0		
	17.1	2.0		
	17.1	-2.0		
	17.1	1.0		
	17.1	-1.0		
	17.1	-6.0		
	17.1	-8.0		
	17.1	4.0		
	17.1	3.0		
	17.3	-5.0		
	17.3	-4.0		
	17.3	-6.0		
	17.3	-6.0		
	17.4	-13.0		
	17.4	-13.0		
	17.4	0.0		
	17.4	-9.0		
	18.3	3.0		
	18.3	-11.0		
	18.3	1.0		
	18.7	8.0		
	18.7	7.0		
	18.7	0.0		
	18.7	9.0		
	18.7	-9.0		
	18.7	-14.5		
	18.7	-8.0		

Total: 210

Interval	Drift (psi)
18.7	-18.0
18.8	12.0
18.8	13.0
18.8	6.0
18.8	10.0
18.9	-14.0
18.9	-12.0
18.9	0.0
18.9	-6.0
19.3	-6.0
19.3	-16.0
19.3	-14.0
19.5	0.5
19.5	-14.0
19.5	-3.0
19.5	-11.0
19.9	-1.0
19.9	1.0
19.9	5.0
19.9	-3.0
19.9	16.5
19.9	18.0
19.9	12.0
19.9	17.5
21.8	-5.0
21.8	-5.0
21.8	0.0
21.8	-11.0
21.8	2.0
21.8	4.0
21.8	-3.0
21.8	3.0
21.8	10.5
21.8	4.5
21.8	10.0
21.8	8.8
21.9	9.0
21.9	7.0
21.9	-4.5
22.0	-11.0
22.0	-11.0
22.0	-6.0
22.0	-15.0
22.1	1.5
22.1	-1.5
22.1	-1.6
22.1	-10.0
22.3	-0.5

	Interval	Drift (psi)	Total:	210
	22.3	-4.0		
	22.3	-9.0		
	22.4	-6.0		
Average:	19.0	-2.9	Count:	96
Standard Deviation (s):		8.546	%:	45.7
Bin 6 (Valid)	22.9	7.0		
	22.9	7.0		
	22.9	-2.0		
	22.9	4.0		
	23.0	2.0		
	23.0	2.0		
	23.0	-6.0		
	23.0	-8.0		
	23.9	5.0		
	23.9	-3.0		
	23.9	-4.0		
	23.9	-5.0		
	23.9	-14.5		
	23.9	-6.5		
	23.9	5.0		
	23.9	-8.0		
	24.8	8.5		
	24.8	5.0		
	24.8	3.0		
	24.8	0.5		
	24.9	-7.0		
	24.9	-13.0		
	24.9	-6.0		
	24.9	-10.0		
Average:	23.9	-1.8	Count:	24
Standard Deviation (s):		6.667	%:	11.4

Interval	Drift (psi)	Total:	210



$F_{calc} = s_1^2 / s_2^2 =$	2.72
F_{crit} = FINV(0.05, 48, 22) =	1.91
Is $F_{calc} \geq F_{crit}$?	Yes
Time-dependent behavior indicated?	Yes

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.20945855
R Square	0.043872884
Adjusted R Square	0.039276119
Standard Error	8.057630539
Observations	210

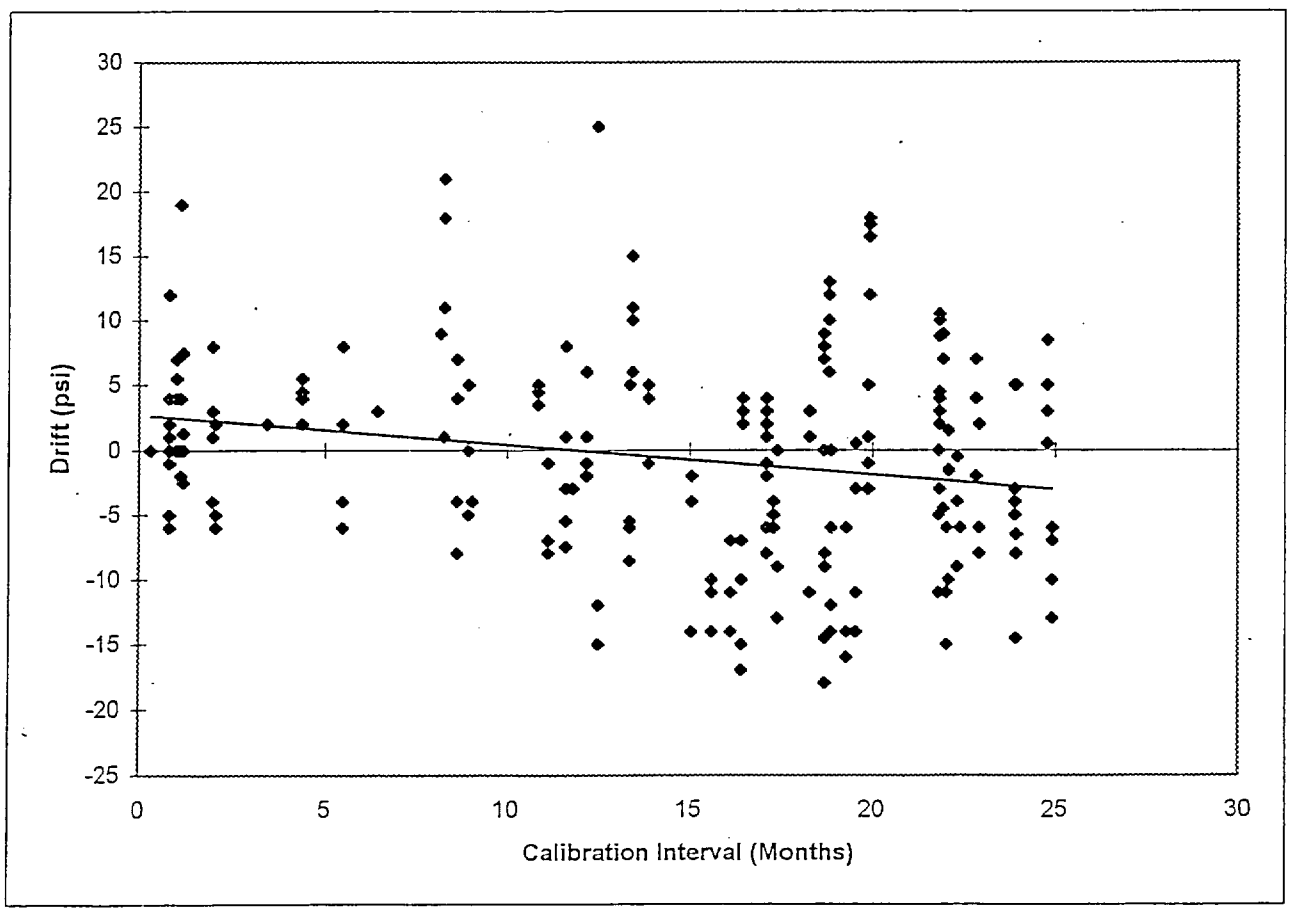
ANOVA

	df	SS	MS	F	Significance F
Regression	1	619.6673111	619.6673111	9.544295708	0.002279717
Residual	208	13504.48526	64.92540991		
Total	209	14124.15257			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.718246653	1.206185699	2.253588859	0.025265018	0.340330724	5.096162581	0.340330724	5.096162581
X Variable 1	-0.229592848	0.074316699	-3.089384358	0.002279717	-0.376103342	-0.083082354	-0.376103342	-0.083082354

F_{crit} = FINV(0.05,2,208) = 3.039289709

R Square > 0.09?	No
P-value for X Variable 1 < 0.05?	Yes
$F > F_{crit}$?	Yes
Time-dependent behavior indicated?	Yes



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.167256479
R Square	0.02797473
Adjusted R Square	0.023301531
Standard Error	4.927928058
Observations	210

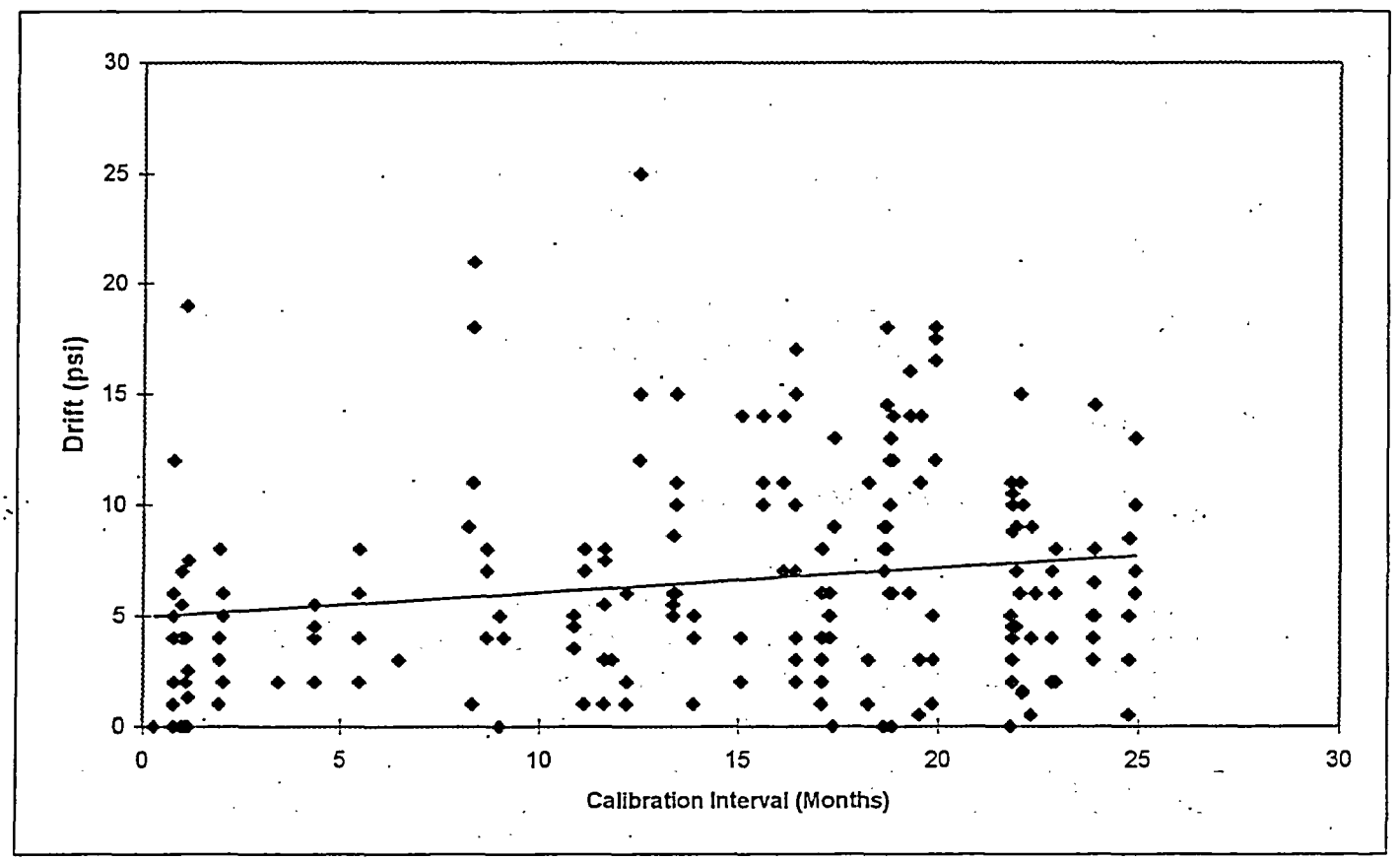
ANOVA

	df	SS	MS	F	Significance F
Regression	1	145.3718772	145.3718772	5.986206313	0.015248325
Residual	208	5051.170789	24.28447495		
Total	209	5196.542667			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.945003421	0.737685393	6.703404284	1.8795E-10	3.490705093	6.39930175	3.490705093	6.39930175
X Variable 1	0.111203706	0.045450998	2.446672498	0.015248325	0.021600048	0.200807365	0.021600048	0.200807365

F_{crit} = FINV(0.05,2,208) = 3.039289709

R Square > 0.09?	No
P-value for X Variable 1 < 0.05?	Yes
$F > F_{crit}$?	Yes
Time-dependent behavior indicated?	Yes



CA-03-055, Rev. 0, Attach. 3

MONTICELLO NUCLEAR GENERATING PLANT		3765
TITLE:	FIRE PROTECTION PROGRAM CHECKLIST	Revision 0
		Page 1 of 7

Initiating Document: CA-03-055 Rev no. 0

Individual Completing Form:

Print Name: DuWayne Wacha Date: 6/13/03

Signature: DuWayne Wacha

The following items ***SHALL*** be considered in evaluating the potential impact on the fire protection program with respect to NRC, NEIL (insurance underwriter), building code, and National Fire Protection Association design and testing code requirements. This checklist is applicable to both classical fire protection and post-fire safe shutdown capability.

	YES	NO
1. Facility Arrangement/Access/Egress		
Will the proposed change temporarily or permanently: Alter or block the access to or egress from an area or room, or Modify the general arrangement of an area or room?	☐	☒
Will the proposed change renovate or alter the occupancy of an area or room such as enclosing or fencing off an area for use as storage space or establishing a personnel work station or office?	☐	☒
Will the proposed change modify the technical nature of surveillance or periodic test procedures for fire barriers or assemblies?	☐	☒
2. Walls/Barriers		
Are changes proposed to any floors, ceilings or walls, including exterior walls?	☐	☒

Changes to floors ceilings and walls would include integral components such as doors and frames (including hardware), dampers, structural steel supports, hatches, curbs, and penetration seals.

3087 (DOCUMENT CHANGE, HOLD AND COMMENT FORM) incorporated:					
FOR ADMINISTRATIVE USE ONLY	Resp Supv: PRGE	Assoc Ref: 4 AWI-08.01.00	SR: N	Freq: 0 yrs	
	ARMS: 3765	Doc Type: REF ONLY	Admin initials:	Date:	

Approved (Signatures available in Master File)

	YES	NO
3. Combustible Load/Ignition Sources		
Does the proposed change increase, decrease or rearrange the combustible loading in any area or room?	☐	☒
Typical combustibles include cable insulation, oils, fire retardant treated wood, flammable liquids, plastics, etc. If the change is the result of new cables being added or removed and the entire length of cable is or will be in conduit, or the cable is metal clad, this question may be answered no. If the change is the result of wiring, components or devices being installed totally inside an existing panel or removed from an existing panel, this question may be answered no.		
Are any special hazards being introduced into an area or room such as hydrogen or combustible metals such as titanium?	☐	☒
Is an ignition source being temporarily or permanently introduced into an area or room?	☐	☒
480V and above electrical devices are considered ignition sources.		
Are combustibles or hazards being permanently introduced in the owner controlled area?	☐	☒
Will thermal stress relieving be employed?	☐	☒
4. Detection		
Does the proposed change modify any fire detection system including quantity, type, circuitry, detector location, detector spacing, or sensitivity?	☐	☒
Will the proposed change temporarily or permanently remove a fire detection system or alarm capability from service?	☐	☒
Within any room or area, are changes proposed to internal structures, cable trays, ventilation ducts, etc. in close proximity to fire/smoke detectors?	☐	☒
Will the proposed change introduce heat producing or generating devices into an area or room containing fire, flame or smoke detectors?	☐	☒
Will the proposed change modify the technical nature or acceptance criteria of surveillance or periodic test procedures for the plant's fire detection systems?	☐	☒
Will the proposed change modify the response to any plant fire alarm?	☐	☒

		YES	NO
5.	**Suppression**		
	Will the proposed change install, modify or eliminate any fire suppression system or manual fire suppression feature, including water or gas supplies and extinguishers?	☐	☒
	Will the proposed change temporarily or permanently remove a fire suppression system or component from service?	☐	☒
	Is any structure, system or component being introduced or modified such that its final configuration could cause interference with suppression system spray patterns?	☐	☒
	Will the proposed change modify the technical nature or acceptance criteria of surveillance or periodic test procedures for the plant's fire suppression systems or water supply equipment?	☐	☒
6.	**Ventilation**		
	Will the proposed change alter the location or type of air supply, or discharge registers or other openings intended for air circulation in a room or area containing smoke or fire detectors; or change the velocity, quantity or direction of air being supplied to or discharged from a room or area containing fire detectors?	☐	☒
7.	**Drainage**		
	Are temporary or permanent changes proposed to the Reactor or Turbine Building floor drain system including processing equipment?	☐	☒
8.	**Oil Systems**		
	Does the proposed change introduce, alter or eliminate any lube oil system including piping route, line pressure, or method of system operation?	☐	☒
9.	**Fire Resistive Coatings/Fire Proofing**		
	Are changes proposed that will in any way install, modify, eliminate or change the type of fire resistive coating/fire proofing on structural steel or other commodities?	☐	☒
	Will the proposed change alter the thickness acceptance criteria of fire coating/fire proofing material?	☐	☒

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MONTICELLO NUCLEAR GENERATING PLANT		3765
TITLE:	FIRE PROTECTION PROGRAM CHECKLIST	Revision 0
		Page 4 of 7

	YES	NO
10. Safe Shutdown Systems		
Exclusive of surveillance, periodic test and maintenance procedures, will the proposed change affect any of the following systems including components, devices, piping or support functions? Circle affected system(s).	☒	☐

Core Spray

Residual Heat Removal (Suppression Pool Cooling Mode)

RHR Service Water System

RHR Auxiliary Air System

ECCS Room Coolers

Reactor Pressure Relief System (SRV's)

Main Steam (MSIV's)

Suppression Pool Level

Suppression Pool Temperature (SPOTMOS)

Reactor Vessel Level

Reactor Vessel Pressure

Alternate Shutdown System (ASDS)

Emergency Service Water System

Control Rod Drive

120V AC Power System

125V DC Essential Power System

250V DC Power System

4kV/480V AC Essential Power System

AC Emergency Power System (Diesel Generators, Support Equipment and Fuel Supply)

Will the proposed change revise the acceptance criteria of any surveillance or periodic test procedure for any component or device in the above systems?	☐	☒

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MONTICELLO NUCLEAR GENERATING PLANT		3765
TITLE:	FIRE PROTECTION PROGRAM CHECKLIST	Revision 0
		Page 5 of 7

	YES	NO
11. Circuits		
Will the proposed change revise the circuit of any component in any of the systems listed in Item 10? Circle the system(s).	☐	☒
Will the proposed change add, delete or change the route of any cable for any component in any of the systems listed in Item 10? Circle the system(s).	☐	☒
Are any changes proposed to the ASDS Panel (C-292) or ASDS Relay Panel (C-293)?	☐	☒
12. Breaker Coordination/Associated Circuits		
Are changes proposed to vital power supplies including 125V DC, 120V AC, 480V, and 4160V, such that, the breaker coordination of these supplies may be affected (adding, deleting or revising loads)?	☐	☒
13. Alternate Shutdown/Control Room Evacuation		
Will the proposed change modify the technical nature of Procedure C.4-C?	☐	☒
Will the proposed change revise any procedure used to assure availability/accessibility of post-fire control room evacuation support equipment contained in the ASDS Panel Equipment Cabinet (procedures, portable lights, radios, etc.)?	☐	☒
14. Portable Fuel Oil Transfer Pump		
Will the proposed change alter the installation, surveillance or test procedures associated with the portable fuel oil transfer pump?	☐	☒
15. Communications		
Will the proposed change modify the radio system, including power supply?	☐	☒
Will the proposed change alter the technical nature or acceptance criteria of the radio system surveillance or periodic test procedures?	☐	☒

Approved (Signatures available in Master File)

MONTICELLO NUCLEAR GENERATING PLANT		3765
TITLE:	FIRE PROTECTION PROGRAM CHECKLIST	Revision 0
		Page 6 of 7

	YES	NO
16. Emergency Lights		
Will the proposed change add, eliminate, change the location or otherwise modify any battery powered emergency lights?	☐	☒
Will the proposed change introduce any commodities that may block the beam of battery powered emergency lights?	☐	☒
Will the proposed change modify the technical nature of the surveillance or periodic test procedures for battery powered emergency lights?	☐	☒

If all questions are answered NO:

For Alterations, on Form 3278 (50.59 Screening), Part IV (Conclusion), Additional Comments and Reviews Section, identify that completion of this checklist resulted in a "no potential impact" determination for the fire protection program. The checklist may be discarded after the alteration is approved.

For Bypasses, indicate in the SRI or engineering evaluation that completion of this checklist resulted in a "no potential impact" determination for the fire protection program. The checklist may be discarded after the bypass is approved.

For Calculations, indicate NO for fire protection program impact on page 2 of the calculation cover sheet, Form 3494. The checklist may be discarded after the calculation is approved.

For Procedures, retain this checklist with the procedure review package until approved. Then discard this checklist. On Form 3274, the signature against Item 1 for either targeted, OCRC, or comprehensive change provides the traceability that the checklist was completed.

If any question is answered YES:

A review and documented disposition is required by a Fire Protection and/or Appendix R Safe Shutdown Subject Matter Expert (SME) to determine if the proposed change affects the Fire Protection Program. It is possible that a question answered YES on this checklist eventually results in no impact to the Program. Forward the proposed change along with this checklist to either the Fire Protection or Appendix R Safe Shutdown SME.

Approved (Signatures available in Master File)

MONTICELLO NUCLEAR GENERATING PLANT		3765
TITLE:	FIRE PROTECTION PROGRAM CHECKLIST	Revision 0
		Page 7 of 7

For Alterations, on Form 3278 (50.59 Screening), Part IV (Conclusion), Additional Comments and Reviews Section, reflect the disposition by the Fire Protection and/or Appendix R Safe Shutdown SME. The checklist and written disposition by the Fire Protection and/or Appendix R Safe Shutdown SME ***SHALL*** be included as an attachment to the alteration package.

For Bypasses, include the checklist and written disposition by the Fire Protection and/or Appendix R Safe Shutdown SME as an attachment to the SRI or engineering evaluation.

For Calculations, indicate NO or YES for Fire Protection Program impact on page 2 of the calculation cover sheet, Form 3494, as appropriate based on the disposition provided by the Fire Protection and/or Appendix R Safe Shutdown SME. The checklist and written disposition by the Fire Protection and/or Appendix R Safe Shutdown SME ***SHALL*** be included in the calculation as an attachment.

For Procedures, attach this checklist along with the written disposition by the Fire Protection and/or Appendix R Safe Shutdown SME to the procedure. The checklist and written disposition ***SHALL*** become part of the permanent record for the procedure.

Approved (Signatures available in Master File)

6/17/2003
4:12 PM

ATTACHMENT A

CALCULATION CA-03-055 Rev. 0

Fire Protection Program Review

ATTACHMENT 4

PAGE 1 OF 1

Document Reviewed _CA-03-055_

Summary Description of Document or Change:

Instrument Drift Analysis – Barksdale B2T-A12SS Pressure Switches

Fire Protection Program Documents Reviewed:

__ USAR	__ 4AWI-08.01.00	__ DBD	__ Ops Man B.08.05-05
_X_ UFHA	__ 4AWI-08.01.01	__ SERs	__ Ops Man B.08.11-05.H
_X_ SSDA	__ 4AWI-08.01.02	__ NEIL Stds	__ Ops Man C.4-C
__ Tech Specs	__ 4AWI-08.01.04	__ Bldg Code	__ Ops Man A.3
	__ 4AWI-04.02.01		

Other _____

Type Review: _X_ Fire Protection

_X_ Safe Shutdown

Review Results: _X_ No Program Impact

__ Approved – No Prior NRC Review Req'd

__ NRC Review Req'd Prior to Implementation

Supporting Statements: _____

A review of the Safe Shutdown component tables of the Safe Shutdown Analysis determined that the subject components are not credited for safe shutdown. The proposed change does not introduce any fire induced failure mechanisms that could adversely impact the ability to achieve or maintain post-fire safe shutdown.

A review of the Updated Fire Hazards Analysis shows that the calculation change does not adversely affect the fire zone matrix and the changes are within the combustible loading limits. Therefore, the change will not reduce the current fire protection features in the area.

Signature: William A Klaus Date: 6/17/03

Print Name: William A Klaus

MONTICELLO NUCLEAR GENERATING PLANT		3495
TITLE:	CALCULATION/ANALYSIS VERIFICATION CHECKLIST	Revision 5
		Page 1 of 1

Place initial by items verified.

CA - 03 - 055
Attachment 5
Page 1 of 2

	REVIEW	Verified
1.	Inputs correctly selected.	RDW
2.	Assumptions described and reasonable.	RDW
3.	Applicable codes, standards and regulations identified and met.	RDW
4.	Appropriate method used.	RDW
5.	Applicable construction and operating experience considered.	RDW
6.	Applicable structure(s), system(s), and component(s) listed.	RDW
7.	Formulas and equations documented, unusual symbols defined.	RDW
8.	Detailed to allow verification without recourse to preparer.	RDW
9.	Neat and legible, pages all correctly numbered.	RDW
10.	Signed by preparer.	RDW
11.	Interface requirements identified and satisfied.	RDW
12.	Acceptance criteria identified, adequate and satisfied.	RDW
13.	Result reasonable compared to inputs.	RDW
14.	Basis of all assumptions, acceptance criteria and inputs are identified.	RDW
15.	Conclusions not in conflict with previous analysis, USAR, Technical Specifications or NRC Safety Evaluations.	RDW
	ALTERNATE CALCULATION	
16.	Alternate calc results consistent with original.	N/A
17.	Items 1-4 above verified. (Required by ANSI N.45.2.11)	N/A
	TESTING	
18.	Testing requirements fully described and adequate.	N/A
19.	Shows adequacy of tested feature at worst case conditions.	N/A
20.	If test is for overall design adequacy, all operating modes considered in determining test conditions.	N/A
21.	If model test, scaling laws and error analysis established.	N/A
22.	Results meet acceptance criteria, or documentation of acceptable resolution is attached.	N/A

OTHER (Explain) _____

	FINAL DOCUMENTATION (Verify applicable items included)	
23.	Alternate or check calcs	N/A
24.	Summary of test results.	N/A
25.	Comments (errors, discrepancies, recommendations).	RDW
26.	Method of resolution of comments.	RDW

Completed By: Roger D. Wyatt Date: 11/5/03

3087 (DOCUMENT CHANGE, HOLD AND COMMENT FORM) incorporated:					
FOR ADMINISTRATIVE USE ONLY	Resp Supv: GSE-NGS	Assoc Ref: AWI-05.01.25	SR: N	Freq: 0	yrs
	ARMS: 3495	Doc Type: 3042	Admin initials:	Date:	

APPROVED (Signatures available in Master File)

NMC
Committed to Nuclear Excellence
Fleet Modification Process

Design Review Comment Form

DOCUMENT NUMBER/ TITLE: *CA-03-055 Instrument Drift Analysis, Barksdalet B2T-A12SS Pressure Switches*

REVISION: 0 DATE: 11/5/03

ITEM #	REVIEWER'S COMMENTS	PREPARER'S RESOLUTION	REVIEWER'S DISPOSITION
1	Evaluation of the Standard Deviation for Time Dependency –Since the F-distribution test in the binning analysis and the majority of the regression analysis tests, as well as the positive slope of absolute values plot, indicate time dependant behavior; a stronger justification needs to be provided to explain why we are treating AD as moderately time dependant.	Revised to conservatively treat AD as strongly time dependant.	Preparer's resolution found to be acceptable. No additional action needed.
2	Minior editorial comments and enhancements per marked-up review copy.	Revised to incorporate mark-up review copy comments.	Preparer's resolution found to be acceptable. No additional action needed.

Reviewer: Roy P. Wyatt Date: 11/5/03

Preparer: Rick Nelson DAN 11/6/03 Date: 11/6/03