Nuclear
Services
Integration
Division

Field Service Procedure
Approval Cover Sheet

Procedure No.	Plant Site
NSID-EIS-84-07	PNJ/Salem Unit#2
Title: REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM CALIBRATION PROCEDURE	
Purchase Order: N/A	S/O No.: PNFN-30433

WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR SERVICE INTEGRATION DIVISION
P.O. Box 2728
Pittsburgh, PA 15230

The procedure approval signature of the cognizant manager below confirms that prior concurrence of required review groups has been obtained.

Dept / Date	Revision 0	Revision	Revision
Originator / Date	Edward P. Liscio Edward P Liscio		
Cognizant Mgr / Date	Joel R. Terry 4/16/84		
Customer / Date	Req'd ☐ Yes ☒ No	Req'd ☐ Yes ☐ No	Req'd ☐ Yes ☐ No

ORIGINAL SIGNED COPY WITH ATTACHED PROCEDURE TO NSID INFORMATION & RECORDS SYSTEMS, BLDG. 701/109

NSID 1031 7-16-83

1.0 PURPOSE

The purpose of this procedure is to detail the steps involved in calibrating the Vessel Level Monitor (VLM) System microprocessor assembly.

2.0 SCOPE

The Vessel Level Monitor (VLM) System comprises two identical microprocessor based monitoring channels, each capable of monitoring various analog and digital inputs, performing calculations using the information obtained from the inputs, and providing vessel level information.

3.0 REFERENCES

A. Supporting Documents

1. "Vessel Level Monitor, Volume II", WNES-NTD, 1981
2. Vessel Level Monitor Scaling Parameters obtained from the site during installation of the system which include:
   1) Elevation and lengths of capillary runs indicated on an isometric drawing
   2) Tag numbers and location of RTD's in the capillary runs
   3) Spans and ranges of RTD's in the capillary runs, DP transmitters, hot leg RTD's and pressure transmitters
   4) Transmitter lead identification and their reference connections to the back of the VLM cabinet

B. Required Documents

1. Vessel Level Monitor System Scaling Calculations (latest revision for the site at which this test is being conducted)
2. Calibration Check Tables for the site being tested (Appendix B of this document)
3. "Vessel Level Monitor, Volume I", WNES-NTD, 1981
4. OPR 610-3 REV 3 "Contol of Field Activities"
5. OPR 215-1 REV 3 "Measuring & Test Equipment (M&TE Control)"

4.0 RESPONSIBILITY

A. WNSID Engineer

1. Provide the equipment as specified in the equipment list
2. Perform the test in accordance with this procedure

B. Customer

1. Provide the I&C personnel for assistance (as required)
2. Provide Quality Control coverage during the calibration

5.0 PREREQUISITES

A. Equipment List

1. Precision Voltage Source (±.01% accuracy)
2. Precision Resistors (±.05% accuracy)

B. Approvals/Qualifications

1. The customer's approval of this procedure is required prior to commencement of work.

Site Signature Date

2. Test equipment in the equipment list is available, operable, and, if necessary, has been calibrated with standards traceable to the National Bureau of Standards and in accordance with WNSID Operating Procedure, OPR 215-1, "Measuring and Test Equipment".

W Signature Date

3. The Vessel Level Monitor (VLM) System has been completely installed and functionally tested.

W Signature Date

4. The information in Reference 3.A.2 has been verified to be correct by a site representative.

W Signature Date

6.0 PROCEDURE

NOTE

The same procedure will be followed for both trains. After calibrating the first train come back to this point and repeat for the second. Figure 1 is a view of the VLM front panel.

1. POWER ON
   Assure power to the VLM system is on. Check to see that the RUN lamp is lit. If the RUN lamp is not lit, depress the reset switch to restart the CPU.

2. TEST & CALIBRATE MODE
   Turn the keyswitch on the front panel to TEST & CALIBRATE/WRITE ENABLE to put the VLM system into the write mode.

3. SENSOR ENGINEERING UNIT CONVERSION DATA
   Move the thumbwheel FUNCTION switch to 14. The general form of the VLM display will be:

(sensor name) ENG COEF (coefficient label) [numeric value of coefficient]

The words enclosed in parenthesis change and are controlled by the following:

Thumbwheel VARIABLE switch	(sensor name)
STEP pushbutton	(coefficient label)

NOTE

Tables 1-10 referenced herein are site specific and are part of Reference 3.B.1.

Enter the values from Table 1 into the VLM by moving the thumbwheel VARIABLE switch to the (sensor name) indicated and pressing the STEP pushbutton to obtain the (coefficient label) indicated. Enter the [numeric value of coefficient] by pressing the button with the HORIZONTAL arrow to position the cursor under the number you wish to change. Now, press the button with the VERTICAL arrow to change the numbers value. With the correct number displayed, press the STORE button to register it in the CPU memory.

4. SENSOR OFF-SCALE HIGH AND LOW SETPOINTS

Move the thumbwheel FUNCTION switch to 10. The general form of the VLM display will be:

(sensor name) OFF-SCALE (Hi or Lo) [numeric value of off-scale Hi or Lo]

The words enclosed in parenthesis change and are controlled by the following:

Thumbwheel VARIABLE switch	(sensor name)
STEP pushbutton	(Hi or Lo)

Enter in the values from Table 2 into the VLM by moving the thumbwheel VARIABLE switch to the (sensor name) indicated. Press the STEP pushbutton to obtain (Hi or Lo). Enter the [numeric value of off-scale Hi or Lo]. Be sure to press the STORE pushbutton after a number is entered to register it in the CPU memory.

5. ALARM SETPOINTS

Move the thumbwheel FUNCTION switch to 11. The general form of the VLM display will be:

(DPi, i=1,4) (Alarm Setpoint) (# of pumps running) PUMPS [value of alarm]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter in the values from Table 3 into the VLM by pressing the STEP pushbutton to get the indicated (DPi, i=1,4) (Alarm Setpoint) and (# of pumps running). Enter the [value of alarm or caution setpoint]. Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

6. NORMAL LEVEL READINGS

Move the thumbwheel FUNCTION switch to 7. The general form of the VLM display will be:

(DPi, i=1,4) NORMAL (# of pumps running) PUMPS [normal level reading]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter the values from Table 4 into the VLM by pressing the STEP pushbutton to get the indicated (DPi, i=1,4) and (# of pumps running). Enter the [normal level reading]. Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

7. PERCENT LEVEL SCALE CALIBRATION DATA

Move the thumbwheel FUNCTION switch to 8. The general form of the VLM display will be:

(DPi, i=1,4) SCALE (coefficient label) [numeric value of coefficient]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter the values from Table 5 into the VLM by pressing the STEP pushbutton to get the indicated (DPi, i=1,4) and (coefficient label). Enter the [numeric value of coefficient]. Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

8. READOUT LIMIT VALUES

Move the thumbwheel FUNCTION switch to 9. The general form of the VLM display will be:

(DPi, i=1,4) LIMIT (Lo or Hi) [numeric value of Lo or Hi limit]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter the values from Table 6 into the VLM by pressing the STEP pushbutton to get the indicated (DPi, i=1,4) and (Hi or Lo). Enter the (numeric value of Lo or Hi limit). Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

9. FLOW HEAD PUMP PERFORMANCE CURVE

Move the thumbwheel FUNCTION switch to 13. The general form of the VLM display will be:

(Low or Hi) RANGE (P or T)/FLOW COEF (coefficient label) [numeric value of coefficient]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter the values from Table 7 into the VLM by pressing the STEP pushbutton to get the indicated (Low or Hi) and (coefficient label). Enter the [numeric value of coefficient]. Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

Move the thumbwheel FUNCTION switch to 12. The general form of the VLM display will be:

FLOW SET (P or T) [numeric value of setpoint]

The words enclosed in parenthesis are controlled by the STEP pushbutton.

Enter the values from the bottom of Table 7 into the VLM by pressing the STEP pushbutton to get the indicated (P or T). Enter the [numeric value of coefficient]. Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

10. IMPULSE LINE VERTICAL LENGTHS

Move the thumbwheel FUNCTION switch to 6. The general form of the VLM display will be: (For thumbwheel VARIABLE switch in positions 1-15)

H [(sensor name), (DPi, i-1,4)] [numeric value height]

The general form of the VLM display will be: (For thumbwheel VARIABLE switch in positions 16-17)

OVERALL HT (DPi, i-1,2) [numeric value overall ht]

For the VARIABLE switch in positions 1-15 the words enclosed in parenthesis are controlled by the following:

thumbwheel VARIABLE switch	(sensor name)
STEP pushbutton	(DPi, i=1,4)

For the VARIABLE switch in positions 16-17 (DPi, i=1,2) is controlled by the thumbwheel VARIABLE switch.

Enter the values from Table 8 into the VLM by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get (DPi, i=1,4). Be sure to press the STORE pushbutton after a number is entered, to register it in the CPU memory.

11. CALIBRATION OF ANALOG INPUTS

A. ZERO SETTING

Record values from Table 9 by performing the following steps:

1) Input 0 ohms to the RTD's, using a precision resistance device. Refer to applicable schematic in Reference 3.B.3 for input connections.

2) Input 0 V to all other transmitters, using a precision voltage device. Refer to applicable schematic in Reference 3.B.3 for input connections.

3) Move the FUNCTION thumbwheel switch to 15.

4) A display will occur of the general form:

– (sensor name) RANGE = (range) (Offset) = [numeric value of Offset or Full Sc]

The words enclosed in parenthesis are controlled by the following:

thumbwheel VARIABLE switch	(sensor name)
STEP pushbutton	(range) (Offset)

NOTE

At this time we are only interested in the (Offset). While pressing the STEP pushbutton, if (Full Sc) should appear, press the STEP pushbutton again to obtain a display with (Offset) in it.

5) Reference the conditions in Table 9 by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get the indicated (range) and (offset).

6) Check Table 9 to assure the [numeric value of the offset] is as expected for the range. If it is not, go to step 13 to perform a potentiometer adjustment and then perform step 12 from the beginning again. If the [numeric value of the offset] is as expected, record this value in the appropriate column in Table 9 and press the STORE pushbutton to enter this offset in CPU memory.

B. FULL SCALE SETTING

Record values from Table 10 by performing the following steps:

7) Input 19.6 ohms to the RTD's and 19.6 mV to all other transmitters using precision resistance and voltage devices. Refer to applicable schematic in Reference 3.B.3 for input connections.
8) Check to see the FUNCTION thumbwheel switch is at 15.
9) The general form of the display will be:

(sensor name) RANGE = (range) (Full Sc) = [numeric value of Offset or Full Sc]

The words enclosed in parenthesis are controlled by the following:

thumbwheel VARIABLE switch	(sensor name)
STEP pushbutton	(range) (Full Sc)

NOTE

At this time we are only interested in the (Full Sc). While pressing the STEP pushbutton, if (Offset) should appear, press the STEP pushbutton again to obtain a display with (Full Sc) in it.

10) Reference the conditions in Table 10 in the column entitled 0-20 mV by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get the indicated (range) and (Full Sc).

11) Check Table 10 to assure the [numeric value of Full Sc] is as expected for the 0-20 mV range. If it is not, go to step 13 to perform a potentiometer adjustment and then perform step 12 from the beginning again. If the [numeric value of the Full Sc] is as expected, record this value in the appropriate column in the 0-20 mV column and press the STORE pushbutton to enter this (Full Sc) in the CPU memory.

12) Input 97.6 ohms to the RTD's and 97.6 mV to all other transmitters using precision resistance and voltage devices. Refer to applicable schematic in Reference 3.B.3 for input connections.

13) Reference the conditions in Table 10 in the column entitled 0-100 mV by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get the indicated (range) and (Full Sc).

14) Check Table 10 to assure the [numeric value of Full Sc] is as expected for the 0-100 mV range. If it is not, go to step 13 to perform a potentiometer adjustment and then perform step 12 from the beginning again. If the [numeric value of the Full Sc] is as expected, record this value in the appropriate column in the 0-100 mV column and press the STORE pushbutton to enter this (Full Sc) in the CPU memory.

15) Input 976 ohms to the RTD sensors and 970 mV to all other transmitters using precision resistance and voltage devices. Refer to applicable schematic in Reference 3.B.3 for input connections.

16) Reference the conditions in Table 10 in the column entitled 0-1 V by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get the indicated (range) and (Full Sc).

17) Check Table 10 to assure the [numeric value of Full Sc] is as expected for the 0-1 V range. If it is not, go to step 13 to perform a potentiometer adjustment and then perform step 12 from the beginning again. If the [numeric value of the Full Sc] is as expected, record this value in the appropriate column in the 0-1 V column and press the STORE pushbutton to enter this (Full Sc) in the CPU memory.

18) Input 9760 ohms to the RTD sensors and 9.76 V to all other transmitters using precision resistance and voltage devices. Refer to applicable schematic in Reference 3.B.3 for input connections.

19) Reference the conditions in Table 10 in the column entitled 0-10 V by moving the thumbwheel VARIABLE switch to get the indicated (sensor name) and the STEP pushbutton to get the indicated (range) and (Full Sc).

20) Check Table 10 to assure the [numeric value of Full Sc] is as expected for the 0-10 V range. If it is not, go to step 13 to perform a potentiometer adjustment and then

perform step 12 from the beginning again. If the [numeric value of the Full Sc] is as expected, record this value in the appropriate column in the 0-10 V column and press the STORE pushbutton to enter this (Full Sc) in the CPU memory.

NOTE

This step is only to be performed if requested in steps 12 and 13. Do not perform this step if steps 12 and 13 are completed with no problems.

12. POTENTIOMETER ADJUSTMENT

A. Locate the 3 potentiometers on the top of the left module of the 12-channel A/D board A5. The left hand potentiometer is labeled FULL SCALE, the middle potentiometer is not labeled, but is the low range zero adjustment, and the right hand potentiometer is labeled zero.

B. Input 0 V to any of the input channels (except RTD's). Adjust the ZERO potentiometer to obtain an Offset reading of approximately 010 on the 0-10 V scale.

C. Adjust the middle (unlabeled) potentiometer to obtain an Offset reading as close to 010 as possible on the 0-1 V or 0-100 V scale. The reading must be below 0FF on the 1 V scale.

D. Input 9.76 V to any of the input channels (except RTD's). Adjust the FULL SCALE potentiometer to obtain an Offset reading on the 0-10 V scale as close to F7E as possible, but below FFF. Change the input to 976 mV and press the step button to obtain the 0-1 V scale. Check that the reading is below FFF.

14. READ MODE

Set the Normal/Test and Calibrate keyswitch to Test and Calibrate Read Only to put the system in the Read Mode.

15. CALIBRATION CHECKOUT

Confirm the calibration of the Vessel Level Monitor for the values just entered, by performing the tests involved in the tables located in Reference 3.B.2. Input the indicated V or mA to the sensor and check the level indications on the VLM remote display. Record the level that was obtained from the Tables.

16. NORMAL MODE

Turn the Normal/Test Calibrate keyswitch to Normal to return the VLM back to normal operation.

7.0 CLOSEOUT

Section 6.0 has been completed for the Vessel Level Monitor System Calibrating Procedure.

Conducted by_____ Date_____ Time_____
WNSD Engineer

Noted by_____ Date_____ Time_____
I&C Supervisor

Review by_____ Date_____ Time_____
Utility QC

APPENDIX B
CALIBRATION CHECK

TABLE 11

TABLE 11
CALIBRATION CHECK
TRAIN A

TEST #: 1								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.177	400.000	88		58		75	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	406.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 12

TABLE 12
CALIBRATION CHECK
TRAIN A

TEST #: 2									
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual	
RTD1	.115	100.000	88		59		75		K
RTD2	.177	400.000	NOTES:						K
RTD3	.115	100.000							
RTD4	.115	100.000							
RTD5	.115	100.000							
RTD6	.115	100.000							
RTD7	.115	100.000							
RTD8	.115	100.000							
DP1	.679	-3.000							
DP2	.581	-10.000							
DP3	.529	5.000							
THOT1	3.286	400.000							
THOT2	3.286	400.000							
PRESS	3.994	2260.000							

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 13

TABLE 13
CALIBRATION CHECK
TRAIN A

Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
TEST #: 3								
RTD1	.115	100.000	95		61		76	
RTD2	.115	100.000	NOTES:					
RTD3	.177	400.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 14

TABLE 14
CALIBRATION CHECK
TRAIN A

TEST #: 4								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	81		47		70	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.177	400.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2250.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 15

TABLE 15
CALIBRATION CHECK
TRAIN A

TEST #: 5								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	82		48		78	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.177	400.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 16

TABLE 16
CALIBRATION CHECK
TRAIN A

TEST #: 6									
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual	
RTD1	.115	100.000	89		54		73		
RTD2	.115	100.000	NOTES:						
RTD3	.115	100.000							
RTD4	.115	100.000							
RTD5	.115	100.000							
RTD6	.177	400.000							
RTD7	.115	100.000							
RTD8	.115	100.000							
DP1	.679	-3.000							
DP2	.581	-10.000							
DP3	.529	5.000							
THOT1	3.286	400.000							
THOT2	3.286	400.000							
PRESS	3.994	2260.000							

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 17

TABLE 17
CALIBRATION CHECK
TRAIN A

TEST #: 7								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		37		65	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.177	400.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 18

TABLE 18
CALIBRATION CHECK
TRAIN A

TEST #: 8								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	89		53		73	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.177	400.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3631
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 19

TABLE 19
CALIBRATION CHECK
TRAIN A

TEST #: 9									
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual	
RTD1	.115	100.000	103		54		73		
RTD2	.115	100.000	NOTES:						
RTD3	.115	100.000							
RTD4	.115	100.000							
RTD5	.115	100.000							
RTD6	.115	100.000							
RTD7	.115	100.000							
RTD8	.115	100.000							
DP1	1.000	-.638							
DP2	.581	-10.000							
DP3	.529	5.000							
THOT1	3.286	400.000							
THOT2	3.286	400.000							
PRESS	3.994	2260.000							

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 20

TABLE 20
CALIBRATION CHECK
TRAIN A

TEST #: 10								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		115		73	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	1.000	-.636						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 21

TABLE 21
CALIBRATION CHECK
TRAIN A

TEST #: 11								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		54		151	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.878	30.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 22

TABLE 22
CALIBRATION CHECK
TRAIN A

TEST #: 12								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	85		47		54	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	1.571	100.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 23

TABLE 23
CALIBRATION CHECK
TRAIN A

Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
TEST #: 13								
RTD1	.115	100.000	85		47		54	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
PTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	1.571	100.000						
PRESS	3.994	2260.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA383L
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 24

TABLE 24
CALIBRATION CHECK
TRAIN A

TEST #: 14								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	87		52		67	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	1.114	100.000						

RTD 1 -TE1313
RTD 2 -TE1317
RTD 3 -TE1315
RTD 4 -TE1316
RTD 5 -TE1314
RTD 6 -TE1319
RTD 7 -TE1318
RTD 8 -TA3831
DP 1 -LT1310
DP 2 -LT1311
DP 3 -LT1312
THOT 1 -TE413
THOT 2 -TE423
PRESS-PT403

TABLE 25

TABLE 25
CALIBRATION CHECK
TRAIN B

TEST #: 15								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.177	462.950	88		58		75	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1321
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 26

TABLE 26
CALIBRATION CHECK
TRAIN B

TEST #: 16								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		37		65	
RTD2	.177	400.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3834
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 27

TABLE 27
CALIBRATION CHECK
TRAIN B

TEST #: 17								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	89		54		73	
RTD2	.115	100.000	NOTES:					
RTD3	.177	400.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 28

TABLE 28
CALIBRATION CHECK
TRAIN B

TEST #: 18								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	95		61		76	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.177	400.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3834
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 29

TABLE 29
CALIBRATION CHECK
TRAIN B

TEST #: 19								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	81		47		70	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.177	400.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1324
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE132
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 30

TABLE 30
CALIBRATION CHECK
TRAIN B

TEST #: 20								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	82		48		70	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.177	400.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	409.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3834
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 31

TABLE 31
CALIBRATION CHECK
TRAIN B

TEST #: 21									
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual	
RTD1	.115	100.000	88		59		75		
RTD2	.115	100.000	NOTES:						
RTD3	.115	100.000							
RTD4	.115	100.000							
RTD5	.115	100.000							
RTD6	.115	100.000							
RTD7	.177	400.000							
RTD8	.115	100.000							
DP1	.679	-3.000							
DP2	.581	-10.000							
DP3	.529	5.000							
THOT1	3.286	400.000							
THOT2	3.286	409.000							
PRESS	3.994	2260.000							

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 32

TABLE 32
CALIBRATION CHECK
TRAIN B

TEST #: 22								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		53		73	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.177	400.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 33

TABLE 33
CALIBRATION CHECK
TRAIN B

TEST #: 23								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	103		54		73	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	1.000	-.638						
DP2	.584	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3834
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 34

TABLE 34
CALIBRATION CHECK
TRAIN B

TEST #: 24								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		115		73	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	1.000	-.636						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 35

TABLE 35
CALIBRATION CHECK
TRAIN B

TEST #: 25								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	88		54		151	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.878	30.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1326
RTD 3 -TE1325
RTD 4 -TE1328
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE432
THOT 2 -TE443
PRESS-PT405

TABLE 36

TABLE 36
CALIBRATION CHECK
TRAIN B

TEST #: 26								
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
RTD1	.115	100.000	85		47		54	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	1.571	100.000						
THOT2	3.286	400.000						
PRESS	3.994	2260.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE435
THOT 2 -TE443
PRESS-PT405

TABLE 37

TABLE 37
CALIBRATION CHECK
TRAIN B

TEST #: 27									
Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual	
RTD1	.115	100.000	85		47		54		
RTD2	.115	100.000	NOTES:						
RTD3	.115	100.000							
RTD4	.115	100.000							
RTD5	.115	100.000							
RTD6	.115	100.000							
RTD7	.115	100.000							
RTD8	.115	100.000							
DP1	.679	-3.000							
DP2	.581	-10.000							
DP3	.529	5.000							
THOT1	3.286	400.000							
THOT2	1.571	100.000							
PRESS	3.994	2260.000							

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TA3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

TABLE 38

TABLE 38
CALIBRATION CHECK
TRAIN B

Sensor Name	Input Volts	E.U. Units	Upper Range Expect	Upper Range Actual	Full Range Expect	Full Range Actual	Dynamic Head Expect	Dynamic Head Actual
TEST #: 28								
RTD1	.115	100.000	87		52		67	
RTD2	.115	100.000	NOTES:					
RTD3	.115	100.000						
RTD4	.115	100.000						
RTD5	.115	100.000						
RTD6	.115	100.000						
RTD7	.115	100.000						
RTD8	.115	100.000						
DP1	.679	-3.000						
DP2	.581	-10.000						
DP3	.529	5.000						
THOT1	3.286	400.000						
THOT2	3.286	400.000						
PRESS	1.114	100.000						

RTD 1 -TE1323
RTD 2 -TE1328
RTD 3 -TE1325
RTD 4 -TE1326
RTD 5 -TE1329
RTD 6 -TE1324
RTD 7 -TE1327
RTD 8 -TE3836
DP 1 -LT1320
DP 2 -LT1321
DP 3 -LT1322
THOT 1 -TE433
THOT 2 -TE443
PRESS-PT405

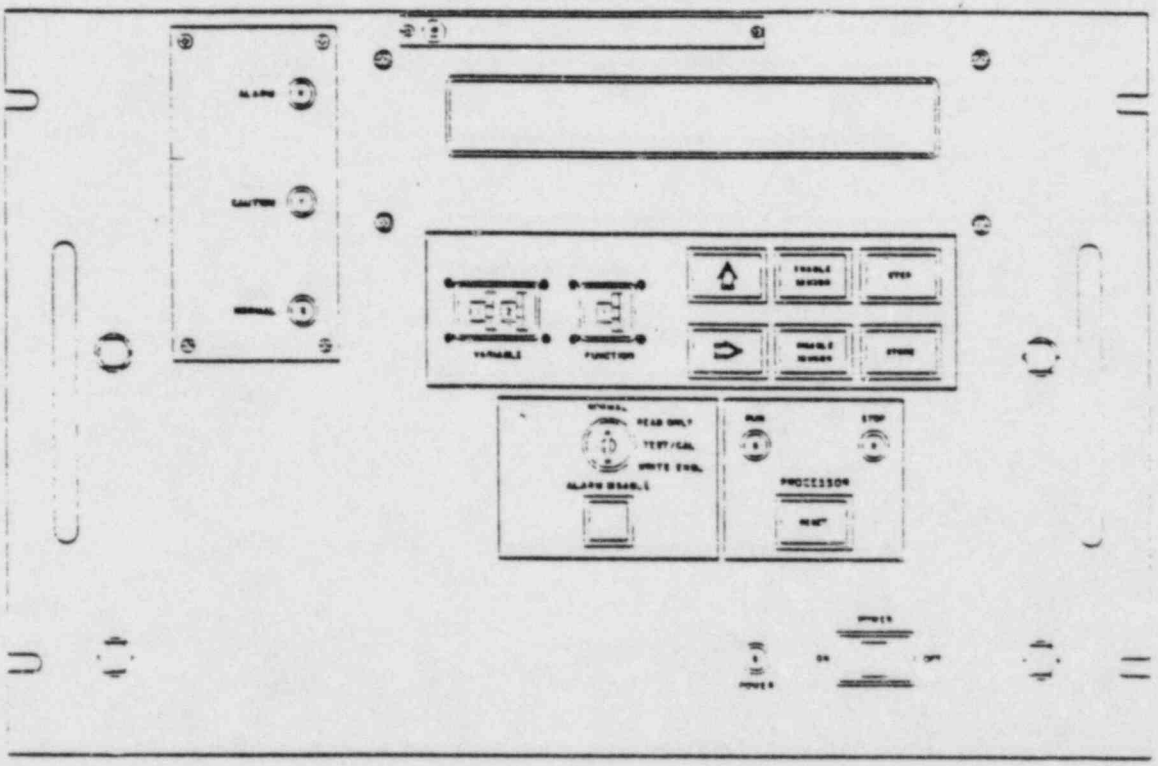

Figure 1 Microprocessor Assembly