UNION ELECTRIC COMPANY

CALLAWAY PLANT
UNIT 1

PRIMARY REACTOR CONTAINMENT STRUCTURAL INTEGRITY TEST

Final Report
January 1984

Bechtel Power Corporation

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STRUCTURAL INTEGRITY TEST

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FINAL REPORT

Prepared by
Bechtel Power Corporation
San Francisco, CA

SU-039

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1. INTRODUCTION

The Callaway Plant Containment Structural Integrity Test was conducted in conjunction with the Preoperational Integrated Leakage Rate Test from January 4, 1984 through January 8, 1984. The primary purpose of the Structural Integrity Test was to verify the design and structural integrity of the containment to withstand postulated pressure loads (in conformance with Reference 6.1) by imposing an internal pressure of 115% of design pressure for a period of not less than two hours.

To accomplish the intended test purpose, specialized measuring devices (extensometers spring-loaded: LVDTs) were employed in the containment structure to provide the necessary deflection data needed to evaluate structural response during containment pressurization, at peak pressure and depressurization. The test was conducted in accordance with site procedure CS-030003 detailing test requirements and instructions for acquiring test data (Reference 6.2). The test procedure incorporated the commitments contained in the Final Safety Analysis Report (Reference 6.3) and conformed to the guidelines set forth in the NRC-approved Bechtel Topical Report BC-TOP-5A (Reference 6.5).

2. SUMMARY AND CONCLUSIONS

The structural integrity test consisted of (1) proof of containment ability to withstand 115% of design pressure and (2) measurement of structural response to changes in containment internal pressure. Test measurements included gross structural deformation and concrete crack growth. Measurement points were located along a sample of typical sections of the containment structure, at thickened sections, and at discontinuities. Test measurements were recorded at specified stages during the pressurization cycle.

The containment structure withstood the test pressure of 69 psig with no indications of structural overloading. Measured values of deformation and concrete crack growth were within design allowable values. The exterior and interior visual examinations verified that the containment concrete and liner surfaces were in sound condition both before and after pressurization.

All deformations at 69 psig were less than the values predicted for maximum test pressure. Radial movements of the containment shell varied between the monitored azimuths at each elevation; however, the net diametral growth across the three instrumented diameters was consistent at all elevations and is both linear with pressure and reasonably close to expected values. The variations in radial displacement with azimuth are attributed to (1) slight rotation of the interior structure which is used as a frame of reference for radial measurements, (2) the normal tendency of the single curvature cylindrical surface of the shell to "roundout" under internal pressure, (3) the stiffening effect of the buttresses, and/or (4) variations due to openings in the containment wall.

Measurements of the vertical movement of the dome were less than two-thirds of the predicted value at peak test pressure.

The measured radial deflections at peak test pressure, including those at the full diametral locations, averaged 40% of the maximum predicted values. The radial movements around the equipment hatch behaved linearly with increasing pressure and were in the elastic region, as expected.

Surface cracks exceeding the threshold of the recordable width of 0.010 inches were found in five of the seven crack mapping areas. Measurable crack growth during containment pressurization was noted in grid areas 1 and 4. In all cases, cracks did not exceed maximum allowable width growth of 0.060 inches. Of particular note are grid areas 3 and 6 which contained no observable cracks.

Overall, the results of the structural integrity test provide direct experimental evidence that the containment structure can withstand the design internal pressure with a sufficient margin of safety and that the gross response to pressure is within allowable limits.

3. CONTAINMENT STRUCTURE AND PRESSURIZATION

The containment is a post-tensioned, reinforced concrete structure designed to contain any accidental release of radioactivity from the reactor coolant system as defined in the Final Safety Analysis Report (Reference 6.3). The containment is designed for an internal accident pressure of 60 psig.

The structure consists of a cylindrical wall and hemispherical dome connected to and supported by a massive reinforced concrete base slab. The cylinder wall and dome thickness is increased at three equally spaced locations to form vertical buttresses for end anchorage of the prestressing tendons. Reinforced openings in the cylinder wall are provided for equipment and personnel access as well as for electrical and mechanical system penetration. The structure is post-tensioned by two groups of stranded tendons. The circumferential group, which consists of horizontal tendons anchored at buttresses 240° apart, prestresses the wall and lower half of the dome in the hoop direction. The vertical group, which consists of inverted U tendons anchored in the tendon access gallery, prestresses the wall and dome in the vertical direction. The entire interior surface of the structure is lined with 1/4 inch thick welded steel plate which serves as a leak tight membrane.

Principal dimensions of the containment structure are:

Inside Diameter	140 ft
Inside Height of Cylinder	140 ft
Curved Dome Height (inside)	205'-0"
Vertical Wall Thickness	4'-0" nominal
Dome Thickness	Tapering from 4'-0" at Springline to 3'-2" at Apex
Foundation Slab Thickness	10'-0"

The containment structure was pressurized pneumatically to verify the required structural integrity and to measure overall leakage. The pressure cycle is shown in Figure 3-1. The test pressure of 69 psig, equal to 1.15 times design pressure (Reference 6.3), was specified to ensure that the test loading includes sufficient margin. Test pressure was held for a period of two hours to record structural response data. Additional holds were included in the cycle to permit constant-pressure data acquisition at a 40 psig hold point for stage 2 crack mapping. The hold point at 48.25 psig during depressurization was required to test containment cooling fans.

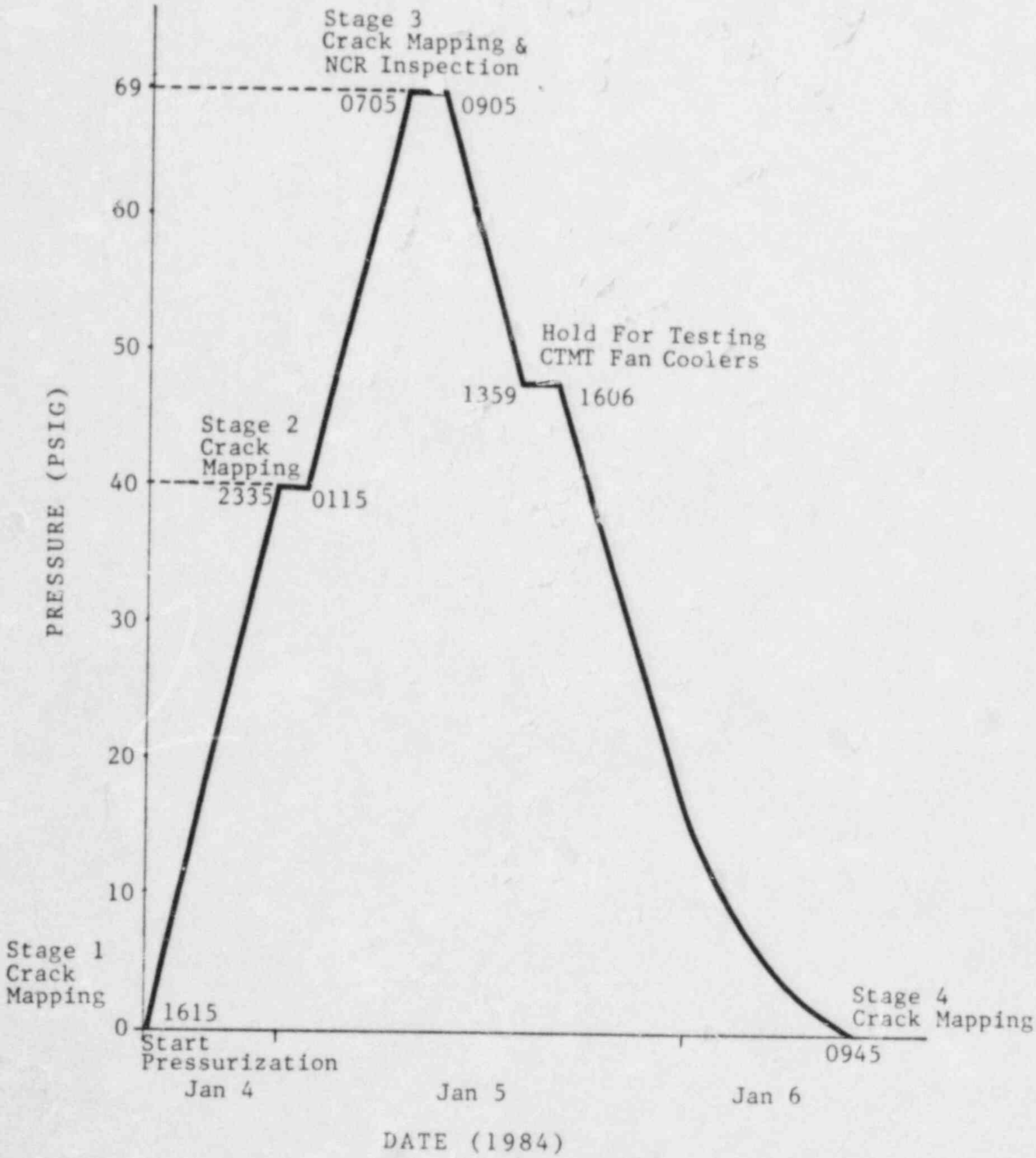


FIGURE 3.1 SIT PRESSURIZATION CYCLE

4. TEST PLAN AND PROCEDURES

To accomplish the objectives of the structural integrity test the containment was pressurized to 1.15 times design pressure for two hours and then depressurized to atmospheric pressure. Pressurization to 1.15 times design pressure was specified to demonstrate that the containment has a margin of safety with respect to internal pressure loading. Containment response to internal pressure was measured in order to verify that the analytical technique used in the design could accurately define the behavior of the structural elements. The structural response measurements consisted of gross structural deformation and concrete surface crack growth.

4.1 DEFORMATION MEASUREMENTS

Gross structural deformations were measured using taut wire extensometers which spanned between points on the containment wall, dome and springline, and fixed points within the structure. Radial and vertical movements of the containment shell were measured at the points shown in Figures 4.1 through 4.3. The indicated points are on regular areas of the containment shell as well as on the discontinuity regions represented by buttresses and the equipment opening. Movements were measured by taut wire extensometers attached to one point on the shell and spanning to an opposing point on the shell or to a point on the interior structure.

The extensometers, illustrated in Figure 4-4, consist of displacement transducer assemblies and low thermal expansion alloy (invar) taut wires. A movement between opposing points on the containment shell or between a point on the containment shell and a fixed reference structure results in an equal movement between the core and body of the linear variable differential transformer (LVDT) which is housed in the transducer assembly. The LVDT output is a voltage which is proportional to the position of the core within the body. The spring in the transducer assembly maintains a nominal 20 lb tension on the wire to reduce sag and eliminate slack at threaded and swivel connections.

Each extensometer is calibrated to establish its displacement-versus-voltage characteristics and spring constant (nominally 2 lb/in.). The spring constant is used to correct for the small changes in wire length which result from transducer displacement. The transducers were calibrated prior to shipment to Callaway. Spot field calibration checks were also conducted to ensure that no damage was incurred during handling.

The transducer's swivels and opposing taut wire ends were secured to fittings which were affixed to the containment liner and internal structures. Following initial attachment, the transducers were aligned

with the wires to eliminate LVDT core side loading and the core positions were adjusted to provide the desired travel.

The extensometers were adjusted just prior to pressurization so that actuator motion was initiated in the direction of expected displacement. Thus, all extensometers were expected to respond to the initial increase in pressure at the start of the test.

The LVDTs were wired to excitation power supplies and a scanning data acquisition system (DAS) which converted LVDT output voltage to a digital format for register display, printed record, and direct entry into the site computer. These data were then manually input into a microcomputer for analysis. The computer was programmed with extensometer calibration and temperature constants and a routine which converted raw voltage data into displacement units. Displacement values printed by the computer are corrected for taut wire/spring interaction and for wire angle relative to the specified direction (radial or vertical) of measurement.

Containment gage pressure was measured by a calibrated ($\pm$ 0.1 psig) dial gage. In-containment temperature and humidity were recorded by the integrated leakage rate test data acquisition equipment. Outside ambient conditions were measured using conventional weather instrumentation.

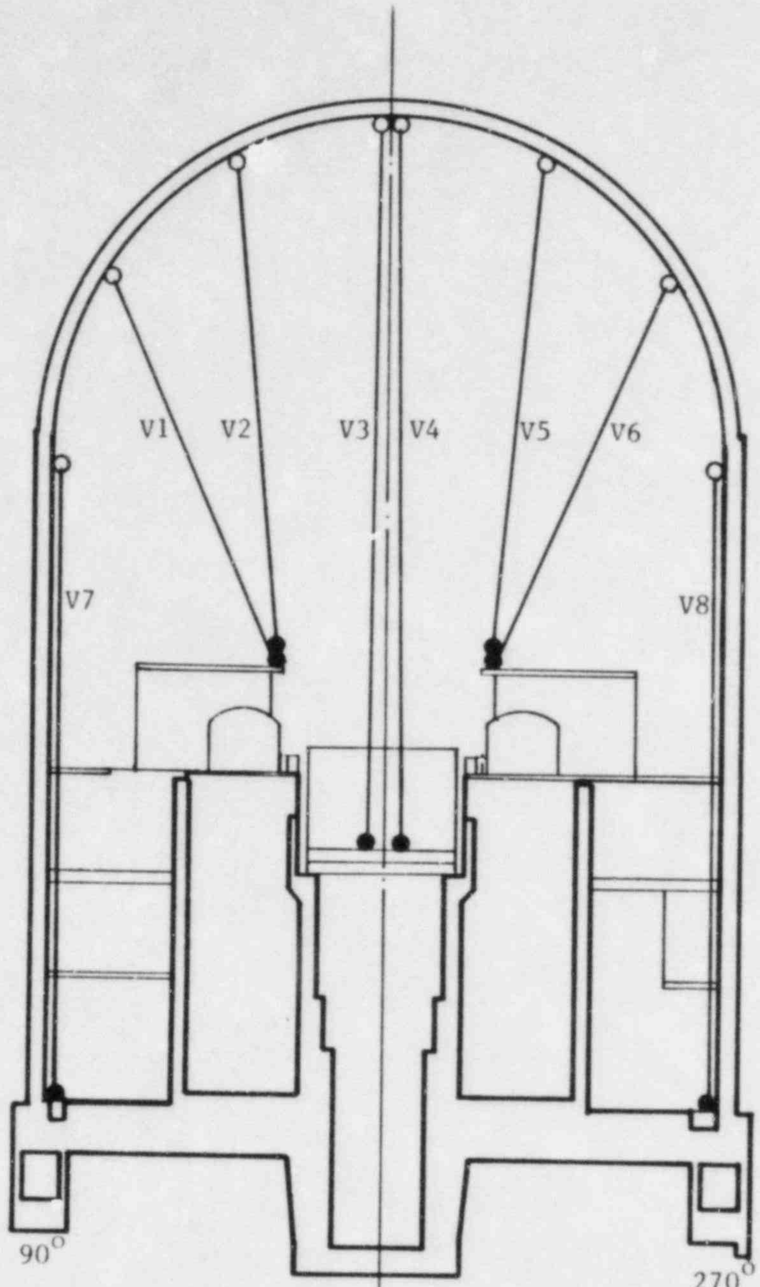
4.2 CONCRETE SURFACE SURVEILLANCE

Seven concrete surface areas were monitored as shown on Figure 4.5. Each area covered 40 or more square feet and was divided into nominally one foot squares by snapped-on chalk lines. Each observed crack was measured using an optical magnifier with an etched scale in the optical system. Cracks which were 0.01 inches or more in width were detailed on data sheets.

4.3 DATA ACQUISITION

During the structural integrity test the deformation data were recorded at 5 psig pressure increments and decrements, at the beginning and end of all constant pressure holds, and at regular intervals during extended holds. At each data acquisition point all voltages were recorded 10 times in rapid succession to provide a basis for identifying spurious values caused by electrical transients. Only the first of the 10 records was manually entered into the microcomputer for analysis.

Concrete surface crack inspections were performed prior to the start of pressurization, at 40 psig during initial pressurization, at peak test pressure, and following the completion of final blowdown.



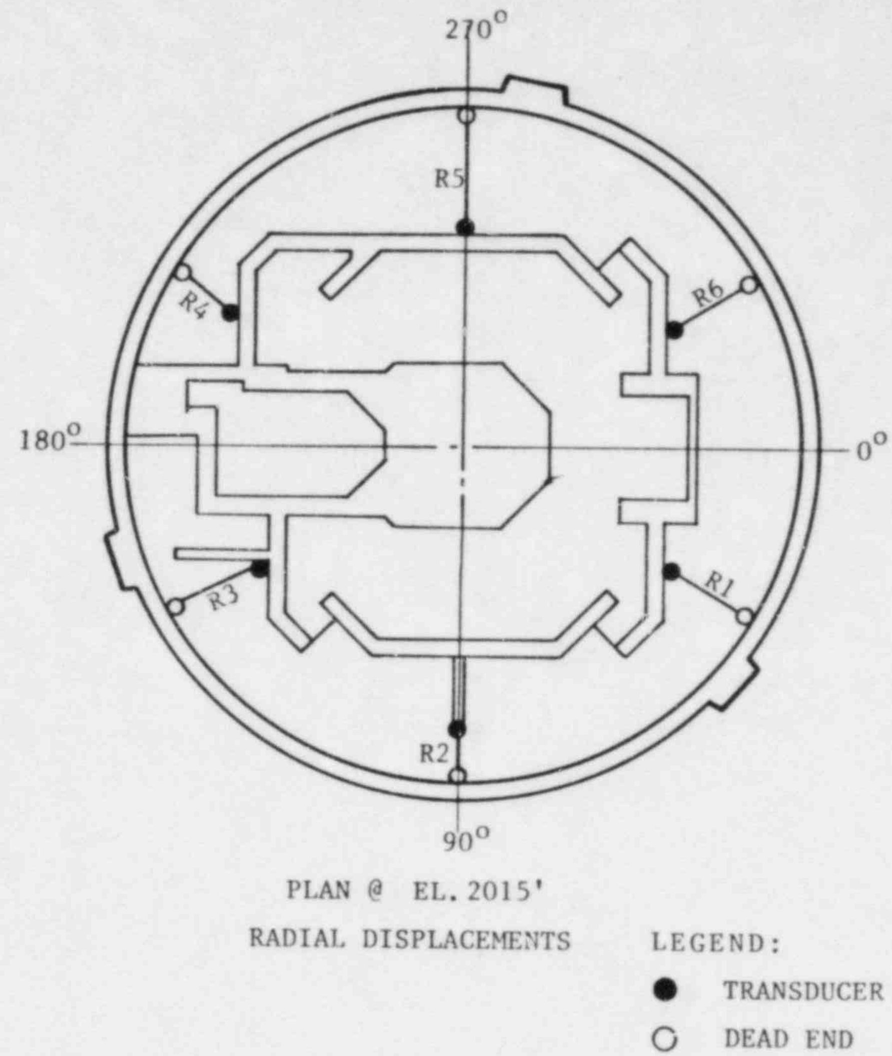


FIGURE 4.1

TAUT WIRE EXTENSOMETER LOCATIONS

WALL RADIAL AND VERTICAL UNITS

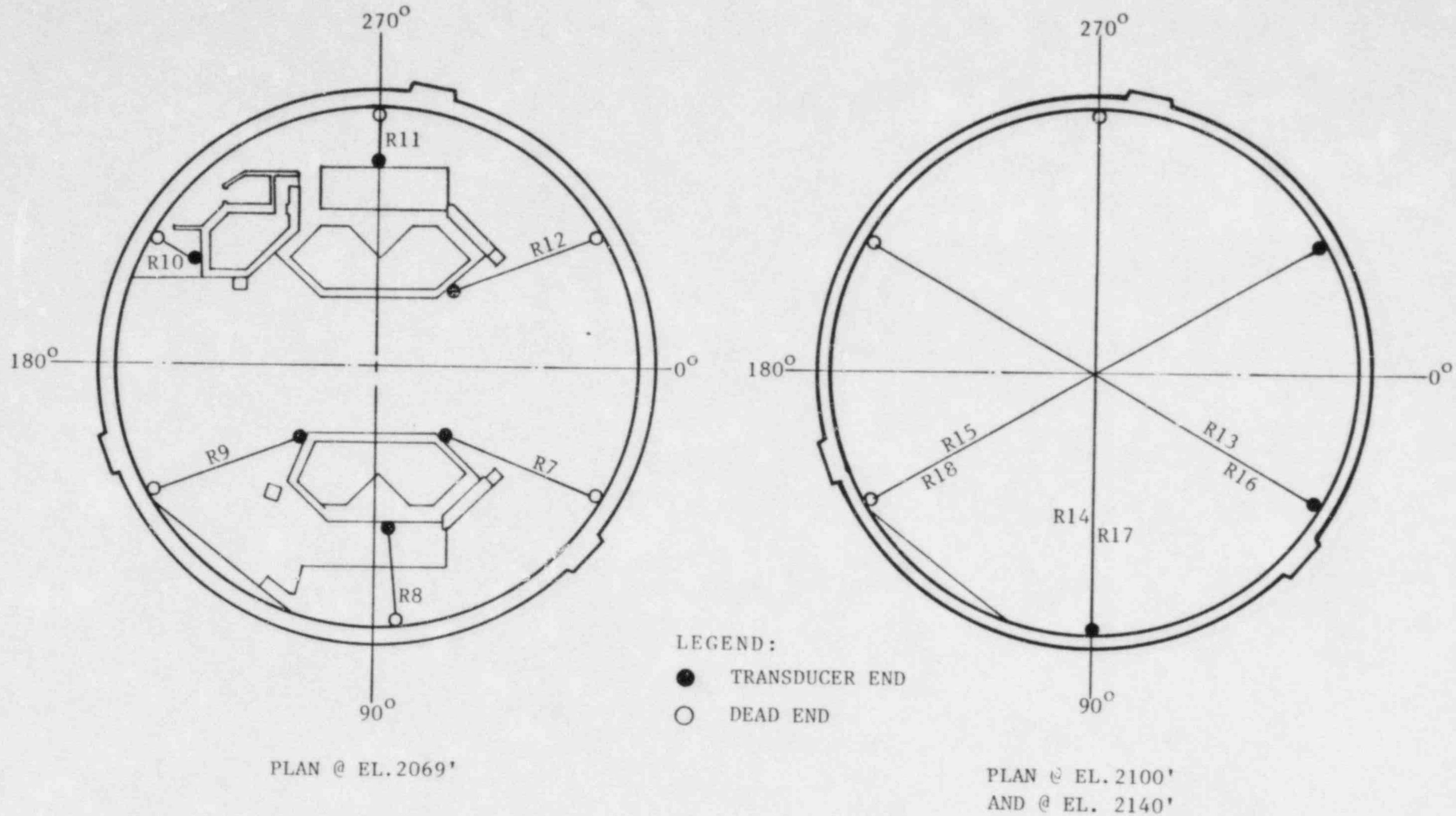


FIGURE 4.2

TAUT WIRE EXTENSOMETER LOCATIONS

WALL RADIAL UNITS

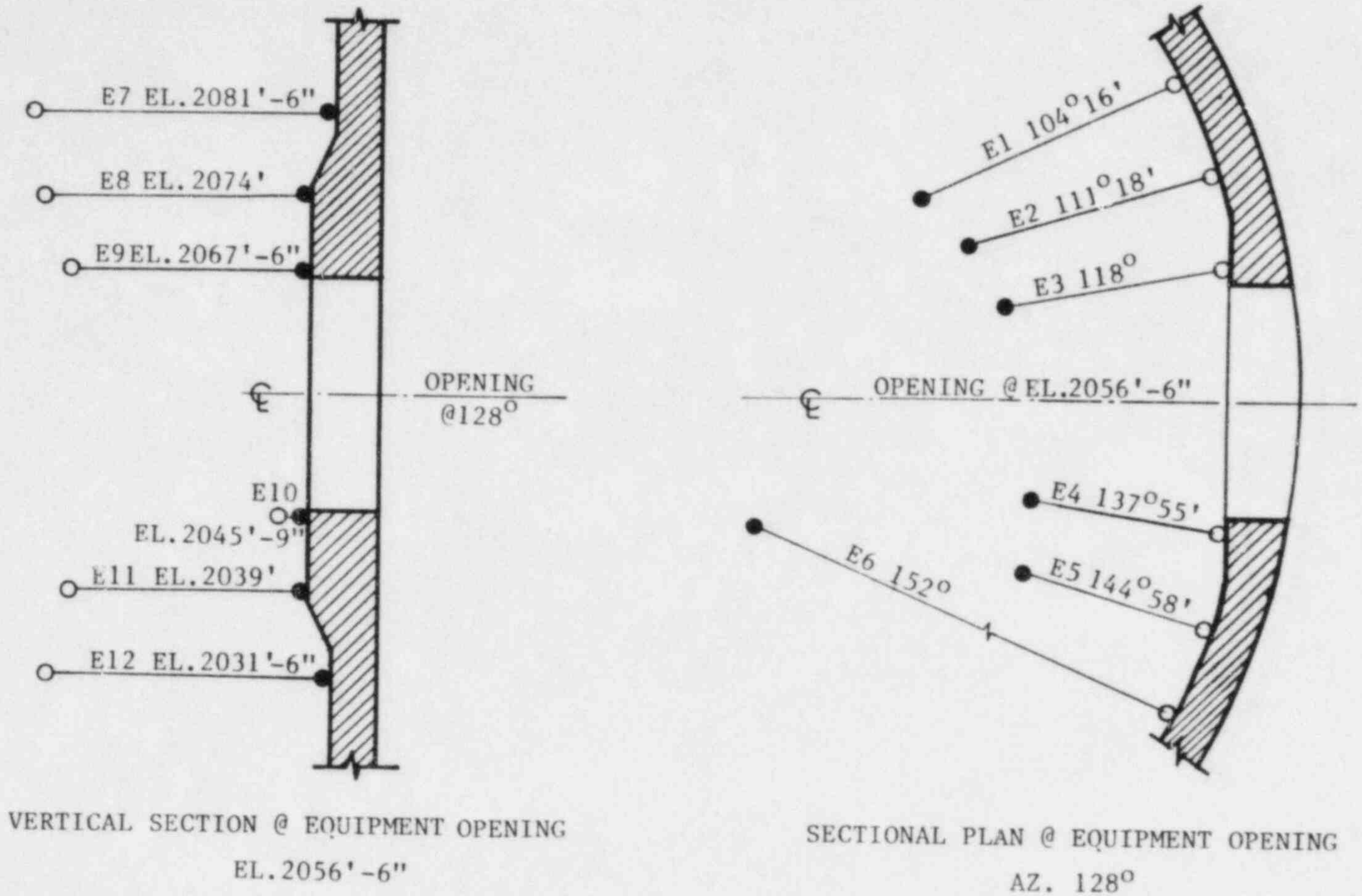


FIGURE 4.3 TAUT WIRE EXTENSOMETER LOCATIONS EQUIPMENT OPENING UNITS

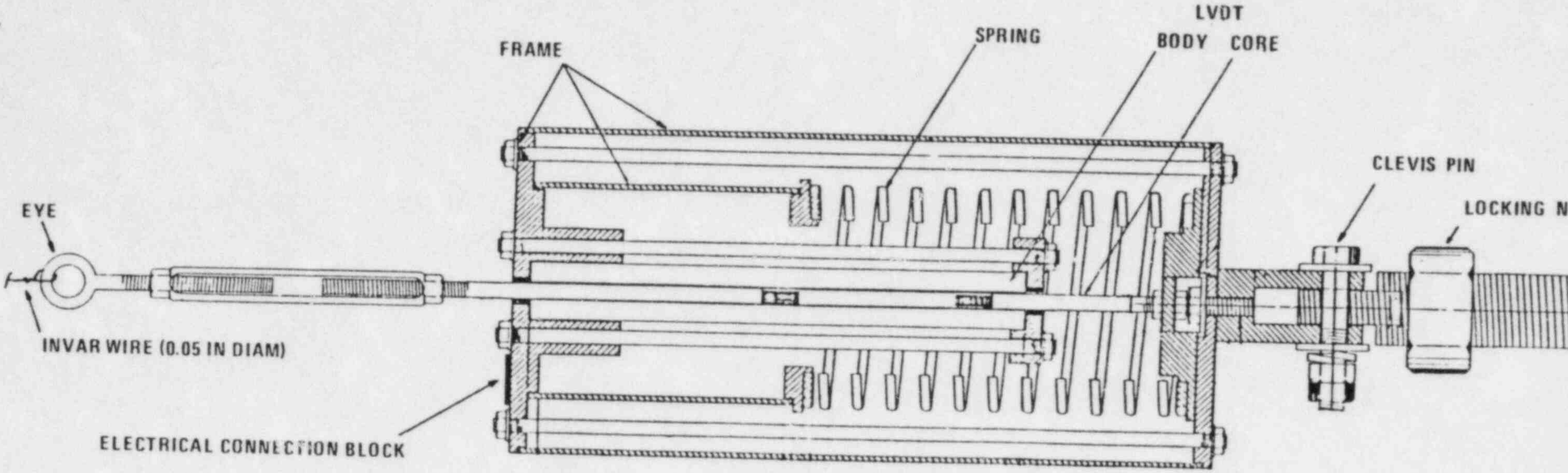


FIGURE 4.4 SCHEMATIC REPRESENTATION OF A TAUT WIRE EXTENSOMETER

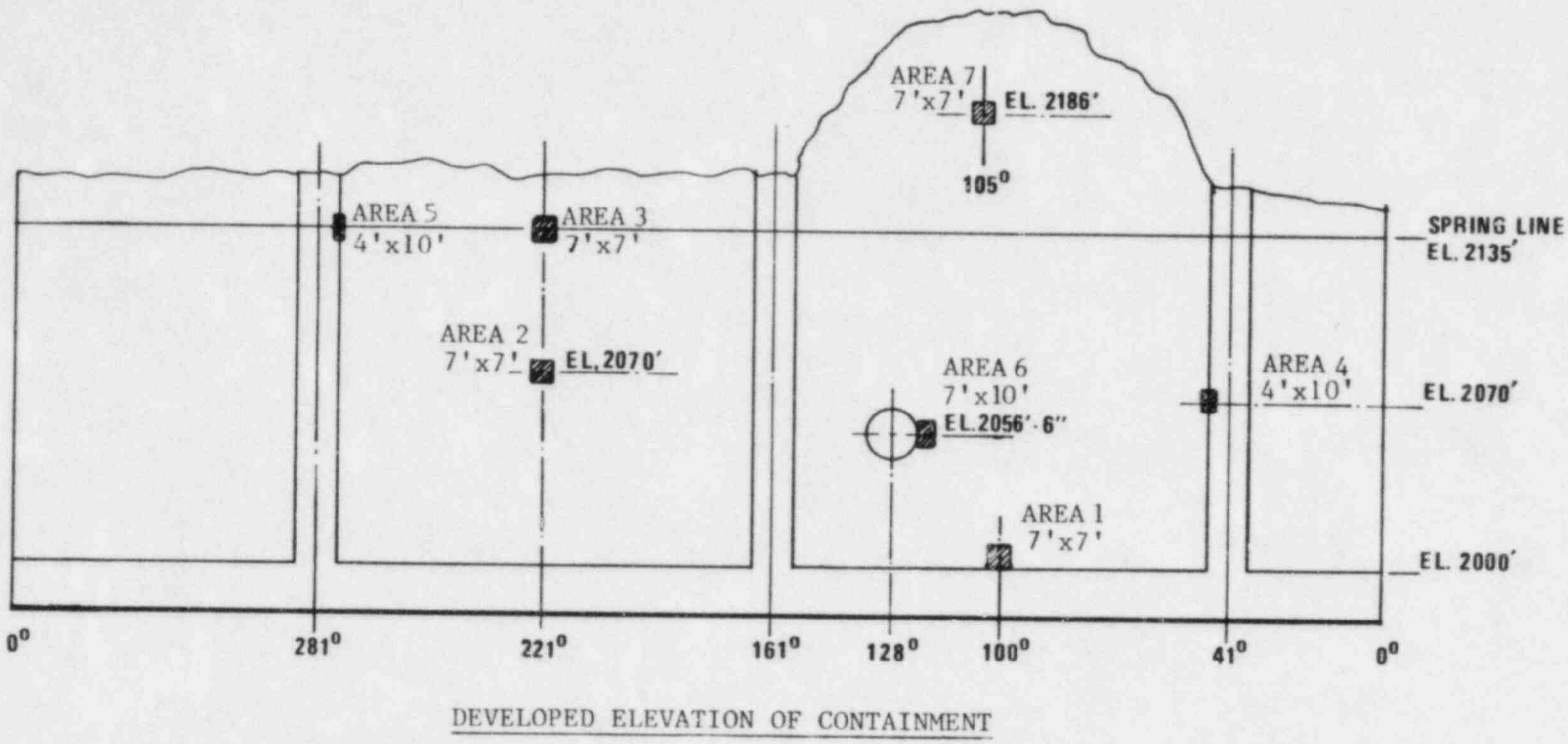


FIGURE 4.5 CONCRETE SURFACE SURVEILLANCE AREAS

5. TEST RESULTS

5.1 CONTAINMENT DEFORMATIONS

Containment displacements were recorded at the times and pressures listed in Table 5.1. The variation of deformation is illustrated in time-versus-deflection plots in Appendix A, and all recorded displacement data sheets are located in Appendix B.

Table 5.2 lists the maximum individual radial movements of the containment at peak test pressure (69 psig). The table also lists the average radial movements measured at each elevation (2015, 2069, 2100, and 2140).

Individual and average vertical movement data are listed in Table 5.3.

Figure 5-1 shows wall and dome deflection measurement and Figure 5-2 shows radial deflection measurements near the equipment hatch at peak pressure. In the horizontal and vertical plane of the equipment hatch area, the deflections are greatest nearest the tangent point of the hatch (E3, E4, E9, and E10) as expected with a flat plane in a cylinder wall. The deflections decreased as the distance from the hatch center increased.

Careful review of Appendix A reveals that the sensors responded to containment pressure in a linear fashion. This close linear correlation between pressure and deflection supports the conclusion that the containment has exhibited proper response and also meets the criteria of Reference 6.4.

Sensors R-17, V-8, and E-8 exhibited normal displacement up to test presure but did not recover normally. Post-test inspection revealed that those sensors had moved out of proper alignment, causing excessive friction on the LVDT shaft bearings, and therefore, resisted axial movement corresponding to the proper displacement.

5.2 CONCRETE SURFACE SURVEILLANCE

The designated areas (Figure 4.5) on the exterior surface of the containment were examined for cracks during the test. These stages of examination were conducted prior to pressurization, at 40 psig during pressurization, at 69 psig, and following the completion of depressurization. Figures 5.3 through 5.6 illustrate all cracks observed in the surveillance areas that measured 0.01 inches (0.25mm) or greater and indicate crack growth during pressurization. Out of 7 surveillance areas, area 3 has no crack observed and area 6 had only one minor crack observed. Therefore, these two data sheets are not included in this report. Figure 5.6 is a specimen sheet which explains the format used to present the surface crack data. All crack patterns observed during the test are typical for a reinforced concrete containment.

5.3 ESTIMATED ACCURACY OF MEASUREMENT

The accuracy of measurement is based on the following items:

- Calibration of instrumentation
- Laboratory testing as in the case of invar wire
- Human factors, i.e., judgment of the reader

Displacements of the containment structure were measured using taut wire extensometers. Accuracy of the extensometer is $\pm$ 0.002 inches as long as wire tension remains constant. When the direction of movement changes, extensometer response can lag due to friction and hysteresis in the mechanism. Typical lag is 0.02 inches for a 100-foot long wire.

The crack patterns were measured using optical comparators calibrated to measure crack width of 0.1mm and wider. Since most cracks observed on the containment were irregular traces on coarse textured concrete surfaces, it was not generally possible to estimate true crack width to better than approximately 0.1mm. For this reason, reported crack widths are considered to be accurate to within $\pm$ 0.1mm.

Table 5.1

TIMES, DATES, AND PRESSURES FOR TEST MEASUREMENTS
(Year - 1984)

TIME	DATE	PRESSURE (psig)
1615	1/4	.00
1711	1/4	5.00
1800	1/4	10.00
1902	1/4	15.00
1958	1/4	20.00
2051	1/4	25.00
2145	1/4	30.70
2240	1/4	35.00
2335	1/4	40.00
0115	1/5	40.00
0214	1/5	45.00
0312	1/5	50.00
0411	1/5	55.00
0510	1/5	60.00
0612	1/5	65.00
0705	1/5	69.00
0905	1/5	69.00
1042	1/5	65.00
1143	1/5	60.00
1242	1/5	55.00
1337	1/5	50.00
1359	1/5	48.25
1006	1/5	48.25
1704	1/5	45.00
1801	1/5	40.00
1905	1/5	35.00
2004	1/5	30.00
2115	1/5	25.00
2235	1/5	20.00
0009	1/6	15.00
0205	1/6	10.00
0445	1/6	5.00
0945	1/6	0.00

Table 5.2

SUMMARY OF RADIAL DEFLECTIONS AT 69 psig

Maximum Predicted Radial Deflection = 0.2 inches

Elevation (ft)	Azimuth 30°/210°		90°/270°		150°/330°		Average (in.)
	Reading (in.)						
2140	.140*		.108*		.171*		.070
2100	.233*		.193*		.228*		.109
2069	0.093	0.219	.113	.147	.122	.136	.138
2015	0.048	0.75	.084	.059	.057	.088	.069

* Diametric measurements.

Table 5.3

SUMMARY OF VERTICAL DEFLECTIONS AT 69 psig

Maximum Predicted Vertical Deflection = 0.250 inches

Distance from Dome Center(ft.)	Reading (in.)	Average (in.)
0'-6"	V_3 = 0.211, V_4 = 0.211	.211
28'-0"	V_2 = 0.195, V_5 = 0.177	.186
56'-0"	V_1 = 0.199, V_6 = 0.178	.188
69'-0"	V_8 = 0.054, V_7 = 0.061	.058

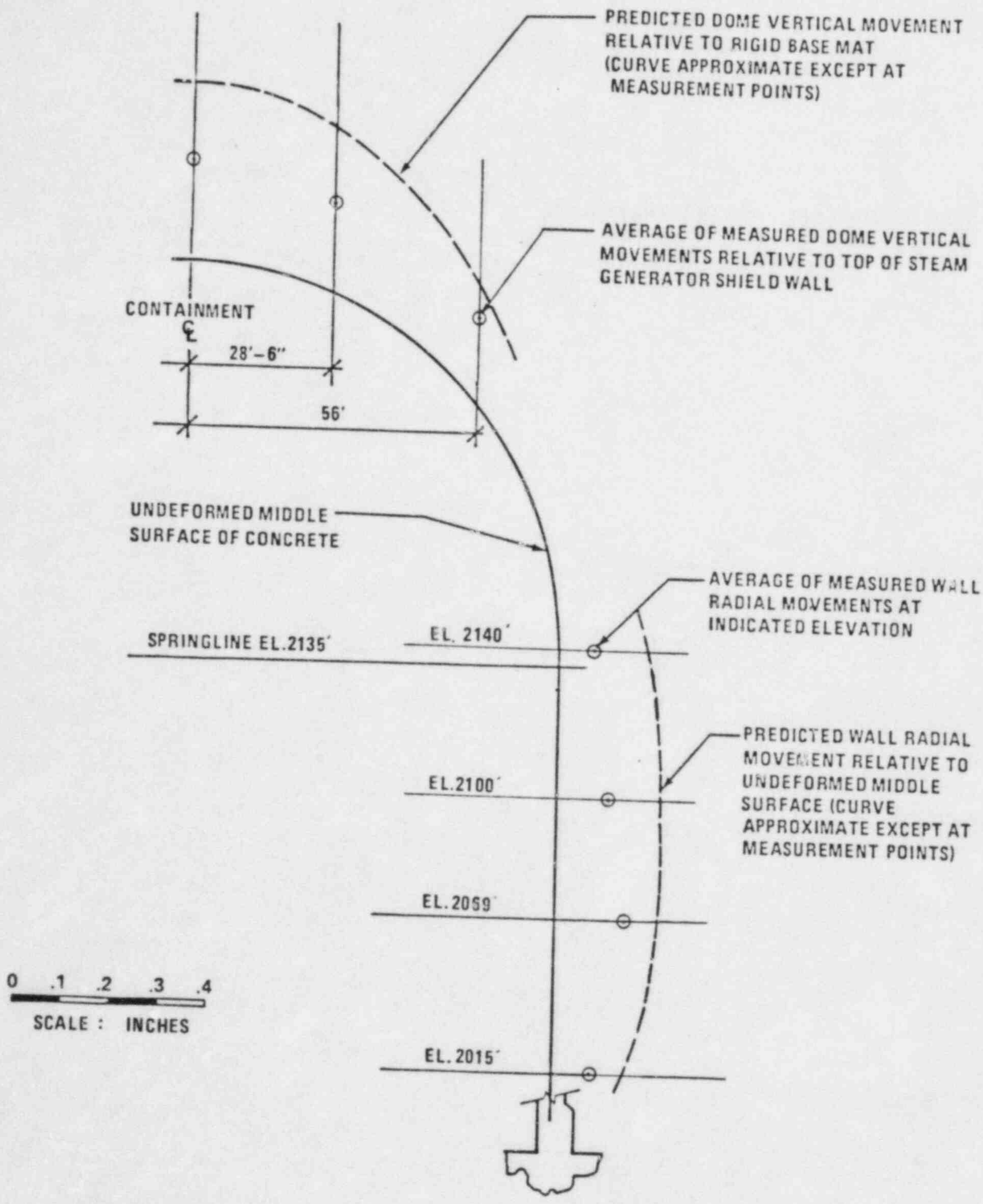


FIGURE 5.1 CONTAINMENT DEFORMATIONS AT 69 PSIG - WALL & DOME

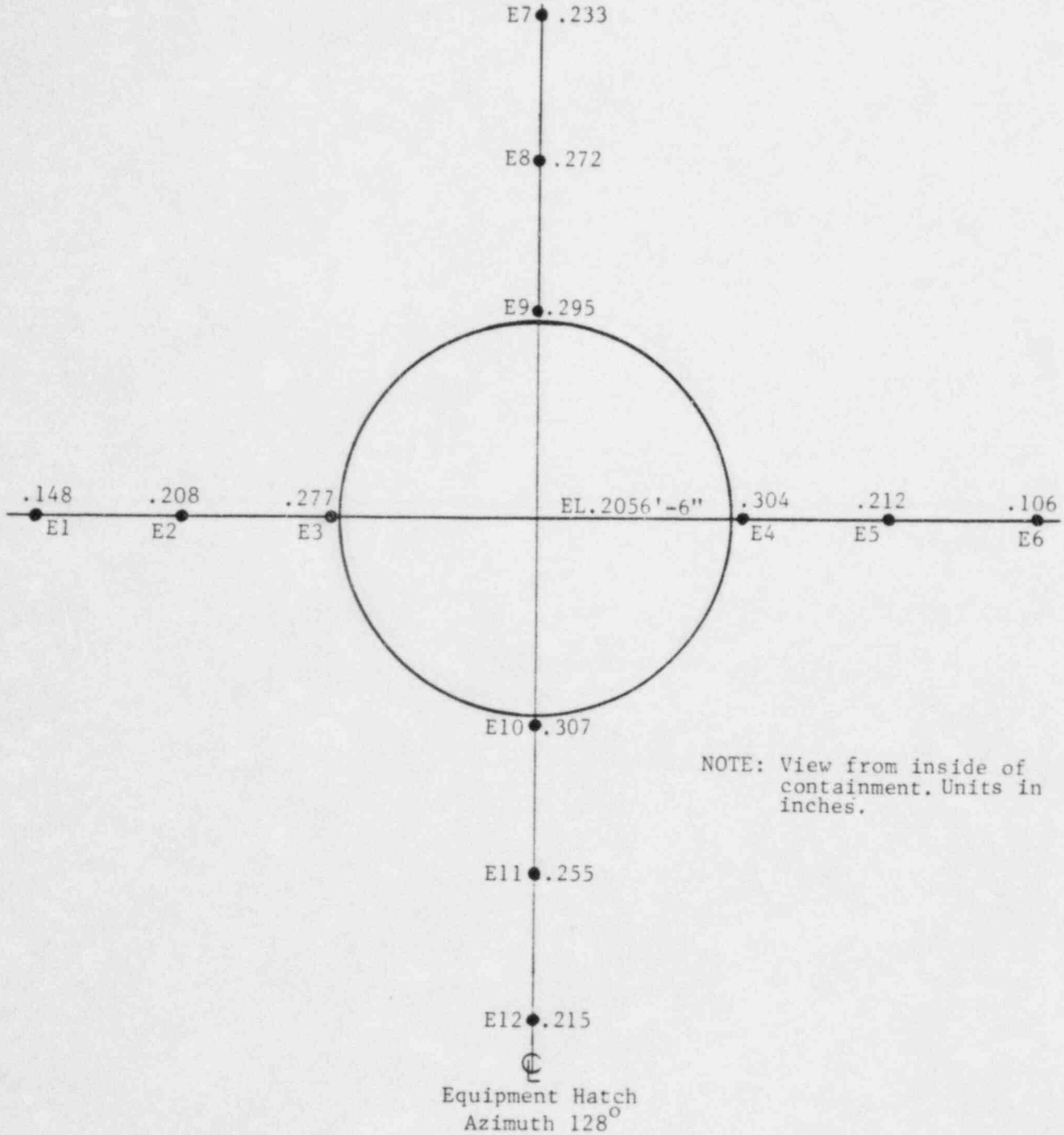
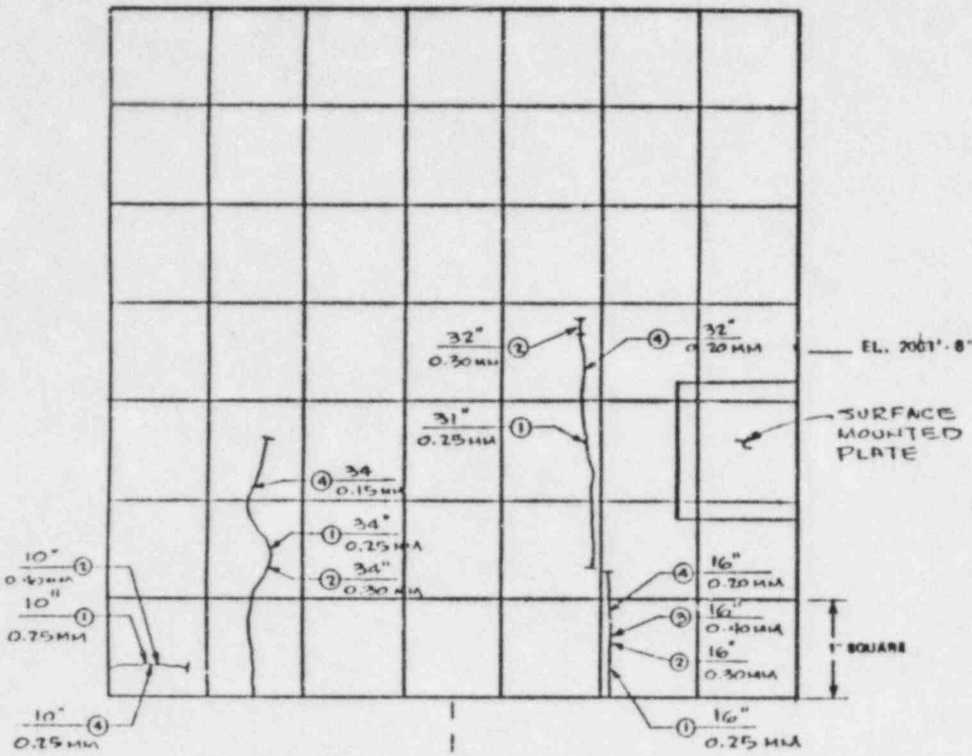
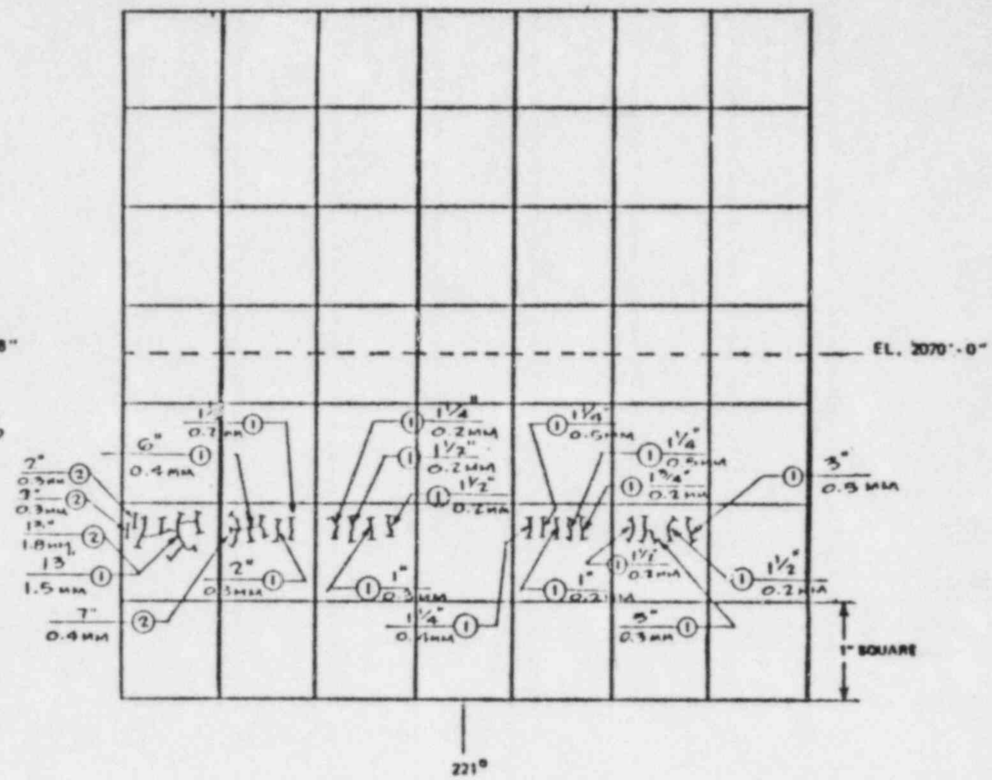


FIGURE 5.2

EQUIPMENT HATCH PEAK PRESSURE RADIAL DEFLECTIONS



AREA 1



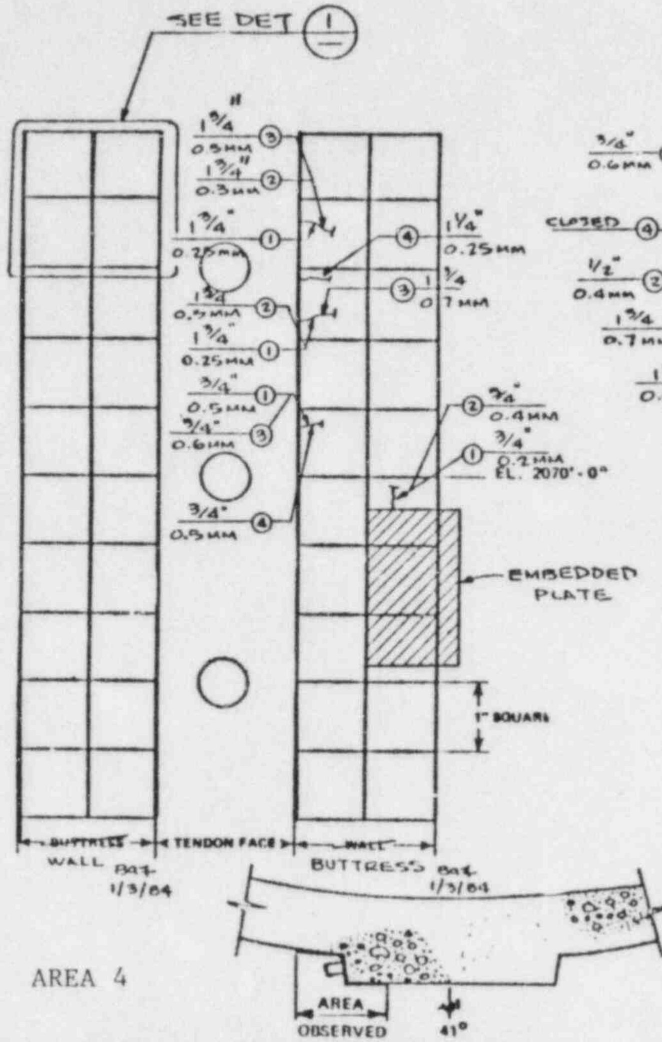
AREA 2

DATE	TIME	TEMP °F IN	TEMP °F OUT	STAGE	PSIG	BY	REMARKS
1/1/84	13:00	69	35	1	0	BXS/RTM	
1/4/84	23:55	78	33	2	40	BXS/RTM	
1/5/84	7:05	76	33	3	69	BXS/RTM	UNO NO CRACK CHANGE
1/6/84	10:10	65	39	4	0	BXS	

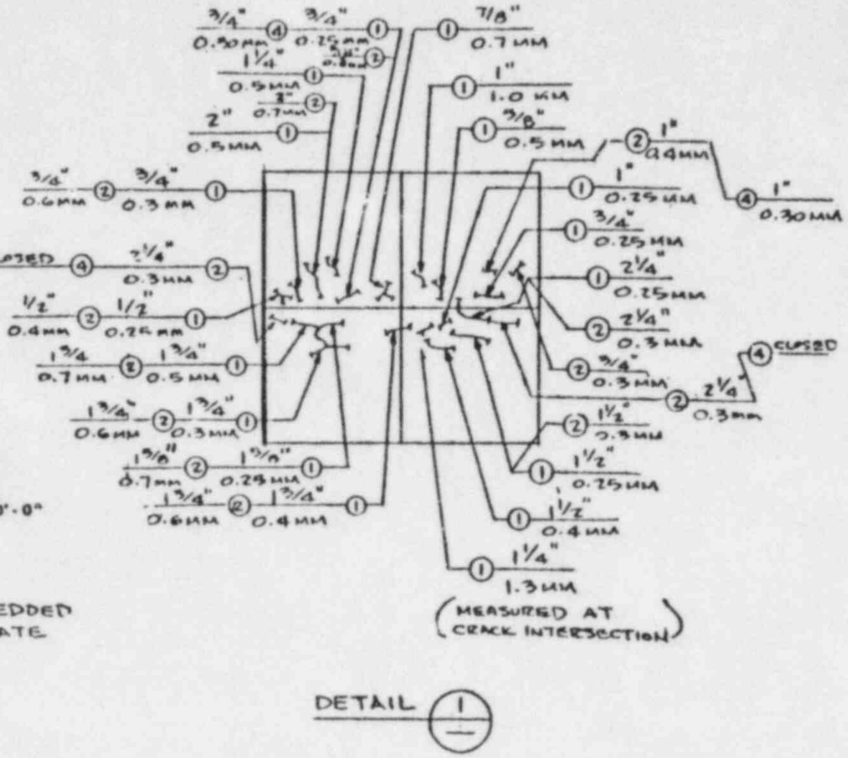
DATE	TIME	TEMP °F IN	TEMP °F OUT	STAGE	PSIG	BY	REMARKS
1/1/84	3:30P	67	35	1	0	[illegible]	
1/5/84	12:30A	78	33	2	40	[illegible]	UNO NO CRACK CHANGE
1/5/84	7:05A	76	33	3	69	[illegible]	NO CRACK CHANGE
1/6/84	10:30A	65	39	4	0	[illegible]	NO CRACK CHANGE

FIGURE 5.3

CONCRETE CRACK MAPPING DATA AREAS 1 & 2



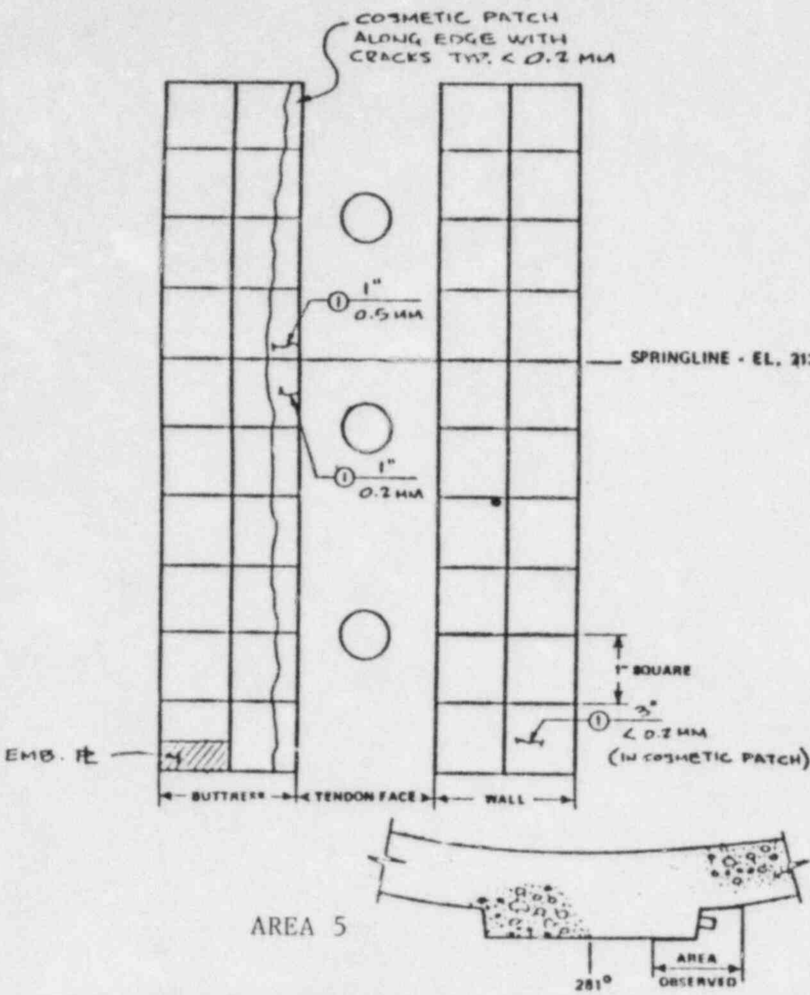
AREA 4



DATE	TIME	TEMP °F IN	TEMP °F OUT	STAGE	PSIG	BY	REMARKS
1/1/84	1:05P	69	35	1	0	W.G.	
1/4/84	12:15A	78	33	2	40	[illegible]	U.N.O. NO CRACK CHANGE
1/5/84	8:00A	76	33	3	69	[illegible]	U.N.O. NO CRACK CHANGE
1/6/84	10:15A	65	37	4	0	W.G.	U.N.O. NO CRACK CHANGE

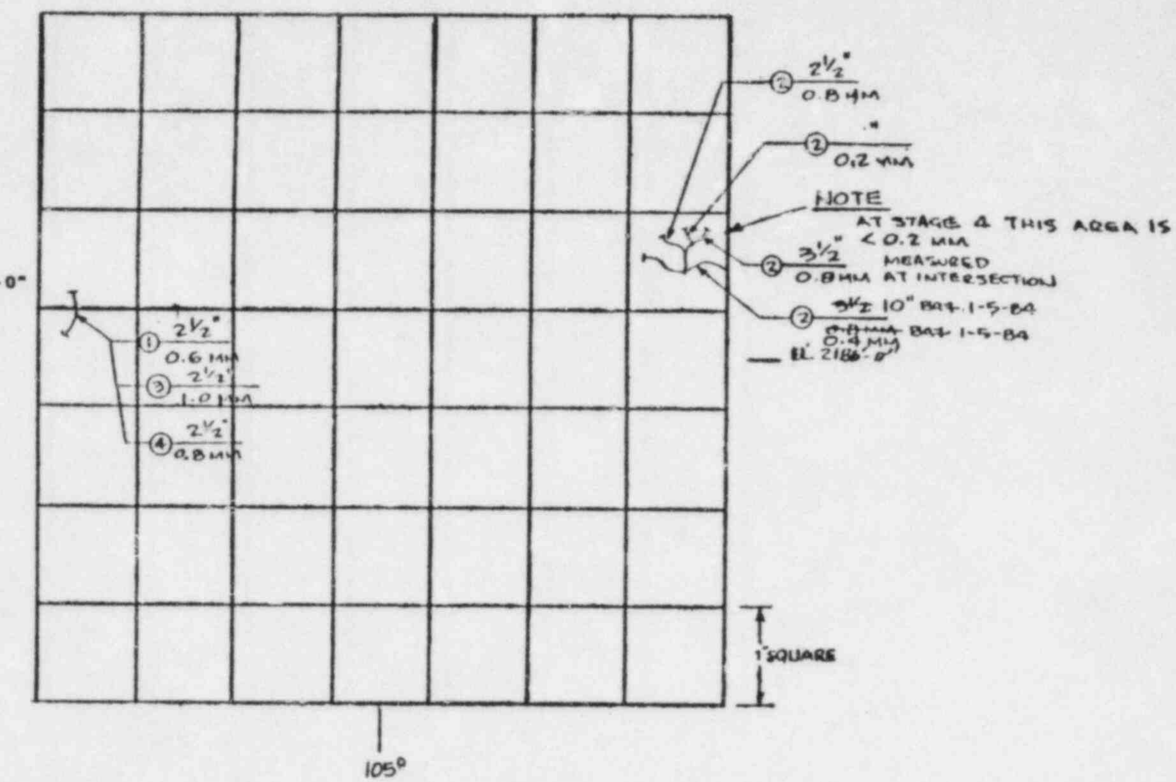
FIGURE 5.4

CONCRETE CRACK MAPPING DATA AREA 4



AREA 5

DATE	TIME	TEMP °F IN	TEMP °F OUT	STAGE	PSIG	BY	REMARKS
1/1/84	3:00P	69	35	1	0	[illegible]	
1/5/84	12:00A	78	33	2	40	[illegible]	NO CHANGE
1/5/84	7:15A	76	33	3	69	[illegible]	NO CHANGE
1/6/84	10:10A	65	39	4	0	[illegible]	NO CHANGE



AREA 7

DATE	TIME	TEMP °F IN	TEMP °F OUT	STAGE	PSIG	BY	REMARKS
1/1/84	3:30P	67	35	1	0	[illegible]	
1/5/84	12:15A	78	33	2	40	[illegible]	UNO NO CRACK CHANGE
1/5/84	8:45A	76	33	3	67	[illegible]	UNO NO CRACK CHANGE
1/6/84	10:30A	65	37	4	0	[illegible]	

FIGURE 5.5

CONCRETE CRACK MAPPING DATA AREAS 5 & 7

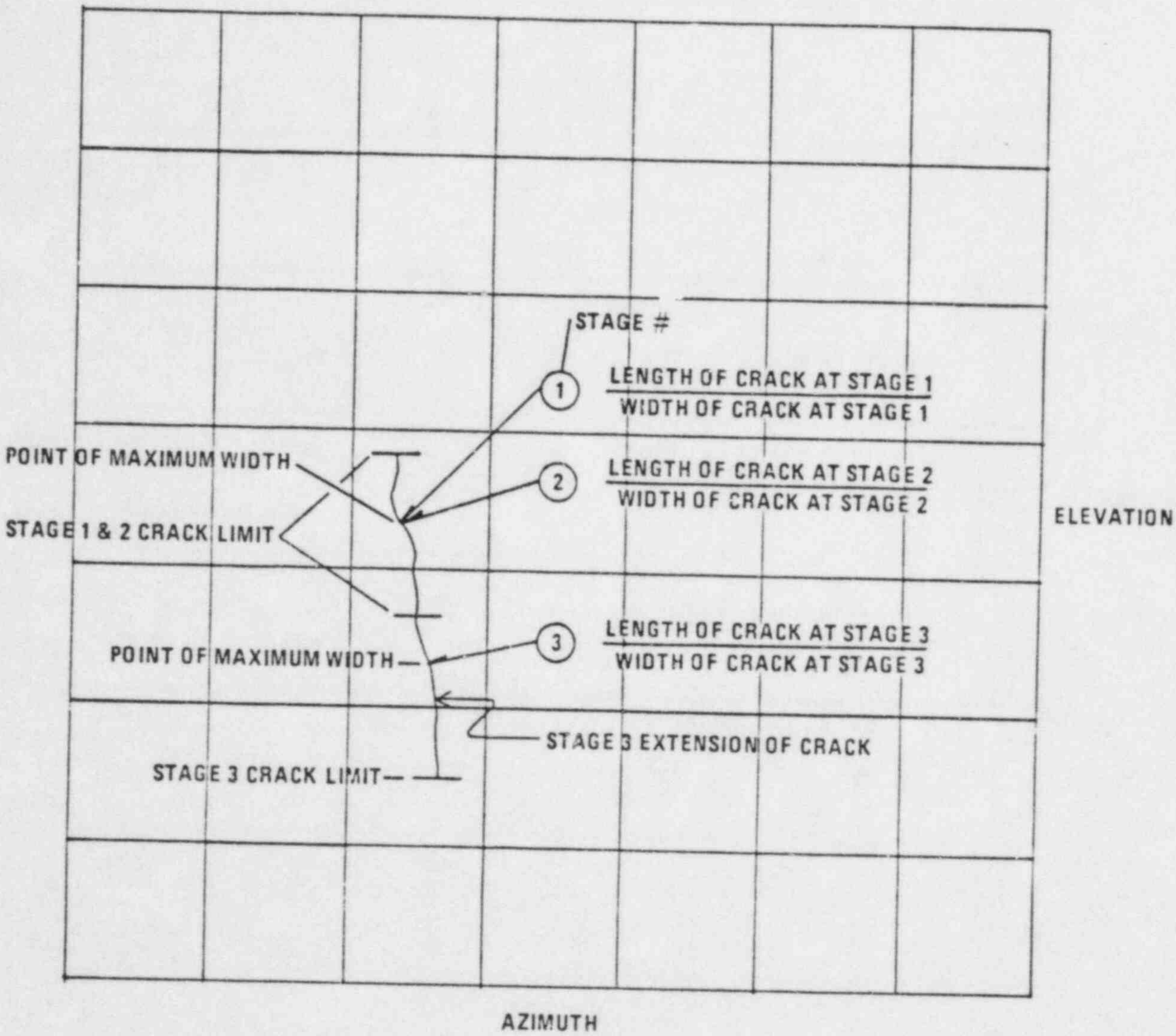


FIGURE 5.6 CONCRETE CRACK MAPPING AREA
SPECIMEN DATA SHEET

6. REFERENCES

6.1 10 CFR 50, Appendix A, General Design Criteria 1.

6.2 Callaway Plant Primary Reactor Containment Structural Integrity Test Procedure CS-030003.

6.3 Callaway Plant Final Safety Analysis Report (FSAR).

6.4 ASME Boiler and Pressure Vessel Code, 1983 Edition, Section III, Division 2, Article CC-6000, Structural Integrity Test of Concrete Containment Structures.

6.5 BC-TOP-5-A, Revision 3, Prestressed Concrete Nuclear Reactor Containment Structures.

6.6 Callaway Plant Primary Reactor Containment Integrated Leakage Rate Test Procedure CS-030001.

APPENDIX A

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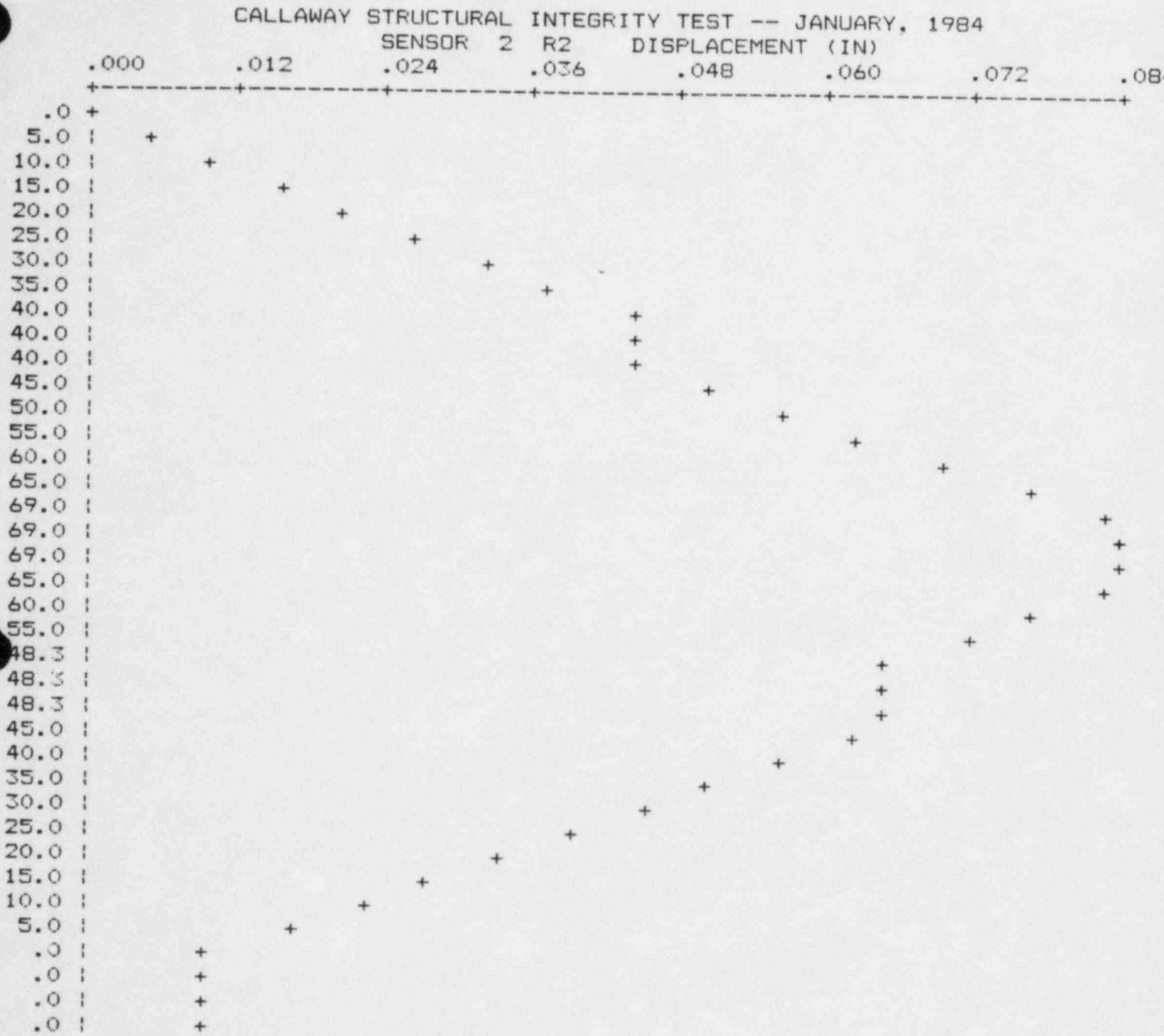
                    CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
                              SENSOR  1  R1     DISPLACEMENT (IN)
       .000      .007      .013      .020      .027      .034      .041      .048
       +---------+---------+---------+---------+---------+---------+---------+
    .0 +
   5.0 +
  10.0 +
  15.0 ¦      +
  20.0 ¦      +
  25.0 ¦            +
  30.0 ¦                    +
  35.0 ¦                           +
  40.0 ¦                                 +
  40.0 ¦                                 +
  40.0 ¦                                  +
  45.0 ¦                                        +
  50.0 ¦                                              +
  55.0 ¦                                                    +
  60.0 ¦                                                          +
  65.0 ¦                                                                +
  69.0 ¦                                                                     +
  69.0 ¦                                                                     +
  69.0 ¦                                                                     +
  65.0 ¦                                                                     +
  60.0 ¦                                                                     +
  55.0 ¦                                                                     +
  48.3 ¦                                                                     +
  48.3 ¦                                                              +
  48.3 ¦                                                              +
  45.0 ¦                                                              +
  40.0 ¦                                                              +
  35.0 ¦                                                     +
  30.0 ¦                                                 +
  25.0 ¦                                             +
  20.0 ¦                                   +
  15.0 ¦                              +
  10.0 ¦                         +
   5.0 ¦                +
    .0 ¦     +
    .0 ¦     +
    .0 ¦     +
    .0 ¦     +
```

APPENDIX A


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 2 R2 DISPLACEMENT (IN)
.000
.012
.024
.036
.048
.060
.072
.084
.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
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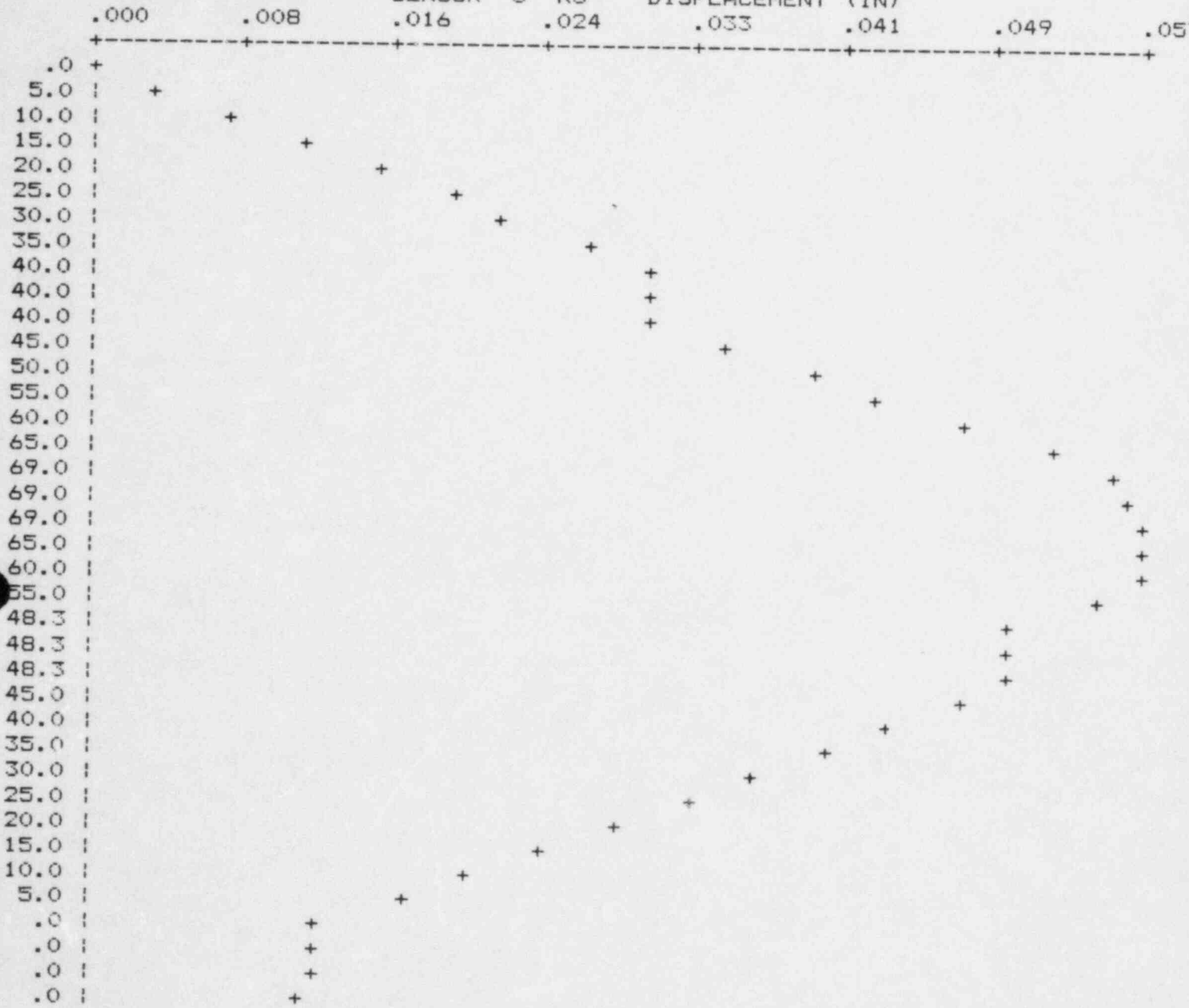

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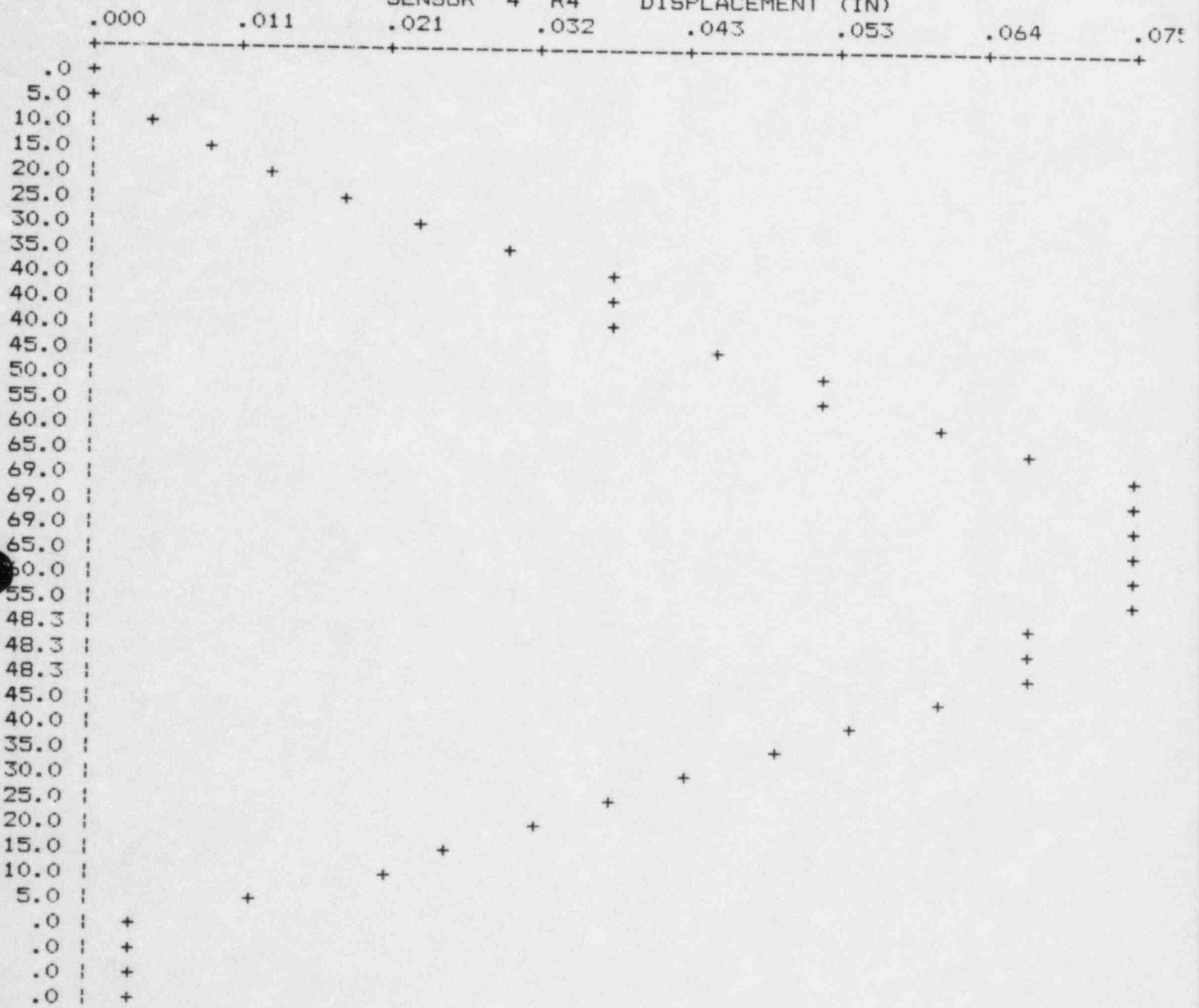
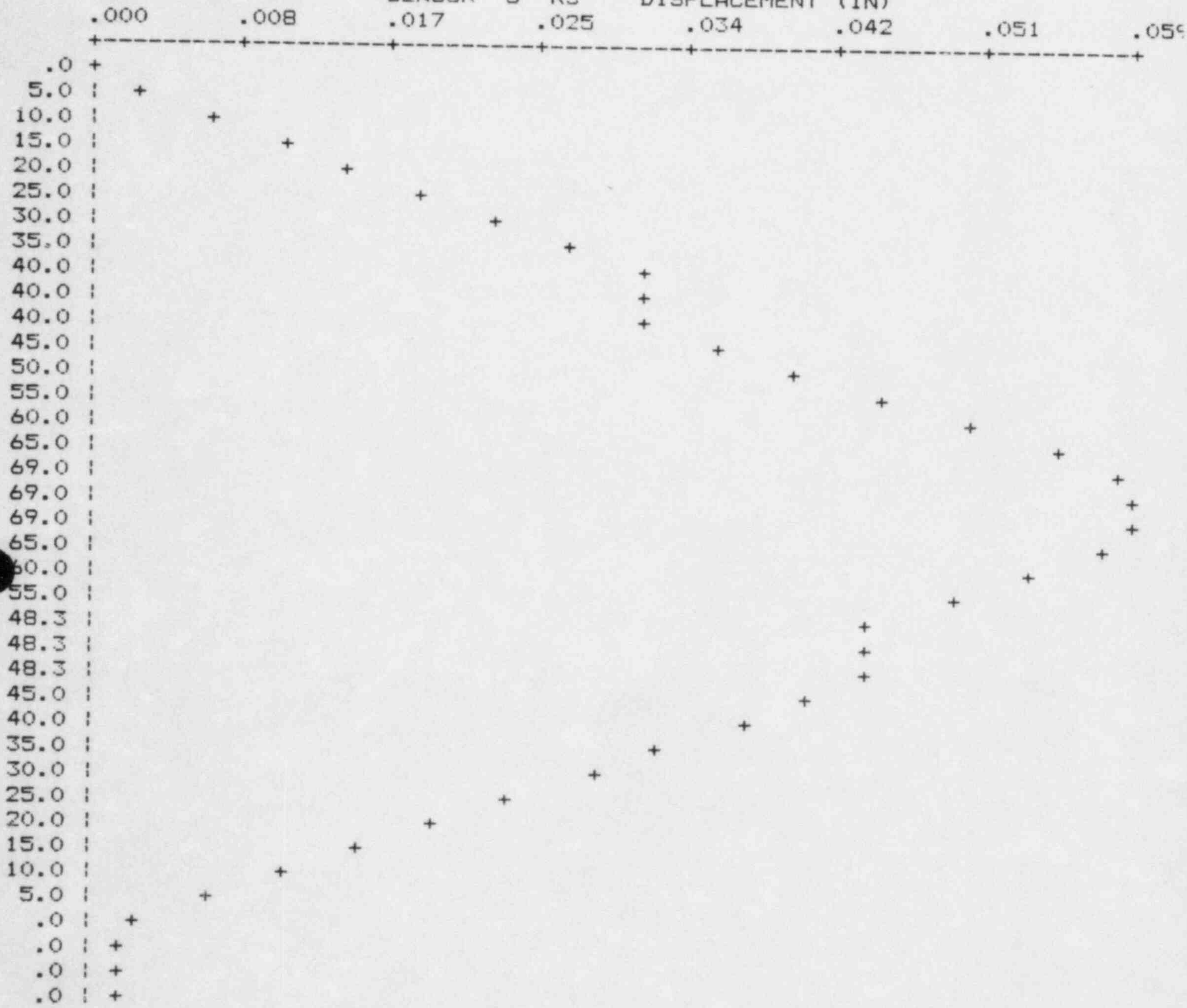
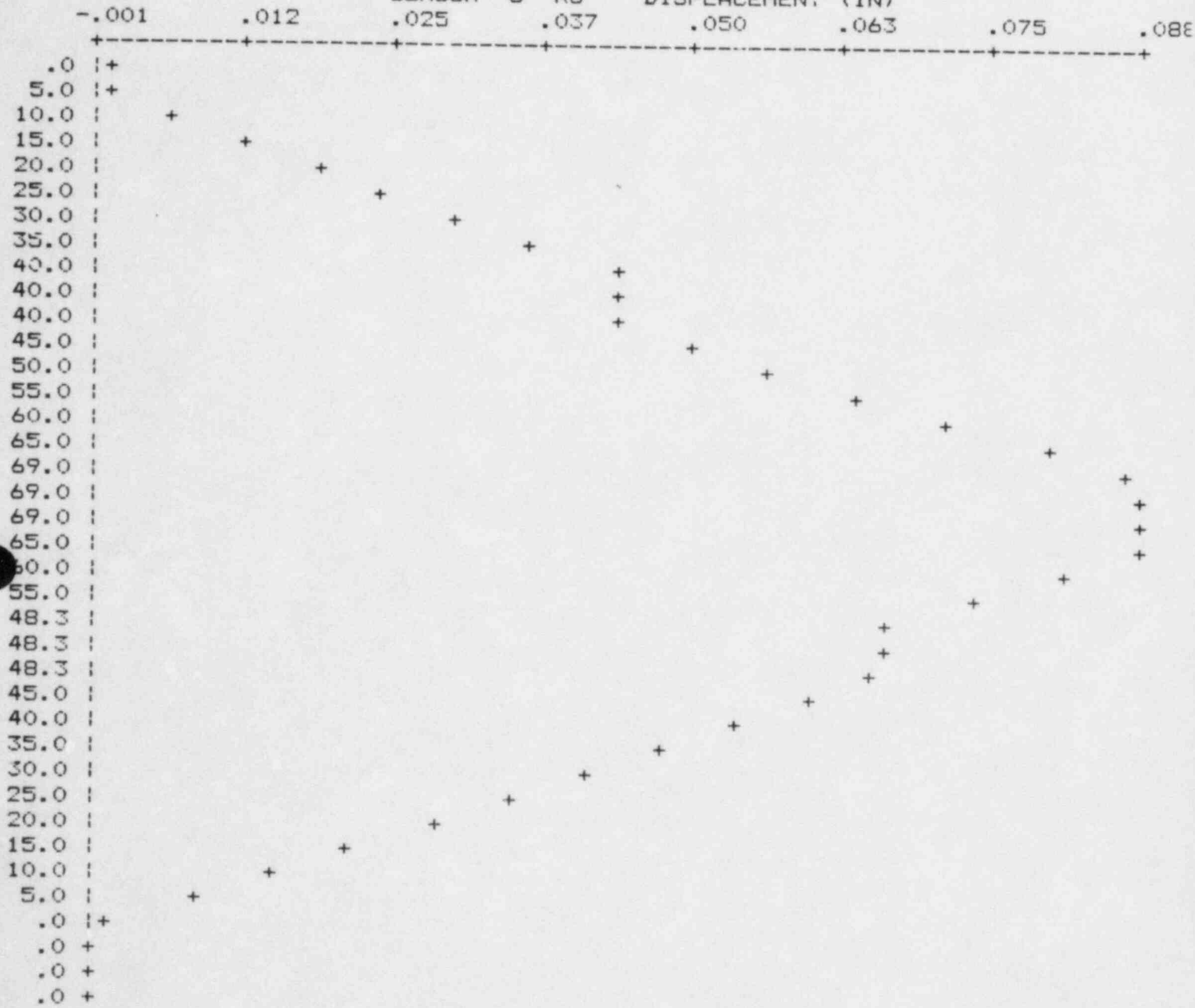


APPENDIX A

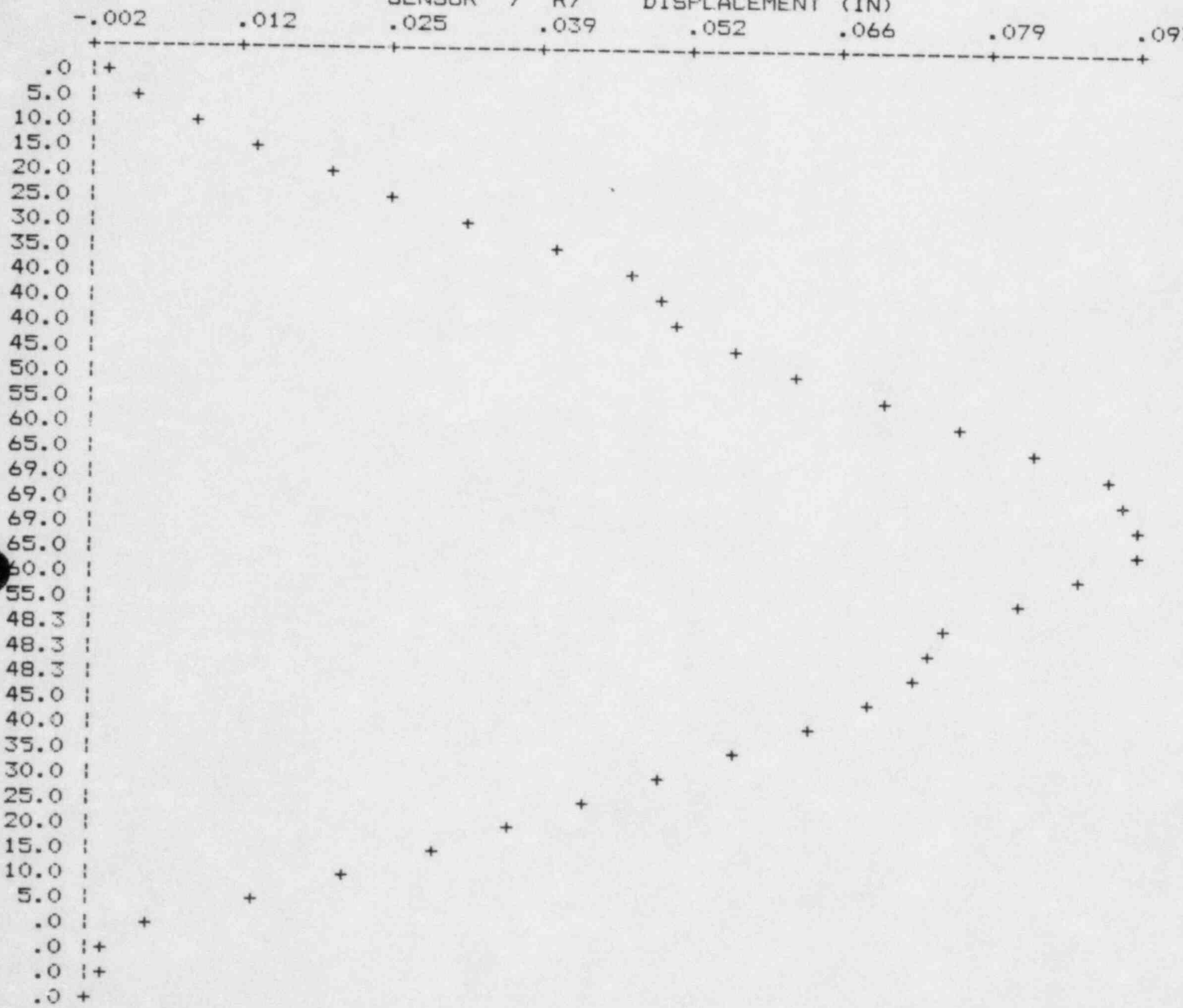
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 5 R5 DISPLACEMENT (IN)



CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 6 R6 DISPLACEMENT (IN)

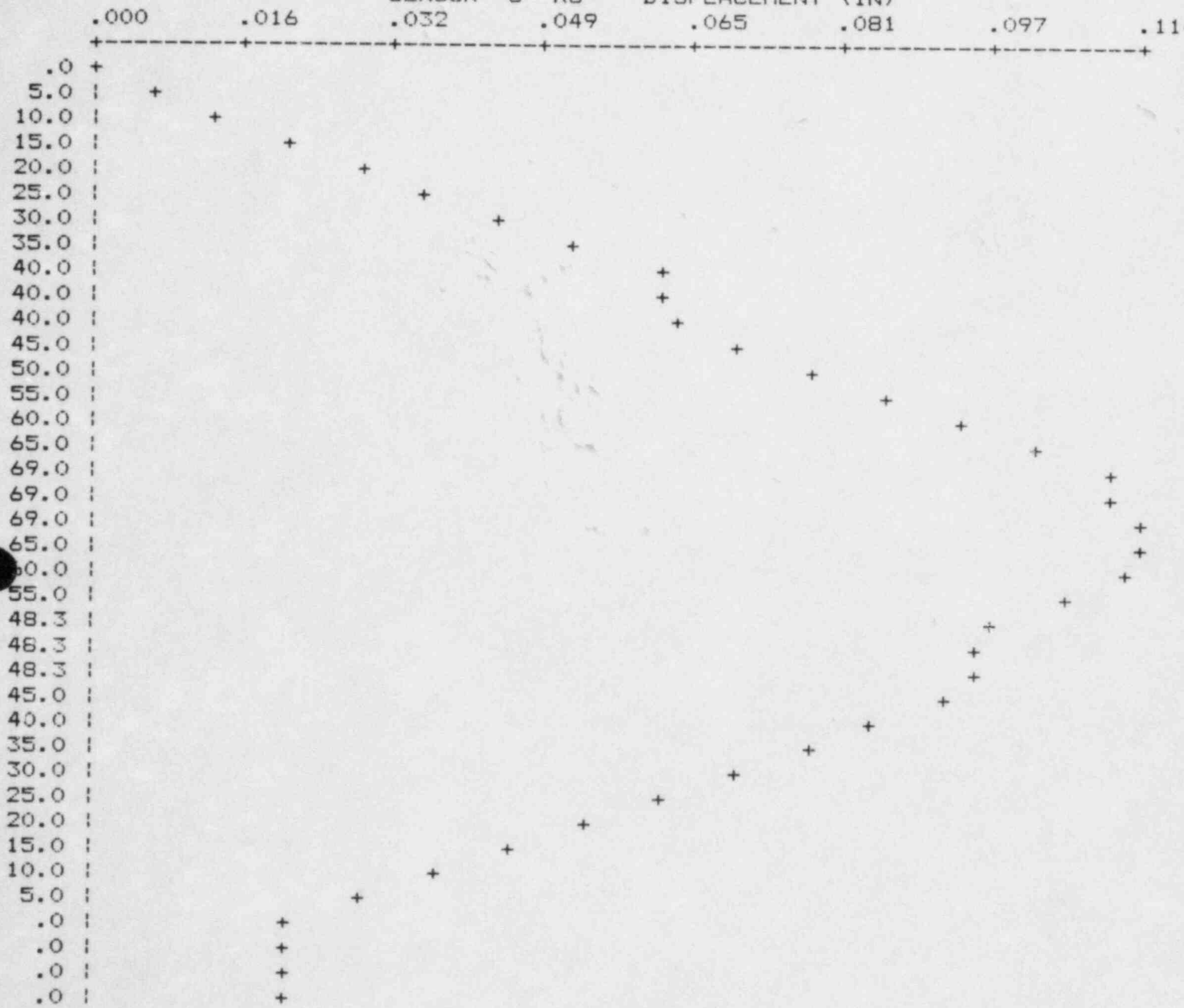


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 7 R7 DISPLACEMENT (IN)

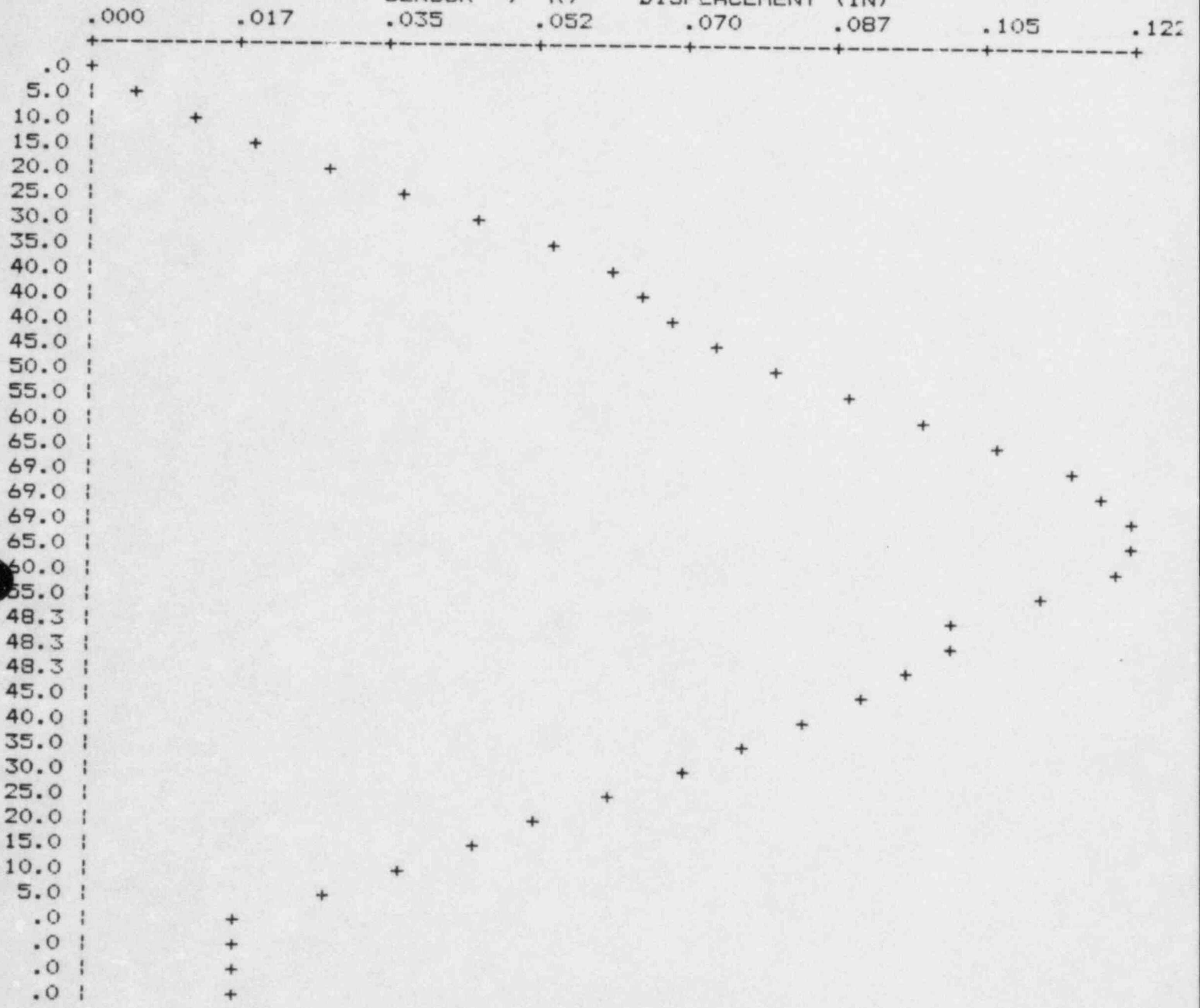


APPENDIX A

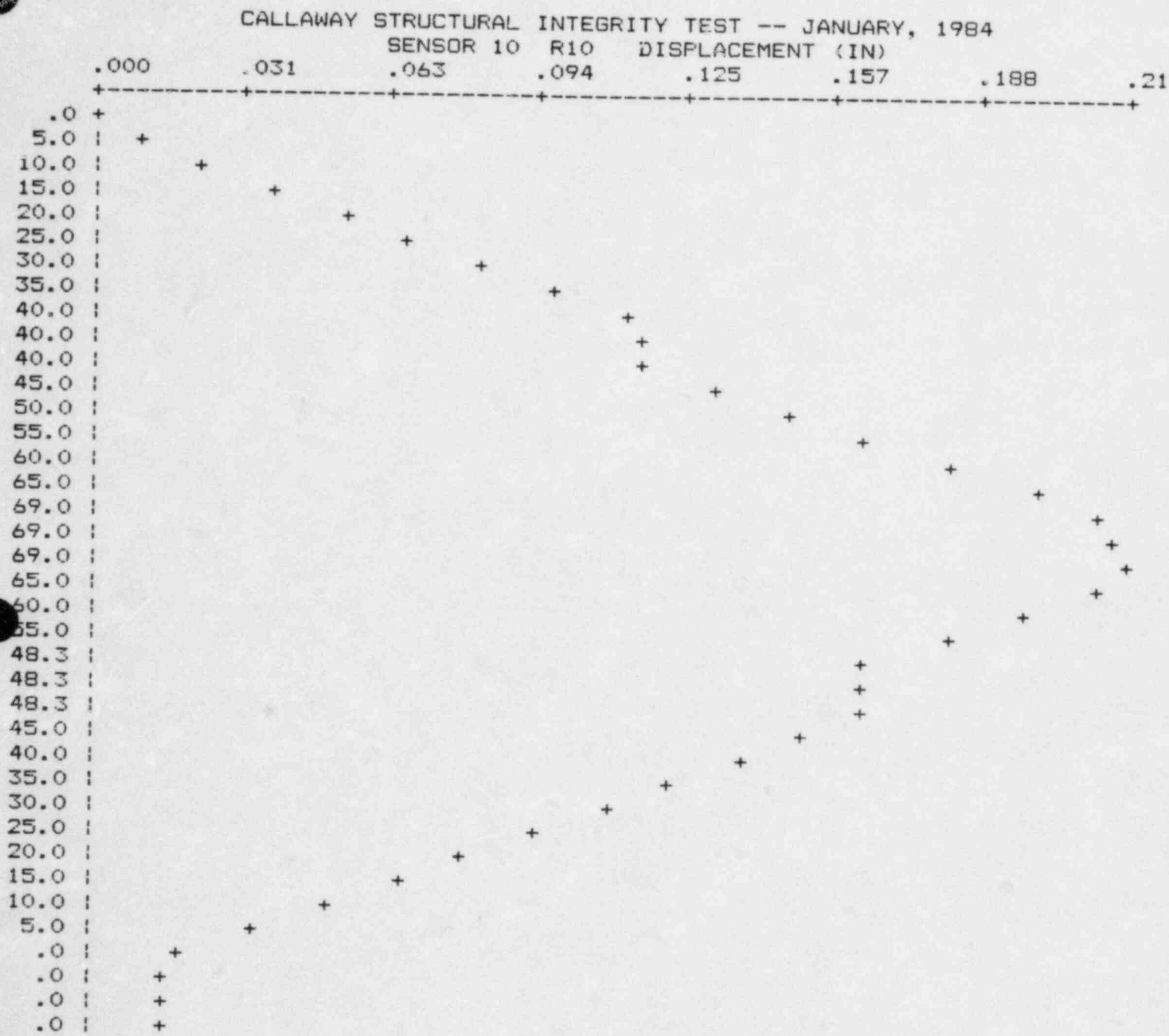
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 8 R8 DISPLACEMENT (IN)



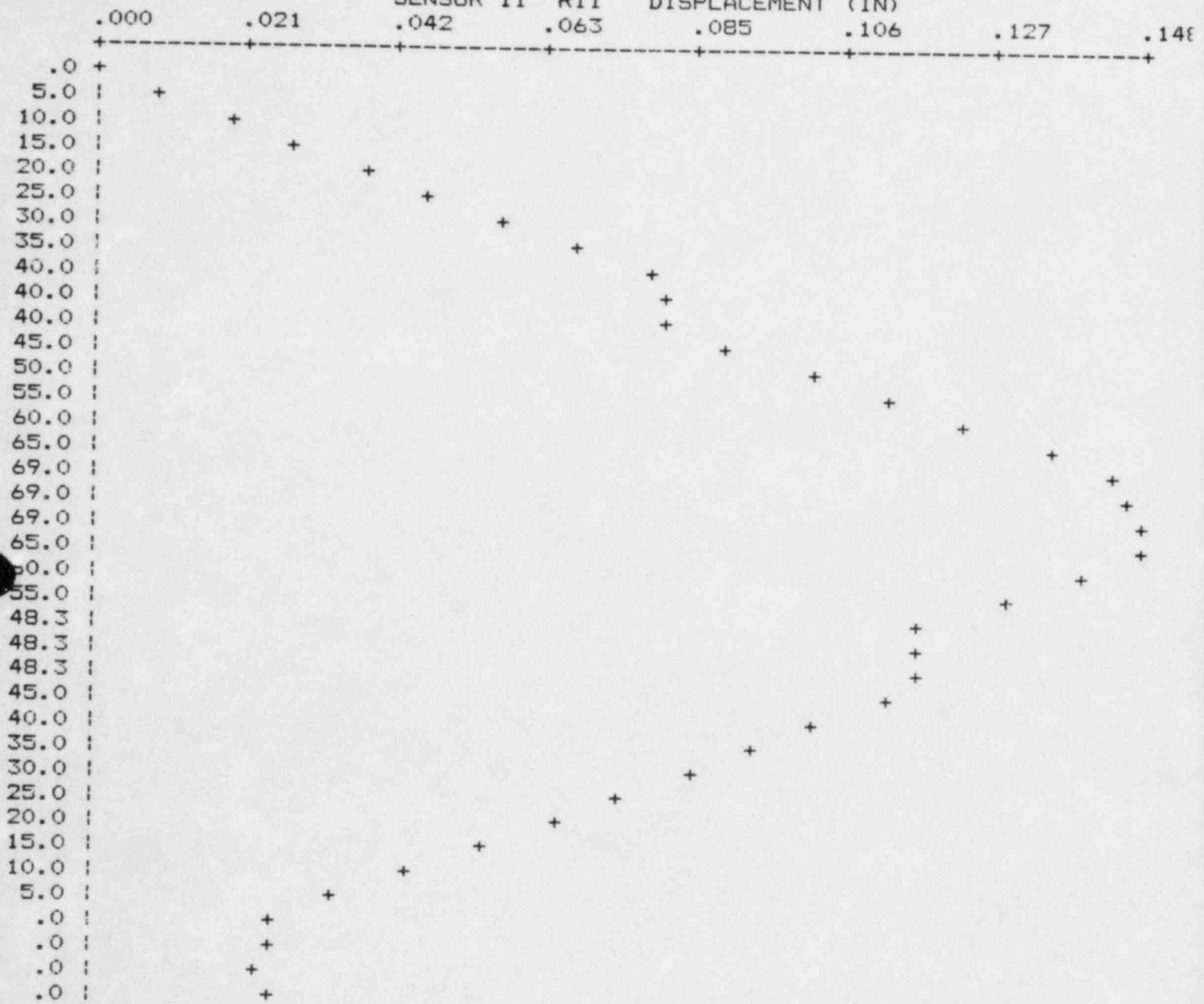
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 9 R9 DISPLACEMENT (IN)



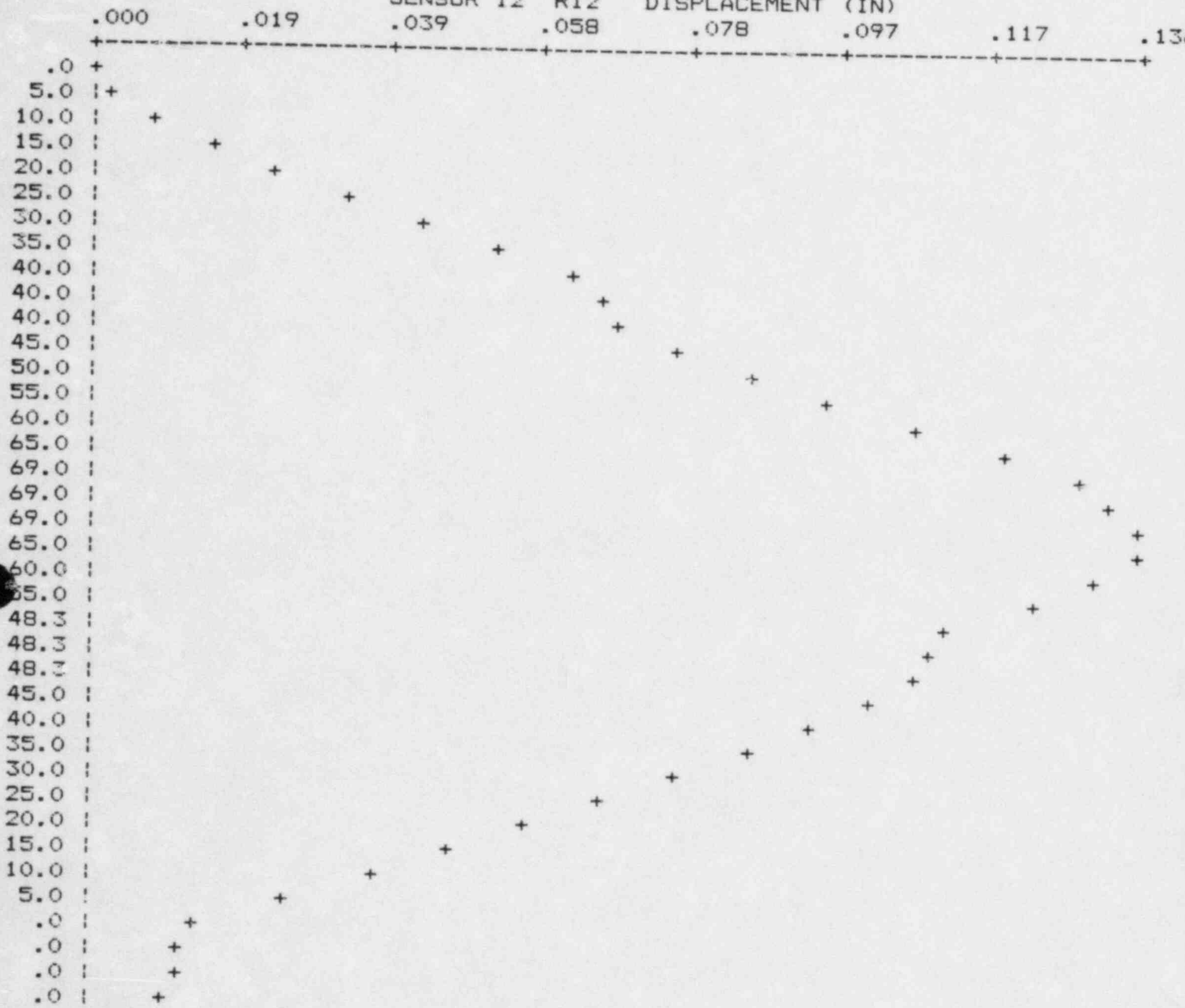
APPENIDX A


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 10 R10 DISPLACEMENT (IN)
.000
.031
.063
.094
.125
.157
.188
.21
.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
40.0
40.0
45.0
50.0
55.0
60.0
65.0
69.0
69.0
69.0
65.0
60.0
55.0
48.3
48.3
48.3
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
.0
.0
.0
.0

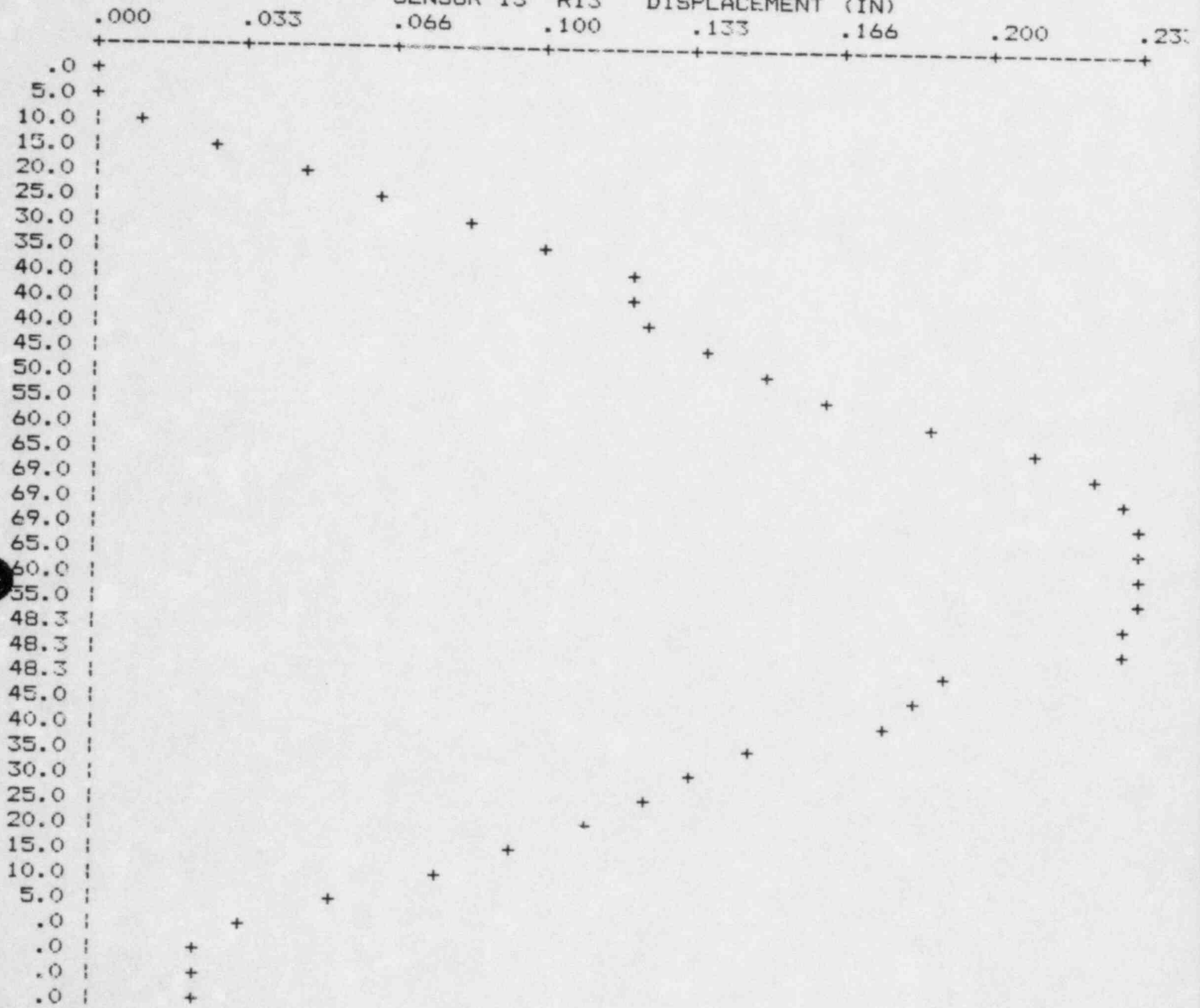
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 11 R11 DISPLACEMENT (IN)

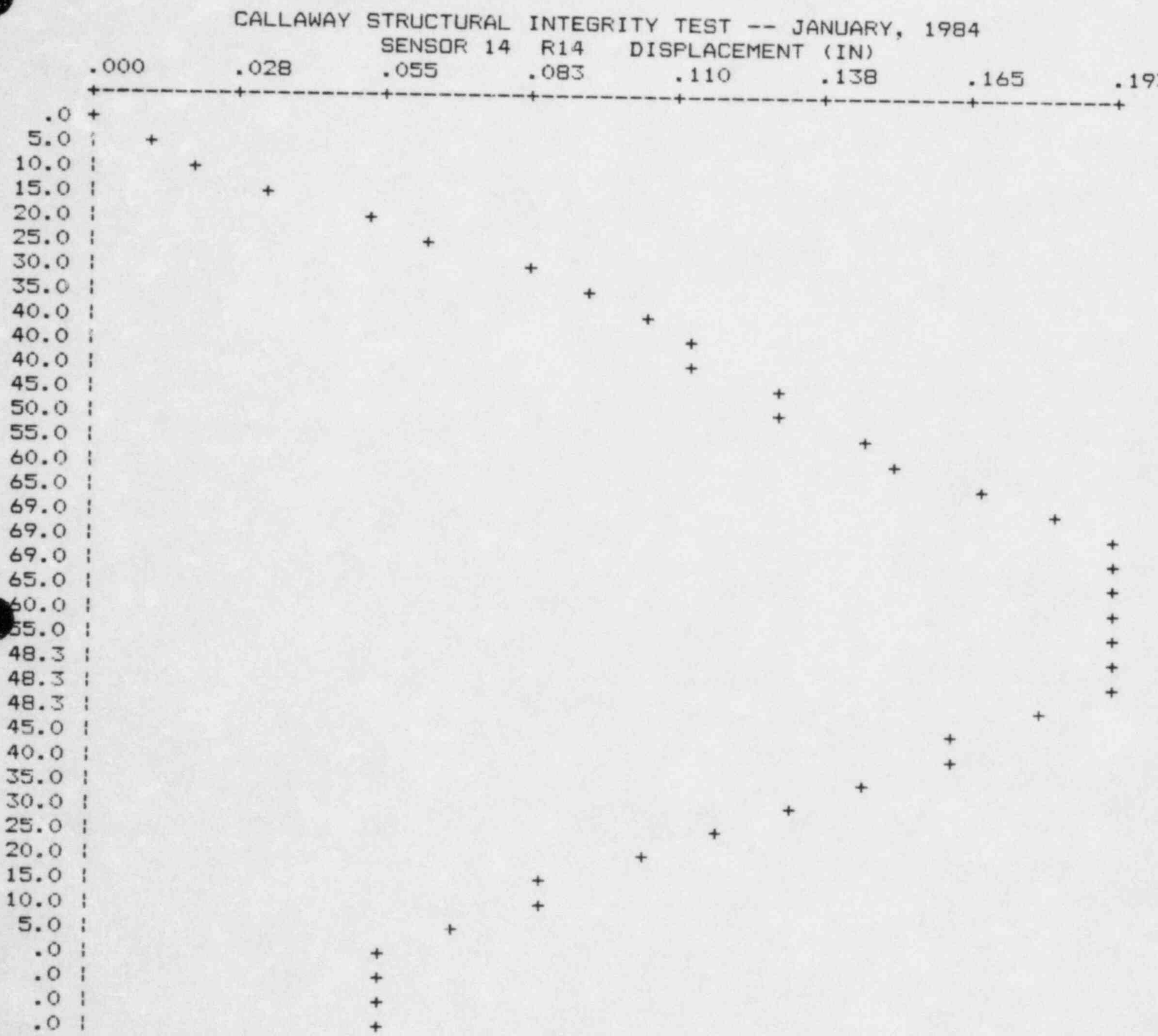


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 12 R12 DISPLACEMENT (IN)

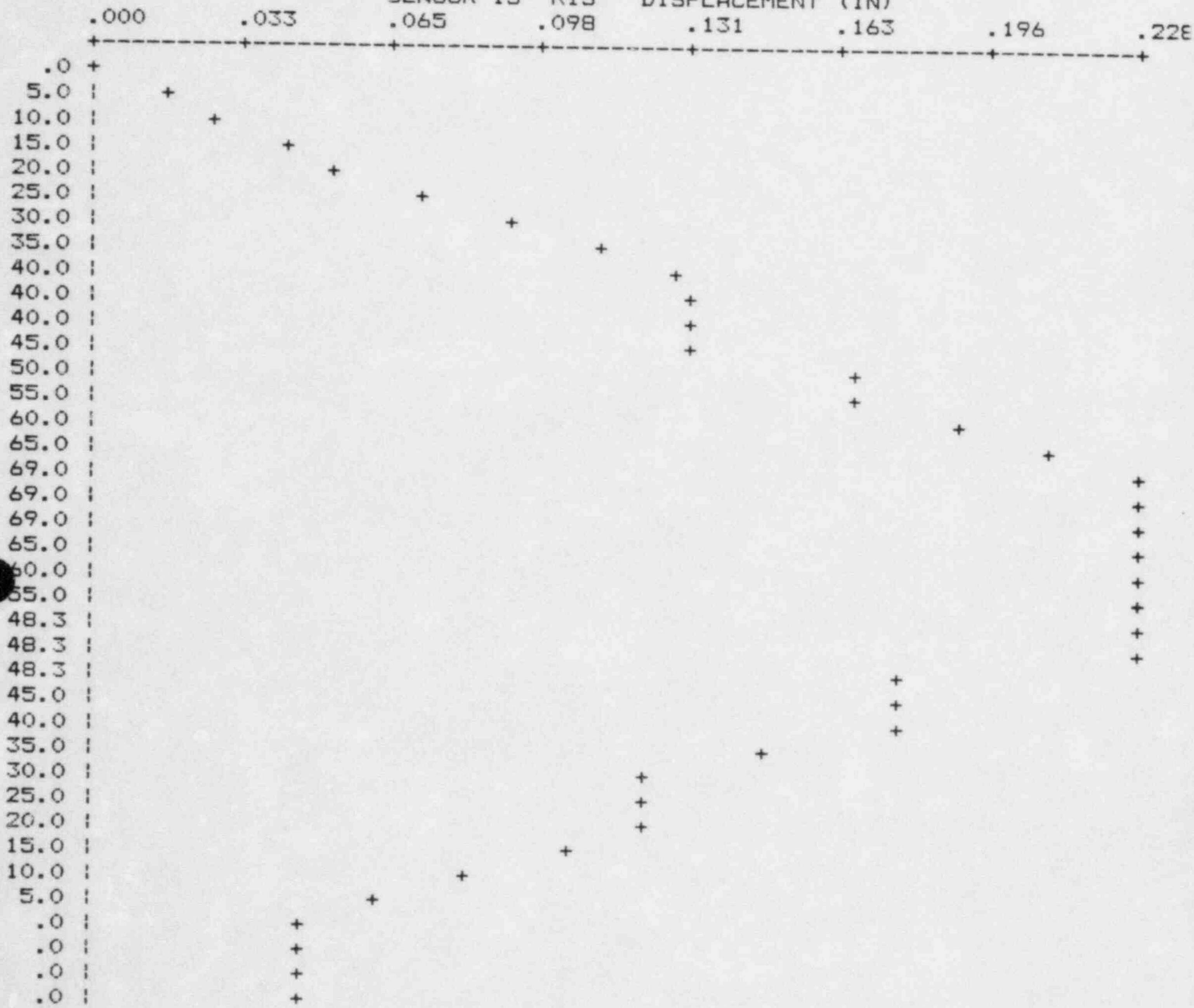


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 13 R13 DISPLACEMENT (IN)




CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 14 R14 DISPLACEMENT (IN)
.000
.028
.055
.083
.110
.138
.165
.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
40.0
40.0
45.0
50.0
55.0
60.0
65.0
69.0
69.0
69.0
65.0
60.0
55.0
48.3
48.3
48.3
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
.0
.0
.0
.0

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 15 R15 DISPLACEMENT (IN)

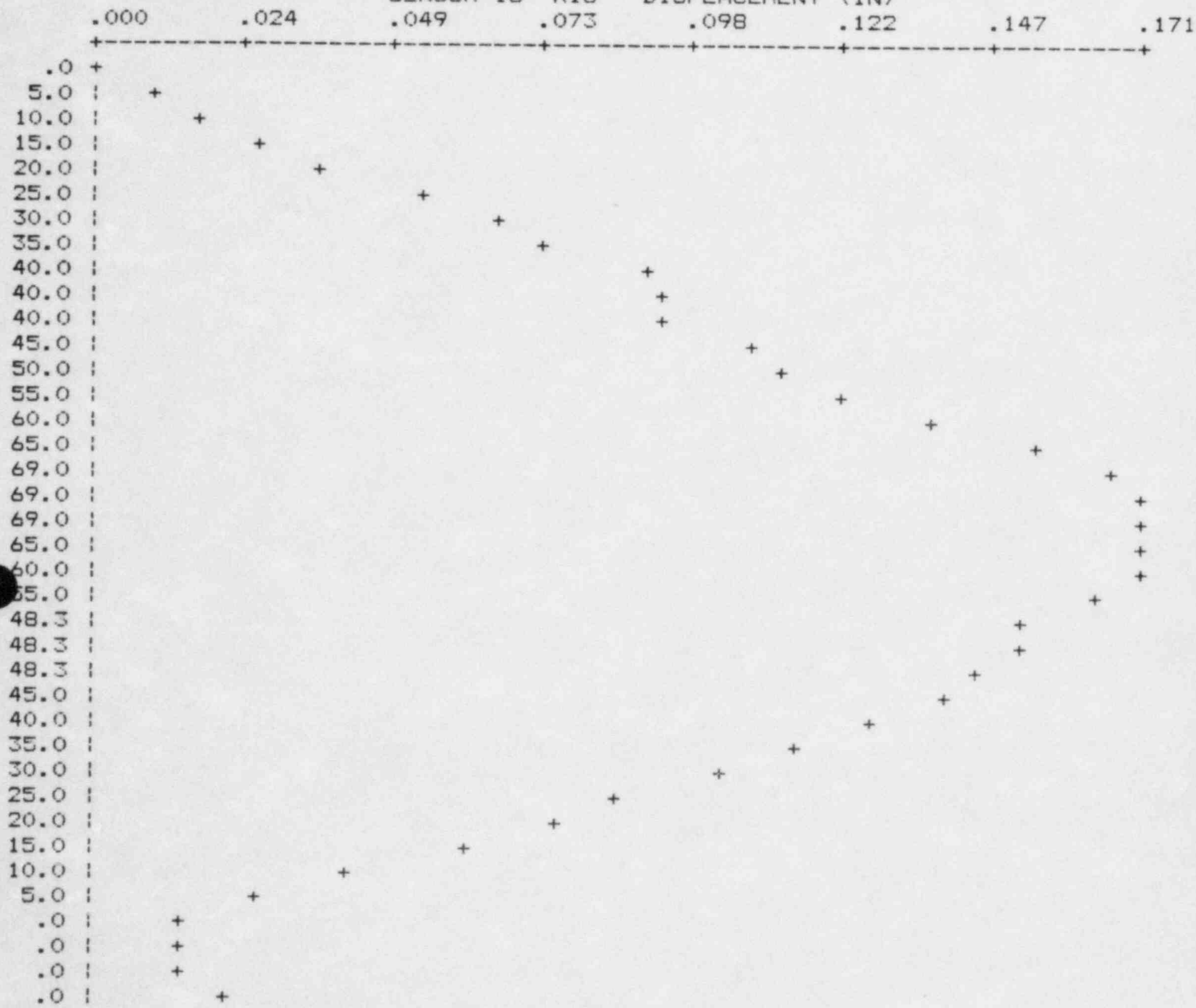


```
              CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
                        SENSOR 16  R16   DISPLACEMENT (IN)
      .000      .020      .040      .060      .080      .100      .120      .141
      +---------+---------+---------+---------+---------+---------+---------+
   .0 +
  5.0 +
 10.0 +
 15.0 +
 20.0 +
 25.0 !         +
 30.0 !         +
 35.0 !                +
 40.0 !                           +
 40.0 !                           +
 40.0 !                           +
 45.0 !                                   +
 50.0 !                                   +
 55.0 !                                            +
 60.0 !                                                     +
 65.0 !                                                             +
 69.0 !                                                                     +
 69.0 !                                                                     +
 69.0 !                                                                     +
 65.0 !                                                                     +
 60.0 !                                                                     +
 55.0 !                                                                     +
 48.3 !                                                                     +
 48.3 !                                                                     +
 48.3 !                                                                     +
 45.0 !                                                                     +
 40.0 !                                                                     +
 35.0 !                                                        +
 30.0 !                                                        +
 25.0 !                                                 +
 20.0 !                                         +
 15.0 !                                 +
 10.0 !                        +
  5.0 !                 +
   .0 !             +
   .0 !        +
   .0 !        +
   .0 !        +
```

```
                    CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
                              SENSOR 17  R17   DISPLACEMENT (IN)
       .000      .015      .031      .046      .062      .078      .093      .10
       +---------+---------+---------+---------+---------+---------+---------+
    .0 +
   5.0 +
  10.0 +
  15.0 +
  20.0 +
  25.0 +
  30.0 !          +
  35.0 !                +
  40.0 !                          +
  40.0 !                          +
  40.0 !                          +
  45.0 !                                 +
  50.0 !                                       +
  55.0 !                                       +
  60.0 !                                                      +
  65.0 !                                                             +
  69.0 !                                                                    +
  69.0 !                                                                    +
  69.0 !                                                                    +
  65.0 !                                                                    +
  60.0 !                                                                    +
  55.0 !                                                                    +
  48.3 !                                                                    +
  48.3 !                                                                    +
  48.3 !                                                                    +
  45.0 !                                                                    +
  40.0 !                                                                    +
  35.0 !                                                                    +
  30.0 !                                                                    +
  25.0 !                                                                    +
  20.0 !                                                                    +
  15.0 !                                                       +
  10.0 !                                                  +
   5.0 !                                        +
    .0 !                               +
    .0 !               +
    .0 !               +
    .0 !               +
```

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

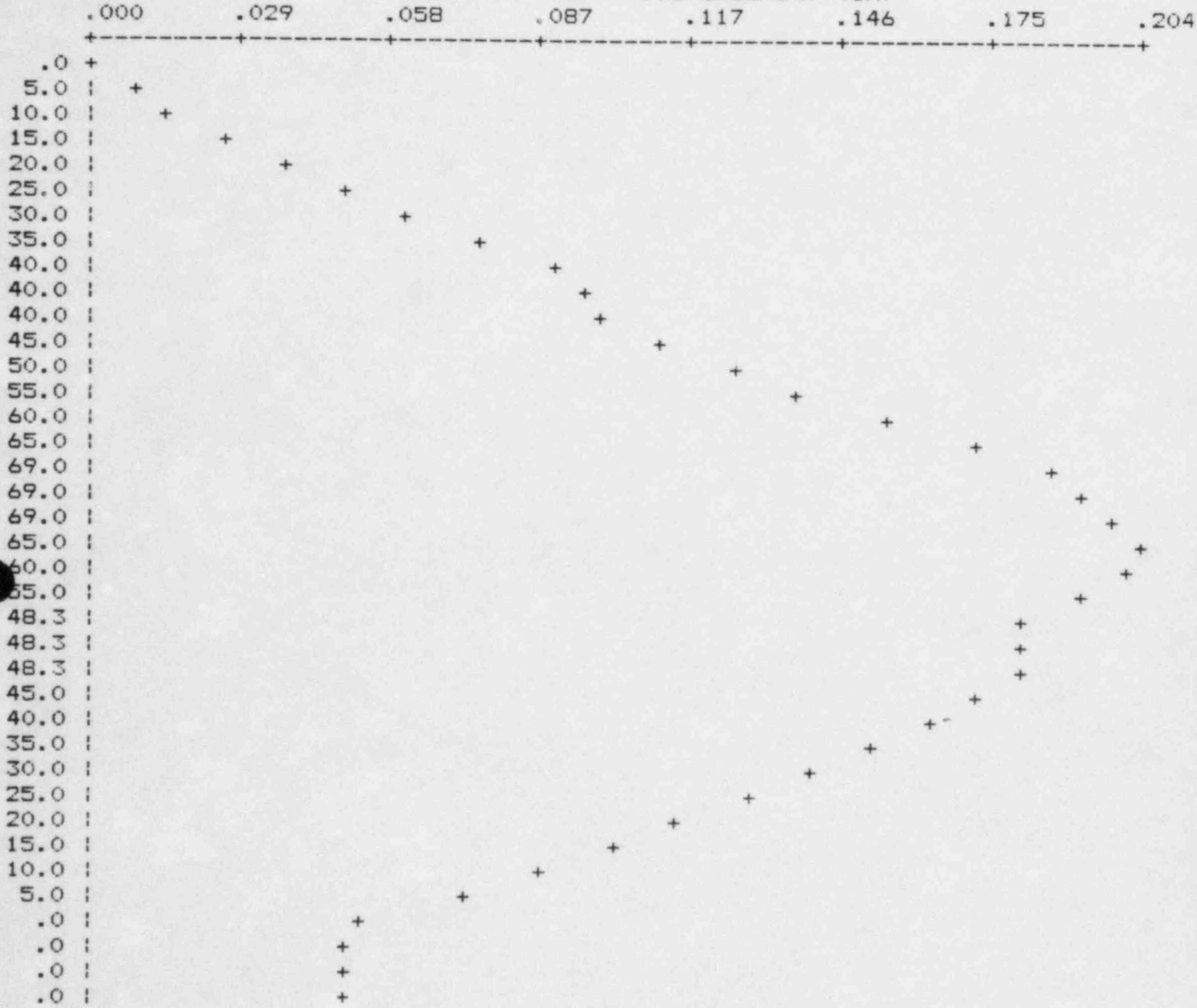
SENSOR 18 R18 DISPLACEMENT (IN)



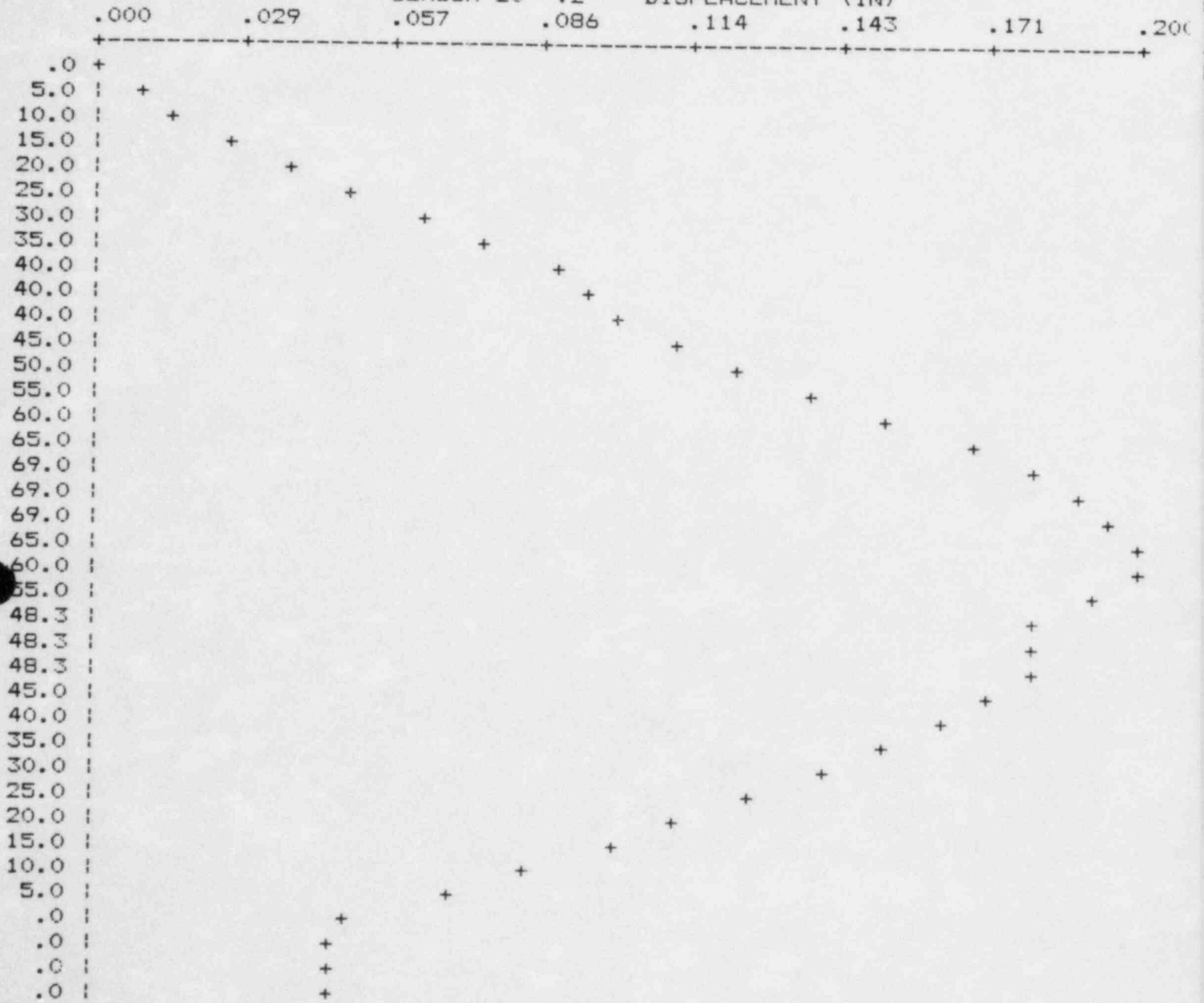
APPENDIX A

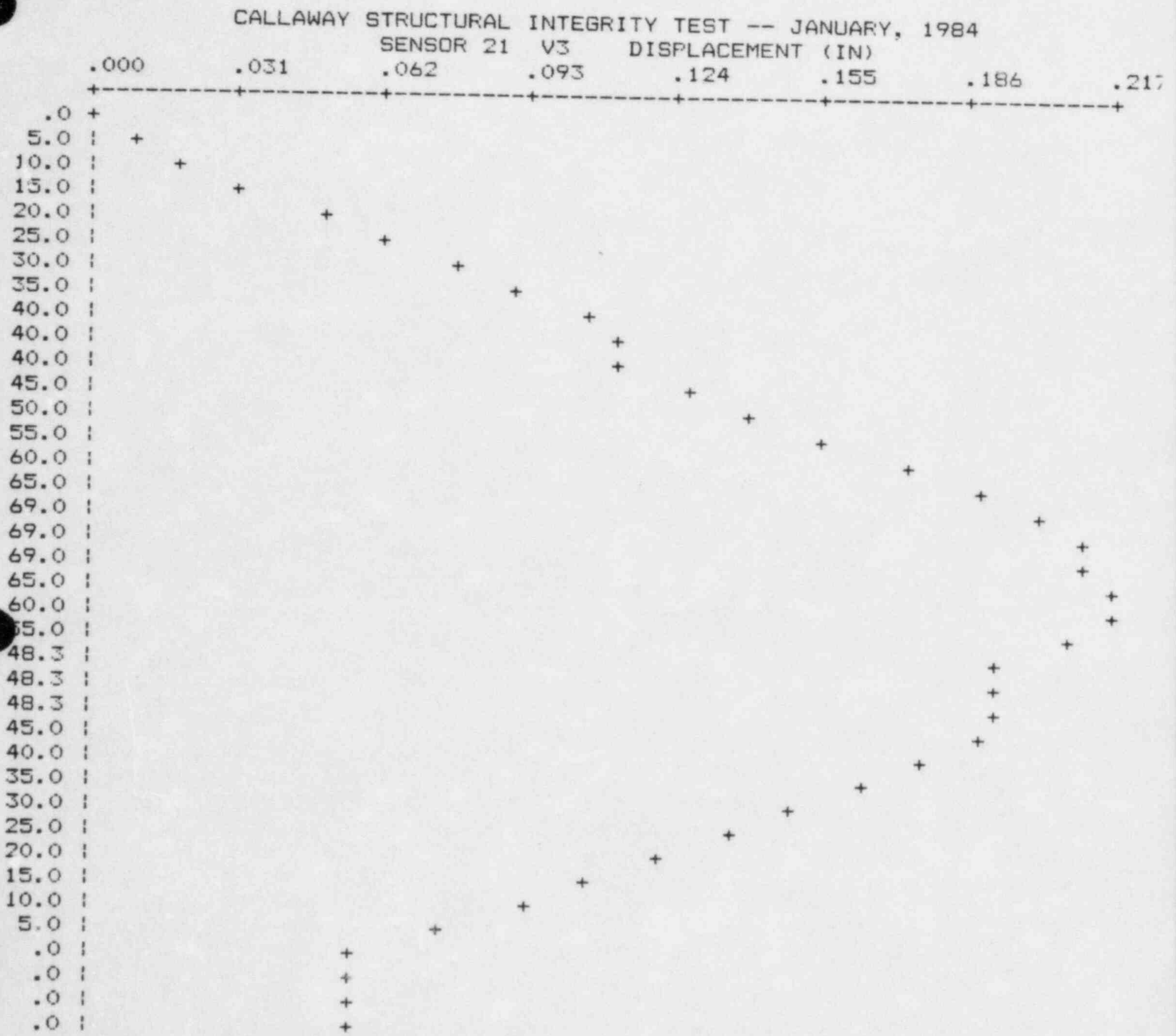
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SENSOR 19 V1 DISPLACEMENT (IN)



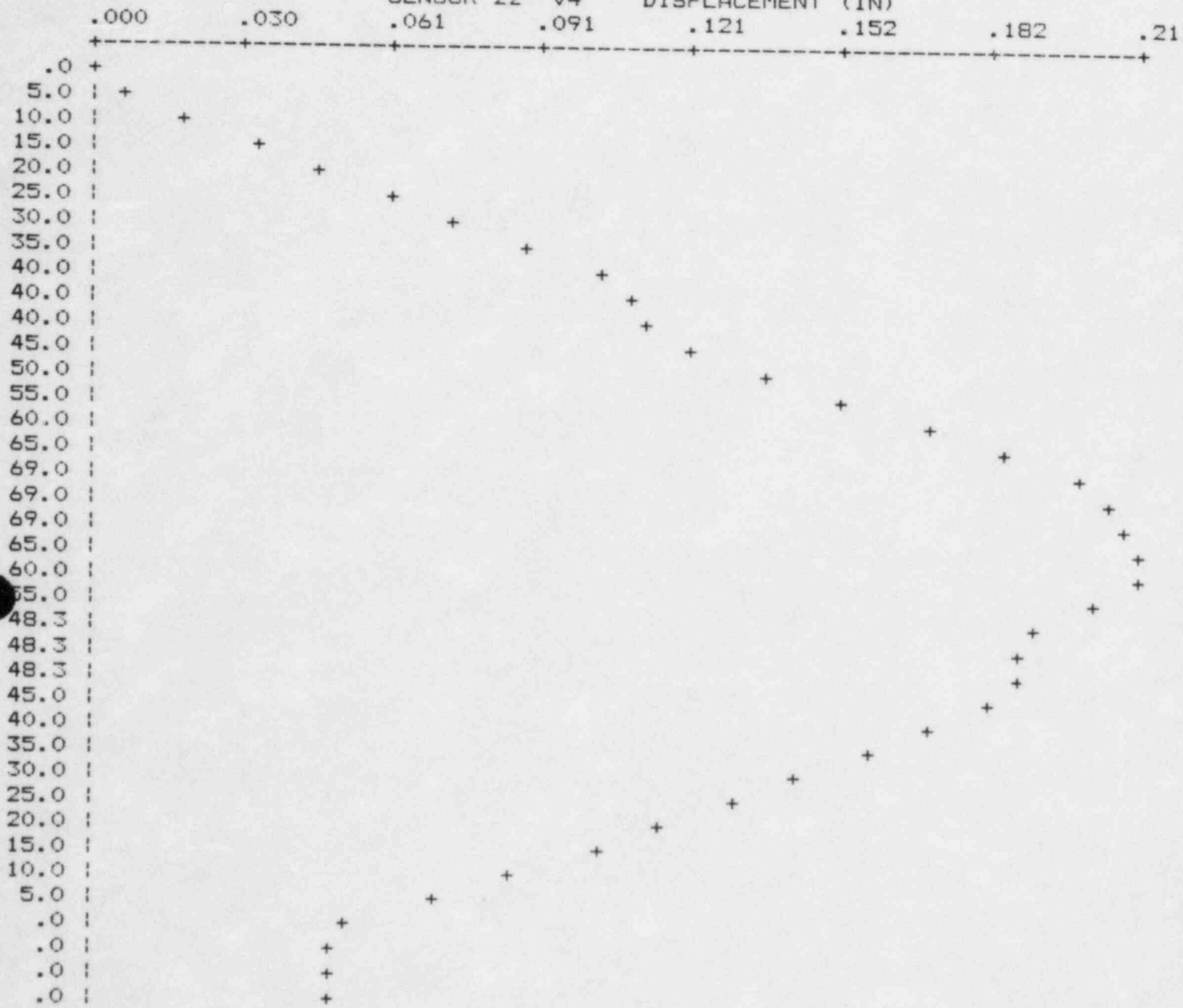
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 20 V2 DISPLACEMENT (IN)




CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 21 V3 DISPLACEMENT (IN)
.000
.031
.062
.093
.124
.155
.186
.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
40.0
40.0
45.0
50.0
55.0
60.0
65.0
69.0
69.0
69.0
65.0
60.0
48.3
48.3
48.3
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
.0
.0
.0
.0

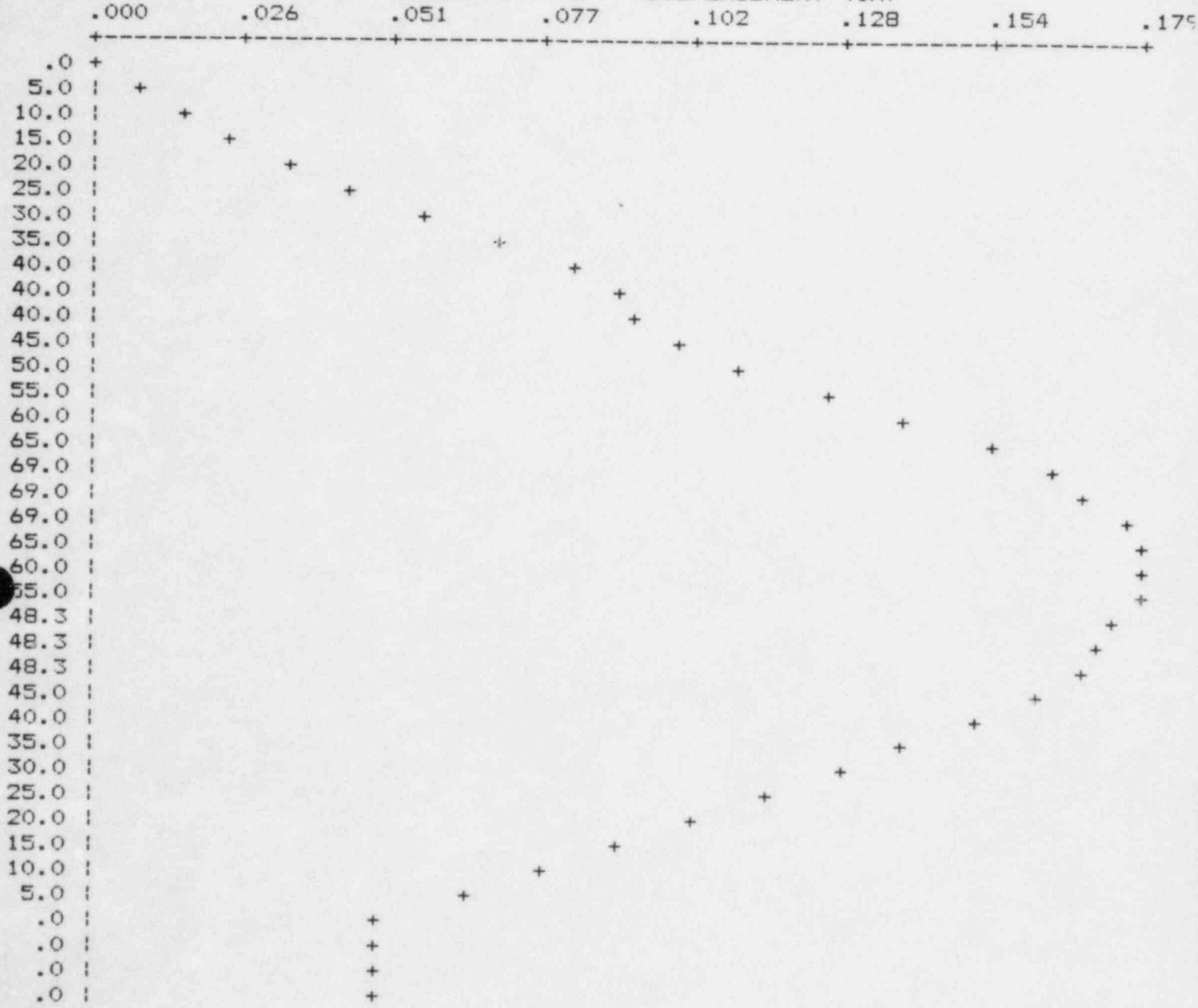
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SENSOR 22 V4 DISPLACEMENT (IN)



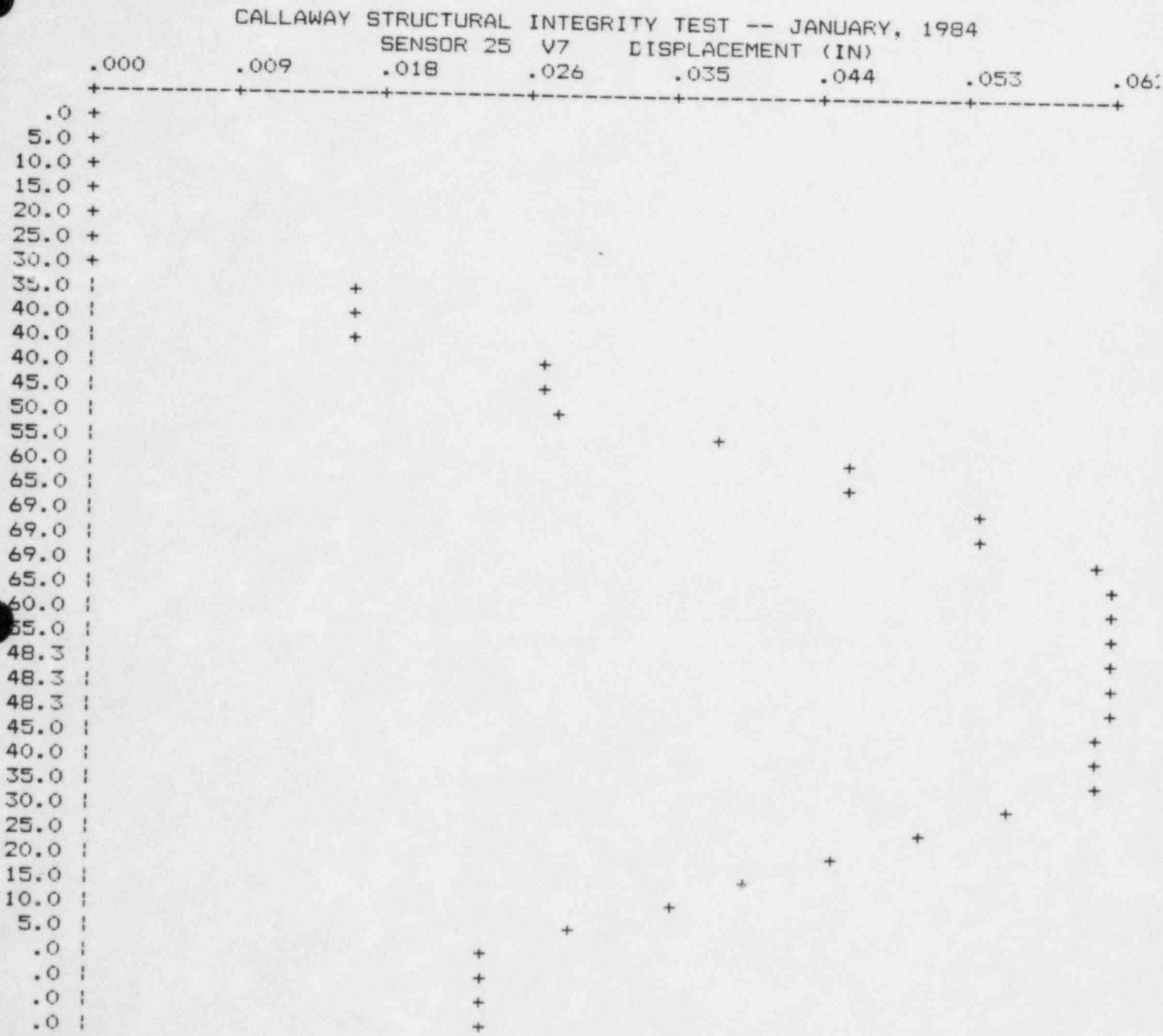
APPENDIX A

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 23 VS DISPLACEMENT (IN)



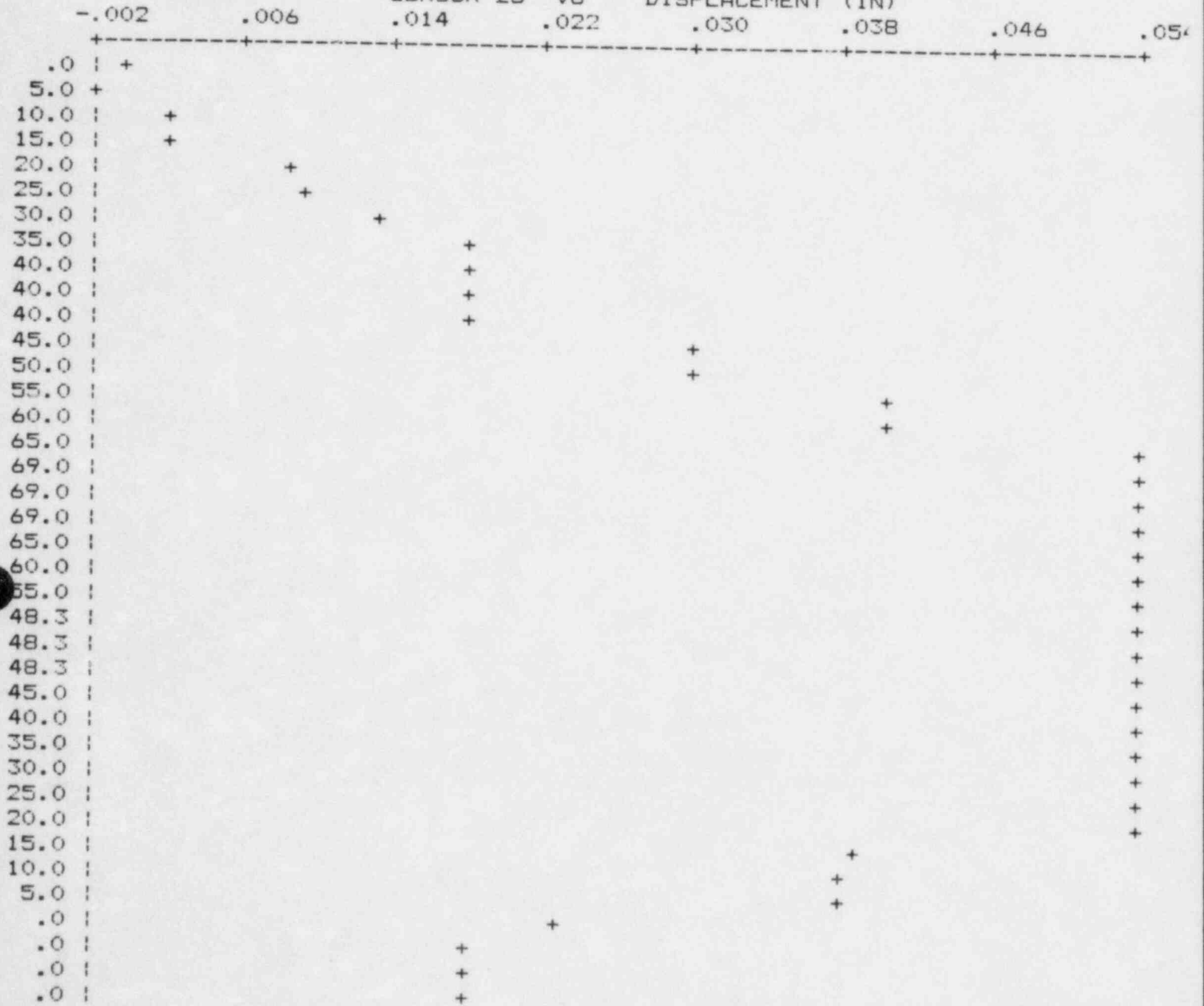
```
              CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
                        SENSOR 24  V6    DISPLACEMENT (IN)
      .000      .026      .052      .078      .104      .130      .156      .18
      +---------+---------+---------+---------+---------+---------+---------+
   .0 +
  5.0 !  +
 10.0 !    +
 15.0 !        +
 20.0 !           +
 25.0 !               +
 30.0 !                    +
 35.0 !                         +
 40.0 !                              +
 40.0 !                                +
 40.0 !                                 +
 45.0 !                                     +
 50.0 !                                         +
 55.0 !                                              +
 60.0 !                                                    +
 65.0 !                                                          +
 69.0 !                                                               +
 69.0 !                                                                 +
 69.0 !                                                                   +
 65.0 !                                                                     +
 60.0 !                                                                     +
 55.0 !                                                                    +
 48.3 !                                                               +
 48.3 !                                                              +
 48.3 !                                                              +
 45.0 !                                                           +
 40.0 !                                                       +
 35.0 !                                                   +
 30.0 !                                              +
 25.0 !                                          +
 20.0 !                                    +
 15.0 !                               +
 10.0 !                          +
  5.0 !                     +
   .0 !                +
   .0 !                  +
   .0 !                  +
   .0 !                  +
```

APPENDIX A

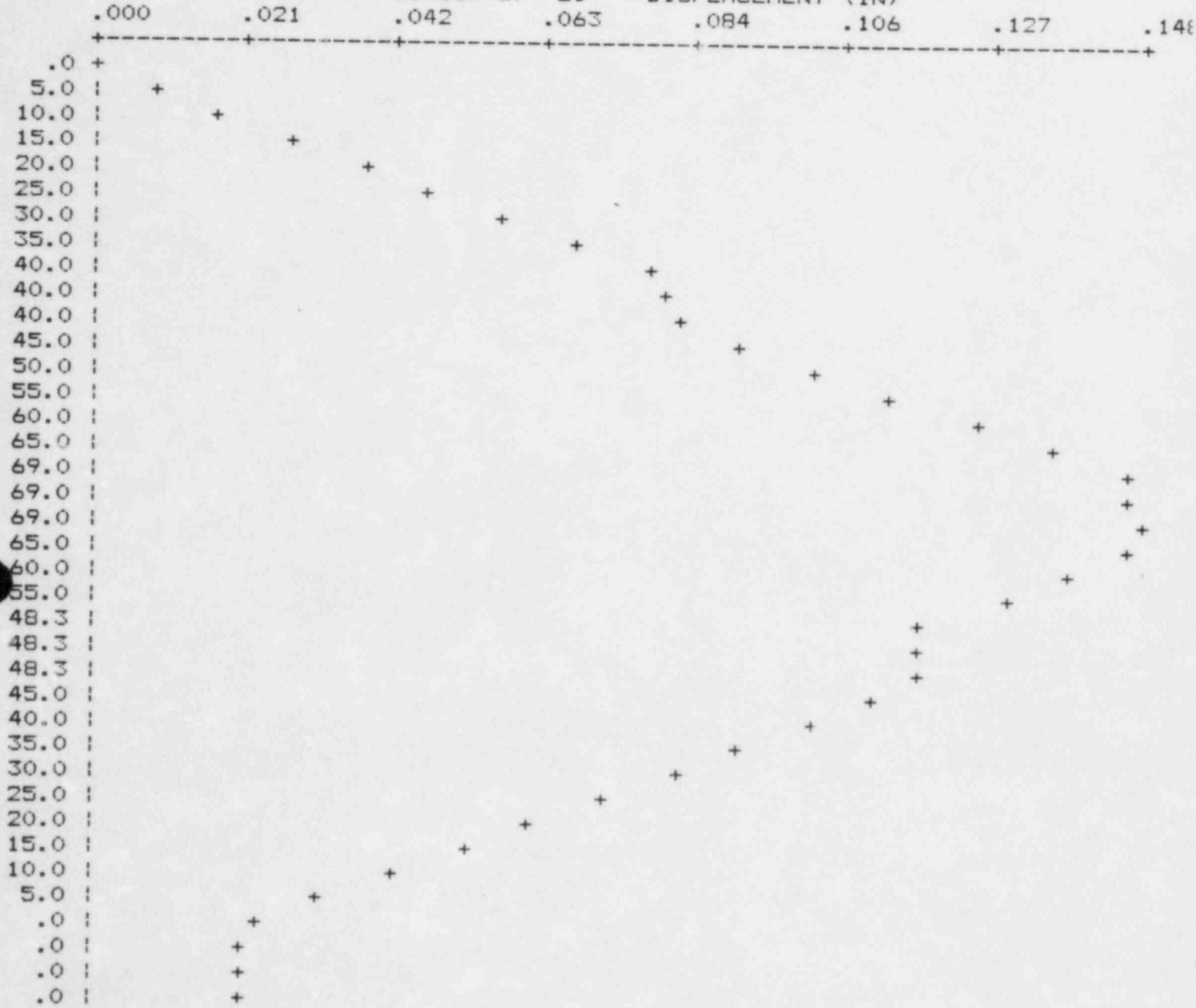

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 25 V7 DISPLACEMENT (IN)
.000
.009
.018
.026
.035
.044
.053
.0
5.0
10.0
15.0
20.0
25.0
30.0
40.0
40.0
40.0
45.0
50.0
55.0
60.0
65.0
69.0
69.0
69.0
65.0
48.3
48.3
48.3
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
.0
.0
.0
.0

APPENDIX A

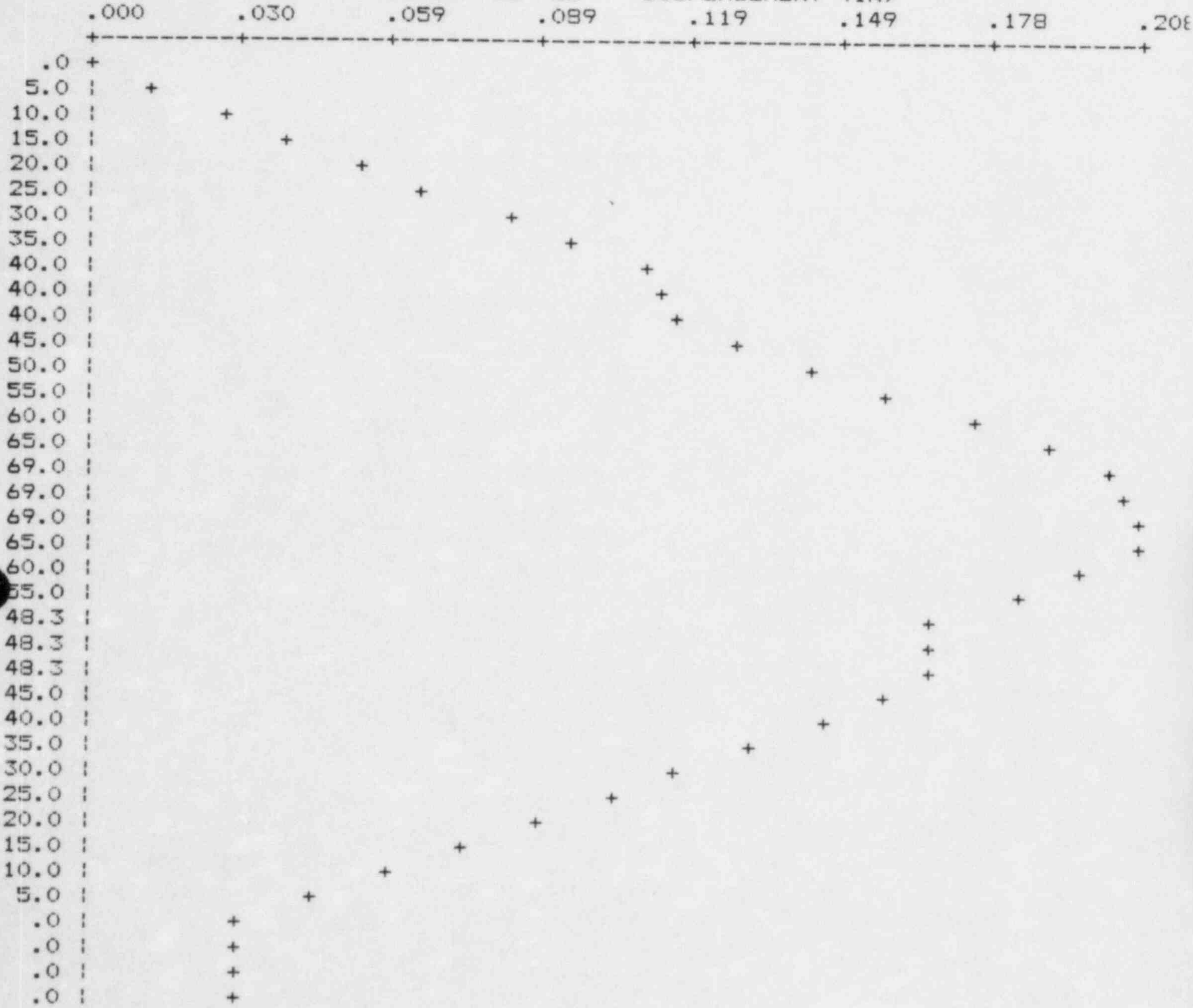
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 26 V8 DISPLACEMENT (IN)



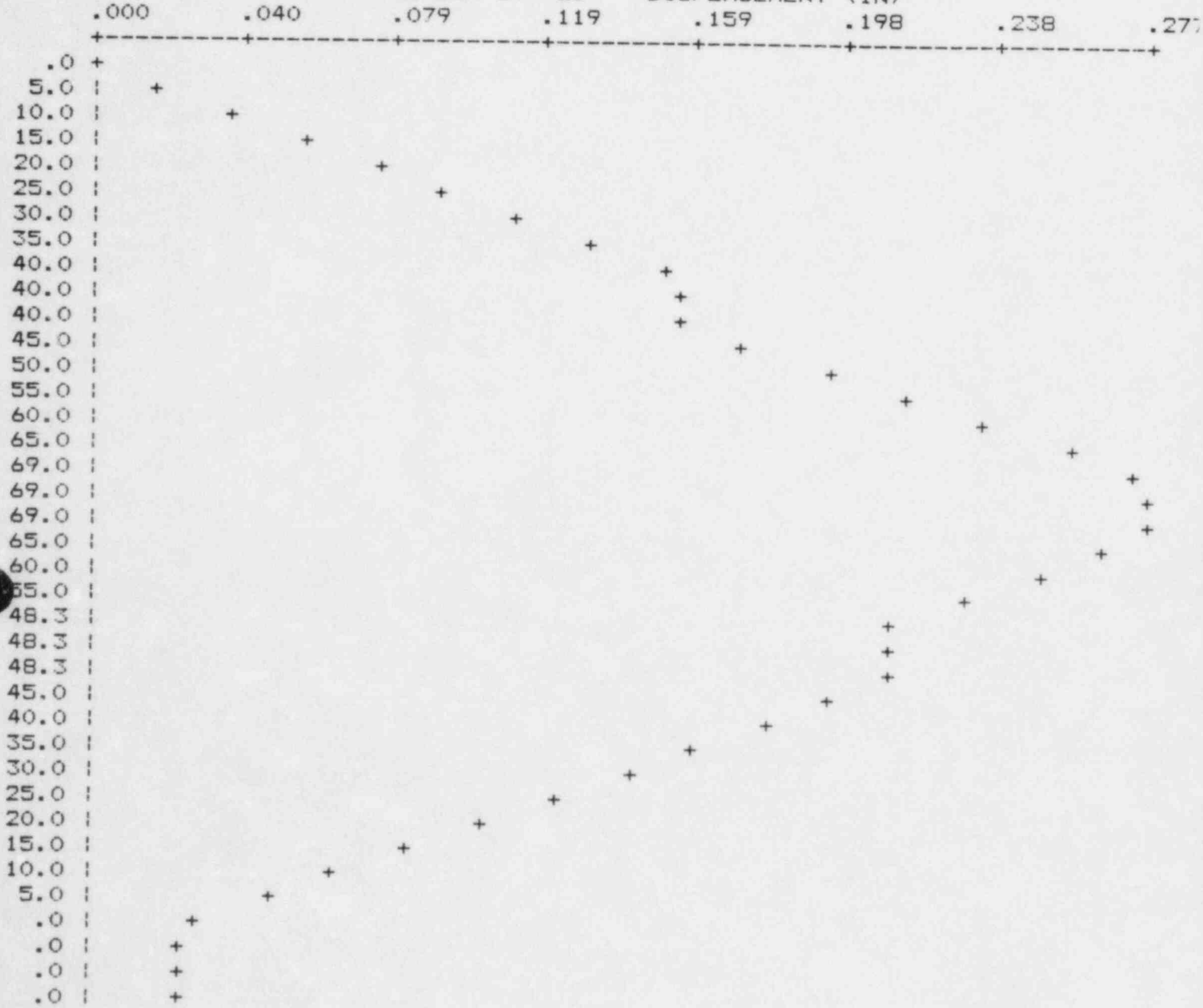
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 27 E1 DISPLACEMENT (IN)



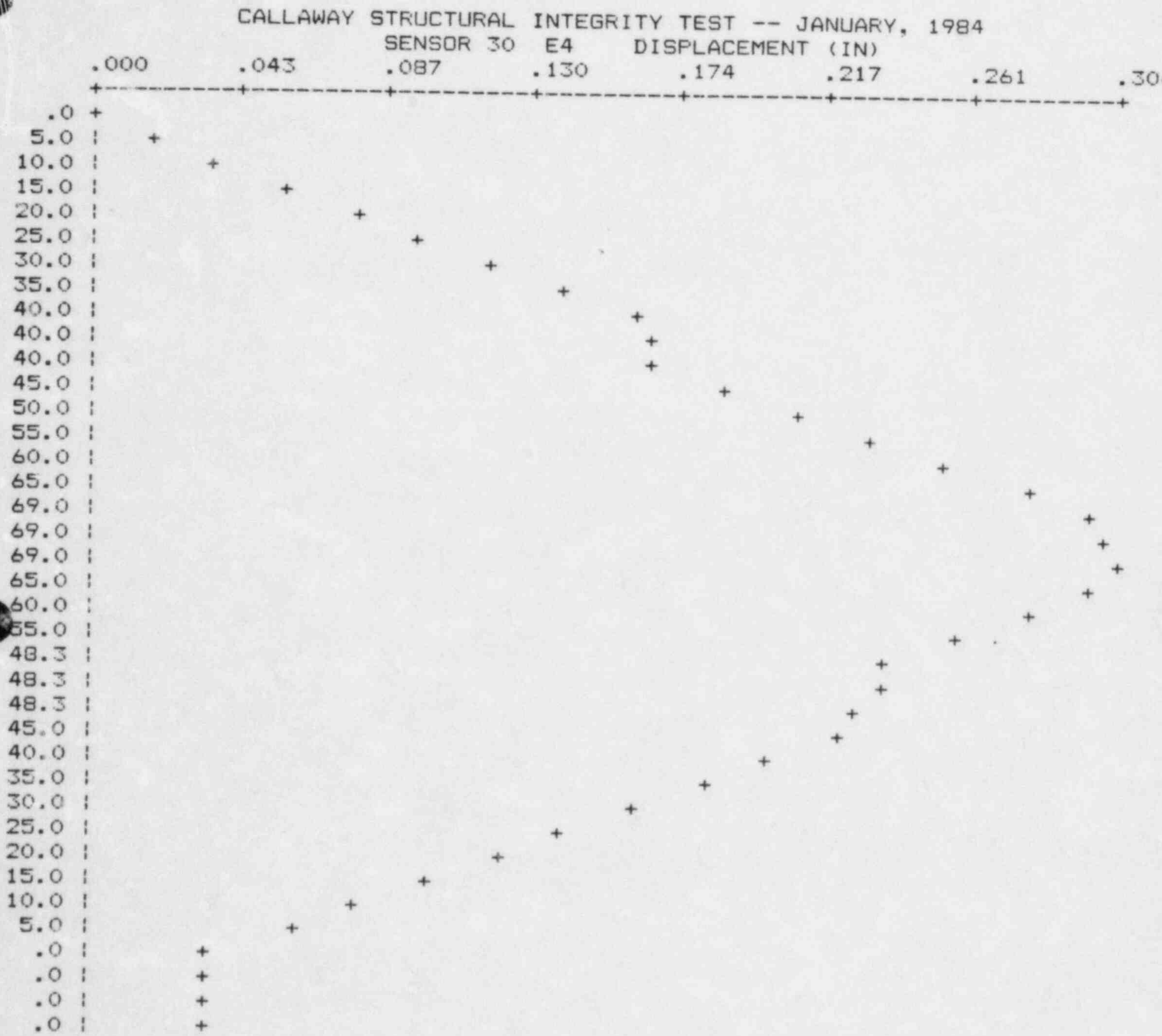
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 28 E2 DISPLACEMENT (IN)



CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 29 E3 DISPLACEMENT (IN)

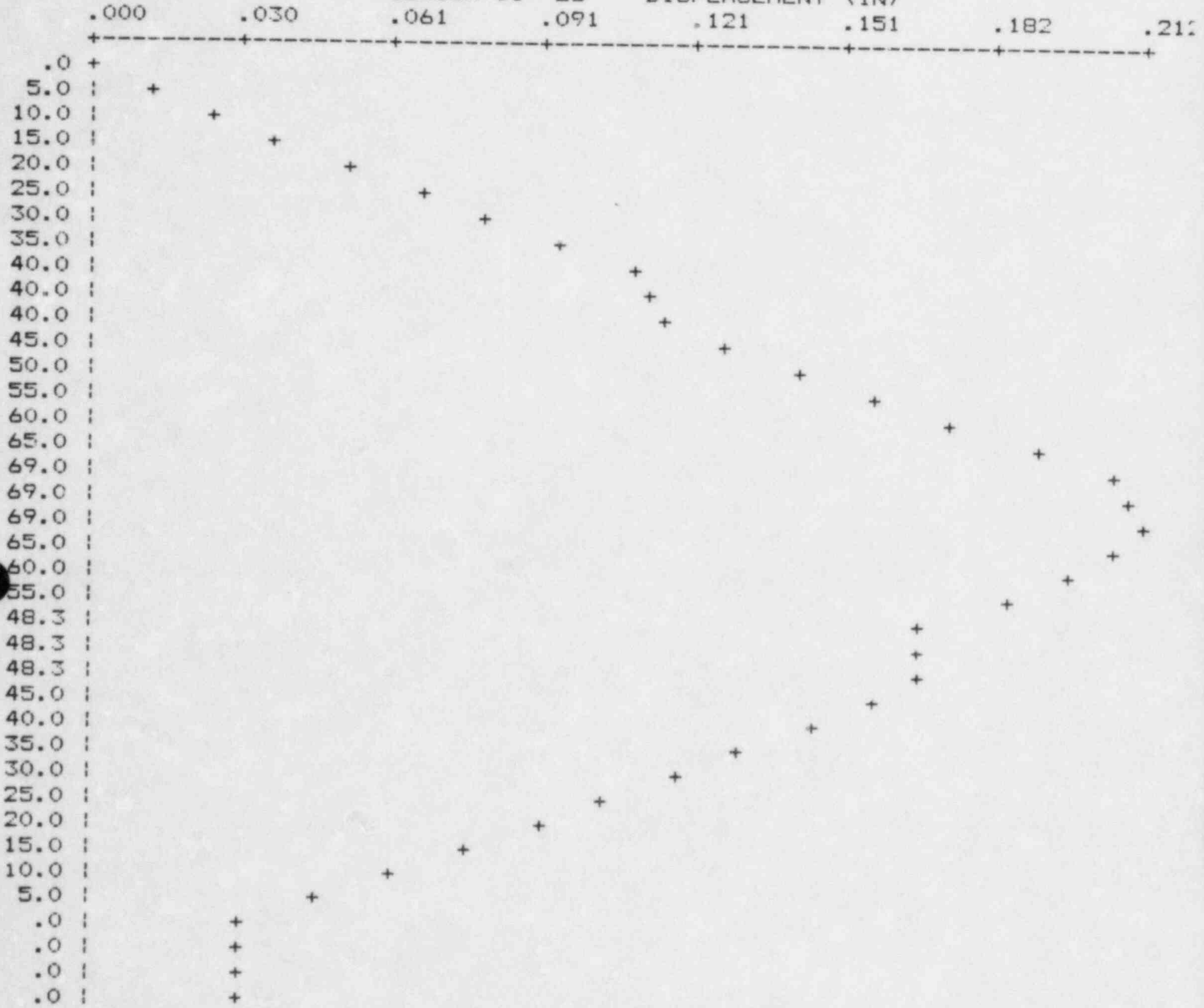


APPENDIX A

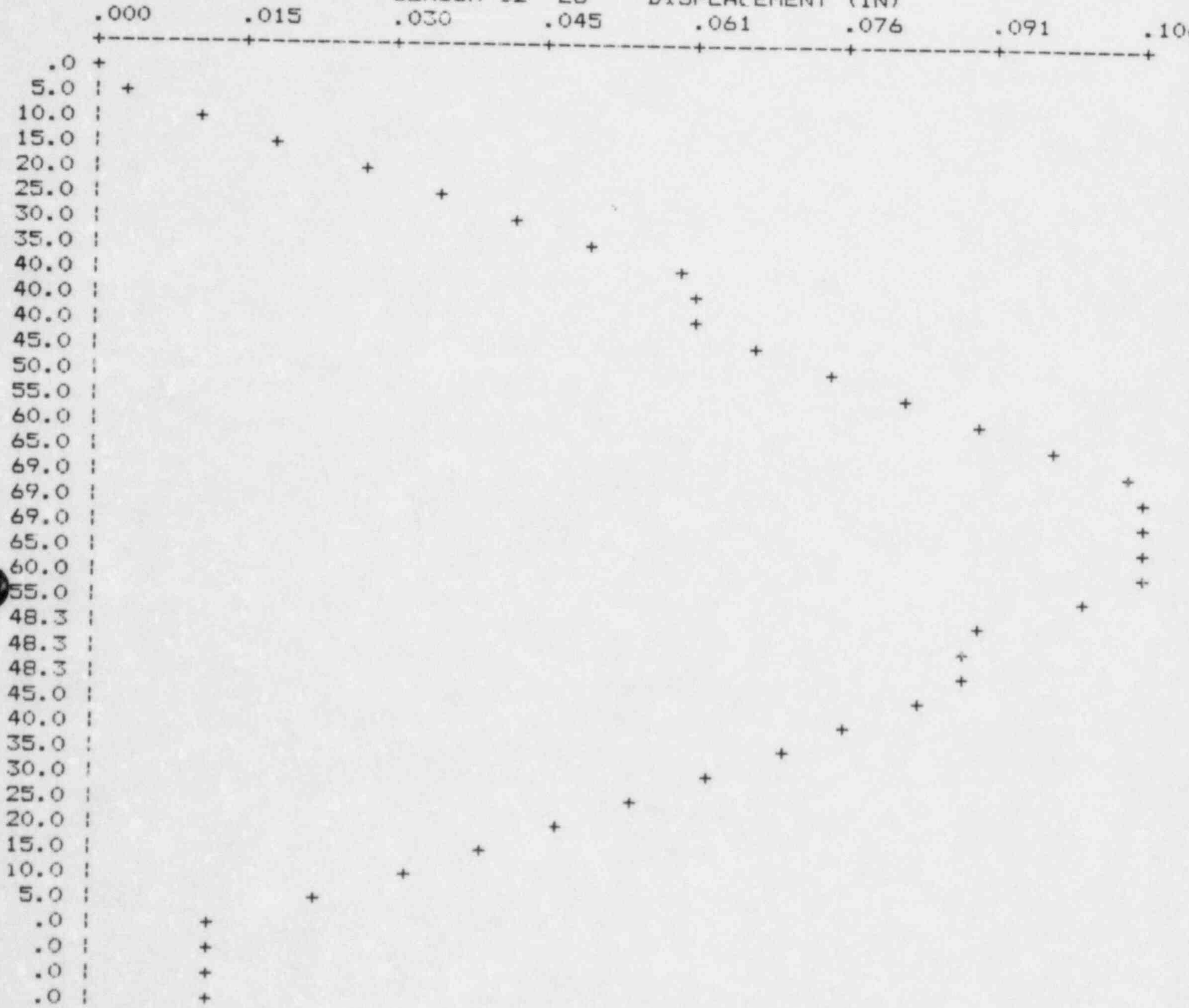

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 30 E4 DISPLACEMENT (IN)
.000 .043 .087 .130 .174 .217 .261 .30
.0 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 40.0 40.0 45.0 50.0 55.0 60.0 65.0 69.0 69.0 69.0 65.0 60.0 55.0 48.3 48.3 48.3 45.0 40.0 35.0 30.0 25.0 20.0 15.0 10.0 5.0 .0 .0 .0 .0

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

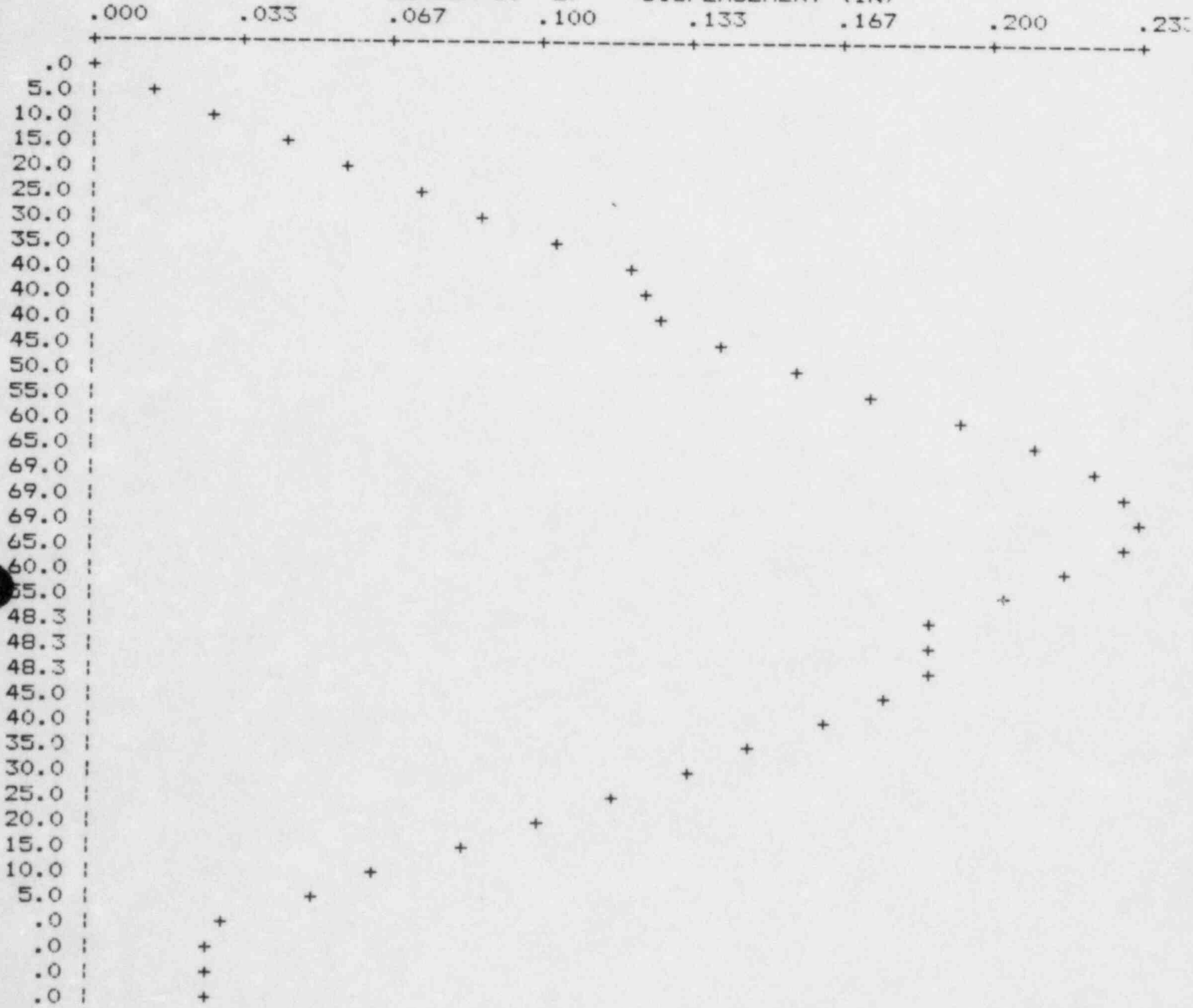
SENSOR 31 E5 DISPLACEMENT (IN)



CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 32 E6 DISPLACEMENT (IN)

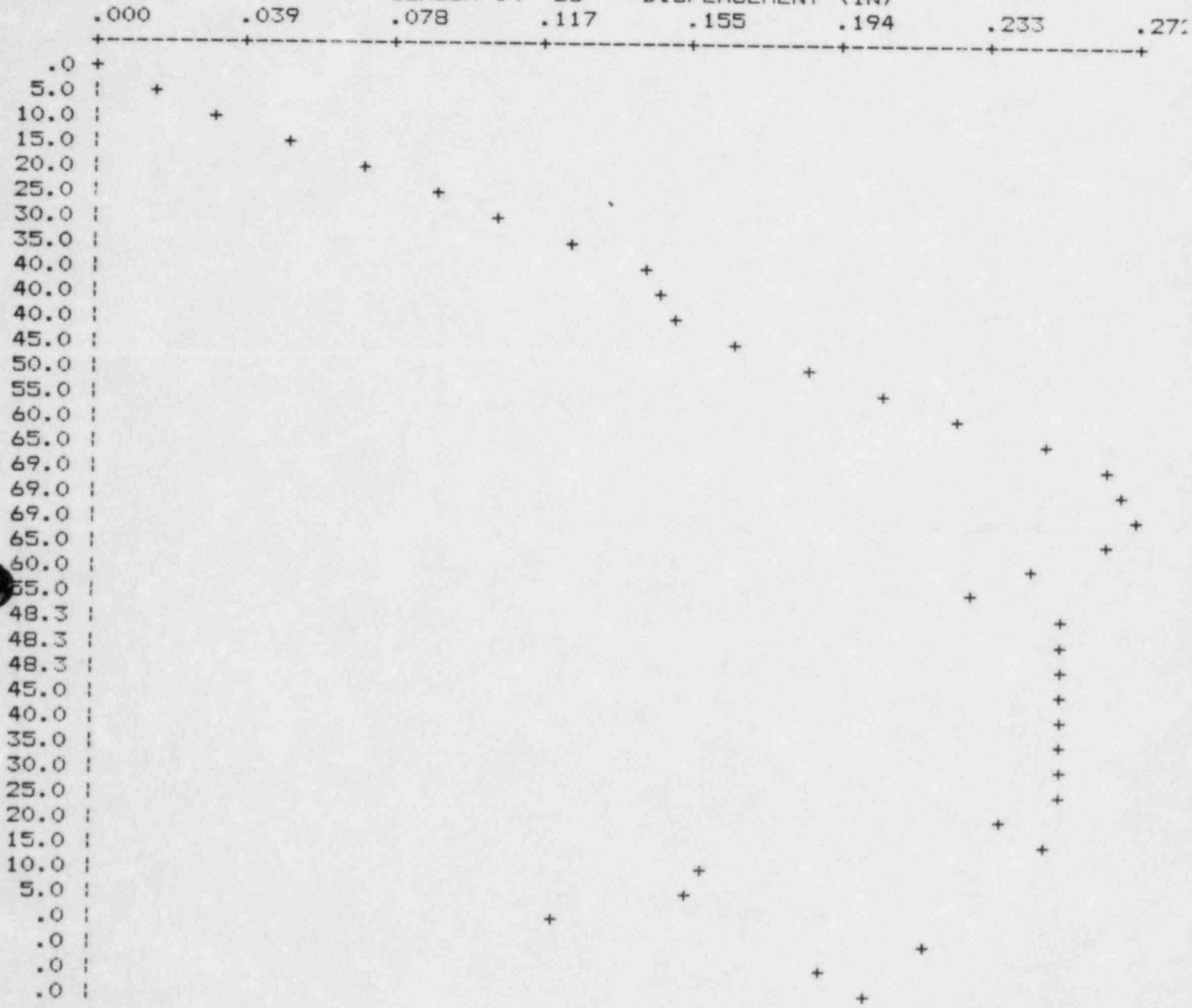


CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 33 E7 DISPLACEMENT (IN)

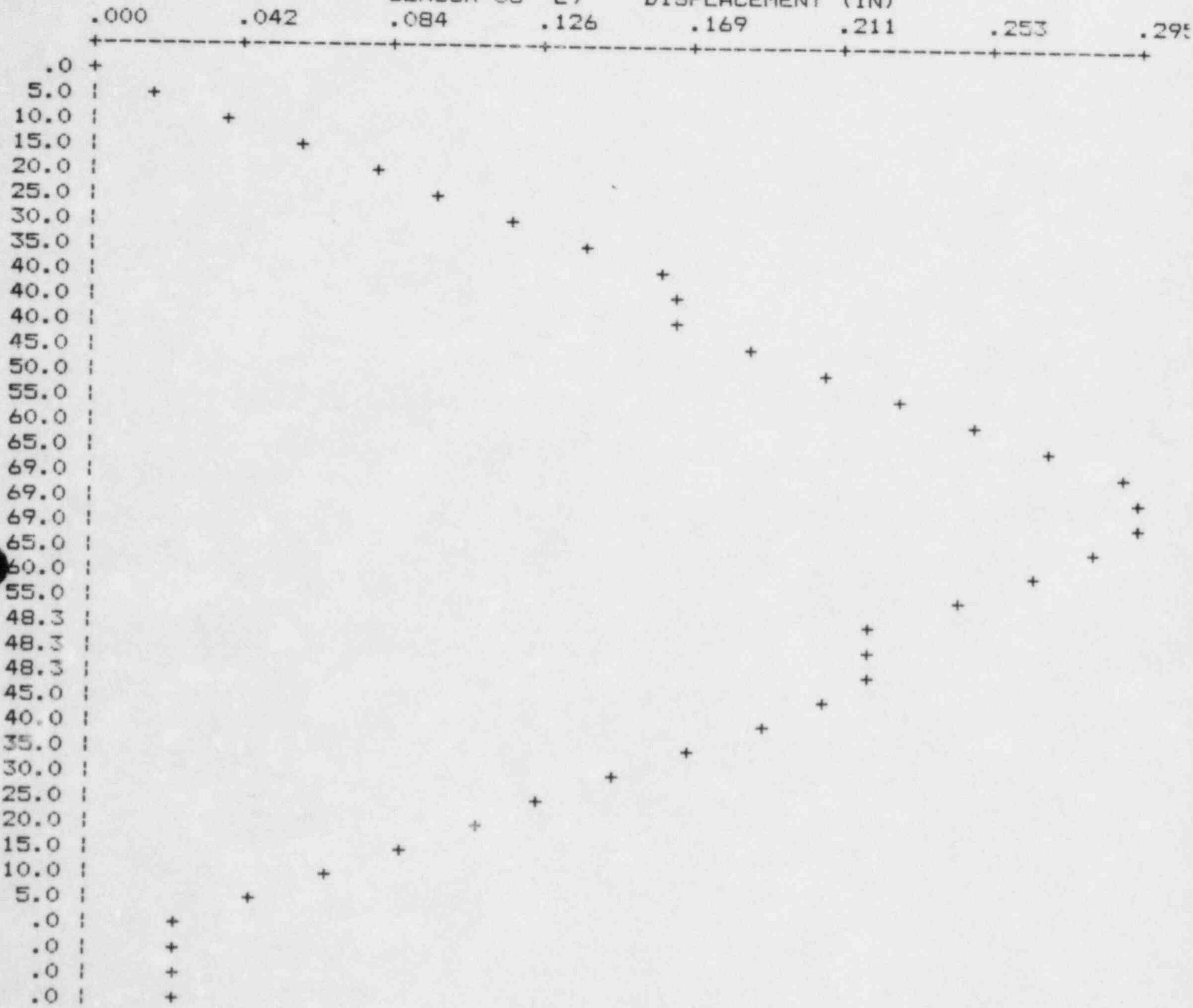


APPENDIX A

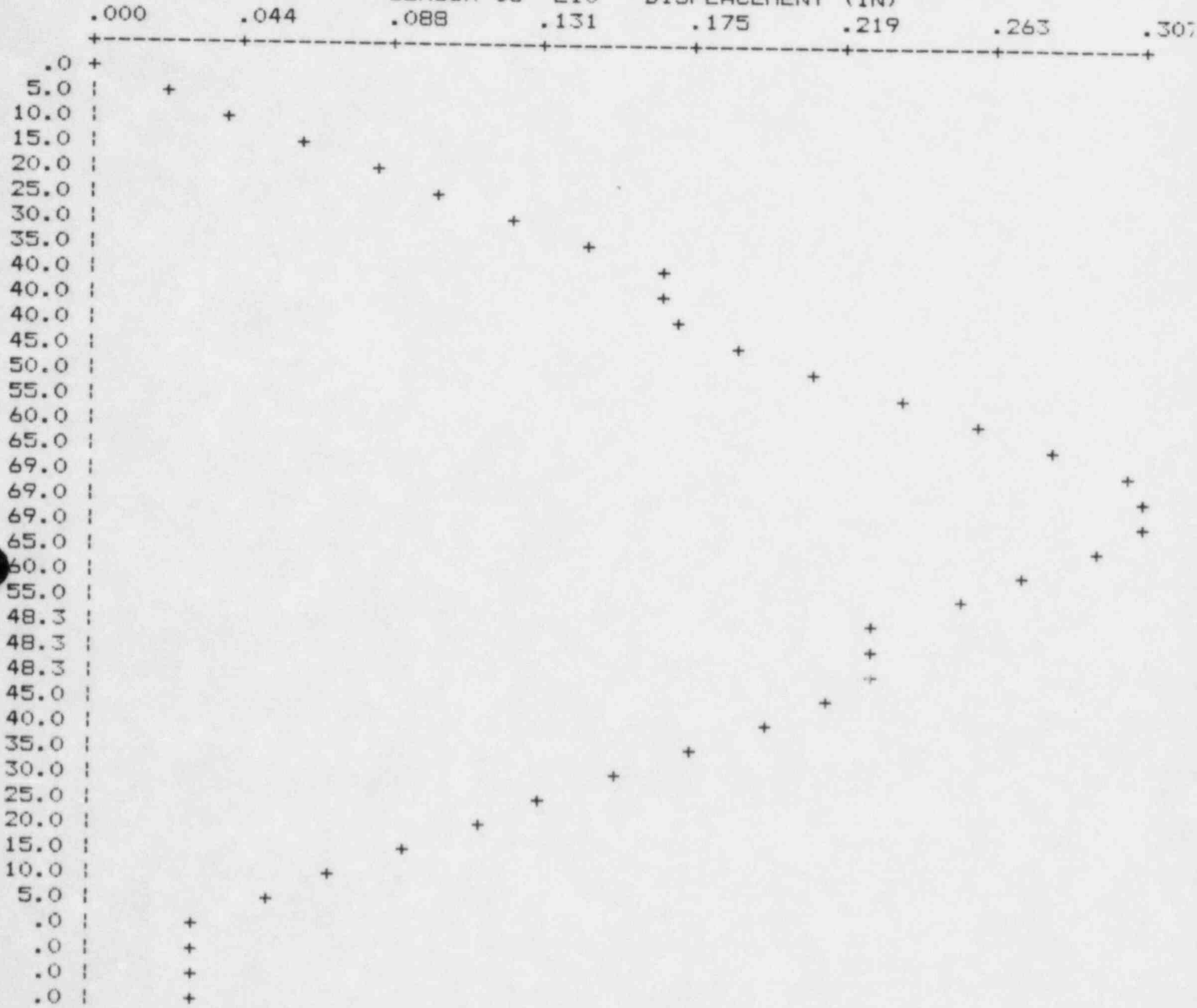
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 34 E8 DISPLACEMENT (IN)



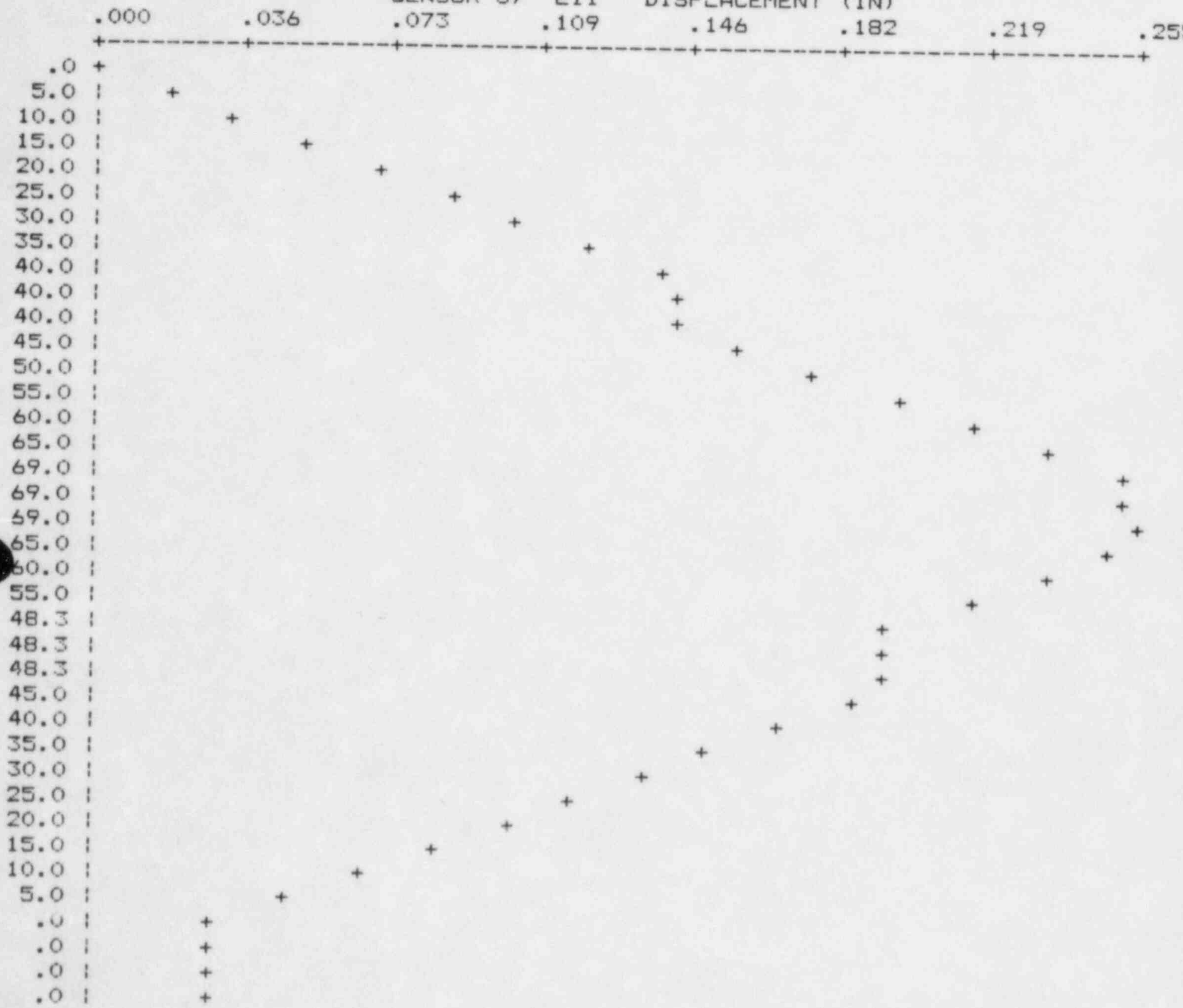
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 35 E9 DISPLACEMENT (IN)



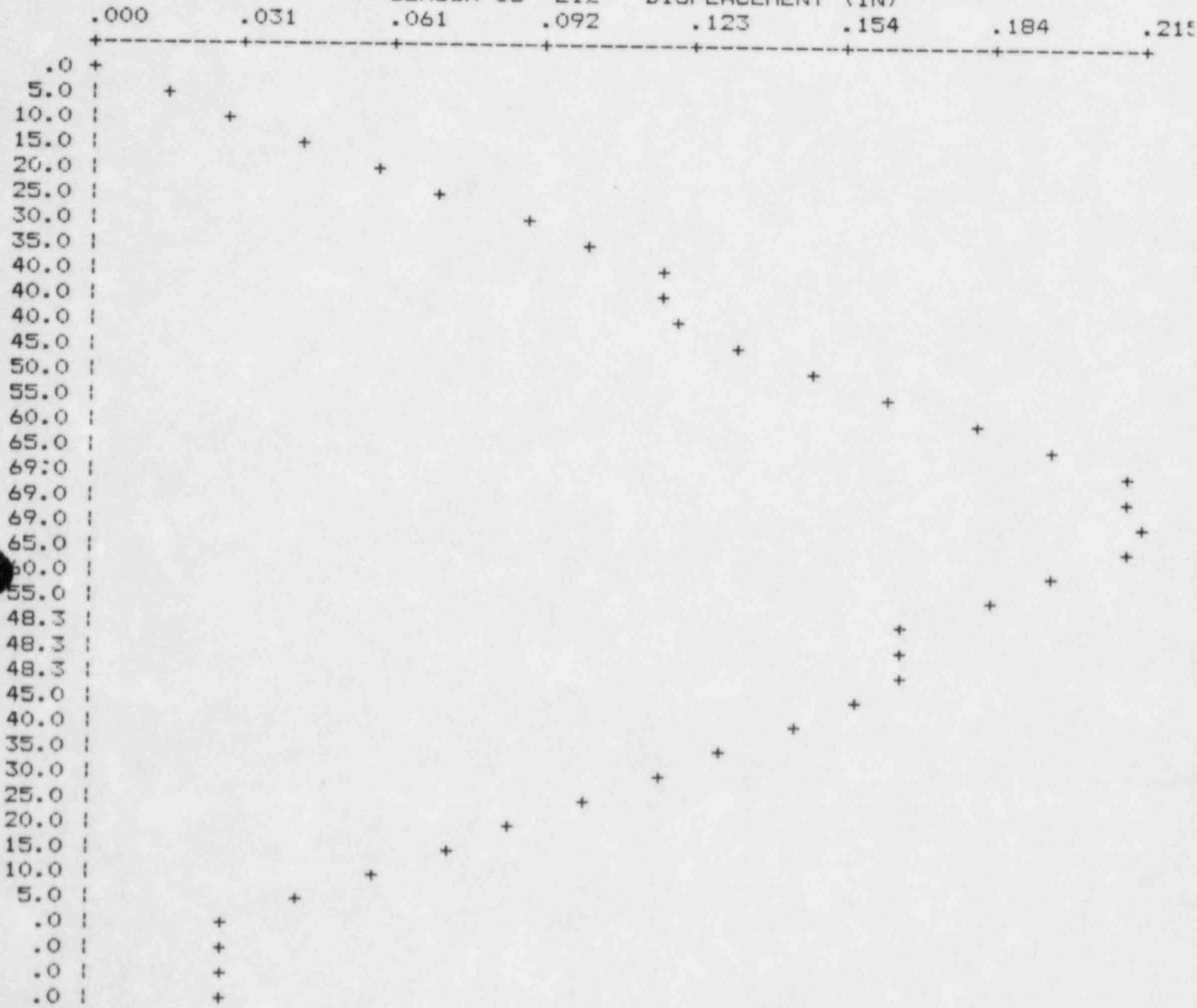
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 36 E10 DISPLACEMENT (IN)



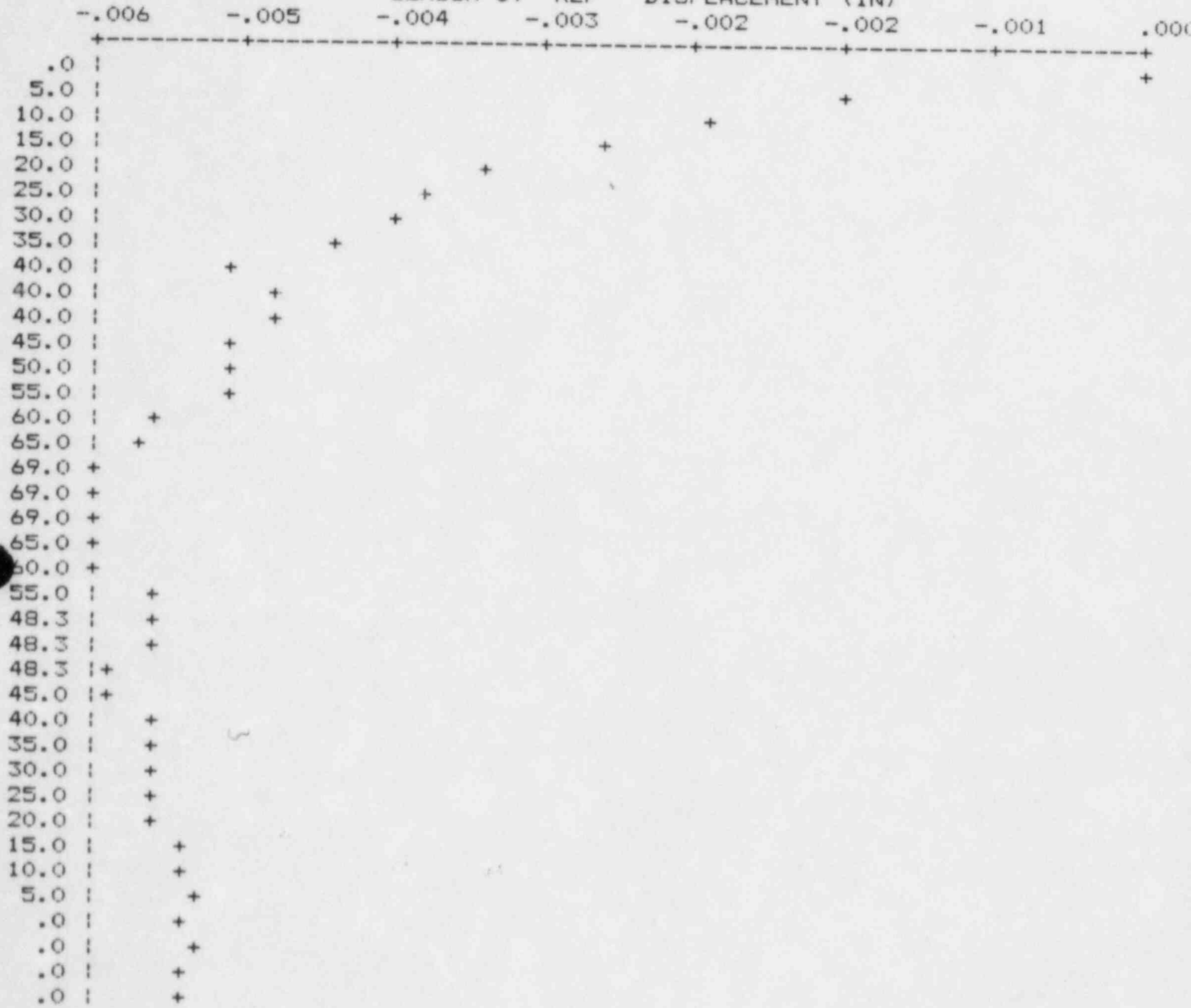
CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 37 E11 DISPLACEMENT (IN)



CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 38 E12 DISPLACEMENT (IN)



CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984
SENSOR 39 REF DISPLACEMENT (IN)



APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1550 104
.00 PSIG 68.50 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2740	.000	0.
2	R2	-2.2740	.000	0.
3	R3	-2.0960	.000	0.
4	R4	-2.3930	.000	0.
5	R5	-2.2460	.000	0.
6	R6	-2.1880	.000	0.
7	R7	-2.3010	.000	0.
8	R8	-2.3000	.000	0.
9	R9	-2.3280	.000	0.
10	R10	-2.3240	.000	0.
11	R11	-2.3110	.000	0.
12	R12	-2.4330	.000	0.
13	R13	-2.3290	.000	0.
14	R14	-2.0610	.000	0.
15	R15	-2.2190	.000	0.
16	R16	-1.9680	.000	0.
17	R17	-2.2890	.000	0.
18	R18	-2.3350	.000	0.
19	V1	-2.5380	.000	0.
20	V2	-3.0290	.000	0.
21	V3	-3.0680	.000	0.
22	V4	-3.2280	.000	0.
23	V5	-2.9690	.000	0.
24	V6	-3.1600	.000	0.
25	V7	-2.3300	.000	0.
26	V8	-2.3180	.000	0.
27	E1	-2.1990	.000	0.
28	E2	-2.2750	.000	0.
29	E3	-1.9800	.000	0.
30	E4	-1.9460	.000	0.
31	E5	-2.0690	.000	0.
32	E6	-2.0490	.000	0.
33	E7	-2.0810	.000	0.
34	E8	-2.2610	.000	0.
35	E9	-2.2960	.000	0.
36	E10	-2.1110	.000	0.
37	E11	-2.5840	.000	0.
38	E12	-2.2390	.000	0.
39	REF	-1.9660	.000	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1711 104
5.00 PSIG 74.50 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2740	.000	0.
2	R2	-2.2310	.005	2.
3	R3	-2.0650	.003	1.
4	R4	-2.3940	.000	0.
5	R5	-2.2200	.003	1.
6	R6	-2.1880	.000	0.
7	R7	-2.2810	.002	1.
8	R8	-2.2390	.007	3.
9	R9	-2.2850	.005	2.
10	R10	-2.2410	.010	4.
11	R11	-2.2300	.009	4.
12	R12	-2.4130	.002	1.
13	R13	-2.3330	.000	0.
14	R14	-1.9740	.010	2.
15	R15	-2.0800	.015	3.
16	R16	-1.9700	.000	0.
17	R17	-2.2910	.000	0.
18	R18	-2.2590	.009	2.
19	V1	-2.4640	.008	2.
20	V2	-2.9650	.007	2.
21	V3	-2.9890	.009	2.
22	V4	-3.1610	.008	2.
23	V5	-2.9080	.007	2.
24	V6	-3.0940	.007	2.
25	V7	-2.3310	.000	0.
26	V8	-2.3310	-.002	0.
27	E1	-2.1280	.008	1.
28	E2	-2.1760	.011	2.
29	E3	-1.8310	.017	2.
30	E4	-1.7950	.018	3.
31	E5	-1.9730	.011	2.
32	E6	-2.0260	.003	0.
33	E7	-1.9480	.014	2.
34	E8	-2.1250	.016	2.
35	E9	-2.1340	.019	3.
36	E10	-1.9250	.021	3.
37	E11	-2.4360	.017	2.
38	E12	-2.1100	.015	2.
39	REF	-1.9800	-.002	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1804 104
10.00 PSIG 76.10 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2750	.000	0.
2	R2	-2.1890	.010	4.
3	R3	-2.0330	.007	3.
4	R4	-2.3590	.004	2.
5	R5	-2.1880	.006	3.
6	R6	-2.1390	.006	2.
7	R7	-2.2390	.007	3.
8	R8	-2.1890	.013	5.
9	R9	-2.2210	.012	5.
10	R10	-2.1310	.023	9.
11	R11	-2.1540	.018	7.
12	R12	-2.3660	.008	3.
13	R13	-2.2410	.010	2.
14	R14	-1.9050	.019	4.
15	R15	-1.9650	.027	5.
16	R16	-1.9700	.000	0.
17	R17	-2.2910	.000	0.
18	R18	-2.1900	.017	3.
19	V1	-2.4010	.015	4.
20	V2	-2.8990	.015	4.
21	V3	-2.9100	.018	5.
22	V4	-3.0610	.019	5.
23	V5	-2.8410	.014	4.
24	V6	-3.0360	.014	4.
25	V7	-2.3310	.000	0.
26	V8	-2.3000	.002	1.
27	E1	-2.0480	.017	2.
28	E2	-2.0490	.026	4.
29	E3	-1.6780	.035	5.
30	E4	-1.6440	.036	5.
31	E5	-1.8670	.023	3.
32	E6	-1.9580	.010	1.
33	E7	-1.8300	.027	4.
34	E8	-1.9880	.032	5.
35	E9	-1.9690	.038	5.
36	E10	-1.7510	.040	6.
37	E11	-2.2960	.034	5.
38	E12	-1.9860	.029	4.
39	REF	-1.9860	-.002	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1902 104
15.00 PSIG 76.30 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2380	.004	2.
2	R2	-2.1410	.015	6.
3	R3	-1.9960	.011	4.
4	R4	-2.3210	.008	3.
5	R5	-2.1510	.011	4.
6	R6	-2.0810	.012	5.
7	R7	-2.1860	.013	5.
8	R8	-2.1210	.021	8.
9	R9	-2.1490	.020	8.
10	R10	-2.0050	.037	15.
11	R11	-2.0640	.028	11.
12	R12	-2.2950	.016	6.
13	R13	-2.0890	.027	5.
14	R14	-1.7810	.034	7.
15	R15	-1.8300	.041	8.
16	R16	-1.9700	.000	0.
17	R17	-2.2910	.000	0.
18	R18	-2.1000	.028	6.
19	V1	-2.3090	.025	7.
20	V2	-2.8080	.025	7.
21	V3	-2.8030	.031	8.
22	V4	-2.9400	.033	9.
23	V5	-2.7630	.023	6.
24	V6	-2.9600	.022	6.
25	V7	-2.3310	.000	0.
26	V8	-2.2940	.003	1.
27	E1	-1.9590	.027	4.
28	E2	-1.9390	.038	5.
29	E3	-1.5060	.055	8.
30	E4	-1.4740	.056	8.
31	E5	-1.7430	.037	5.
32	E6	-1.8840	.019	3.
33	E7	-1.6950	.042	6.
34	E8	-1.8310	.051	7.
35	E9	-1.7880	.058	8.
36	E10	-1.5630	.061	9.
37	E11	-2.1460	.051	7.
38	E12	-1.8630	.042	6.
39	REF	-1.9910	-.003	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1958 104
20.00 PSIG 77.13 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2380	.004	2.
2	R2	-2.0940	.021	8.
3	R3	-1.9560	.015	6.
4	R4	-2.2800	.013	5.
5	R5	-2.1140	.015	6.
6	R6	-2.0280	.018	7.
7	R7	-2.1310	.019	8.
8	R8	-2.0540	.029	11.
9	R9	-2.0740	.028	11.
10	R10	-1.8810	.052	21.
11	R11	-1.9840	.038	15.
12	R12	-2.2210	.024	10.
13	R13	-1.9120	.048	10.
14	R14	-1.6360	.051	10.
15	R15	-1.7220	.053	11.
16	R16	-1.9700	.000	0.
17	R17	-2.2920	.000	0.
18	R18	-2.0190	.037	7.
19	V1	-2.2080	.037	10.
20	V2	-2.7100	.036	10.
21	V3	-2.6540	.048	13.
22	V4	-2.8200	.046	12.
23	V5	-2.6610	.034	9.
24	V6	-2.8680	.032	9.
25	V7	-2.3310	.000	0.
26	V8	-2.2410	.009	2.
27	E1	-1.8690	.037	5.
28	E2	-1.8000	.054	8.
29	E3	-1.3400	.074	11.
30	E4	-1.3010	.076	11.
31	E5	-1.6200	.051	7.
32	E6	-1.8150	.027	4.
33	E7	-1.5580	.056	8.
34	E8	-1.6750	.069	10.
35	E9	-1.6100	.079	11.
36	E10	-1.3750	.082	12.
37	E11	-1.9940	.069	10.
38	E12	-1.7300	.058	8.
39	REF	-1.9960	-.004	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2051 104
25.00 PSIG 77.35 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1990	.009	4.
2	R2	-2.0480	.026	10.
3	R3	-1.9160	.020	8.
4	R4	-2.2390	.018	7.
5	R5	-2.0790	.019	7.
6	R6	-1.9760	.024	10.
7	R7	-2.0740	.026	10.
8	R8	-1.9880	.036	14.
9	R9	-1.9990	.036	14.
10	R10	-1.7580	.066	26.
11	R11	-1.8980	.047	19.
12	R12	-2.1440	.033	13.
13	R13	-1.7900	.061	12.
14	R14	-1.5340	.063	13.
15	R15	-1.5540	.070	14.
16	R16	-1.7940	.020	4.
17	R17	-2.2930	.000	0.
18	R18	-1.8850	.053	11.
19	V1	-2.1040	.048	13.
20	V2	-2.6010	.049	13.
21	V3	-2.5310	.063	17.
22	V4	-2.7040	.059	16.
23	V5	-2.5680	.044	12.
24	V6	-2.7730	.043	11.
25	V7	-2.3310	.000	0.
26	V8	-2.2340	.010	3.
27	E1	-1.7800	.047	7.
28	E2	-1.6860	.067	10.
29	E3	-1.1750	.093	13.
30	E4	-1.1300	.096	14.
31	E5	-1.4950	.065	9.
32	E6	-1.7480	.034	5.
33	E7	-1.4160	.072	10.
34	E8	-1.5200	.087	12.
35	E9	-1.4350	.099	14.
36	E10	-1.1900	.102	15.
37	E11	-1.8490	.086	12.
38	E12	-1.6080	.071	10.
39	REF	-1.9990	-.004	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2145 104
30.00 PSIG 77.78 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1580	.014	6.
2	R2	-1.9980	.032	13.
3	R3	-1.8950	.022	9.
4	R4	-2.1910	.023	9.
5	R5	-2.0400	.023	9.
6	R6	-1.9220	.030	12.
7	R7	-2.0160	.032	13.
8	R8	-1.9220	.044	18.
9	R9	-1.9210	.045	18.
10	R10	-1.6260	.082	33.
11	R11	-1.8080	.058	23.
12	R12	-2.0610	.042	17.
13	R13	-1.5980	.083	17.
14	R14	-1.3620	.084	17.
15	R15	-1.3680	.090	18.
16	R16	-1.7940	.020	4.
17	R17	-2.1460	.016	3.
18	R18	-1.7840	.065	13.
19	V1	-1.9840	.061	16.
20	V2	-2.4890	.062	16.
21	V3	-2.4080	.077	21.
22	V4	-2.5800	.073	20.
23	V5	-2.4460	.058	15.
24	V6	-2.6680	.055	15.
25	V7	-2.3300	.000	0.
26	V8	-2.1990	.014	4.
27	E1	-1.6890	.057	8.
28	E2	-1.5420	.083	12.
29	E3	-1.0100	.112	16.
30	E4	-.9520	.117	17.
31	E5	-1.3680	.080	11.
32	E6	-1.6760	.043	6.
33	E7	-1.2700	.088	13.
34	E8	-1.3600	.106	15.
35	E9	-1.2580	.119	17.
36	E10	-1.0000	.123	18.
37	E11	-1.7010	.103	15.
38	E12	-1.4620	.088	13.
39	REF	-2.0000	-.004	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DA^TA AT 2240 104
35.00 PSIG 77.99 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1160	.019	8.
2	R2	-1.9480	.037	15.
3	R3	-1.8540	.027	11.
4	R4	-2.1380	.030	12.
5	R5	-2.0010	.027	11.
6	R6	-1.8650	.036	15.
7	R7	-1.9510	.040	16.
8	R8	-1.8550	.052	21.
9	R9	-1.8400	.054	21.
10	R10	-1.4940	.097	39.
11	R11	-1.7140	.069	27.
12	R12	-1.9760	.052	21.
13	R13	-1.4590	.099	20.
14	R14	-1.2710	.095	19.
15	R15	-1.1800	.110	22.
16	R16	-1.6660	.034	7.
17	R17	-2.0640	.026	5.
18	R18	-1.7080	.074	15.
19	V1	-1.8600	.075	20.
20	V2	-2.3680	.075	20.
21	V3	-2.2940	.091	24.
22	V4	-2.4480	.088	24.
23	V5	-2.3410	.069	18.
24	V6	-2.5560	.067	18.
25	V7	-2.1880	.016	4.
26	V8	-2.1630	.018	5.
27	E1	-1.5960	.068	10.
28	E2	-1.4310	.095	14.
29	E3	-.8360	.132	19.
30	E4	-.7730	.138	20.
31	E5	-1.2400	.095	14.
32	E6	-1.6040	.051	7.
33	E7	-1.1200	.104	15.
34	E8	-1.1980	.125	18.
35	E9	-1.0750	.140	20.
36	E10	-.8080	.145	21.
37	E11	-1.5430	.122	17.
38	E12	-1.3330	.102	15.
39	REF	-2.0030	-.004	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2335 104
40.00 PSIG 78.21 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0800	.023	9.
2	R2	-1.8940	.044	17.
3	R3	-1.8210	.030	12.
4	R4	-2.0720	.037	15.
5	R5	-1.9640	.031	13.
6	R6	-1.8060	.043	17.
7	R7	-1.8910	.047	19.
8	R8	-1.7710	.061	25.
9	R9	-1.7700	.061	25.
10	R10	-1.3580	.113	45.
11	R11	-1.6240	.079	32.
12	R12	-1.8890	.061	25.
13	R13	-1.2660	.121	24.
14	R14	-1.1810	.106	21.
15	R15	-1.0280	.126	25.
16	R16	-1.4750	.056	11.
17	R17	-1.9220	.042	8.
18	R18	-1.5590	.092	18.
19	V1	-1.7280	.090	24.
20	V2	-2.2410	.090	24.
21	V3	-2.1610	.106	28.
22	V4	-2.3080	.104	28.
23	V5	-2.2210	.082	22.
24	V6	-2.4350	.080	21.
25	V7	-2.1880	.016	4.
26	V8	-2.1620	.018	5.
27	E1	-1.4980	.079	11.
28	E2	-1.2940	.111	16.
29	E3	-.6640	.151	22.
30	E4	-.5860	.160	23.
31	E5	-1.1060	.110	16.
32	E6	-1.5340	.059	8.
33	E7	-.9640	.121	17.
34	E8	-1.0310	.145	21.
35	E9	-.8920	.161	23.
36	E10	-.6140	.166	24.
37	E11	-1.3980	.139	20.
38	E12	-1.2010	.117	17.
39	REF	-2.0080	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 35 105
40.00 PSIG 74.66 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0800	.023	9.
2	R2	-1.8880	.044	18.
3	R3	-1.8210	.030	12.
4	R4	-2.0710	.037	15.
5	R5	-1.9630	.031	13.
6	R6	-1.8040	.043	17.
7	R7	-1.8700	.049	20.
8	R8	-1.7700	.061	25.
9	R9	-1.7340	.065	26.
10	R10	-1.3400	.115	46.
11	R11	-1.6080	.081	32.
12	R12	-1.8480	.066	26.
13	R13	-1.2660	.121	24.
14	R14	-1.1110	.114	23.
15	R15	-.9760	.132	26.
16	R16	-1.4740	.056	11.
17	R17	-1.9230	.042	8.
18	R18	-1.5560	.092	18.
19	V1	-1.6690	.096	26.
20	V2	-2.1910	.096	25.
21	V3	-2.1140	.112	30.
22	V4	-2.2680	.108	29.
23	V5	-2.1660	.088	24.
24	V6	-2.3880	.086	23.
25	V7	-2.1880	.016	4.
26	V8	-2.1630	.018	5.
27	E1	-1.4810	.080	11.
28	E2	-1.2630	.114	16.
29	E3	-.6480	.153	22.
30	E4	-.5540	.164	23.
31	E5	-1.0740	.113	16.
32	E6	-1.5210	.060	9.
33	E7	-.9330	.124	18.
34	E8	-1.0050	.148	21.
35	E9	-.8740	.164	23.
36	E10	-.6000	.168	24.
37	E11	-1.3740	.142	20.
38	E12	-1.2000	.117	17.
39	REF	-2.0060	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 115 105
40.00 PSIG 74.12 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0790	.023	9.
2	R2	-1.8890	.044	18.
3	R3	-1.8210	.030	12.
4	R4	-2.0710	.037	15.
5	R5	-1.9630	.031	13.
6	R6	-1.8050	.043	17.
7	R7	-1.8610	.050	20.
8	R8	-1.7500	.064	26.
9	R9	-1.7160	.067	27.
10	R10	-1.3310	.116	46.
11	R11	-1.6080	.081	32.
12	R12	-1.8290	.068	27.
13	R13	-1.2650	.121	24.
14	R14	-1.1110	.114	23.
15	R15	-.9760	.132	26.
16	R16	-1.4740	.056	11.
17	R17	-1.9210	.042	8.
18	R18	-1.5560	.092	18.
19	V1	-1.6360	.100	27.
20	V2	-2.1540	.100	27.
21	V3	-2.1140	.112	30.
22	V4	-2.2480	.111	30.
23	V5	-2.1310	.092	25.
24	V6	-2.3580	.089	24.
25	V7	-2.0880	.028	7.
26	V8	-2.1630	.018	5.
27	E1	-1.4690	.082	12.
28	E2	-1.2610	.115	16.
29	E3	-.6360	.155	22.
30	E4	-.5380	.166	24.
31	E5	-1.0590	.115	16.
32	E6	-1.5200	.060	9.
33	E7	-.8980	.128	18.
34	E8	-.9860	.150	21.
35	E9	-.8630	.165	24.
36	E10	-.5890	.169	24.
37	E11	-1.3740	.142	20.
38	E12	-1.1790	.120	17.
39	REF	-2.0060	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 214 105
45.00 PSIG 76.49 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0410	.028	11.
2	R2	-1.8410	.050	20.
3	R3	-1.7840	.034	14.
4	R4	-2.0050	.045	18.
5	R5	-1.9280	.035	14.
6	R6	1.7430	.050	20.
7	R7	-1.8120	.056	22.
8	R8	-1.7040	.069	28.
9	R9	-1.6640	.073	29.
10	R10	-1.2080	.131	52.
11	R11	-1.5300	.090	36.
12	R12	-1.7610	.076	30.
13	R13	-1.1280	.137	27.
14	R14	-.9780	.130	26.
15	R15	-.9760	.132	26.
16	R16	-1.3210	.073	15.
17	R17	-1.8310	.052	10.
18	R18	-1.4310	.107	21.
19	V1	-1.5380	.111	30.
20	V2	-2.0600	.110	29.
21	V3	-1.9910	.126	34.
22	V4	-2.1410	.123	33.
23	V5	-2.0580	.100	27.
24	V6	-2.2590	.100	27.
25	V7	-2.0880	.028	7.
26	V8	-2.0600	.030	8.
27	E1	-1.3890	.091	13.
28	E2	-1.1460	.128	18.
29	E3	-.4840	.172	25.
30	E4	-.3740	.185	26.
31	E5	-.9480	.128	18.
32	E6	-1.4660	.066	9.
33	E7	-.7740	.141	20.
34	E8	-.8450	.167	24.
35	E9	-.6990	.184	26.
36	E10	-.4040	.189	27.
37	E11	-1.2340	.158	23.
38	E12	-1.0650	.133	19.
39	REF	-2.0080	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 312 105
50.00 PSIG 77.99 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0080	.032	13.
2	R2	-1.7860	.056	22.
3	R3	-1.7390	.039	16.
4	R4	-1.9390	.053	21.
5	R5	-1.8860	.040	16.
6	R6	-1.6860	.057	23.
7	R7	-1.7590	.062	25.
8	R8	-1.6280	.078	31.
9	R9	-1.6040	.080	32.
10	R10	-1.0690	.147	59.
11	R11	-1.4310	.101	40.
12	R12	-1.6790	.085	34.
13	R13	-1.0140	.150	30.
14	R14	-.9780	.130	26.
15	R15	-.6440	.167	33.
16	R16	-1.3230	.073	15.
17	R17	-1.7280	.064	13.
18	R18	-1.3890	.112	22.
19	V1	-1.4180	.124	33.
20	V2	-1.9560	.122	33.
21	V3	-1.8700	.140	37.
** 22	V4	-2.0140	.137	37.
23	V5	-1.9580	.111	30.
24	V6	-2.1630	.111	30.
25	V7	-2.0860	.028	7.
26	V8	-2.0600	.030	8.
27	E1	-1.2980	.101	14.
28	E2	-1.0100	.143	20.
29	E3	-.3040	.193	28.
30	E4	-.1910	.207	30.
31	E5	-.8190	.142	20.
32	E6	-1.4000	.074	11.
33	E7	-.6280	.157	22.
34	E8	-.6860	.186	27.
35	E9	-.5180	.204	29.
36	E10	-.2040	.212	30.
37	E11	-1.0780	.176	25.
38	E12	-.9240	.149	21.
39	REF	-2.0080	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 411 105
55.00 PSIG 79.50 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9720	.036	14.
2	R2	-1.7280	.063	25.
3	R3	-1.7090	.043	17.
4	R4	-1.9390	.053	21.
5	R5	-1.8440	.045	18.
6	R6	-1.6200	.064	26.
7	R7	-1.6920	.069	28.
8	R8	-1.5610	.086	34.
9	R9	-1.5180	.089	36.
10	R10	-.9250	.164	65.
11	R11	-1.3410	.112	45.
12	R12	-1.5940	.095	38.
13	R13	-.8900	.164	33.
14	R14	-.8490	.145	29.
15	R15	-.6440	.167	33.
16	R16	-1.1610	.091	18.
17	R17	-1.7280	.064	13.
18	R18	-1.2880	.124	25.
19	V1	-1.2910	.138	37.
20	V2	-1.8340	.136	36.
21	V3	-1.7560	.154	41.
22	V4	-1.8790	.152	41.
23	V5	-1.8340	.125	33.
24	V6	-2.0450	.124	33.
25	V7	-1.9960	.038	10.
26	V8	-1.9690	.041	11.
27	E1	-1.1990	.112	16.
28	E2	-.8780	.158	23.
29	E3	-.1310	.213	30.
30	E4	-.0020	.229	33.
31	E5	-.6840	.158	23.
32	E6	-1.3340	.082	12.
33	E7	-.4710	.174	25.
34	E8	-.5180	.206	29.
35	E9	-.3300	.226	32.
36	E10	.0020	.235	34.
37	E11	-.2090	.196	28.
38	E12	-.7890	.164	23.
39	REF	-2.0080	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 510 105
60.00 PSIG 79.72 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9400	.040	16.
2	R2	-1.6680	.070	28.
3	R3	-1.6690	.047	19.
4	R4	-1.8710	.061	21.
5	R5	-1.8010	.049	20.
6	R6	-1.5500	.072	29.
7	R7	-1.6310	.076	31.
8	R8	-1.4880	.094	38.
9	R9	-1.4410	.098	39.
10	R10	-.7780	.181	72.
11	R11	-1.2430	.123	49.
12	R12	-1.4900	.107	43.
13	R13	-.6880	.187	37.
14	R14	-.7890	.153	31.
15	R15	-.4410	.188	38.
16	R16	-1.0100	.108	22.
17	R17	-1.5310	.086	17.
18	R18	-1.1710	.137	27.
19	V1	-1.1510	.154	41.
20	V2	-1.7030	.151	40.
21	V3	-1.5930	.173	46.
22	V4	-1.7380	.168	45.
23	V5	-1.7180	.138	37.
24	V6	-1.9180	.138	37.
25	V7	-1.9250	.046	12.
26	V8	-1.9690	.041	11.
27	E1	-1.0950	.124	18.
28	E2	-.7280	.175	25.
29	E3	.0590	.234	33.
30	E4	.1930	.252	36.
31	E5	-.5440	.174	25.
32	E6	-1.2640	.089	13.
33	E7	-.3040	.192	27.
34	E8	-.3430	.226	32.
35	E9	-.1350	.249	36.
36	E10	.2130	.258	37.
37	E11	-.7530	.214	31.
38	E12	-.6410	.181	26.
39	REF	2.0110	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 612 105
65.00 PSIG 79.93 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9090	.044	18.
2	R2	-1.6080	.077	31.
3	R3	-1.6260	.052	21.
4	R4	-1.8100	.068	27.
5	R5	-1.7560	.054	22.
6	R6	-1.4790	.080	32.
7	R7	-1.5690	.083	33.
8	R8	-1.4120	.103	41.
9	R9	-1.3560	.107	43.
10	R10	-.6180	.200	80.
11	R11	-1.1410	.135	54.
12	R12	-1.3850	.118	47.
13	R13	-.4950	.209	42.
14	R14	-.6510	.169	34.
15	R15	-.2490	.209	42.
16	R16	-.8630	.125	25.
17	R17	-1.4280	.098	20.
18	R18	-1.0360	.153	31.
19	V1	-.9890	.172	46.
20	V2	-1.5590	.168	45.
21	V3	-1.4500	.189	50.
22	V4	-1.5810	.186	50.
23	V5	-1.5810	.153	41.
24	V6	-1.7800	.153	41.
25	V7	-1.9240	.046	12.
26	V8	-1.8540	.054	14.
27	E1	-.9940	.135	19.
28	E2	-.5940	.190	27.
29	E3	.2440	.256	37.
30	E4	.3960	.276	39.
31	E5	-.3980	.190	27.
32	E6	-1.1940	.097	14.
33	E7	-.1390	.210	30.
34	E8	-.1650	.247	35.
35	E9	.0590	.271	39.
36	E10	.4290	.282	40.
37	E11	-.5860	.234	33.
38	E12	-.4900	.198	28.
39	REF	-2.0120	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 705 105
69.00 PSIG 79.82 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8780	.048	19.
2	R2	-1.5550	.083	33.
3	R3	-1.5900	.056	22.
4	R4	-1.7490	.075	30.
5	R5	-1.7200	.058	23.
6	R6	-1.4190	.087	35.
7	R7	-1.5160	.089	36.
8	R8	-1.3540	.110	44.
9	R9	-1.2860	.115	46.
10	R10	-.4890	.215	86.
11	R11	-1.0590	.144	58.
12	R12	-1.2980	.128	51.
13	R13	-.3610	.224	45.
14	R14	-.5480	.182	36.
15	R15	-.0650	.228	46.
16	R16	-.7280	.140	28.
17	R17	-1.3390	.108	22.
18	R18	-.9230	.167	33.
19	V1	-.8610	.186	50.
20	V2	-1.4390	.181	48.
21	V3	-1.3430	.202	54.
22	V4	-1.4450	.201	54.
23	V5	-1.4740	.164	44.
24	V6	-1.6600	.167	44.
25	V7	-1.8610	.053	14.
26	V8	-1.8540	.054	14.
27	E1	-.9080	.145	21.
28	E2	-.4880	.202	29.
29	E3	.4040	.274	39.
30	E4	.5700	.297	42.
31	E5	-.2690	.205	29.
32	E6	-1.1300	.105	15.
33	E7	-.0060	.224	32.
34	E8	-.0130	.265	38.
35	E9	.2290	.290	41.
36	E10	.6130	.302	43.
37	E11	-.4460	.250	36.
38	E12	-.3630	.212	30.
39	REF	-2.0140	-.006	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 805 105
69.00 PSIG 75.90 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8780	.048	19.
2	R2	-1.5500	.083	33.
3	R3	-1.5860	.056	22.
4	R4	-1.7490	.075	30.
5	R5	-1.7150	.059	24.
6	R6	-1.4100	.088	35.
7	R7	-1.5040	.091	36.
8	R8	-1.3430	.111	44.
9	R9	-1.2480	.119	48.
10	R10	-.4650	.218	87.
11	R11	-1.0430	.146	58.
12	R12	-1.2600	.133	53.
13	R13	-.3210	.229	46.
14	R14	-.4580	.192	38.
15	R15	-.0650	.228	46.
16	R16	-.7250	.140	28.
17	R17	-1.3390	.108	22.
18	R18	-.8850	.171	34.
19	V1	-.7950	.193	52.
20	V2	-1.3700	.189	50.
21	V3	-1.2660	.211	56.
22	V4	-1.4040	.206	55.
23	V5	-1.4300	.169	45.
24	V6	-1.6040	.173	46.
25	V7	-1.8610	.053	14.
26	V8	-1.8550	.054	14.
27	E1	-.8910	.146	21.
28	E2	-.4650	.205	29.
29	E3	.4190	.276	39.
30	E4	.6010	.301	43.
31	E5	-.2380	.209	30.
32	E6	-1.1210	.106	15.
33	E7	.0490	.230	33.
34	E8	.0190	.269	38.
35	E9	.2540	.293	42.
36	E10	.6340	.305	44.
37	E11	-.4260	.252	36.
38	E12	-.3510	.213	30.
39	REF	-2.0140	-.006	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 905 105
69.00 PSIG 74.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8790	.047	19.
2	R2	-1.5460	.084	33.
3	R3	-1.5780	.057	23.
4	R4	-1.7480	.075	30.
5	R5	-1.7150	.059	24.
6	R6	-1.4100	.088	35.
7	R7	-1.4890	.093	37.
8	R8	-1.3240	.113	45.
9	R9	-1.2190	.122	49.
10	R10	-.4480	.219	88.
11	R11	-1.0310	.147	59.
12	R12	-1.2280	.136	54.
13	R13	-.2880	.233	47.
14	R14	-.4560	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7250	.140	28.
17	R17	-1.3390	.108	22.
18	R18	-.8850	.171	34.
19	V1	-.7460	.199	53.
20	V2	-1.3200	.195	52.
21	V3	-1.2660	.211	56.
22	V4	-1.3650	.211	56.
23	V5	-1.3640	.177	47.
24	V6	-1.5550	.178	48.
25	V7	-1.7940	.061	16.
26	V8	-1.8550	.054	14.
27	E1	-.8800	.148	21.
28	E2	-.4340	.208	30.
29	E3	.4330	.277	40.
30	E4	.6300	.304	43.
31	E5	-.2110	.212	30.
32	E6	-1.1200	.106	15.
33	E7	.0780	.233	33.
34	E8	.0430	.272	39.
35	E9	.2700	.295	42.
36	E10	.6510	.307	44.
37	E11	-.4050	.255	36.
38	E12	-.3360	.215	31.
39	REF	-2.0140	-.006	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1042 105
65.00 PSIG 70.10 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8780	.048	19.
2	R2	-1.5610	.082	33.
3	R3	-1.5780	.057	23.
4	R4	-1.7480	.075	30.
5	R5	-1.7310	.057	23.
6	R6	-1.4110	.088	35.
7	R7	-1.4910	.092	37.
8	R8	-1.3200	.114	45.
9	R9	-1.2160	.122	49.
10	R10	-.5080	.212	85.
11	R11	-1.0240	.148	59.
12	R12	-1.2340	.135	54.
13	R13	-.2880	.233	47.
14	R14	-.4540	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7240	.141	28.
17	R17	-1.3390	.108	22.
18	R18	-.8840	.171	34.
19	V1	-.7000	.204	54.
20	V2	-1.2760	.200	53.
21	V3	-1.2150	.217	58.
22	V4	-1.3490	.212	57.
23	V5	-1.3400	.179	48.
24	V6	-1.5160	.182	49.
25	V7	-1.7890	.062	16.
26	V8	-1.8550	.054	14.
27	E1	-.9030	.145	21.
28	E2	-.4340	.208	30.
29	E3	.3450	.267	38.
30	E4	.5530	.295	42.
31	E5	-.2530	.207	30.
32	E6	-1.1190	.106	15.
33	E7	.0460	.230	33.
34	E8	-.0390	.262	37.
35	E9	.1660	.283	40.
36	E10	.5150	.291	42.
37	E11	-.4660	.248	35.
38	E12	-.3740	.211	30.
39	REF	-2.0140	-.006	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1143 105
60.00 PSIG 67.30 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8790	.047	19.
2	R2	-1.6050	.077	31.
3	R3	-1.5780	.057	23.
4	R4	-1.7480	.075	30.
5	R5	-1.7700	.053	21.
6	R6	-1.4680	.081	33.
7	R7	-1.5310	.088	35.
8	R8	-1.3390	.111	45.
9	R9	-1.2340	.120	48.
10	R10	-.6340	.198	79.
11	R11	-1.0990	.139	56.
12	R12	-1.2880	.129	52.
13	R13	-.2850	.233	47.
14	R14	-.4540	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7240	.141	28.
17	R17	-1.3390	.108	22.
18	R18	-.8830	.171	34.
19	V1	-.7140	.202	54.
20	V2	-1.2780	.200	53.
21	V3	-1.2150	.217	58.
22	V4	-1.3490	.212	57.
23	V5	-1.3400	.179	48.
24	V6	-1.5180	.182	49.
25	V7	-1.7890	.062	16.
26	V8	-1.8540	.054	14.
27	E1	-.9800	.137	20.
28	E2	-.5410	.196	28.
29	E3	.1890	.249	36.
30	E4	.3980	.277	40.
31	E5	-.3540	.196	28.
32	E6	-1.1190	.106	15.
33	E7	-.0650	.218	31.
34	E8	-.1750	.246	35.
35	E9	.0000	.264	38.
36	E10	.3380	.272	39.
37	E11	-.6030	.232	33.
38	E12	-.4750	.197	28.
39	REF	-2.0140	-.006	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1242 105
55.00 PSIG 66.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.8780	.048	19.
2	R2	-1.6500	.072	29.
3	R3	-1.6000	.055	22.
4	R4	-1.7480	.075	30.
5	R5	-1.8080	.049	19.
6	R6	-1.5280	.075	30.
7	R7	-1.5810	.082	33.
8	R8	-1.3930	.105	42.
9	R9	-1.3060	.112	45.
10	R10	-.7630	.183	73.
11	R11	-1.1830	.130	52.
12	R12	-1.3490	.122	49.
13	R13	-.2850	.233	47.
14	R14	-.4540	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7240	.141	28.
17	R17	-1.3380	.108	22.
18	R18	-.9360	.165	33.
19	V1	-.7940	.194	52.
20	V2	-1.3440	.192	51.
21	V3	-1.2830	.209	56.
22	V4	-1.4290	.203	54.
23	V5	-1.3400	.179	48.
24	V6	-1.5490	.179	48.
25	V7	-1.7880	.062	16.
26	V8	-1.8540	.054	14.
27	E1	-1.0580	.128	18.
28	E2	-.6480	.184	26.
29	E3	.0360	.232	33.
30	E4	.2390	.258	37.
31	E5	-.4610	.183	26.
32	E6	-1.1680	.100	14.
33	E7	-.1860	.205	29.
34	E8	-.3160	.230	33.
35	E9	-.1660	.245	35.
36	E10	.1600	.252	36.
37	E11	-.7510	.214	31.
38	E12	-.6140	.184	26.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1415 105
48.25 PSIG 66.60 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9180	.043	17.
2	R2	-1.7080	.065	26.
3	R3	-1.6460	.049	20.
4	R4	-1.8080	.068	27.
5	R5	-1.8540	.044	17.
6	R6	-1.6040	.066	26.
7	R7	-1.6450	.075	30.
8	R8	-1.4660	.097	39.
9	R9	-1.3990	.102	41.
10	R10	-.9330	.163	65.
11	R11	-1.2940	.117	47.
12	R12	-1.4510	.111	44.
13	R13	-.3000	.231	46.
14	R14	-.4540	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7240	.141	28.
17	R17	-1.3360	.109	22.
18	R18	-1.0480	.152	30.
19	V1	-.9080	.181	48.
20	V2	-1.4410	.181	48.
21	V3	-1.4140	.194	52.
22	V4	-1.5500	.190	51.
23	V5	-1.3980	.173	46.
24	V6	-1.6460	.168	45.
25	V7	-1.7900	.062	16.
26	V8	-1.8540	.054	14.
27	E1	-1.1590	.116	17.
28	E2	-.8040	.166	24.
29	E3	-.1650	.209	30.
30	E4	.0360	.234	33.
31	E5	-.6010	.167	24.
32	E6	-1.2660	.089	13.
33	E7	-.3440	.188	27.
34	E8	-.1240	.252	36.
35	E9	-.3800	.220	31.
36	E10	-.0600	.228	33.
37	E11	-.9230	.194	28.
38	E12	-.7660	.166	24.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1500 105
48.25 PSIG 67.68 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9190	.043	17.
2	R2	-1.7110	.065	26.
3	R3	-1.6480	.049	20.
4	R4	-1.8090	.068	27.
5	R5	-1.8540	.044	17.
6	R6	-1.6050	.066	26.
7	R7	-1.6540	.074	30.
8	R8	-1.4690	.096	39.
9	R9	-1.4130	.101	40.
10	R10	-.9340	.163	65.
11	R11	-1.2940	.117	47.
12	R12	-1.4700	.109	44.
13	R13	-.3010	.231	46.
14	R14	-.4550	.193	39.
15	R15	-.0640	.228	46.
16	R16	-.7240	.141	28.
17	R17	-1.3380	.108	22.
18	R18	-1.0490	.152	30.
19	V1	-.9190	.180	48.
20	V2	-1.4580	.179	48.
21	V3	-1.4140	.194	52.
22	V4	-1.5510	.190	51.
23	V5	-1.4150	.171	46.
24	V6	-1.6760	.165	44.
25	V7	-1.7910	.061	16.
26	V8	-1.8540	.054	14.
27	E1	-1.1610	.116	17.
28	E2	-.8040	.166	24.
29	E3	-.1680	.208	30.
30	E4	.0350	.234	33.
31	E5	-.6110	.166	24.
32	E6	-1.2730	.088	13.
33	E7	-.3440	.188	27.
34	E8	-.1260	.252	36.
35	E9	-.3810	.220	31.
36	E10	-.0510	.229	33.
37	E11	-.9240	.194	28.
38	E12	-.7680	.166	24.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1600 105
48.25 PSIG 68.90 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9190	.043	17.
2	R2	-1.7100	.065	26.
3	R3	-1.6480	.049	20.
4	R4	-1.8110	.068	27.
5	R5	-1.8540	.044	17.
6	R6	-1.6130	.065	26.
7	R7	-1.6680	.072	29.
8	R8	-1.4690	.096	39.
9	R9	-1.4580	.096	38.
10	R10	-.9410	.162	65.
11	R11	-1.2940	.117	47.
12	R12	-1.4880	.107	43.
13	R13	-.6540	.191	38.
14	R14	-.5580	.180	36.
15	R15	-.5610	.176	35.
16	R16	-.7250	.140	28.
17	R17	-1.3360	.109	22.
18	R18	-1.1140	.144	29.
19	V1	-.9190	.180	48.
20	V2	-1.4580	.179	48.
21	V3	-1.4140	.194	52.
22	V4	-1.5510	.190	51.
23	V5	-1.4360	.169	45.
24	V6	-1.6860	.164	44.
25	V7	-1.7900	.062	16.
26	V8	-1.8550	.054	14.
27	E1	-1.1610	.116	17.
28	E2	-.8040	.166	24.
29	E3	-.1680	.208	30.
30	E4	-.0260	.227	32.
31	E5	-.6190	.165	24.
32	E6	-1.2810	.088	13.
33	E7	-.3450	.187	27.
34	E8	-.1260	.252	36.
35	E9	-.3830	.220	31.
36	E10	-.0510	.229	33.
37	E11	-.9240	.194	28.
38	E12	-.7660	.166	24.
39	REF	-2.0130	-.006	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1704 105
45.00 PSIG 67.70 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9200	.042	17.
2	R2	-1.7360	.062	25.
3	R3	-1.6690	.047	19.
4	R4	-1.8680	.061	24.
5	R5	-1.8800	.041	16.
6	R6	-1.6510	.061	24.
7	R7	-1.7050	.068	27.
8	R8	-1.5000	.093	37.
9	R9	-1.5030	.091	36.
10	R10	-1.0250	.152	61.
11	R11	-1.3410	.112	45.
12	R12	-1.5390	.101	40.
13	R13	-.7190	.184	37.
14	R14	-.6980	.164	33.
15	R15	-.5600	.176	35.
16	R16	-.7250	.140	28.
17	R17	-1.3350	.109	22.
18	R18	-1.1540	.139	28.
19	V1	-.9800	.173	46.
20	V2	-1.5150	.173	46.
21	V3	-1.4590	.188	50.
22	V4	-1.6080	.183	49.
23	V5	-1.5080	.161	43.
24	V6	-1.7590	.156	41.
25	V7	-1.7930	.061	16.
26	V8	-1.8550	.054	14.
27	E1	-1.2180	.110	16.
28	E2	-.8890	.157	22.
29	E3	-.2750	.196	28.
30	E4	-.0930	.220	31.
31	E5	-.6910	.157	22.
32	E6	-1.3210	.083	12.
33	E7	-.4460	.177	25.
34	E8	-.1260	.252	36.
35	E9	-.4960	.207	30.
36	E10	-.1790	.214	31.
37	E11	-1.0110	.184	26.
38	E12	-.8500	.157	22.
39	REF	-2.0130	-.006	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1801 105
40.00 PSIG 66.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9700	.036	15.
2	R2	-1.7830	.056	23.
3	R3	-1.7010	.043	17.
4	R4	-1.9190	.055	22.
5	R5	-1.9160	.037	15.
6	R6	-1.7090	.054	22.
7	R7	-1.7530	.062	25.
8	R8	-1.5650	.085	34.
9	R9	-1.5610	.084	34.
10	R10	-1.1460	.138	55.
11	R11	-1.4200	.102	41.
12	R12	-1.6040	.094	37.
13	R13	-.7900	.175	35.
14	R14	-.6980	.164	33.
15	R15	-.5610	.176	35.
16	R16	-.7250	.140	28.
17	R17	-1.3360	.109	22.
18	R18	-1.2600	.127	25.
19	V1	-1.0680	.163	44.
20	V2	-1.6030	.163	43.
21	V3	-1.5680	.176	47.
22	V4	-1.7160	.171	46.
23	V5	-1.5990	.151	40.
24	V6	-1.8460	.146	39.
25	V7	-1.7940	.061	16.
26	V8	-1.8550	.054	14.
27	E1	-1.2980	.101	14.
28	E2	-.9990	.144	21.
29	E3	-.4280	.178	25.
30	E4	-.2400	.201	29.
31	E5	-.7990	.145	21.
32	E6	-1.3830	.076	11.
33	E7	-.5780	.162	23.
34	E8	-.1280	.252	36.
35	E9	-.6600	.188	27.
36	E10	-.3550	.195	28.
37	E11	-1.1490	.168	24.
38	E12	-.9640	.144	21.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1901 105
35.00 PSIG 65.20 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-1.9920	.034	14.
2	R2	-1.8340	.051	20.
3	R3	-1.7350	.040	16.
4	R4	-1.9700	.049	20.
5	R5	-1.9540	.032	13.
6	R6	-1.7680	.047	19.
7	R7	-1.8080	.056	22.
8	R8	-1.6310	.078	31.
9	R9	-1.6280	.077	31.
10	R10	-1.2700	.123	49.
11	R11	-1.4990	.093	37.
12	R12	-1.6810	.085	34.
13	R13	-1.0410	.147	29.
14	R14	-.8460	.146	29.
15	R15	-.8400	.146	29.
16	R16	-.9500	.115	23.
17	R17	-1.3350	.109	22.
18	R18	-1.3700	.114	23.
19	V1	-1.1690	.152	41.
20	V2	-1.7060	.151	40.
21	V3	-1.6650	.164	44.
22	V4	-1.8310	.158	42.
23	V5	-1.7010	.139	37.
24	V6	-1.9410	.135	36.
25	V7	-1.7940	.061	16.
26	V8	-1.8540	.054	14.
27	E1	-1.3830	.091	13.
28	E2	-1.1150	.131	19.
29	E3	-.5940	.159	23.
30	E4	-.4060	.182	26.
31	E5	-.9150	.132	19.
32	E6	-1.4420	.069	10.
33	E7	-.7160	.147	21.
34	E8	-.1280	.252	36.
35	E9	-.8310	.168	24.
36	E10	-.5390	.174	25.
37	E11	-1.2950	.151	22.
38	E12	-1.0850	.130	19.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2004 105
30.00 PSIG 64.80 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0160	.031	12.
2	R2	-1.8810	.045	18.
3	R3	-1.7690	.036	14.
4	R4	-2.0210	.043	17.
5	R5	-1.9910	.028	11.
6	R6	-1.8240	.041	16.
7	R7	-1.8630	.050	20.
8	R8	-1.6990	.070	28.
9	R9	-1.6990	.069	28.
10	R10	-1.3910	.109	44.
11	R11	-1.5800	.084	34.
12	R12	-1.7560	.077	31.
13	R13	-1.1560	.134	27.
14	R14	-.9490	.133	27.
15	R15	-1.0810	.121	24.
16	R16	-.9500	.115	23.
17	R17	-1.3350	.109	22.
18	R18	-1.4610	.103	21.
19	V1	-1.2750	.140	37.
20	V2	-1.8090	.139	37.
21	V3	-1.7950	.149	40.
22	V4	-1.9590	.143	38.
23	V5	-1.8030	.128	34.
24	V6	-2.0460	.124	33.
25	V7	-1.8430	.056	15.
26	V8	-1.8550	.054	14.
27	E1	-1.4690	.082	12.
28	E2	-1.2490	.116	17.
29	E3	-.7540	.141	20.
30	E4	-.5740	.162	23.
31	E5	-1.0330	.118	17.
32	E6	-1.5060	.062	9.
33	E7	-.8590	.132	19.
34	E8	-.1280	.252	36.
35	E9	-1.0010	.149	21.
36	E10	-.7190	.155	22.
37	E11	-1.4260	.135	19.
38	E12	-1.2140	.116	17.
39	REF	-2.0110	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2115 105
25.00 PSIG 64.60 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0690	.025	10.
2	R2	-1.9310	.039	16.
3	R3	-1.8030	.032	13.
4	R4	-2.0740	.037	15.
5	R5	-2.0300	.024	10.
6	R6	-1.8830	.034	14.
7	R7	-1.9230	.043	17.
8	R8	-1.7680	.062	25.
9	R9	-1.7680	.062	25.
10	R10	-1.5190	.094	38.
11	R11	-1.6640	.074	30.
12	R12	-1.8410	.067	27.
13	R13	-1.2410	.124	25.
14	R14	-1.0790	.118	24.
15	R15	-1.0800	.121	24.
16	R16	-1.0850	.100	20.
17	R17	-1.3350	.109	22.
18	R18	-1.6050	.086	17.
19	V1	-1.3710	.127	34.
20	V2	-1.9210	.126	34.
21	V3	-1.9110	.135	36.
22	V4	-2.0710	.131	35.
23	V5	-1.9210	.115	31.
24	V6	-2.1580	.111	30.
25	V7	-1.8850	.051	14.
26	V8	-1.8550	.054	14.
27	E1	-1.5600	.072	10.
28	E2	-1.3610	.103	15.
29	E3	-.9180	.122	17.
30	E4	-.7510	.141	20.
31	E5	-1.1590	.104	15.
32	E6	-1.5710	.054	8.
33	E7	-1.0110	.116	17.
34	E8	-.1310	.251	36.
35	E9	-1.1810	.128	18.
36	E10	-.9090	.133	19.
37	E11	-1.5800	.117	17.
38	E12	-1.3400	.102	15.
39	REF	-2.0110	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 2235 105
20.00 PSIG 64.06 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.0990	.021	8.
2	R2	-1.9820	.034	13.
3	R3	-1.8390	.028	11.
4	R4	-2.1190	.032	13.
5	R5	-2.0690	.020	8.
6	R6	-1.9410	.028	11.
7	R7	-1.9860	.036	14.
8	R8	-1.8360	.054	22.
9	R9	-1.8500	.053	21.
10	R10	-1.6440	.080	32.
11	R11	-1.7490	.065	26.
12	R12	-1.9290	.057	23.
13	R13	-1.3680	.110	22.
14	R14	-1.1980	.104	21.
15	R15	-1.0810	.121	24.
16	R16	-1.2180	.085	17.
17	R17	-1.3380	.108	22.
18	R18	-1.6910	.076	15.
19	V1	-1.5010	.115	31.
20	V2	-2.0400	.113	30.
21	V3	-2.0360	.121	32.
22	V4	-2.1980	.116	31.
23	V5	-2.0360	.103	27.
24	V6	-2.2610	.100	27.
25	V7	-1.9340	.045	12.
26	V8	-1.8550	.054	14.
27	E1	-1.6480	.062	9.
28	E2	-1.4940	.088	13.
29	E3	-1.0840	.103	15.
30	E4	-.9240	.121	17.
31	E5	-1.2790	.090	13.
32	E6	-1.6420	.046	7.
33	E7	-1.1620	.099	14.
34	E8	-.2450	.238	34.
35	E9	-1.3580	.108	15.
36	E10	-1.0940	.113	16.
37	E11	-1.7250	.101	14.
38	E12	-1.4760	.086	12.
39	REF	-2.0110	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 9 106
15.00 PSIG 63.90 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1250	.018	7.
2	R2	-2.0340	.028	11.
3	R3	-1.8730	.025	10.
4	R4	-2.1680	.026	10.
5	R5	-2.1060	.016	6.
6	R6	-2.0000	.021	8.
7	R7	-2.0490	.029	11.
8	R8	-1.9090	.045	18.
9	R9	-1.9200	.045	18.
10	R10	-1.7680	.065	26.
11	R11	-1.8310	.055	22.
12	R12	-2.0190	.047	19.
13	R13	-1.5200	.092	18.
14	R14	-1.3380	.087	17.
15	R15	-1.2380	.104	21.
16	R16	-1.3590	.069	14.
17	R17	-1.5080	.089	18.
18	R18	-1.8240	.060	12.
19	V1	-1.6290	.101	27.
20	V2	-2.1640	.099	26.
21	V3	-2.1630	.106	28.
22	V4	-2.3250	.102	27.
23	V5	-2.1560	.089	24.
24	V6	-2.3860	.086	23.
25	V7	-1.9790	.040	11.
26	V8	-1.9860	.039	10.
27	E1	-1.7350	.052	7.
28	E2	-1.6240	.074	11.
29	E3	-1.2540	.083	12.
30	E4	-1.0980	.100	14.
31	E5	-1.4030	.076	11.
32	E6	-1.7060	.039	6.
33	E7	-1.3200	.082	12.
34	E8	-.1430	.250	36.
35	E9	-1.5310	.088	13.
36	E10	-1.2790	.092	13.
37	E11	-1.8760	.083	12.
38	E12	-1.5960	.073	10.
39	REF	-2.0100	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 205 106
10.00 PSIG 63.90 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1550	.014	6.
2	R2	-2.0810	.022	9.
3	R3	-1.9090	.021	8.
4	R4	-2.2110	.021	8.
5	R5	-2.1450	.011	4.
6	R6	-2.0590	.015	6.
7	R7	-2.1140	.021	9.
8	R8	-1.9730	.038	15.
9	R9	-1.9940	.037	15.
10	R10	-1.8940	.050	20.
11	R11	-1.9200	.045	18.
12	R12	-2.1090	.037	15.
13	R13	-1.6710	.075	15.
14	R14	-1.3380	.087	17.
15	R15	-1.4430	.082	16.
16	R16	-1.5190	.051	10.
17	R17	-1.5830	.080	16.
18	R18	-1.9740	.043	9.
19	V1	-1.7610	.086	23.
20	V2	-2.2910	.084	22.
21	V3	-2.2790	.092	25.
22	V4	-2.4650	.086	23.
23	V5	-2.2740	.076	20.
24	V6	-2.5030	.073	19.
25	V7	-2.0230	.035	9.
26	V8	-1.9880	.039	10.
27	E1	-1.8240	.042	6.
28	E2	-1.7440	.060	9.
29	E3	-1.4180	.065	9.
30	E4	-1.2710	.080	11.
31	E5	-1.5280	.062	9.
32	E6	-1.7760	.031	4.
33	E7	-1.4850	.064	9.
34	E8	-.9200	.158	23.
35	E9	-1.7060	.068	10.
36	E10	-1.4660	.072	10.
37	E11	-2.0230	.066	9.
38	E12	-1.7280	.058	8.
39	REF	-2.0100	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 445 106
5.00 PSIG 64.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.1810	.011	4.
2	R2	-2.1310	.016	7.
3	R3	-1.9440	.017	7.
4	R4	-2.2890	.012	5.
5	R5	-2.1850	.007	3.
6	R6	-2.1200	.008	3.
7	R7	-2.1810	.014	5.
8	R8	-2.0480	.029	12.
9	R9	-2.0710	.028	11.
10	R10	-2.0190	.036	14.
11	R11	-2.0080	.035	14.
12	R12	-2.2030	.026	10.
13	R13	-1.8530	.054	11.
14	R14	-1.4780	.070	14.
15	R15	-1.6240	.063	13.
16	R16	-1.6480	.036	7.
17	R17	-1.7180	.065	13.
18	R18	-2.0990	.028	6.
19	V1	-1.8900	.072	19.
20	V2	-2.4190	.070	19.
21	V3	-2.4280	.075	20.
22	V4	-2.6140	.069	19.
23	V5	-2.3940	.063	17.
24	V6	-2.6280	.059	16.
25	V7	-2.0740	.029	8.
26	V8	-1.9880	.039	10.
27	E1	-1.9080	.033	5.
28	E2	-1.8690	.046	7.
29	E3	-1.5790	.046	7.
30	E4	-1.4460	.059	8.
31	E5	-1.6580	.047	7.
32	E6	-1.8550	.022	3.
33	E7	-1.6300	.049	7.
34	E8	-.9500	.155	22.
35	E9	-1.8810	.048	7.
36	E10	-1.6500	.051	7.
37	E11	-2.1650	.049	7.
38	E12	-1.8640	.042	6.
39	REF	-2.0090	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 946 106
.00 PSIG 65.26 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2400	.004	2.
2	R2	-2.1860	.010	4.
3	R3	-1.9850	.012	5.
4	R4	-2.3650	.003	1.
5	R5	-2.2260	.002	1.
6	R6	-2.1810	.001	0.
7	R7	-2.2730	.003	1.
8	R8	-2.1180	.021	8.
9	R9	-2.1640	.018	7.
10	R10	-2.1550	.020	8.
11	R11	-2.0840	.026	10.
12	R12	-2.3140	.013	5.
13	R13	-2.0260	.035	7.
14	R14	-1.6050	.055	11.
15	R15	-1.7740	.047	9.
16	R16	-1.7260	.027	5.
17	R17	-1.8450	.051	10.
18	R18	-2.2010	.016	3.
19	V1	-2.0610	.053	14.
20	V2	-2.6040	.048	13.
21	V3	-2.5880	.056	15.
22	V4	-2.7810	.051	13.
23	V5	-2.5250	.049	13.
24	V6	-2.7480	.046	12.
25	V7	-2.1210	.024	6.
26	V8	-2.1230	.023	6.
27	E1	-1.9960	.023	3.
28	E2	-2.0030	.031	4.
29	E3	-1.7480	.027	4.
30	E4	-1.6340	.037	5.
31	E5	-1.8010	.031	4.
32	E6	-1.9410	.012	2.
33	E7	-1.8140	.029	4.
34	E8	-1.2490	.119	17.
35	E9	-2.0640	.027	4.
36	E10	-1.8400	.030	4.
37	E11	-2.3240	.030	4.
38	E12	-2.0000	.027	4.
39	REF	-2.0100	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1248 106
.00 PSIG 67.00 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2410	.004	2.
2	R2	-2.1860	.010	4.
3	R3	-1.9860	.012	5.
4	R4	-2.3650	.003	1.
5	R5	-2.2290	.002	1.
6	R6	-2.1930	-.001	0.
7	R7	-2.3060	-.001	0.
8	R8	-2.1200	.021	8.
9	R9	-2.1760	.017	7.
10	R10	-2.1840	.016	7.
11	R11	-2.0910	.025	10.
12	R12	-2.3290	.012	5.
13	R13	-2.1280	.023	5.
14	R14	-1.6080	.054	11.
15	R15	-1.7740	.047	9.
16	R16	-1.8010	.019	4.
17	R17	-2.0700	.025	5.
18	R18	-2.2030	.016	3.
19	V1	-2.0830	.051	13.
20	V2	-2.6210	.047	12.
21	V3	-2.5880	.056	15.
22	V4	-2.7880	.050	13.
23	V5	-2.5240	.049	13.
24	V6	-2.6940	.052	14.
25	V7	-2.1210	.024	6.
26	V8	-2.1630	.018	5.
27	E1	-2.0030	.022	3.
28	E2	-2.0030	.031	4.
29	E3	-1.7560	.026	4.
30	E4	-1.6410	.036	5.
31	E5	-1.8090	.030	4.
32	E6	-1.9440	.012	2.
33	E7	-1.8400	.026	4.
34	E8	-.4100	.218	31.
35	E9	-2.0710	.026	4.
36	E10	-1.8360	.031	4.
37	E11	-2.3240	.030	4.
38	E12	-2.0010	.027	4.
39	REF	-2.0090	-.005	0.

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1354 106
.00 PSIG 67.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2410	.004	2.
2	R2	-2.1860	.010	4.
3	R3	-1.9880	.012	5.
4	R4	-2.3660	.003	1.
5	R5	-2.2300	.002	1.
6	R6	-2.1940	-.001	0.
7	R7	-2.3090	-.001	0.
8	R8	-2.1200	.021	8.
9	R9	-2.1760	.017	7.
10	R10	-2.1840	.016	7.
11	R11	-2.1000	.024	10.
12	R12	-2.3340	.011	4.
13	R13	-2.1290	.023	5.
14	R14	-1.6080	.054	11.
15	R15	-1.7740	.047	9.
16	R16	-1.8010	.019	4.
17	R17	-2.0700	.025	5.
18	R18	-2.2030	.016	3.
19	V1	-2.0840	.050	13.
20	V2	-2.6210	.047	12.
21	V3	-2.5880	.056	15.
22	V4	-2.7880	.050	13.
23	V5	-2.5240	.049	13.
24	V6	-2.6890	.052	14.
25	V7	-2.1210	.024	6.
26	V8	-2.1640	.018	5.
27	E1	-2.0030	.022	3.
28	E2	-2.0040	.031	4.
29	E3	-1.7580	.026	4.
30	E4	-1.6410	.036	5.
31	E5	-1.8090	.030	4.
32	E6	-1.9440	.012	2.
33	E7	-1.8400	.026	4.
34	E8	-.6640	.188	27.
35	E9	-2.0710	.026	4.
36	E10	-1.8340	.031	4.
37	E11	-2.3240	.030	4.
38	E12	-2.0010	.027	4.
39	REF	-2.0100	-.005	0.

APPENDIX B

CALLAWAY STRUCTURAL INTEGRITY TEST -- JANUARY, 1984

SUMMARY OF DATA AT 1646 106
.00 PSIG 67.40 F

TRANSDUCER		VOLTAGE	DISPLACEMENT (IN)	% OF PREDICTED
1	R1	-2.2410	.004	2.
2	R2	-2.1860	.010	4.
3	R3	-1.9890	.012	5.
4	R4	-2.3660	.003	1.
5	R5	-2.2340	.001	1.
6	R6	-2.1940	-.001	0.
7	R7	-2.3160	-.002	-1.
8	R8	-2.1200	.021	8.
9	R9	-2.1750	.017	7.
10	R10	-2.1850	.016	7.
11	R11	-2.0990	.024	10.
12	R12	-2.3430	.010	4.
13	R13	-2.1280	.023	5.
14	R14	-1.6080	.054	11.
15	R15	-1.7740	.047	9.
16	R16	-1.8030	.019	4.
17	R17	-2.0710	.025	5.
18	R18	-2.1580	.021	4.
19	V1	-2.0840	.050	13.
20	V2	-2.6210	.047	12.
21	V3	-2.5880	.056	15.
22	V4	-2.7880	.050	13.
23	V5	-2.5250	.049	13.
24	V6	-2.6880	.052	14.
25	V7	-2.1210	.024	6.
26	V8	-2.1640	.018	5.
27	E1	-2.0030	.022	3.
28	E2	-2.0040	.031	4.
29	E3	-1.7590	.025	4.
30	E4	-1.6410	.036	5.
31	E5	-1.8090	.030	4.
32	E6	-1.9430	.012	2.
33	E7	-1.8400	.026	4.
34	E8	-.5580	.201	29.
35	E9	-2.0730	.026	4.
36	E10	-1.8340	.031	4.
37	E11	-2.3240	.030	4.
38	E12	-2.0000	.027	4.
39	REF	-2.0100	-.005	0.

UNION ELECTRIC COMPANY

CALLAWAY PLANT
UNIT 1

PRIMARY REACTOR CONTAINMENT

INTEGRATED LEAKAGE RATE TEST

Final Report
January 1984

Bechtel Power Corporation

UNION ELECTRIC COMPANY

CALLAWAY PLANT UNIT 1

PRIMARY REACTOR CONTAINMENT

INTEGRATED LEAKAGE RATE TEST

January 1984

FINAL REPORT

Prepared by
Bechtel Power Corporation
San Francisco, CA

SU-051

TABLE OF CONTENTS

ILRT REPORT FOR CALLAWAY NUCLEAR STATION

1.0 INTRODUCTION

The reactor containment building Integrated Leakage Rate Test (Type A) was performed to demonstrate that leakage through the primary reactor containment and penetrations does not exceed allowable leakage rate values as specified in the Plant Technical specifications.

This report describes the preoperational Integrated Leakage Rate Test at the Callaway Plant, Unit 1, per 10CFR50, Appendix J requirments. The preoperational ILRT was successfully completed on Janury 8, 1984.

A Structural Integrity Test (SIT) was conducted in conjunction with and immediately prior to the ILRT. Test results and data for the SIT are included in a separate report.

Following the completion of the SIT the containment was depressurized to atmospheric pressure. Containment entry was made for inspection and after a 7.5 hours hold the pressurization was started for ILRT. The test duration was 24 hours followed by a 4-hour verification test.

The following documents contain the test requirements and acceptance criteria for the ILRT:

1. Callaway Plant Unit 1 Technical Specification
2. Appendix J to 10CFR50, Reactor Containment Leakage Testing for Water Cooled Reactors.
3. U.S. Nuclear Regulatory Commission Regulatory Guide 1.68, Preoperational and Initial Startup Test Program for Water Cooled Power Reactors.
4. Bechtel Topical Report BN-TOP-1, Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants.
5. ANSI/ANS 56.8-1981 - Containment System Leakage Testing Requirements.
6. Callaway Plant Procedure CS-030001, Primary Reactor Containment Integrated Leakage Rate Test.

2.0 SUMMARY

The containment building integrated leakage rate test (Type A) was successfully completed meeting all acceptance criteria set forth in the governing documents listed in Section 1. The test results are reported in accordance with the requirements of 10CFR50, Appendix J, Section V.B.3.

The calculated leakage rates were 0.045 wt% per day using the Mass Point Analysis technique and 0.043 wt% per day using the Total Time Analysis technique.

The 95% upper confidence limits were 0.047 wt% per day for Mass Point and 0.051 wt% per day for Total Time Analysis techniques. The acceptance criteria of 75% of La is 0.150 wt% per day.

Following completion of the ILRT, a successful verification test was performed. The Mass Point calculated leakage rate was 0.228 wt% per day with a lower limit of 0.195 wt% per day and upper limit of 0.295 wt% per day. The Total Time calculated leakage rate was 0.251 wt% per day with a lower limit of 0.193 wt% per day and upper limit of 0.293 wt% per day.

During the ILRT and verification test two independent computer systems were used to calculate leakage. The Calloway plant (BOP) computer was generating data simultaneously with Bechtel's IBM-PC computer. A good agreement was found between the two sets of results. The ILRT results of the IBM and plant computers are shown in Appendixes D and K respectively.

Pressurization for ILRT started on January 6, 1984 at 1738. Test pressure was reached at 0355 on January 7, 1984. All containment fans were turned off and a 4.75 hours stabilization period followed. The 24-hour leakage rate test started at 0845 on January 7. The 75% of La allowable leakage rate criteria was met after 7.5 hours testing, however the test continued for 24 hours per procedure. The 4-hour verification test started at 0950 and was completed at 1350 on January 8, 1984.

Prior to the test, a surveillance of reactor containment penetrations and isolation valves was performed to meet the requirements of Appendix J to 10CFR50, Sections III D.3. In addition, a general containment inspection was performed on the accessible surfaces in accordance with Section V. of 10CFR50, Appendix J, before pressurization. No containment damage was found.

During the ILRT the tendon end anchorage area of the surveillance tendons were visually inspected in accordance with the requirements of Regulatory Guide 1.35, Revision 2, Section C, Paragraph 3. However, the inspections were performed since the NRC had not, at the time the ILRT was conducted, accepted Bechtel's changes to the NRC standard version of Sections 3/4.6.1.6 which was to be used for the SNUPPS Technical Specifications involving Containment Vessel Structural Integrity. Bechtel's change involved compliance to proposed Revision 3 of regulatory Guide 1.35 instead of to Revision 2. In the proposed Revision 3, the requirement to perform inspection of the concrete surrounding the tendon end anchorages during the ILRT has been eliminated. The proposed changes were subsequently accepted by the NRC. All inspected tendon ends were found satisfactory.

2.0 SUMMARY (Cont'd)

The Local Leak Rate Test program was completed prior to the ILRT. The details and results are submitted to the NRC in a separate report. The total of the local leak rates are below the .6 La allowable limit. See Appendix H for a summary of the test results.

TEST DATA SUMMARY TABLE

A. Plant Information

Owner	Union Electric Company
Plant	Callaway Nuclear Station
Location	Fulton, Missouri
Containment Type	Post-tensioned Concrete
Date Test Completed	January 8, 1984

B. Technical Data

1. Containment Net Free Air Volume	2,500,000 cu. ft.
2. Design Pressure	60 psig
3. Containment ILRT Average Temperature Limits	40 - 120°F

C. Test Results - Type A Test

1. Test Method	Absolute	
2. Data Analysis Technique	Leakage Rate: Total-Time (per BN-TOP-1) and Mass point (per ANSI 56.8-1981)	
3. Test Pressure	48.1 (+2,-0) psig	
4. Maximum allowable Leakage Rate, La	0.2 wt% per day	
5. 75% of La	0.15 wt% per day	
6. Integrated Leakage Rate	Calculated Leakage Rate wt%/day	Upper 95% Confidence Limit wt%/day
a. Total Time Analysis	0.043	0.051
b. Mass Point Analysis	0.045	0.047
7. Verification Test Imposed Leakage Rate, Li	15.20 scfm 0.20 wt%/day	
8. Verification Test Results	Leakage Rate, wt%/day	
a. Total Time analysis	0.251	
b. Mass Point analysis	0.228	

9. Verification Test Limits

a. Total Time Analysis

	wt%/days
Upper Limit (Li + Lam + .25La)	0.293
Lower Limit (Li + Lam - .25La)	0.193

b. Mass Point Analysis

Upper Limit (Li + Lam + .25La)	0.295
Lower Limit (Li + Lam - .25La)	0.195

D. LLRT Adjustments and Other Penalties: None

E. LLRT Results

LLRT, Subtotal of Type B and C Tests: 17,694 sccm or 0.00842 wt%/day

Total LLRT Leakage: 0.00842 wt%/day < 0.6 La = 0.12 wt%/day

3.0 DISCUSSION

During the Structural Integrity Test preceding the ILRT, the containment penetrations were inspected for leaks and no leakage was found.

The pressurization system consisted of Atlas - Copco, diesel motor driven oil free compressors, a refrigerated air dryer and moisture separator. Pressurization rate was between 4.6 and 5.8 psig/hr.

All containment isolation valves were lined up in post-LOCA condition in accordance with the ILRT procedure. There were no exceptions to the valve lineup.

The containment was pressurized to 50.05 psig (test pressure is 48.1, +2, -0 psig), when the compressors were stopped. All containment fans were turned off at the beginning of stabilization period. After stabilization was achieved a 24-hour ILRT was performed. The resulting leakage rates were well below the allowable limits.

Two computers were used for simultaneous processing of the ILRT data. Callaway's BOP plant computer and Bechtel's IBM-PC computer were calculating leakage rates independently using a common data input. A comparison of the two separate results in Appendix D (IBM-PC) and Appendix K (BOP) indicate a very close correlation between the leakage rates.

4.0 TEST SEQUENCE

Containment pressurization started on January 6, 1984 at 1738 with all compressors running. The test pressure was reached at 0355 the following day.

The Test Phases were as follows:

Test Phase	Time	Duration	Date
Pressurization	1738 - 0355	10:58 hrs	Jan. 6-7
Stabilization	0400 - 0800	4.00	Jan. 7
ILRT	0845 - 0845	24.0	Jan 7-8
Verification (stabilization)	0845 - 0950	1.1	Jan. 8
Verification Test	0950 - 1350	4.0	Jan. 8
Depressurization (started)	1500 -	N.A.	Jan. 8

5.0 INSTRUMENTATION AND DATA ACQUISITION

The following instrumentation system was used:

Reqd.	Description	Data	
Absolute Pressure			
2	Precision Pressure Gauge Mensor Model 10100-001	Range:	0-100 psia
		Accuracy:	+/-0.02% FS
		Sensitivity:	0.001 psia
		Repeatability:	0.0005% FS
		Resolution:	0.001% FS
		Calibr. Date:	12/20/83
Drybulb Temperature			
24	Resistance Temperature Detectors, Platinum 100 ohm RTD's	Range:	0-150°F
		Accuracy:	+/-0.10°FS
		Sensitivity:	0.10°F
		Repeatability:	0.10°F
		Calibr. Date:	12/22/83
Dewpoint Temperature			
6	Dewpoint Detectors, Chilled Mirror EG&G Model 660-1	Range:	(-58)-212°F
		Accuracy:	+/-0.54°F
		Sensitivity:	0.10°F
		Repeatability:	0.10°F
		Calibr. Date:	12/22/83
Flow Meters			
2	Mass Flowmeter, Volumetrics Model W-096-7B	Range:	1.5-15 cfm
		Accuracy:	+/-1.0% FS
		[illegible]ty:	0.1%FS
		[illegible]ty:	0.10 scfm
		[illegible]e:	12/22/83

The BOP plant computer was utilized for da[illegible] on system. All instruments were directly connected to the comp[illegible]sures and temperatures were continuously displayed on the [illegible]-PC used a direct data input from the plant computer.

DRYBULB AND DEWPOINT TEMPERATURE SENSOR LOCATIONS

RTD'S

Tag No.	Elevation (ft)	Azimuth (Degree)	Distance From CTMT Center (ft)	Volume Fractions
GP-TE-1	2180	0	28	0.0327
GP-TE-2	2180	90	28	0.0327
GP-TE-3	2180	180	28	0.0327
GP-TE-4	2180	270	28	0.0327
GP-TE-5	2140	45	35	0.0553
GP-TE-6	2140	135	35	0.0553
GP-TE-7	2140	225	35	0.0553
GP-TE-8	2140	315	35	0.0553
GP-TE-9	2100	0	35	0.0530
GP-TE-10	2100	90	35	0.0530
GP-TE-11	2100	180	35	0.0530
GP-TE-12	2100	270	35	0.0530
GP-TE-13	2060	60	56	0.0463
GP-TE-14	2060	180	56	0.0463
GP-TE-15	2060	300	56	0.0463
GP-TE-16	2060	Center	0	0.0463
GP-TE-17	2031	180	22	0.0176
GP-TE-18	2030	0	61	0.0380
GP-TE-19	2030	120	59	0.0380
GP-TE-20	2030	240	61	0.0380
GP-TE-21	2010	0	27	0.0380
GP-TE-22	2010	90	33	0.0380
GP-TE-23	2010	270	22	0.0380
GP-TE-24	1988	0	22	0.0052
				1.0000

DEWCELLS

GP-ME-19	2180	Center	0	0.1309
GP-ME-20	2140	Center	0	0.2213
GP-ME-21	2100	Center	0	0.2119
GP-ME-22	2060	Center	0	0.2025
GP-ME-23	2030	120	59	0.1141
GP-ME-24	2010	0	27	0.1193
				1.0000

The overall Instrumentation Selection Guide (ISG) value was calculated (see Appendix G) in accordance with ANSI/ANS 56.8-1981 based on above instrumentation and on a 24-hour test duration. The calculated ISG = 0.0069 < 0.25 La. There was no instrument failure; therefore, post-ILRT ISG calculation was not required.

The ILRT data collection system consisted of drybulb and dewpoint temperature sensors, precision pressure gauges and mass flow meters. All sensors were connected to the BOP plant computer. The computer was used for Data Acquisition System, scanning, collecting and storing data in 15 minute intervals. Bechtel's IBM-PC computer was connected to the BOP plant computer with a direct data link. The pressure gauges and flowmeters were installed in an instrument cabinet supplied by Volumetrics.

6.0 TEST METHOD

The containment leakage rate testing method applied is the Absolute Method as described in ANSI/ANS 56.8-1981. This is a direct application of the ideal gas law, PV = WRT.

Two data analysis techniques were used:

1. The Mass Point Analysis Techniques

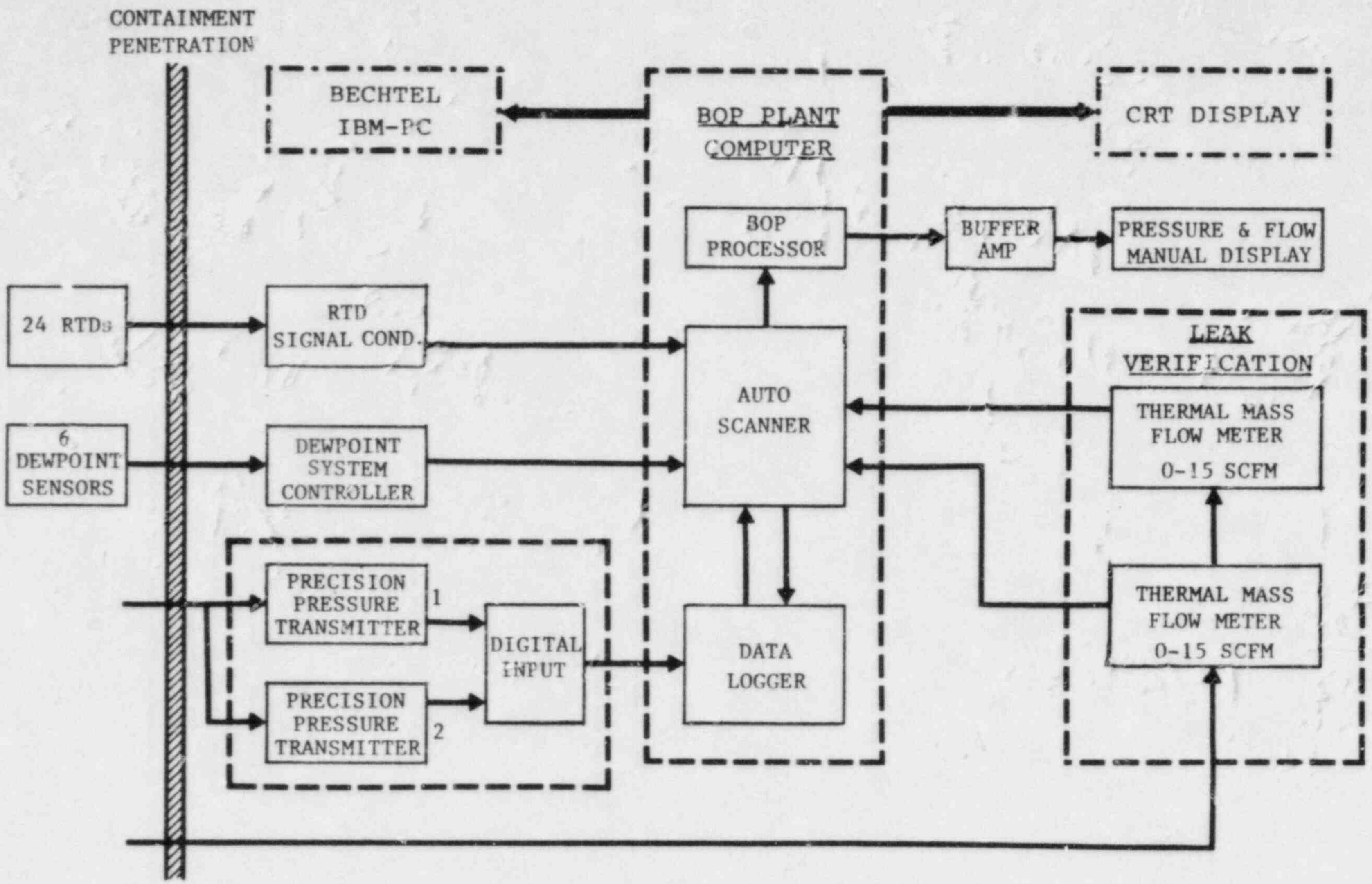
   This technique calculates the containment air mass at each time interval. A straight line least squares analysis is used, and the slope of the regression line represents the rate of change of air mass with respect to time, which is the leakage rate.

2. The Total Time Analysis Technique

   This technique calculates leakage rate based on the most recent data point taken at the start of the test. The overall leakage rate is determined by applying linear regression analysis to the leakage rates at each time point.

A 95% upper confidence level was calculated for leakage rate data as required by ANSI/ANS 58.6-1981. This is to ensure a 95% probability that the calculated leakage rate value is within the acceptance limits. All calculations were done with the BOP and IBM computers using an ILRT computer program described in Appendix A.

The temperature, pressure and containment air mass history are plotted by the computer program. The plots are in Appendix A.



CALLAWAY UNIT 1 ILRT DATA ACQUISITION SYSTEM

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APPENDIX A

DESCRIPTION OF BECHTEL ILRT COMPUTER PROGRAM

APPENDIX A

DESCRIPTION OF BECHTEL ILRT COMPUTER PROGRAM

A. Program and Report Description

1. The Bechtel ILRT computer program is used to determine the integrated leakage rate of a nuclear primary containment structure. The program is used to compute leakage rate based on input values of time, free air volume, containment atmosphere total pressure, drybulb temperature, and dewpoint temperature (water vapor pressure). Leakage rate is computed using the Absolute Method as defined in ANSI/ANS 56.8-1981, "Containment System Leakage Testing Requirements" and BN-TOP-1, Rev 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants". The program is designed to allow the user to evaluate containment leakage rate test results at the jobsite during containment leakage testing. Current leakage rate values may be obtained at any time during the testing period using one of two computational methods, yielding three different report printouts.

2. In the first printout, the Total Time Report, leakage rate is computed from initial values of free air volume, containment atmosphere drybulb temperature and partial pressure of dry air, the latest values of the same parameters, and elapsed time. These individually computed leakage rates are statistically averaged using linear regression by the method of least squares. The Total Time Method is the computational technique upon which the short duration test criteria of BN-TOP-1, Rev 1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plant," are based.

3. The second printout is the Mass Point Report and is based on the Mass Point Analysis Technique described in ANSI/ANS 56.8-1981, "Containment System Leakage Testing Requirements." The mass of dry air in the containment is computed at each data point (time) using the Equation of State, from current values of containment atmosphere drybulb temperature and partial pressure of dry air. Contained mass is "plotted" versus time and a regression line is fit to the data using the method of least squares. Leakage rate is determined from the statistically derived slope and intercept of the regression line.

4. The third printout, the Trend Report, is a summary of leakage rate values based on Total time and Mass Point computations presented as a function of number of data points and elapsed time (test duration). The Trend Report provides all leakage rate values required for comparision to the acceptance criteria of BN-TOP-1 for conduct of a short duration test.

5. The program generates a predictor report based on Reference 7. The "predictor" is an estimate of the upper bound on the change in mass point calculated leakage rate which will occur during the next four hours. The estimate is based on the mass point calculated leakage rates and 95% UCLs during the previous four hours.

6. The program is written in a high level language (FORTRAN) and is designed for use on a micro-computer with direct data input from the data acquisition system. Brief descriptions of program use, formulae used for leakage rate computations, and program logic are provided in the following paragraphs.

B. Explanation of Program

1. The Bechtel ILRT computer program is written, for use by experienced ILRT personnel, to determine containment integrated leakage rates based on the Absolute Method described in ANSI/ANS 56.8-1981 and BN-TOP-1.

2. Information loaded into the program prior to or at the start of the test:

   a. Number of containment atmosphere drybulb temperature sensors, dewpoint temperature (water vapor pressure) sensors and pressure gages to be used in leakage rate computations for the specific test

   b. Volume fractions assigned to each of the above sensors

   c. Calibration data for above sensors

   d. Test title

   e. Test pressure

   f. Maximum allowable leakage rate at test pressure

3. Data received from the data acquistion system during the test, and used to compute leakage rates:

   a. Time and date

   b. Containment atmosphere drybulb temperatures

   c. Containment atmosphere pressure(s)

   d. Containment atmosphere dewpoint temperatures

   e. Containment free air volume.

4. After all data at a given time are received , a Summary of Measured Data report (refer to "Program Logic," Paragraph D, "Data" option command) is printed.

5. If drybulb and dewpoint temperature sensors should fail during the test, the data from the sensor(s) are not used. The volume fractions for the remaining sensors are recomputed and reloaded into the program for use in ensuring leakage rate computations.

C. Leakage Rate Formulae

1. Computation Using the Total Time Method:

a. Measured leakage rate from data:

$$P_1 V_1 = W_1 R T_1 \quad (1)$$

$$P_i V_i = W_i R T_i \quad (2)$$

$$L_i = \frac{2400\,(W_1 - W_i)}{\Delta t_i\, W_1} \quad (3)$$

Solving for W_1 and W_i and substituting equations (1) and (2) into (3) yields:

$$L_i = \frac{2400}{\Delta t_i}\left[1 - \frac{T_1 P_i V_i}{T_i P_1 V_1}\right] \quad (4)$$

where

W_1, W_i = Weight of contained mass of dry air at times t_1 and t_i, respectively, lbm.

T_1, T_i = Containment atmosphere drybulb temperature at times t_1 and t_i, respectively, °R.

P_1, P_i = Partial pressure of the dry air component of the containment atmosphere at times t_1 and t_i, respectively, psia.

V_1, V_i = Containment free air volume at times t_1 and t_i, respectively (constant or variable during the test), ft^3.

t_1, t_i = Time at 1^{st} and i^{th} data points respectively, hr.

Δt_i = Elapsed time from t_1 to t_i, hr.

R = Specific gas constant for air = 53.35 ft.lbf/lbm.°R.

L_i = Measured leakage rate computed during time interval t_1 to t_i, wt.%/day.

To reduce truncation error, the computer program uses the following equivalent formulation:

$$L_i = \frac{-2400}{\Delta t_i}\left[\frac{\Delta W_i}{W_1}\right]$$

where

$$\frac{\Delta W_i}{W_1} = \frac{W_i - W_1}{W_1}$$

$$= \frac{\frac{\Delta P_i}{P_1} + \frac{\Delta V_i}{V_1} + \frac{\Delta P_i \Delta V_i}{P_1 V_1} - \frac{\Delta T_i}{T_1}}{1 + \frac{\Delta T_i}{T_1}}$$

$\Delta P_i = P_i - P_1$
$\Delta V_i = V_i - V_1$
$\Delta T_i = T_i - T_1$

b. Calculated leakage rate from regression analysis:

$$\overline{L} = a + b\,\Delta t_N \tag{5}$$

where

$\overline{L}$ = Calculated leakage rate, wt.%/day, as determined from the regression line.

$$a = (\Sigma L_i - b\Sigma\Delta t_i)/N \tag{6}$$

$$b = \frac{N(\Sigma L_i \Delta t_i) - (\Sigma L_i)(\Sigma\Delta t_i)}{N(\Sigma\Delta t_i^2) - (\Sigma\Delta t_i)^2} \tag{7}$$

N = Number of data points

$$\Sigma = \sum_{i=1}^{N}$$

c. 95% upper confidence limit on the calculated leakage rate:

$$UCL = a + b\,\Delta t_N + S_{\overline{L}} \tag{8}$$

where

UCL = 95% upper confidence limit wt.%/day, at elapsed time Δt_N.

For $\Delta t_N < 24$

$$S_{\overline{L}} = t_{0.025;N-2} \left[(\Sigma L_i^2 - a\Sigma L_i - b\Sigma L_i \Delta t_i)/(N-2) \right]^{1/2} \times \left[1 + \frac{1}{N} + (\Delta t_N - \overline{\Delta t})^2 / (\Sigma \Delta t_i^2 - (\Sigma \Delta t_i)^2/N) \right]^{1/2} \quad (9a)$$

where $t_{0.025;N-2} = 1.95996 + \frac{2.37226}{N-2} + \frac{2.82250}{(N-2)^2}$;

For $\Delta t_N \geq 24$

$$S_{\overline{L}} = t_{0.025;N-2} \left[(\Sigma L_i^2 - a\Sigma L_i - b\Sigma L_i \Delta t_i)/(N-2) \right]^{1/2} \times \left[\frac{1}{N} + (\Delta t_N - \overline{\Delta t})^2 / (\Sigma \Delta t_i^2 - (\Sigma t_i)^2/N) \right]^{1/2} \quad (9b)$$

$$\text{where } t_{0.025;N-2} = \frac{1.6449(N-2)^2 + 3.5283(N-2) + 0.85602}{(N-2)^2 + 1.2209(N-2) - 1.5162}$$

$\overline{L_i}$ = Calculated leakage rate computed using equation (5) at total elapsed time Δt_i, %/day.

$$\overline{\Delta t} = \frac{\Sigma \Delta t_i}{N}$$

2. Computation using the Mass Point Method

a. Contained mass of dry air from data:

$$W_i = 144 \frac{P_i V_i}{R T_i} \quad (10)$$

where

All symbols as previously defined.

b. Calculated leakage rate from regression analysis, $W = a + b\,\Delta t$

$$\overline{L} = -2400 \frac{b}{a} \quad (11)$$

where

$\overline{L}$ = Calculated leakage rate, wt.%/day, as determined from the regression line.

$$a = (\Sigma W_i - b\Sigma\Delta t_i)/N \qquad (12)$$

$$b = \frac{N(\Sigma W_i \Delta t_i) - (\Sigma W_i)(\Sigma\Delta t_i)}{N(\Sigma\Delta t_i^2) - (\Sigma\Delta t_i)^2} \qquad (13)$$

Δt_i = Total elapsed time at time of i^{th} data point, hr

N = Number of data points

W_i = Contained mass of dry air at i^{th} data point, lbm, as computed from equation (10).

$$\Sigma = \sum_{i=1}^{N}$$

To reduce truncation error, the computer program uses the following equivalent formulation:

$$a = W_1 \left[1 + (\Sigma \frac{\Delta W_i}{W_1} - \frac{b}{W_1} \Sigma \Delta t_i)/N \right] \qquad (14)$$

$$b = W_i \left[\frac{N (\Sigma \frac{\Delta W_i}{W_i} \Delta t_i) - \Sigma \frac{\Delta W_i}{W_i} \Sigma \Delta t_i}{N(\Sigma\Delta t_i^2) - (\Sigma\Delta t_i)^2} \right] \qquad (15)$$

where $\frac{\Delta W_i}{W_1}$ is as previously defined.

c. 95% upper confidence limit.

$$UCL = \frac{-2400}{a} (b - S_b) \qquad (16)$$

where

UCL = 95% upper confidence limit, wt.%/day.

$$S_b = t_{0.025;N-2}\left[\frac{SN^{1/2}}{[N\Sigma\Delta t_i^2 - (\Sigma\Delta t_i)^2]^{1/2}}\right] \quad (17)$$

where $t_{0.025;N-2} = \dfrac{1.6449(N-2)^2 + 3.5283\,(N-2)^2 + 0.85602}{(N-2)^2 + 1.2209\,(N-2) - 1.5162}$

$$S = \left[\frac{\Sigma[W_i - (a + b\,\Delta t_i)]^2}{N-2}\right]^{1/2}$$

$$= W_1\left\{\frac{1}{N-2}\left[\Sigma(\Delta W_i/W_1)^2 - [\Sigma(\Delta W_i/W_1)]^2/N - \frac{[\Sigma(\Delta W_i/W_1)\,\Delta t_i - \Sigma(\Delta W_i/W_1)(\Sigma\Delta t_i)/N]^2}{\Sigma(\Delta t_i^2) - (\Sigma\,\Delta t_i)^2/N}\right]\right\}^{1/2} \quad (18)$$

d. Predictor:

$$\text{Predictor} = \frac{2[(UCL-L) + 4\,(|A| + 2\,S_A)]}{100\ La}$$

where

UCL = 95% upper confidence limit of mass point calculated leakage rate at end of test

Lm = mass point calculated leakage rate at end of test

A = value of linear regression analysis slope of mass point calculated leakage rate vs. time for last 4 hours of test data

S_A = linear regression analysis standard deviation of slope

La = allowable leakage rate

In terms of elasped time, Δt and mass point calculated leakage rate Lm_i calculated at the end of i^{th} time interval.

$$A = \frac{1}{M}\left[\sum_{4\,hr} Lm_i - B\sum_{4\,hr}\Delta t_i\right] \qquad (19)$$

$$B = \frac{M\sum_{4\,hr} Lm_i\Delta t_i - \sum_{4\,hr} Lm_i \sum_{4\,hr}\Delta t_i}{M\sum_{4\,hr}\Delta t_i^2 - \sum_{4\,hr}\Delta t_i^{\;2}} \qquad (20)$$

$$S_A = \sqrt{\frac{\sum_{4\,hr} Lm_i - A\sum_{4\,hr} Lm_i - B\sum_{4\,hr} Lm_i\,\Delta t_i}{[M-2]\,[M\sum_{4\,hr}\Delta t_i - (\sum_{4\,hr}\Delta t_i)^2]}} \qquad (21)$$

Lm_i = mass point calculated leakage rate evaluated using data up to time Δt_i.

$\sum_{4\,hr}$ = summation over last 4 hours of test data.

$= \sum_{N-M+1}^{N}$

M = number of data points for last 4 hours of test.

D. Program Logic

1. The Bechtel ILRT computer program logic flow is controlled by a set of user options. The user options and a brief description of their associated function are presented below.

OPTION COMMAND	FUNCTION
	After starting the program execution, the user either enters the name of the file containing previously entered data or initializes a new data file.
DATA	Enables user to enter raw data. When the system requests values of time, volume, temperature, pressure and vapor pressure, the user enters the appropriate data. After completing the data entry, a summary is printed out. The user then verifies that the data were entered correctly. If errors are detected, the user will then be given the opportunity to correct the errors. After the user verifies that the data were entered correctly, a Corrected Data Summary Report of time, data, average temperature, partial pressure of dry air, and water vapor pressure is printed.
TREND	A Trend Report is printed.
TOTAL	A Total Time Report is printed.
MASS	A Mass Point Report is printed.
TERM	Enables user to sign-off temporarily or permanently. All data is saved on a file for restarting.
CORR	Enables user to correct previously entered data.
LIST	A Summary Data Report is printed.
READ	Enable the computer to receive the next set of data from the data acquisition system directly.
PLOT	Enables user to plot summary data, individual sensor data or air mass versus time.
DELETE	Enables user to delete a data point.
INSERT	Enables user to reinstate a previously deleted data point.
VOLFRA	Enable user to change volume fractions.
PRED	A predictor report is printed.

OPTION COMMAND	FUNCTION
TIME	Enable the user to specify the time interval for a report or plot.
VERF	Enable the user to input imposed leakage rate and calcaluted ILRT leakage rates at start of verification test.

E. COMPUTER REPORT AND DATA PRINTOUT

MASS POINT REPORT

The Mass Point Report presents leakage rate data (wt%/day) as determined by the Mass Point Method. The "Calculated Leakage Rate" is the value determined from the regression analysis. The "Containment Air Mass" values are the masses of dry air in the containment (lbm). These air masses, determined from the Equation of State, are used in the regression analysis.

TOTAL TIME REPORT

The Total Time Report presents data leakage rate (wt%/day) as determined by the Total Time Method. The "Calculated Leakage Rate" is the value determined from the regression analysis. The "Measured Leakage Rates" are the leakage rate values determined using Total Time calculations. These values of leakage rate are used in the regression analysis.

TREND REPORT

The Trend Report presents leakage rates as determined by the Mass Point and Total Time methods in percent of the initial contained mass of dry air per day (wt%/day), versus elapsed time (hours) and number of data points.

PREDICTOR REPORT

The predictor reports presents a predicted upper bound on the change in calculated mass point leakage rate over the next four hours.

SUMMARY DATA REPORT

The Summary Data report presents the actual data used to calculate leakage rates by the various methods described in the "Computer Program" section of this report. The six column headings are TIME, DATE, TEMP, PRESSURE, VPRS, and VOLUME and contain data defined as follows:

1. TIME: Time in 24-hour notations (hours and minutes).

2. DATE: Calendar date (month and day).

3. TEMP: Containment weighted-average drybulb temperature in absolute units, degrees Rankine (°R).

4. PRESSURE: Partial pressure of the dry air component of the containment atmosphere in absolute units (psia).

5. VPRS: Partial pressure of water vapor of the containment atmosphere in absolute units (psia).

6. VOLUME: Containment free air volume (cu. ft.).

F. SUMMARY OF MEASURED DATA AND SUMMARY OF CORRECTED DATA

The Summary of Measured Data presents the individual containment atmosphere drybulb temperatures, dewpoint temperatures, absolute total pressure and free air volume measured at the time and date.

1. TEMP 1 through TEMP N are the drybulb temperatures, where N = No. of RTD's. The values in the right-hand column are temperatures (°F), multiplied by 100, as read from the data acquisition system (DAS). The values in the left-hand column are the corrected temperatures expressed in absolute units (°R).

2. PRES 1 through PRES N are the total pressures, absolute, were N = No. of pressure sensors. The right-hand value, in parentheses, is a number in counts as read from the DAS. This count value is converted to a value in psia by the computer via the instrument's calibration table, counts versus psia. The left-hand column is the absolute total pressure, psia.

3. VPRS 1 through VPRS N are the dewpoint temperatures (water vapor pressures), where N = No. of dewpoint sensors. The values in the right-hand column are temperatures (°F), multiplied by 100 as read from the DAS. The values in the left-hand column are the water vapor pressures (psia) from the steam tables for saturated steam corresponding to the dewpoint (saturation) temperatures in the center column.

The Summary of Corrected Data presents corrected temperature and pressure values and calculated air mass determined as follows:

1. TEMPERATURE (°R) is the volume weighted average containment atmosphere drybulb temperature derived from TEMP 1 through TEMP N.

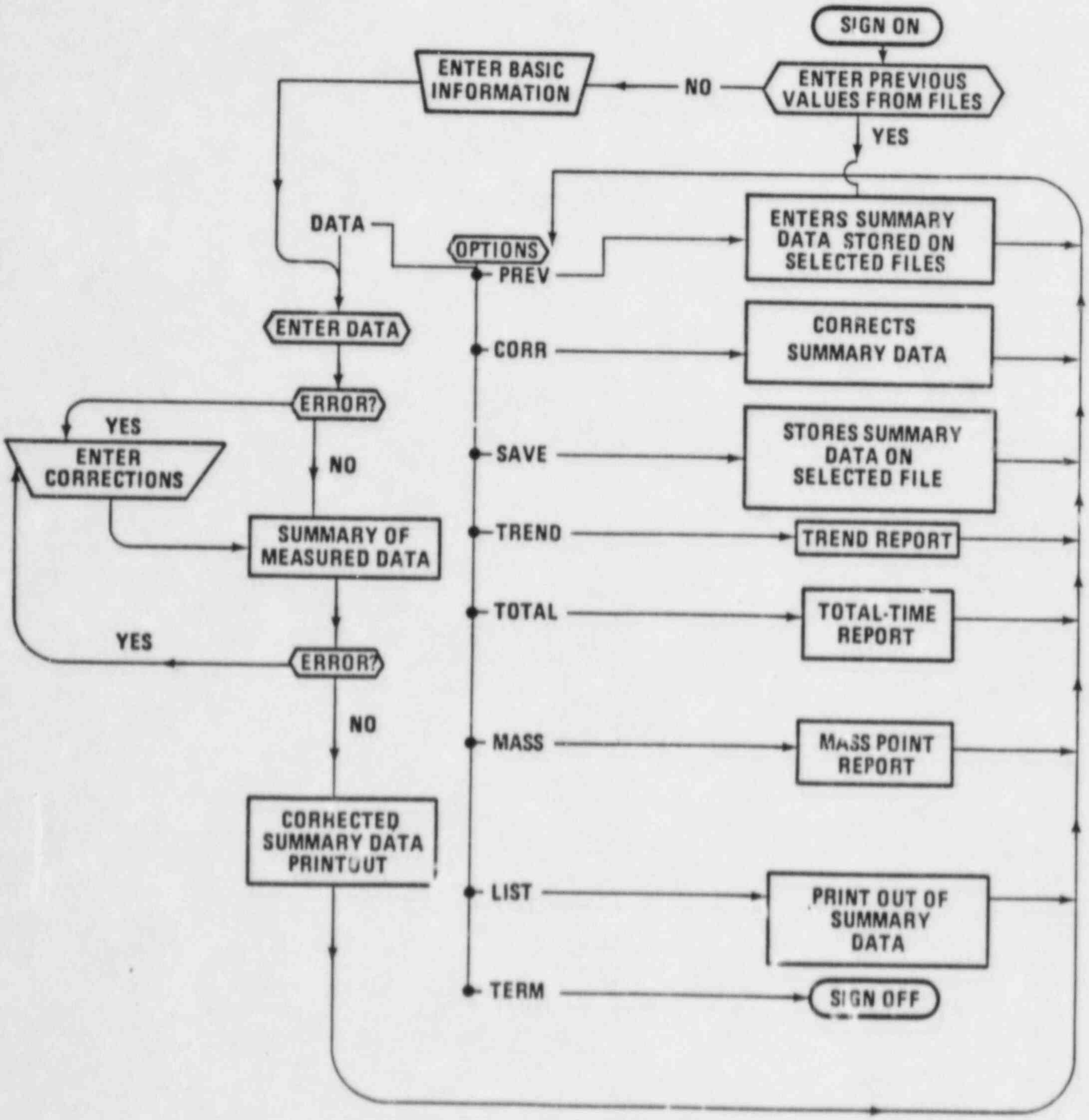
2. CORRECTED PRESSURE (psia) is the partial pressure of the dry air component of the containment atmosphere, absolute. The volume weighted average containment atmosphere water vapor pressure is subtracted from the volume weighted average total pressure, yielding the partial pressure of the dry air.

3. VAPOR PRESSURE (psia) is the volume weighted average containment atmosphere water vapor pressure, absolute derived from VPRS 1 through VPRS N.

4. VOLUME (cu. ft.) is the containment free air volume.

5. CONTAINMENT AIR MASS (lbm) is the calculated mass of dry air in the containment. The mass of dry air is calculated using the containment free air volume and the above TEMPERATURE and CORRRECTED PRESSURE of the dry air.

BECHTEL CONTAINMENT INTEGRATED LEAKAGE RATE TEST COMPUTER PROGRAM FLOW CHART



APPENDIX B

STABILIZATION SUMMARY DATA

CALLAWAY ILRT
TEMPERATURE STABILIZATION

FROM A STARTING TIME AND DATE OF: 400 107 1984

TIME (HOURS)	TEMP (R)	AVE T (4HRS)	ANSI AVE T (1HR)	DIFF	BN-TOP-1 AVE T (2HRS)
.00	534.79				
.25	534.23				
.50	533.81				
.75	533.46				
1.00	533.15				
1.25	532.87				
1.50	532.65				
1.75	532.44				
2.00	532.24				-1.275*
2.25	532.08				-1.075*
2.50	531.92				-.945*
2.75	531.77				-.841*
3.00	531.63				-.762*
3.25	531.51				-.677*
3.50	531.39				-.628*
3.75	531.29				-.573*
4.00	531.17	-.907	-.464	-.44*	-.269*

* INDICATES TEMPERATURE STABILIZATION HAS BEEN SATISFIED

CALLAWAY ILRT
SUMMARY DATA

ALMAX = .200 VOLUME = 2500000.
VRATET = .243 VRATEM = .245

TIME	DATE	TEMP	PRESSURE	VPRS	VOLUME
400	107	534.793	63.7942	.3498	2500000.
415	107	534.232	63.7325	.3460	2500000.
430	107	533.807	63.6798	.3442	2500000.
445	107	533.455	63.6384	.3406	2500000.
500	107	533.154	63.6002	.3393	2500000.
515	107	532.867	63.5644	.3361	2500000.
530	107	532.646	63.5388	.3347	2500000.
545	107	532.436	63.5139	.3326	2500000.
600	107	532.243	63.4893	.3312	2500000.
615	107	532.081	63.4681	.3289	2500000.
630	107	531.916	63.4492	.3278	2500000.
645	107	531.772	63.4310	.3265	2500000.
700	107	531.630	63.4146	.3249	2500000.
715	107	531.513	63.3985	.3240	2500000.
730	107	531.390	63.3847	.3218	2500000.
745	107	531.291	63.3706	.3204	2500000.
800	107	531.166	63.3574	.3201	2500000.

APPENDIX C

ILRT TREND REPORT

CALLAWAY ILRT
TREND REPORT

TIME AND DATE AT START OF TEST: 845 107 1984

NO. PTS	END TIME	TOTAL TIME ANALYSIS MEAS.	CALCULATED	UCL	MASS POINT ANALYSIS CALCULATED	UCL
4	930	.137	.066	1.736	.094	.364
5	945	.082	.054	.692	.078	.204
6	1000	.062	.039	.449	.059	.137
7	1015	.088	.047	.371	.070	.124
8	1030	.018	.021	.286	.035	.090
9	1045	.057	.021	.255	.039	.080
10	1100	.061	.024	.237	.043	.076
11	1115	.079	.032	.232	.054	.084
12	1130	.098	.045	.236	.070	.099
13	1145	.097	.054	.236	.080	.107
14	1200	.071	.054	.225	.077	.100
15	1215	.079	.056	.218	.078	.098
16	1230	.103	.064	.220	.087	.106
17	1245	.092	.068	.217	.089	.106
18	1300	.099	.072	.217	.093	.109
19	1315	.091	.075	.213	.094	.108
20	1330	.091	.076	.210	.094	.107
21	1345	.091	.078	.207	.095	.106
22	1400	.084	.079	.203	.093	.103
23	1415	.079	.077	.198	.091	.100
24	1430	.082	.077	.194	.089	.098
25	1445	.071	.075	.189	.086	.095
26	1500	.077	.075	.186	.084	.093
27	1515	.070	.073	.181	.081	.090
28	1530	.074	.072	.178	.080	.088
29	1545	.078	.072	.175	.079	.087
30	1600	.072	.071	.172	.078	.085
31	1615	.075	.071	.169	.077	.084
32	1630	.074	.071	.167	.076	.082
33	1645	.073	.070	.165	.075	.081
34	1700	.071	.069	.162	.074	.080
35	1715	.074	.069	.160	.074	.079
36	1730	.077	.069	.159	.074	.079
37	1745	.073	.069	.157	.074	.078
38	1800	.075	.069	.155	.073	.078
39	1815	.068	.068	.153	.072	.077
40	1830	.065	.067	.151	.071	.075
41	1845	.066	.066	.149	.070	.074
42	1900	.069	.066	.147	.069	.073
43	1915	.056	.064	.144	.067	.071
44	1930	.058	.063	.142	.065	.070
45	1945	.066	.062	.140	.065	.069
46	2000	.073	.062	.140	.065	.070
47	2015	.066	.062	.138	.065	.069
48	2030	.068	.062	.137	.065	.069
49	2045	.069	.062	.136	.065	.068
50	2100	.062	.061	.134	.064	.068

CALLAWAY ILRT
TREND REPORT (Continued)

TIME AND DATE AT START OF TEST: 845 107 1984

NO. PTS	END TIME	TOTAL TIME ANALYSIS MEAS.	CALCULATED	UCL	MASS POINT ANALYSIS CALCULATED	UCL
51	2115	.064	.061	.133	.063	.067
52	2130	.064	.060	.132	.063	.066
53	2145	.064	.060	.131	.063	.066
54	2200	.061	.059	.129	.062	.065
55	2215	.062	.059	.128	.062	.065
56	2230	.060	.058	.127	.061	.064
57	2245	.064	.058	.126	.061	.064
58	2300	.062	.058	.125	.060	.063
59	2315	.064	.057	.124	.060	.063
60	2330	.059	.057	.123	.060	.062
61	2345	.060	.057	.122	.059	.062
62	0	.063	.056	.121	.059	.062
63	15	.062	.056	.120	.059	.061
64	30	.061	.056	.119	.059	.061
65	45	.062	.056	.119	.059	.061
66	100	.058	.055	.118	.058	.060
67	115	.058	.055	.117	.058	.060
68	130	.055	.054	.116	.057	.059
69	145	.057	.054	.115	.056	.059
70	200	.061	.054	.114	.056	.059
71	215	.056	.053	.113	.056	.058
72	230	.056	.053	.113	.056	.058
73	245	.053	.052	.112	.055	.057
74	300	.054	.052	.111	.055	.057
75	315	.055	.052	.110	.054	.056
76	330	.056	.051	.109	.054	.056
77	345	.046	.050	.108	.053	.055
78	400	.052	.050	.107	.052	.055
79	415	.051	.049	.106	.052	.054
80	430	.050	.049	.105	.051	.053
81	445	.051	.048	.104	.051	.053
82	500	.051	.048	.104	.050	.053
83	515	.052	.048	.103	.050	.052
84	530	.051	.047	.102	.050	.052
85	545	.051	.047	.101	.049	.051
86	600	.047	.046	.100	.049	.051
87	615	.049	.046	.100	.048	.050
88	630	.051	.046	.099	.048	.050
89	645	.052	.046	.099	.048	.050
90	700	.050	.045	.098	.047	.050
91	715	.048	.045	.097	.047	.049
92	730	.049	.044	.097	.047	.049
93	745	.049	.044	.096	.047	.049
94	800	.046	.044	.095	.046	.048
95	815	.049	.043	.095	.046	.048
96	830	.047	.043	.094	.046	.048
97	845	.048	.043	.051	.045	.047

APPENDIX D

IBM COMPUTER AND ILRT SUMMARY DATA -

MASS POINT AND TOTAL TIME

CALLAWAY ILRT
SUMMARY DATA

ALMAX = .200 VOLUME = 2500000.
VRATET = .243 VRATEM = .245

TIME	DATE	TEMP	PRESSURE	VPRS	VOLUME
845	107	530.886	63.3213	.3172	2500000.
900	107	530.818	63.3112	.3158	2500000.
915	107	530.719	63.3013	.3147	2500000.
930	107	530.649	63.2903	.3147	2500000.
945	107	530.584	63.2830	.3135	2500000.
1000	107	530.504	63.2737	.3128	2500000.
1015	107	530.430	63.2633	.3127	2500000.
1030	107	530.352	63.2566	.3108	2500000.
1045	107	530.298	63.2480	.3110	2500000.
1100	107	530.241	63.2406	.3104	2500000.
1115	107	530.190	63.2330	.3095	2500000.
1130	107	530.135	63.2246	.3099	2500000.
1145	107	530.091	63.2188	.3082	2500000.
1200	107	530.030	63.2130	.3075	2500000.
1215	107	529.974	63.2051	.3074	2500000.
1230	107	529.941	63.1983	.3072	2500000.
1245	107	529.896	63.1935	.3060	2500000.
1300	107	529.851	63.1866	.3064	2500000.
1315	107	529.806	63.1816	.3054	2500000.
1330	107	529.760	63.1756	.3054	2500000.
1345	107	529.724	63.1706	.3044	2500000.
1400	107	529.670	63.1646	.3044	2500000.
1415	107	529.616	63.1583	.3047	2500000.
1430	107	529.591	63.1543	.3037	2500000.
1445	107	529.546	63.1502	.3028	2500000.
1500	107	529.522	63.1459	.3026	2500000.
1515	107	529.470	63.1403	.3027	2500000.
1530	107	529.443	63.1360	.3025	2500000.
1545	107	529.423	63.1324	.3011	2500000.
1600	107	529.378	63.1275	.3010	2500000.
1615	107	529.349	63.1231	.3009	2500000.
1630	107	529.311	63.1183	.3012	2500000.
1645	107	529.285	63.1149	.3006	2500000.
1700	107	529.253	63.1110	.3000	2500000.
1715	107	529.226	63.1067	.2998	2500000.
1730	107	529.201	63.1026	.2999	2500000.
1745	107	529.172	63.0995	.2995	2500000.
1800	107	529.147	63.0956	.2994	2500000.
1815	107	529.107	63.0920	.2985	2500000.
1830	107	529.079	63.0890	.2985	2500000.
1845	107	529.052	63.0852	.2978	2500000.
1900	107	529.027	63.0810	.2985	2500000.
1915	107	529.013	63.0824	.2941	2500000.
1930	107	528.973	63.0767	.2963	2500000.
1945	107	528.956	63.0718	.2977	2500000.
2000	107	528.949	63.0685	.2975	2500000.
2015	107	528.911	63.0657	.2968	2500000.
2030	107	528.885	63.0616	.2974	2500000.

CALLAWAY ILRT
SUMMARY DATA (Continued)

ALMAX = .200
VRATET = .243

VOLUME = 2500000.
VRATEM = .245

TIME	DATE	TEMP	PRESSURE	VPRS	VOLUME
2045	107	528.867	63.0586	.2974	2500000.
2100	107	528.833	63.0563	.2962	2500000.
2115	107	528.817	63.0533	.2967	2500000.
2130	107	528.809	63.0520	.2960	2500000.
2145	107	528.784	63.0487	.2953	2500000.
2200	107	528.755	63.0457	.2953	2500000.
2215	107	528.732	63.0424	.2956	2500000.
2230	107	528.716	63.0407	.2948	2500000.
2245	107	528.700	63.0368	.2952	2500000.
2300	107	528.681	63.0349	.2946	2500000.
2315	107	528.660	63.0315	.2955	2500000.
2330	107	528.633	63.0298	.2947	2500000.
2345	107	528.622	63.0276	.2944	2500000.
0	108	528.612	63.0249	.2951	2500000.
15	108	528.594	63.0228	.2942	2500000.
30	108	528.580	63.0208	.2937	2500000.
45	108	528.569	63.0186	.2939	2500000.
100	108	528.534	63.0159	.2941	2500000.
115	108	528.521	63.0142	.2938	2500000.
130	108	528.498	63.0123	.2937	2500000.
145	108	528.497	63.0110	.2930	2500000.
200	108	528.489	63.0075	.2936	2500000.
215	108	528.462	63.0062	.2928	2500000.
230	108	528.452	63.0046	.2924	2500000.
245	108	528.428	63.0028	.2922	2500000.
300	108	528.412	63.0004	.2926	2500000.
315	108	528.408	62.9991	.2919	2500000.
330	108	528.393	62.9964	.2926	2500000.
345	108	528.378	62.9994	.2881	2500000.
400	108	528.354	62.9929	.2916	2500000.
415	108	528.346	62.9921	.2914	2500000.
430	108	528.328	62.9904	.2916	2500000.
445	108	528.318	62.9881	.2914	2500000.
500	108	528.304	62.9863	.2917	2500000.
515	108	528.299	62.9849	.2911	2500000.
530	108	528.276	62.9824	.2911	2500000.
545	108	528.273	62.9816	.2909	2500000.
600	108	528.247	62.9802	.2908	2500000.
615	108	528.240	62.9777	.2913	2500000.
630	108	528.232	62.9757	.2908	2500000.
645	108	528.225	62.9736	.2914	2500000.
700	108	528.208	62.9729	.2906	2500000.
715	108	528.197	62.9720	.2900	2500000.
730	108	528.181	62.9693	.2907	2500000.
745	108	528.175	62.9681	.2904	2500000.
800	108	528.157	62.9678	.2892	2500000.
815	108	528.151	62.96[illegible]8	.2902	2500000.
830	108	528.142	62.9643	.2897	2500000.
845	108	528.127	62.9622	.2898	2500000.

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
845	530.886	63.3213	804853.		
900	530.818	63.3112	804829.	24.1	96.5
915	530.719	63.3013	804853.	-24.0	.4
930	530.649	63.2903	804819.	34.2	45.8
945	530.584	63.2830	804826.	-6.9	27.5
1000	530.504	63.2737	804827.	-1.6	20.7
1015	530.430	63.2633	804809.	18.6	29.7
1030	530.352	63.2566	804842.	-33.8	6.1
1045	530.298	63.2480	804815.	27.9	19.3
1100	530.241	63.2406	804807.	7.5	20.5
1115	530.190	63.2330	804787.	19.9	26.4
1130	530.135	63.2246	804763.	24.6	32.9
1145	530.091	63.2188	804755.	7.3	32.6
1200	530.030	63.2130	804776.	-20.8	23.7
1215	529.974	63.2051	804760.	16.0	26.6
1230	529.941	63.1983	804723.	36.8	34.6
1245	529.896	63.1935	804730.	-6.9	30.7
1300	529.851	63.1866	804711.	18.7	33.3
1315	529.806	63.1816	804716.	-4.7	30.4
1330	529.760	63.1756	804709.	7.4	30.4
1345	529.724	63.1706	804700.	8.7	30.6
1400	529.670	63.1646	804704.	-4.3	28.3
1415	529.616	63.1583	804707.	-2.4	26.6
1430	529.591	63.1543	804695.	11.5	27.5
1445	529.546	63.1502	804710.	-15.0	23.8
1500	529.522	63.1459	804692.	18.1	25.8
1515	529.470	63.1403	804700.	-8.0	23.5
1530	529.443	63.1360	804685.	14.9	24.9
1545	529.423	63.1324	804670.	15.2	26.2
1600	529.378	63.1275	804677.	-6.9	24.3
1615	529.349	63.1231	804664.	13.1	25.2
1630	529.311	63.1183	804661.	3.0	24.8
1645	529.285	63.1149	804657.	4.0	24.5
1700	529.253	63.1110	804656.	.5	23.9
1715	529.226	63.1067	804641.	14.9	24.9
1730	529.201	63.1026	804628.	13.1	25.7
1745	529.172	63.0995	804634.	-5.6	24.3
1800	529.147	63.0956	804622.	12.3	25.0
1815	529.107	63.0920	804635.	-13.2	23.0
1830	529.079	63.0890	804639.	-4.1	22.0
1845	529.052	63.0852	804633.	6.4	22.0
1900	529.027	63.0810	804618.	15.1	23.0

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
1915	529.013	63.0824	804656.	-38.4	18.8
1930	528.973	63.0767	804646.	10.4	19.3
1945	528.956	63.0718	804608.	37.3	22.3
2000	528.949	63.0685	804578.	30.7	24.5
2015	528.911	63.0657	804599.	-20.9	22.1
2030	528.885	63.0616	804586.	12.3	22.7
2045	528.867	63.0586	804576.	10.0	23.1
2100	528.833	63.0563	804599.	-22.3	20.8
2115	528.817	63.0533	804584.	14.5	21.5
2130	528.809	63.0520	804579.	4.6	21.5
2145	528.784	63.0487	804575.	4.1	21.4
2200	528.755	63.0457	804580.	-4.9	20.6
2215	528.732	63.0424	804573.	7.3	20.8
2230	528.716	63.0407	804576.	-3.1	20.2
2245	528.700	63.0368	804552.	24.4	21.5
2300	528.681	63.0349	804555.	-2.9	21.0
2315	528.660	63.0315	804544.	10.6	21.3
2330	528.633	63.0298	804563.	-18.8	19.7
2345	528.622	63.0276	804552.	11.0	20.1
0	528.612	63.0249	804532.	19.6	21.0
15	528.594	63.0228	804533.	-.9	20.6
30	528.580	63.0208	804530.	2.8	20.5
45	528.569	63.0186	804519.	11.6	20.9
100	528.534	63.0159	804537.	-18.2	19.5
115	528.521	63.0142	804534.	2.7	19.3
130	528.498	63.0123	804546.	-11.7	18.3
145	528.497	63.0110	804530.	16.3	19.0
200	528.489	63.0075	804498.	32.0	20.6
215	528.462	63.0062	804522.	-24.1	18.9
230	528.452	63.0046	804517.	4.9	18.9
245	528.428	63.0028	804530.	-13.6	17.9
300	528.412	63.0004	804524.	6.4	18.0
315	528.408	62.9991	804514.	9.8	18.3
330	528.393	62.9964	804503.	11.7	18.7
345	528.378	62.9994	804563.	-60.5	15.3
400	528.354	62.9929	804518.	45.1	17.4
415	528.346	62.9921	804518.	-.1	17.2
430	528.328	62.9904	804524.	-6.0	16.7
445	528.318	62.9881	804510.	14.2	17.2
500	528.304	62.9863	804508.	1.5	17.0

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
515	528.299	62.9849	804498.	10.3	17.3
530	528.276	62.9824	804501.	-2.9	17.0
545	528.273	62.9816	804496.	5.4	17.0
600	528.247	62.9802	804517.	-21.0	15.8
615	528.240	62.9777	804497.	19.3	16.5
630	528.232	62.9757	804484.	13.7	17.0
645	528.225	62.9736	804466.	17.2	17.6
700	528.208	62.9729	804483.	-17.0	16.6
715	528.197	62.9720	804489.	-5.3	16.2
730	528.181	62.9693	804479.	10.0	16.5
745	528.176	62.9681	804474.	4.8	16.5
800	528.157	62.9678	804496.	-22.2	15.4
815	528.151	62.9648	804467.	29.1	16.4
830	528.142	62.9643	804475.	-8.2	15.9
845	528.137	62.9622	804471.	4.5	15.9

FREE AIR VOLUME USED (CU. FT.) =2500000.
REGRESSION LINE
  INTERCEPT (LBM) = 804798.
  SLOPE (LBM/HR) = -15.2
MAXIMUM ALLOWABLE LEAKAGE RATE = .200
75% OF MAXIMUM ALLOWABLE LEAKAGE RATE = .150
THE UPPER 95% CONFIDENCE LIMIT = .047
THE CALCULATED LEAKAGE RATE = .045

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
845	530.886	63.3213	
900	530.818	63.3112	.288
915	530.719	63.3013	.001
930	530.649	63.2903	.137
945	530.584	63.2830	.082
1000	530.504	63.2737	.062
1015	530.430	63.2633	.088
1030	530.352	63.2566	.018
1045	530.298	63.2480	.057
1100	530.241	63.2406	.061
1115	530.190	63.2330	.079
1130	530.135	63.2246	.098
1145	530.091	63.2188	.097
1200	530.030	63.2130	.071
1215	529.974	63.2051	.079
1230	529.941	63.1983	.103
1245	529.896	63.1935	.092
1300	529.851	63.1866	.099
1315	529.806	63.1816	.091
1330	529.760	63.1756	.091
1345	529.724	63.1706	.091
1400	529.670	63.1646	.084
1415	529.616	63.1583	.079
1430	529.591	63.1543	.082
1445	529.546	63.1502	.071
1500	529.522	63.1459	.077
1515	529.470	63.1403	.070
1530	529.443	63.1360	.074
1545	529.423	63.1324	.078
1600	529.378	63.1275	.072
1615	529.349	63.1231	.075
1630	529.311	63.1183	.074
1645	529.285	63.1149	.073
1700	529.253	63.1110	.071
1715	529.226	63.1067	.074
1730	529.201	63.1026	.077
1745	529.172	63.0995	.073
1800	529.147	63.0956	.075
1815	529.107	63.0920	.068
1830	529.079	63.0890	.065
1845	529.052	63.0852	.066
1900	529.027	63.0810	.069

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
1915	529.013	63.0824	.056
1930	528.973	63.0767	.058
1945	528.956	63.0718	.066
2000	528.949	63.0685	.073
2015	528.911	63.0657	.066
2030	528.885	63.0616	.068
2045	528.867	63.0586	.069
2100	528.833	63.0563	.062
2115	528.817	63.0533	.064
2130	528.809	63.0520	.064
2145	528.784	63.0487	.064
2200	528.755	63.0457	.061
2215	528.732	63.0424	.062
2230	528.716	63.0407	.060
2245	528.700	63.0368	.064
2300	528.681	63.0349	.062
2315	528.660	63.0315	.064
2330	528.633	63.0298	.059
2345	528.622	63.0276	.060
0	528.612	63.0249	.063
15	528.594	63.0228	.062
30	528.580	63.0208	.061
45	528.569	63.0186	.062
100	528.534	63.0159	.058
115	528.521	63.0142	.058
130	528.498	63.0123	.055
145	528.497	63.0110	.057
200	528.489	63.0075	.061
215	528.462	63.0062	.056
230	528.452	63.0046	.056
245	528.428	63.0028	.053
300	528.412	63.0004	.054
315	528.408	62.9991	.055
330	528.393	62.9964	.056
345	528.378	62.9994	.046
400	528.354	62.9929	.052
415	528.346	62.9921	.051
430	528.328	62.9904	.050
445	528.318	62.9881	.051
500	528.304	62.9863	.051

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

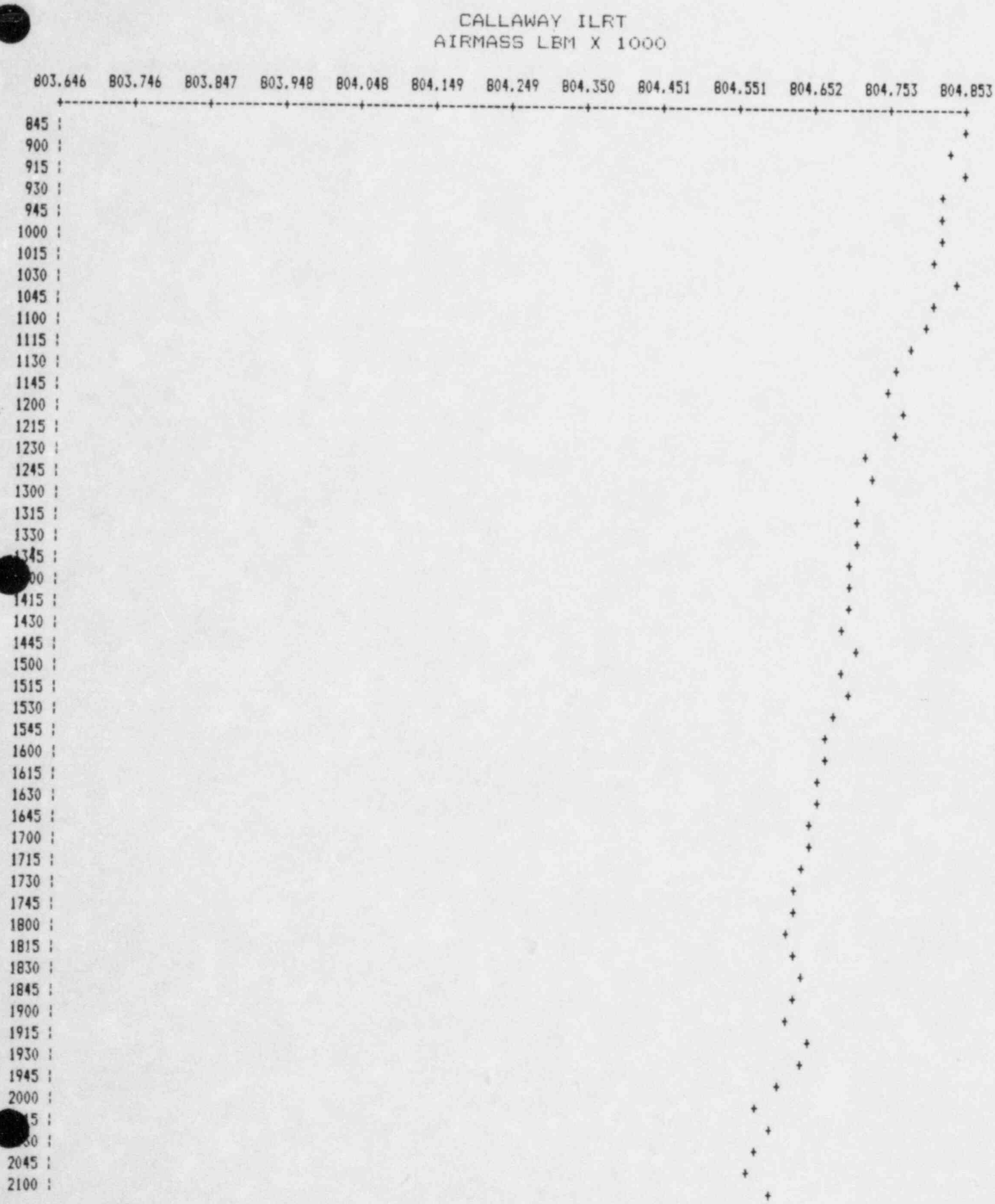
TIME AND DATE AT START OF TEST: 845 107 1984
TEST DURATION: 24.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
515	528.299	62.9849	.052
530	528.276	62.9824	.051
545	528.273	62.9816	.051
600	528.247	62.9802	.047
615	528.240	62.9777	.049
630	528.232	62.9757	.051
645	528.225	62.9736	.052
700	528.208	62.9729	.050
715	528.197	62.9720	.048
730	528.181	62.9693	.049
745	528.175	62.9681	.049
800	528.157	62.9678	.046
815	528.151	62.9648	.049
830	528.142	62.9643	.047
845	528.127	62.9622	.048

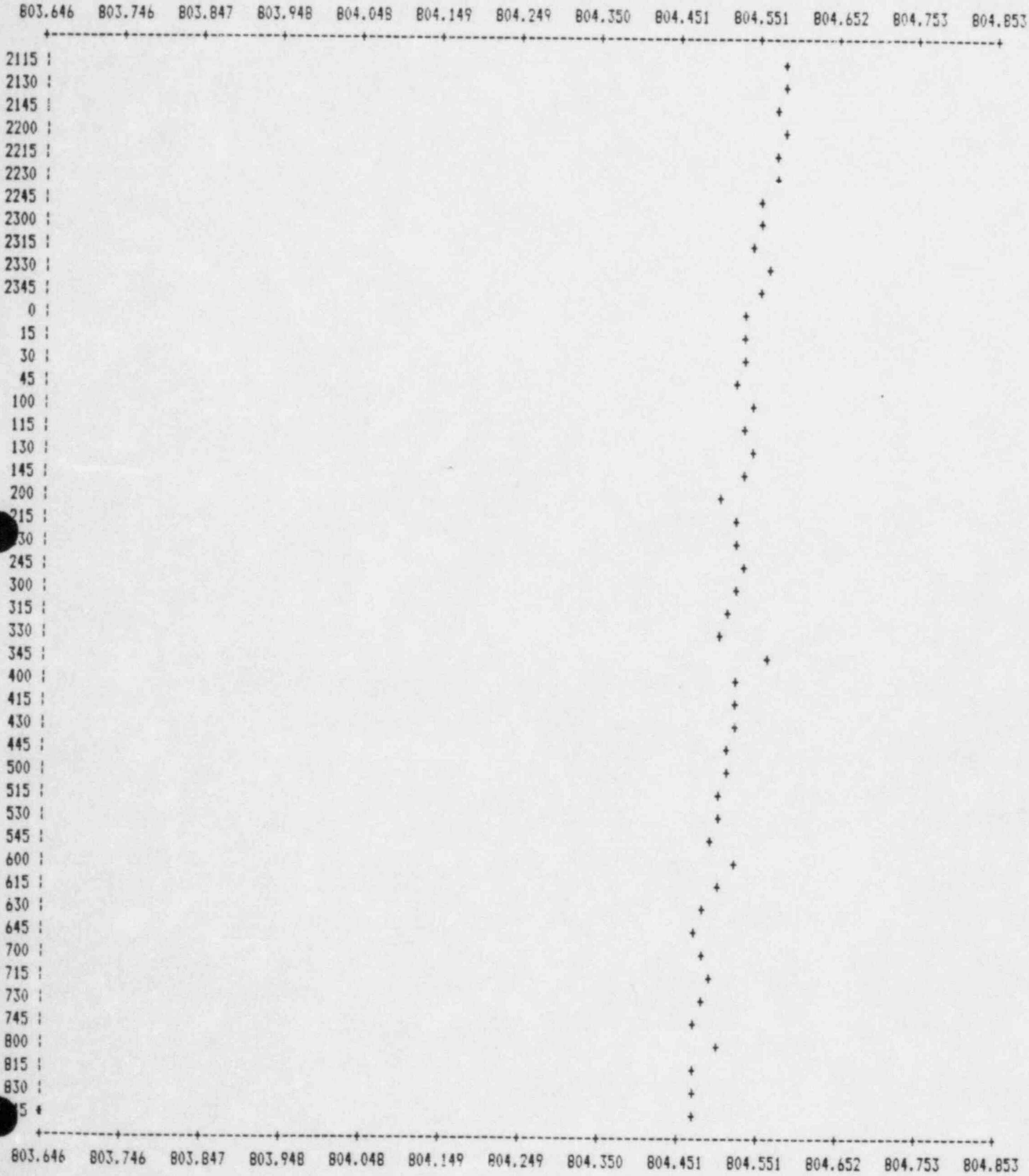
MEAN OF THE MEASURED LEAKAGE RATES = .067
MAXIMUM ALLOWABLE LEAKAGE RATE = .200
75% OF MAXIMUM ALLOWABLE LEAKAGE RATE = .150
THE UPPER 95% CONFIDENCE LIMIT = .051
THE CALCULATED LEAKAGE RATE = .043

APPENDIX E

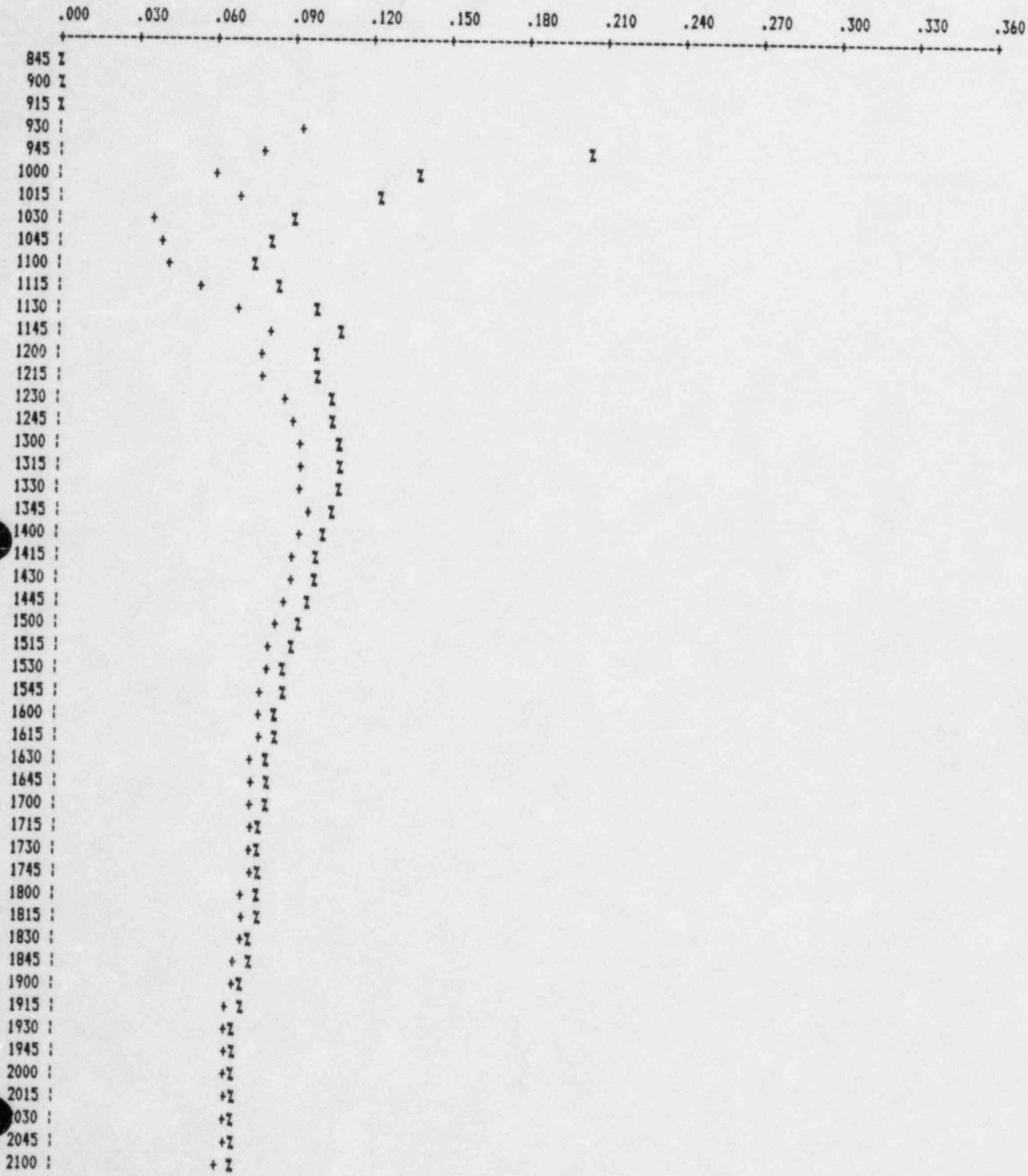
ILRT PLOTS


CALLAWAY ILRT
AIRMASS LBM X 1000
803.646
803.746
803.847
803.948
804.048
804.149
804.249
804.350
804.451
804.551
804.652
804.753
804.853
845
900
915
930
945
1000
1015
1030
1045
1100
1115
1130
1145
1200
1215
1230
1245
1300
1315
1330
1415
1430
1445
1500
1515
1530
1545
1600
1615
1630
1645
1700
1715
1730
1745
1800
1815
1830
1845
1900
1915
1930
1945
2000
2045
2100

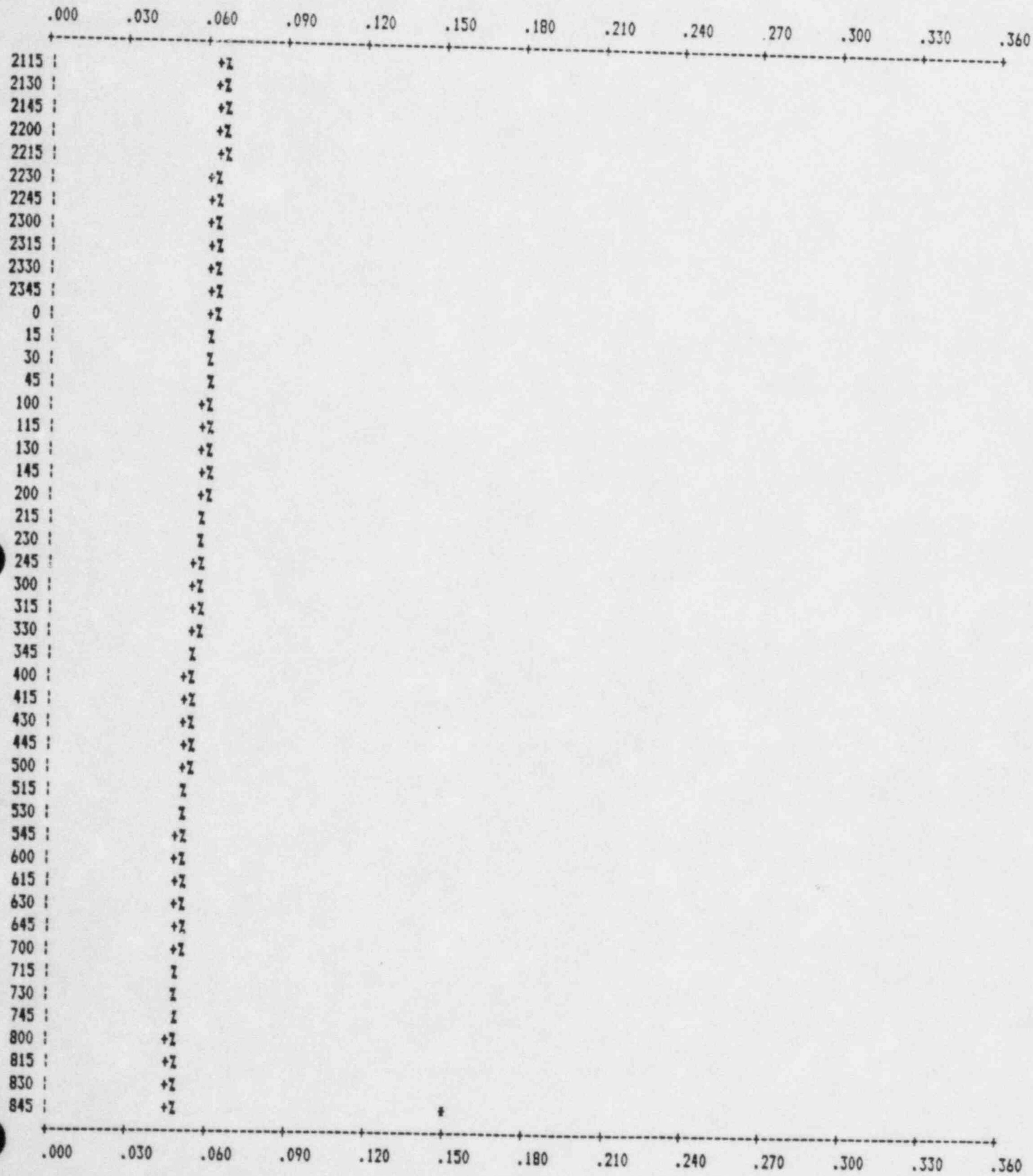
CALLAWAY ILRT
AIRMASS LBM X 1000 (CONT'D)

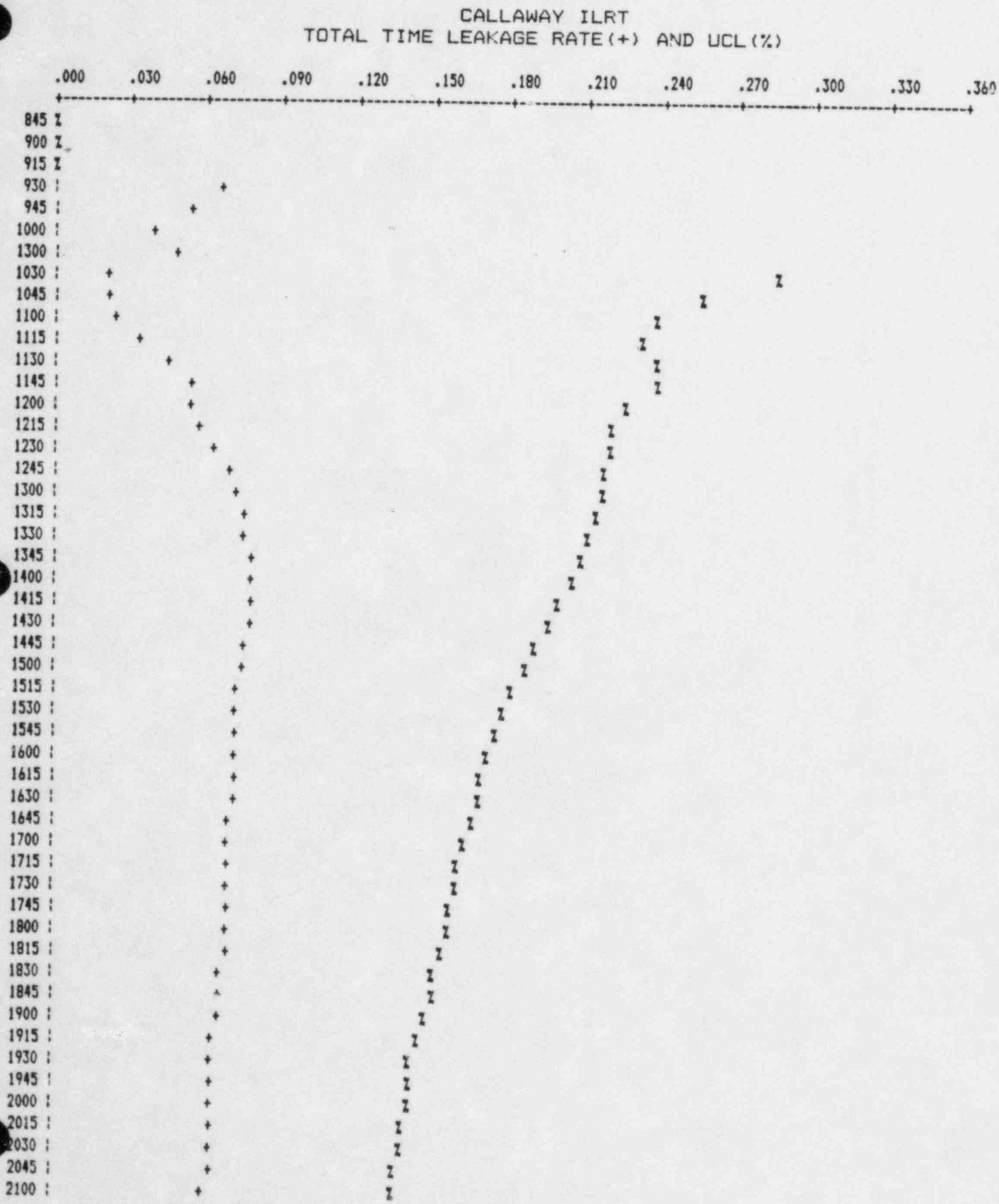


CALLAWAY ILRT
MASS POINT LEAKAGE RATE(+) AND UCL(%)

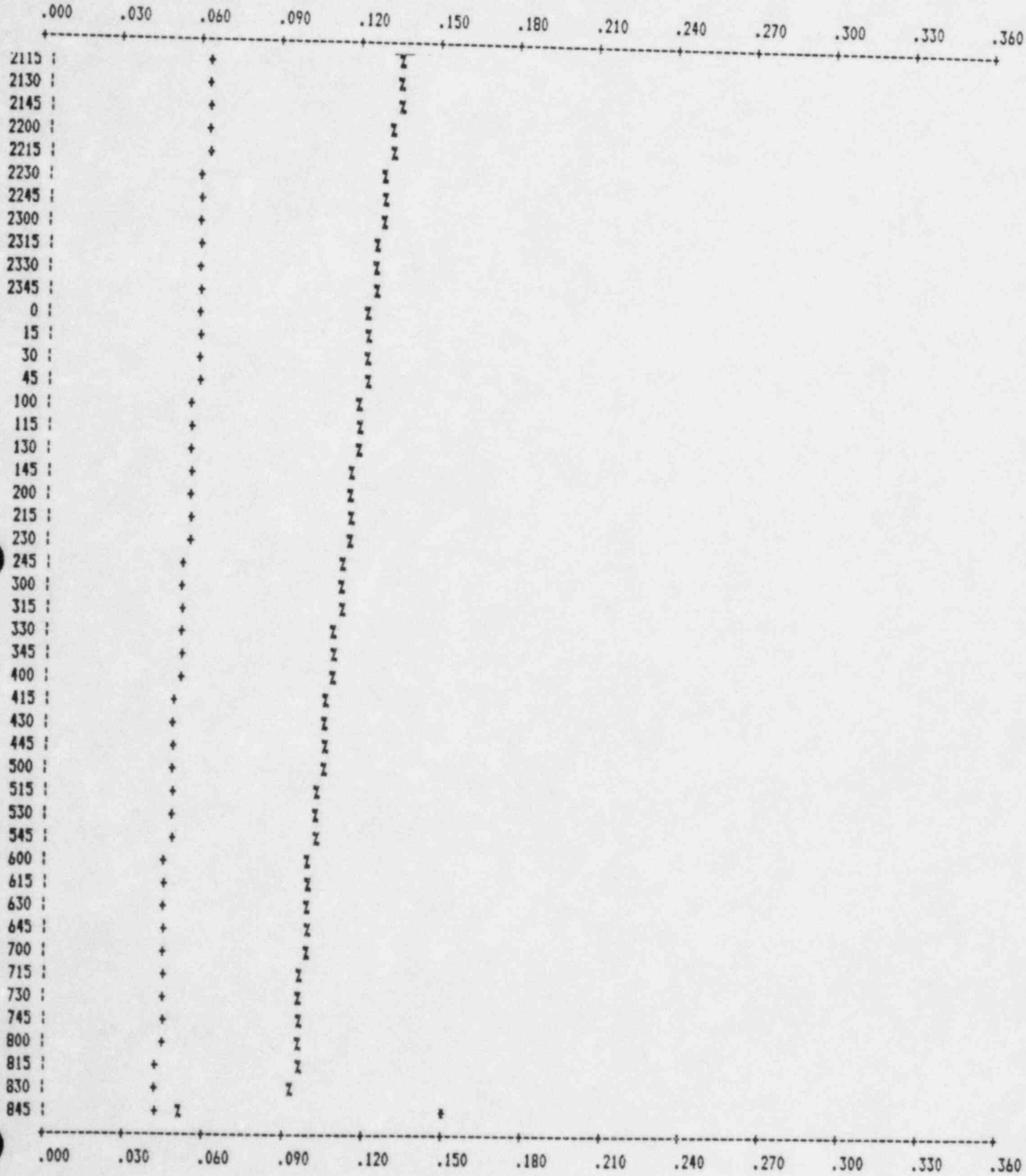


CALLAWAY ILRT
MASS POINT LEAKAGE RATE(+) AND UCL(%) (CONT'D)

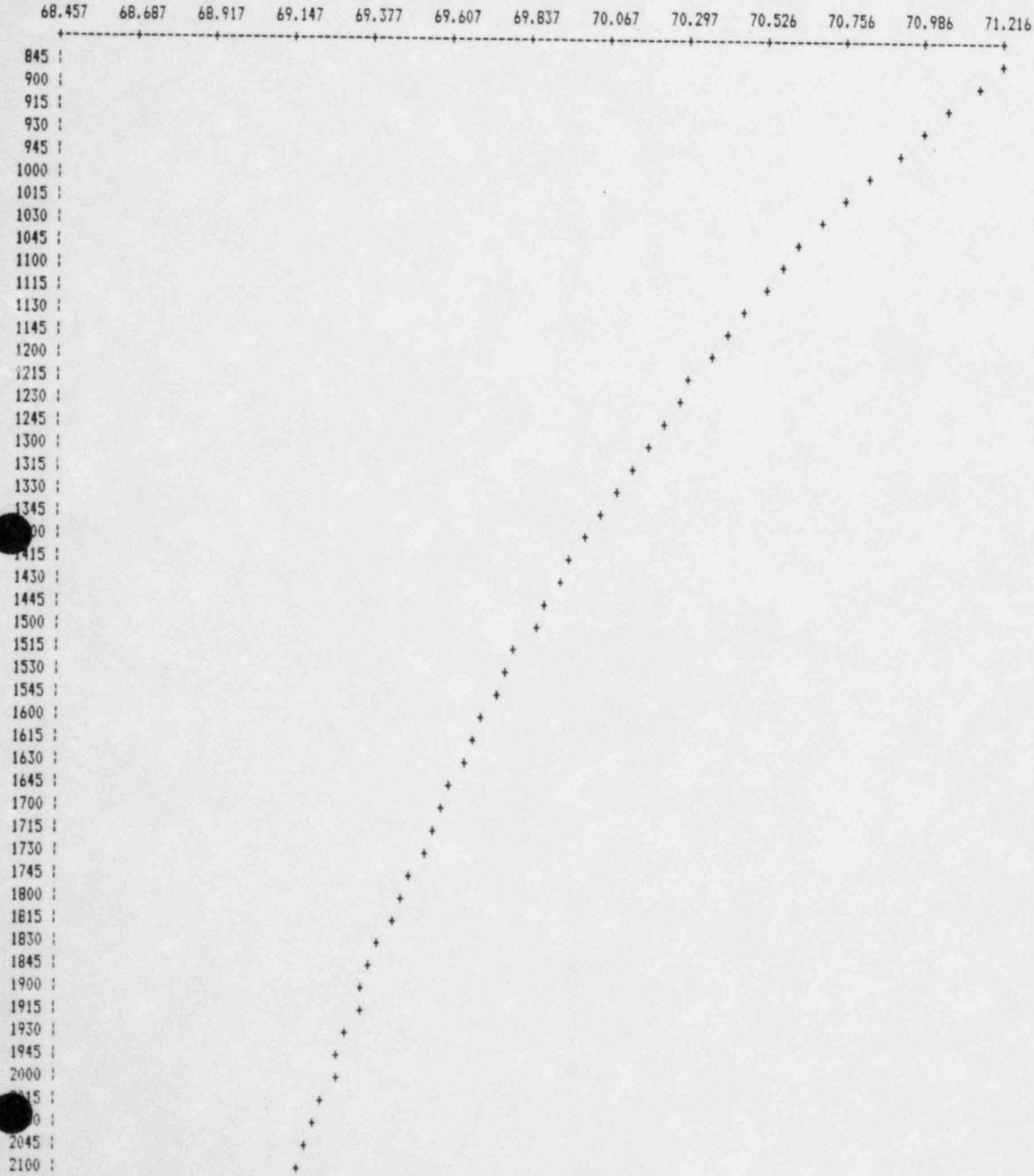



CALLAWAY ILRT
TOTAL TIME LEAKAGE RATE(+) AND UCL(%)
.000
.030
.060
.090
.120
.150
.180
.210
.240
.270
.300
.330
.360
845
900
915
930
945
1000
1300
1030
1045
1100
1115
1130
1145
1200
1215
1230
1245
1300
1315
1330
1345
1400
1415
1430
1445
1500
1515
1530
1545
1600
1615
1630
1645
1700
1715
1730
1745
1800
1815
1830
1845
1900
1915
1930
1945
2000
2015
2030
2045
2100

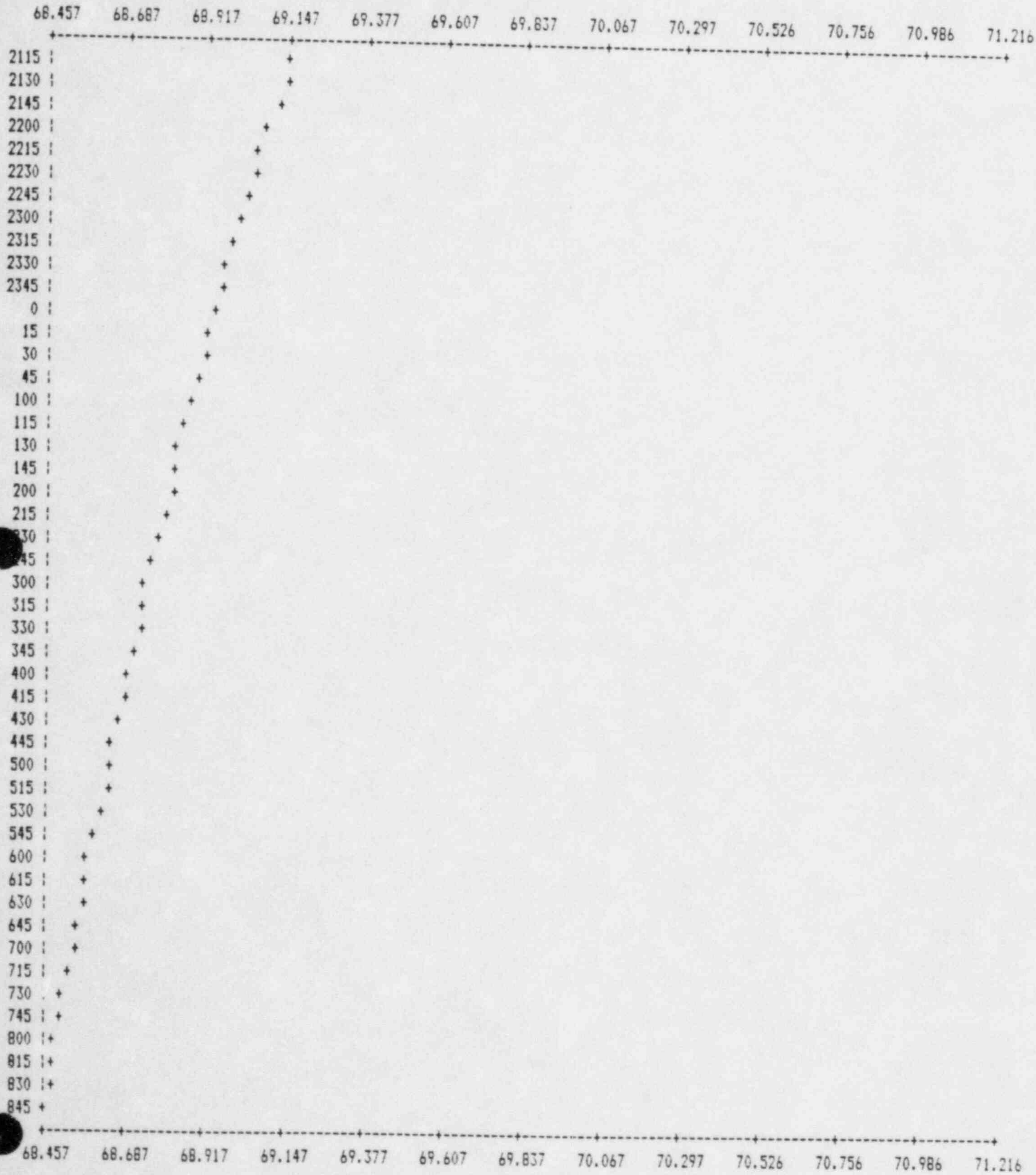
CALLAWAY ILRT
TOTAL TIME LEAKAGE RATE(+) AND UCL(%) (CONT'D)

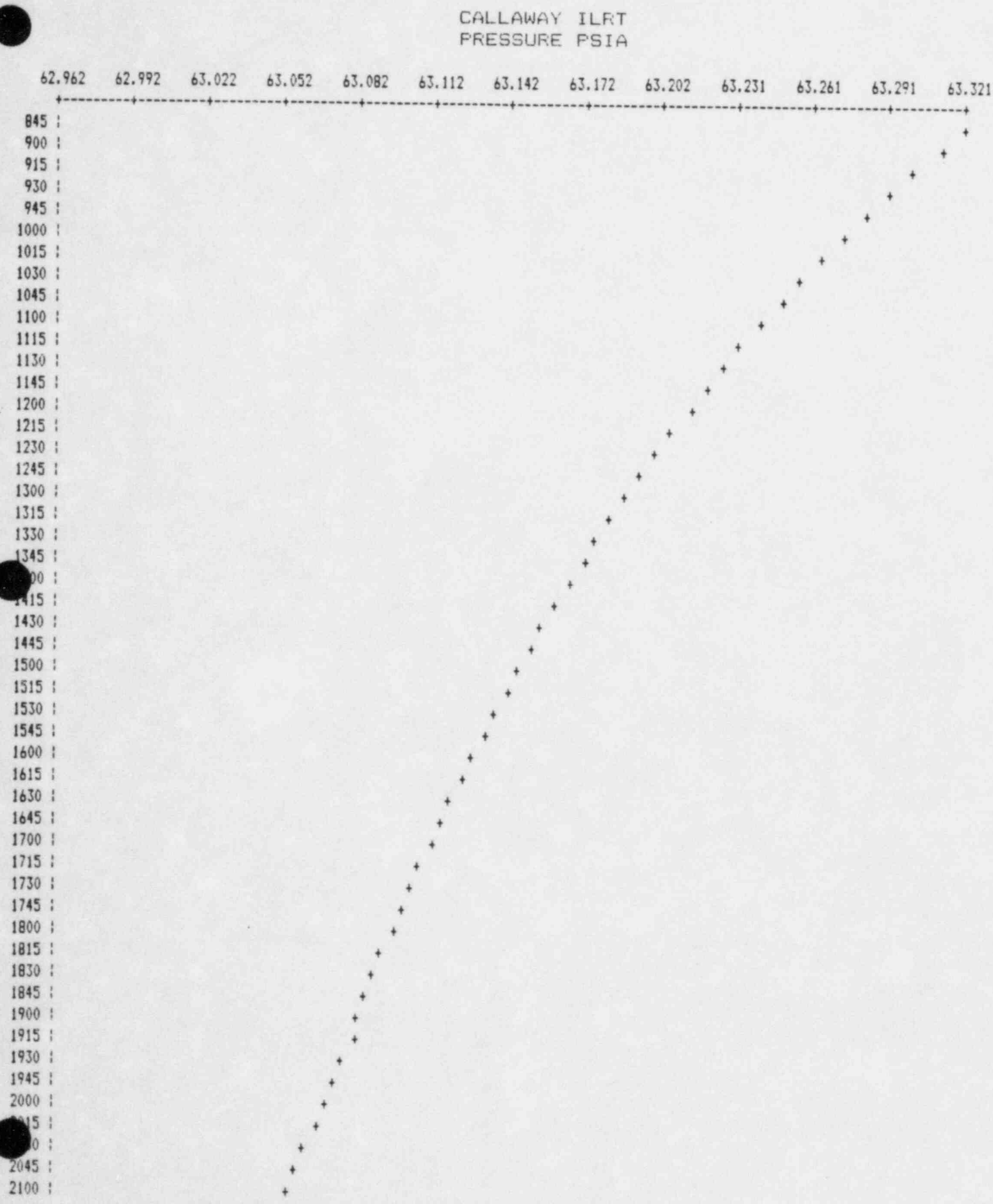


CALLAWAY ILRT
TEMPERATURE DEGREES F

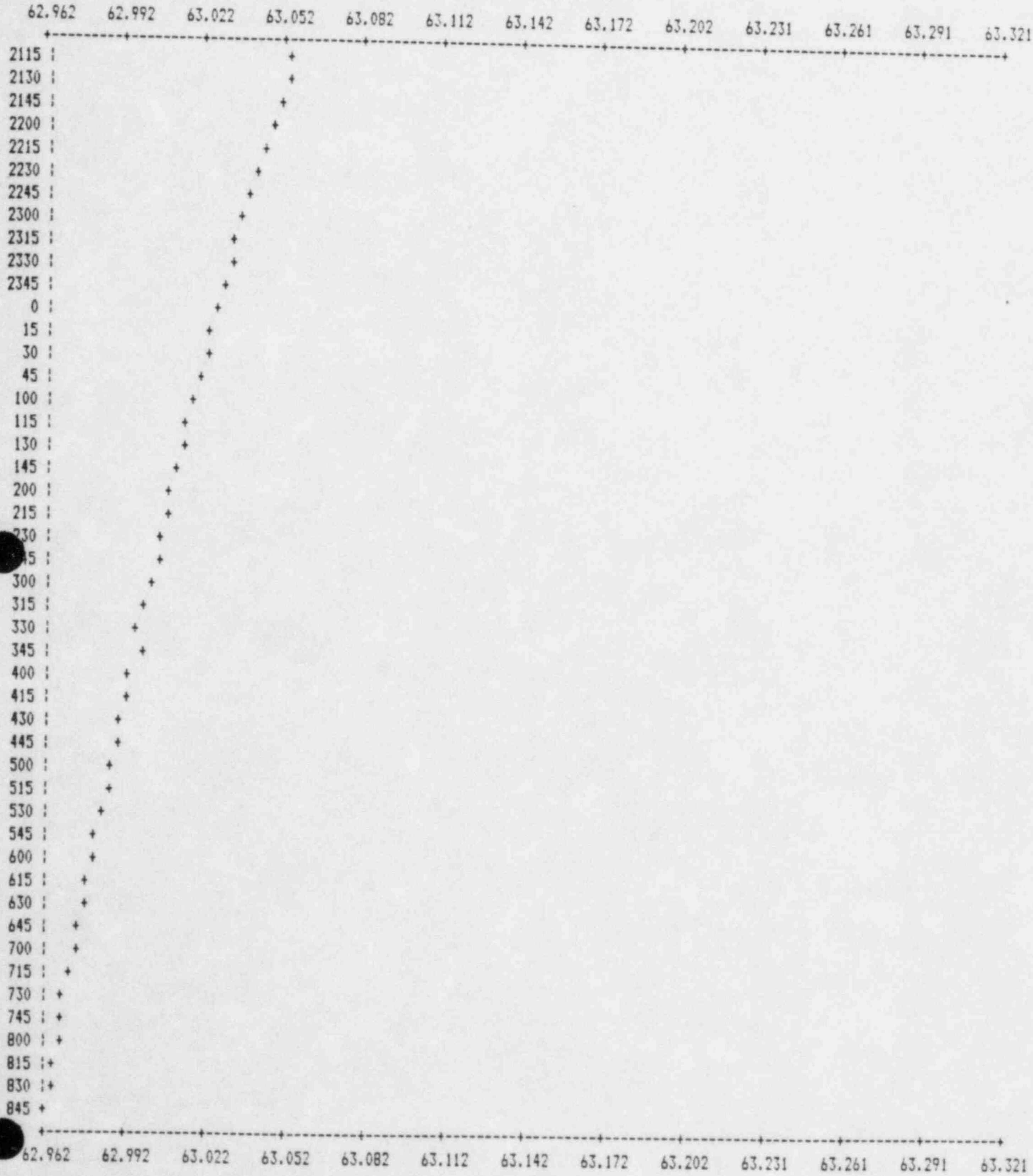


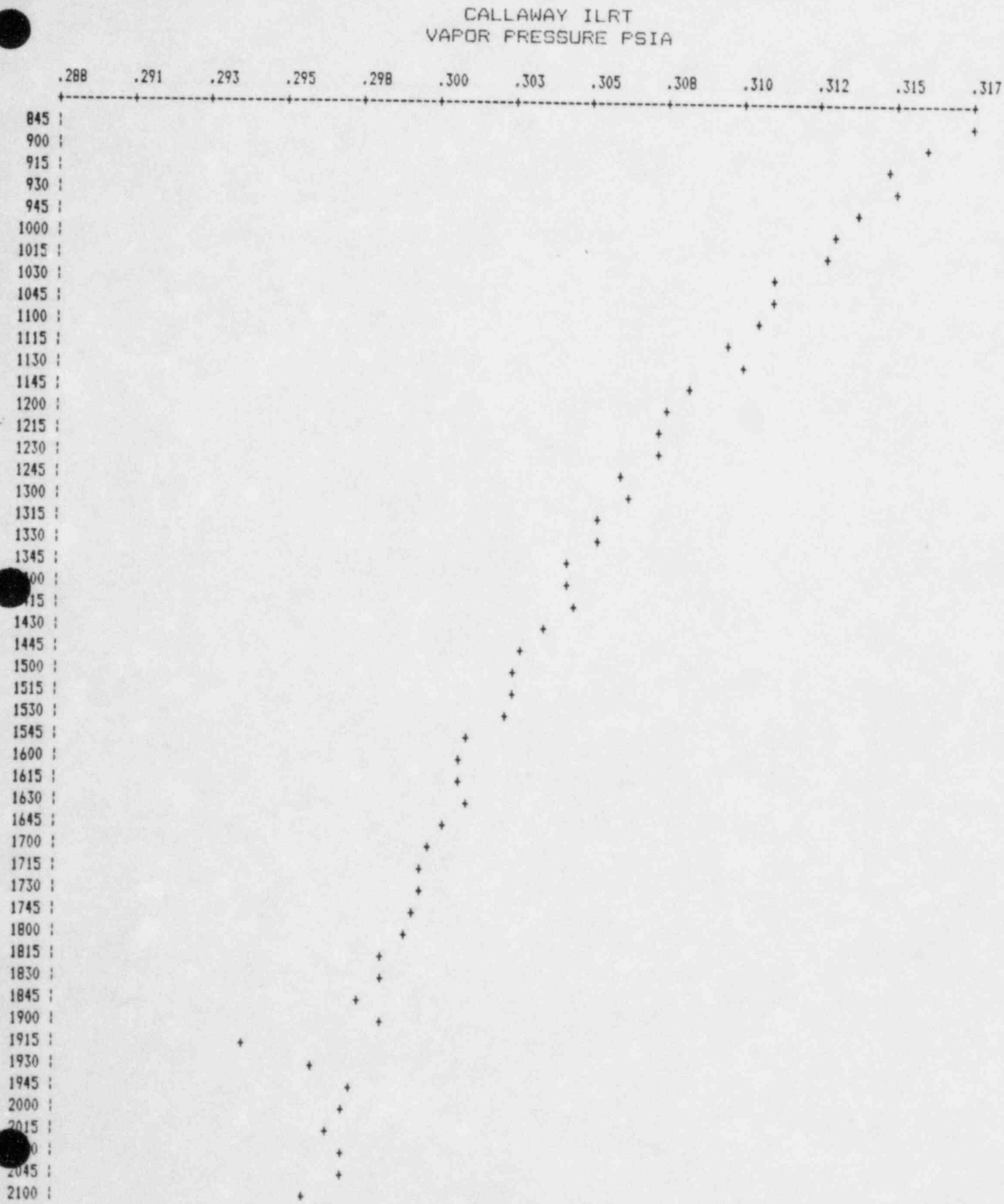
CALLAWAY ILRT
TEMPERATURE DEGREES F (CONT'D)



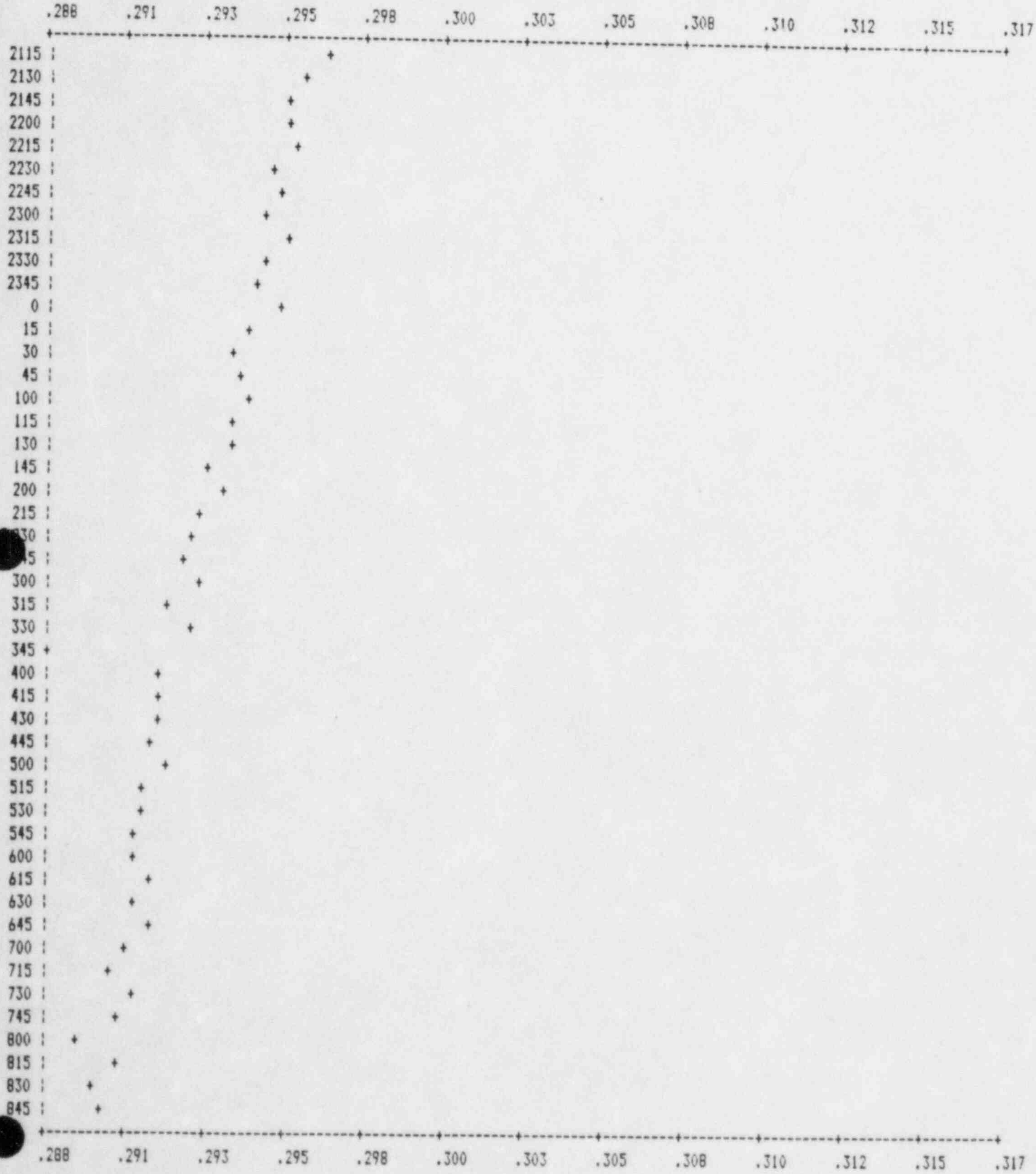

CALLAWAY ILRT
PRESSURE PSIA
62.962
62.992
63.022
63.052
63.082
63.112
63.142
63.172
63.202
63.231
63.261
63.291
63.321
845
900
915
930
945
1000
1015
1030
1045
1100
1115
1130
1145
1200
1215
1230
1245
1300
1315
1330
1345
1415
1430
1445
1500
1515
1530
1545
1600
1615
1630
1645
1700
1715
1730
1745
1800
1815
1830
1845
1900
1915
1930
1945
2000
2045
2100

CALLAWAY ILRT
PRESSURE PSIA (CONT'D)




CALLAWAY ILRT
VAPOR PRESSURE PSIA
.288
.291
.293
.295
.298
.300
.303
.305
.308
.310
.312
.315
.317
845
900
915
930
945
1000
1015
1030
1045
1100
1115
1130
1145
1200
1215
1230
1245
1300
1315
1330
1345
1430
1445
1500
1515
1530
1545
1600
1615
1630
1645
1700
1715
1730
1745
1800
1815
1830
1845
1900
1915
1930
1945
2000
2100

CALLAWAY ILRT
VAPOR PRESSURE PSIA (CONT'D)



APPENDIX F

VERIFICATION TEST SUMMARY DATA

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
MASS POINT ANALYSIS

TIME AND DATE AT START OF TEST: 950 108 1984
TEST DURATION: 4.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	CTMT. AIR MASS (LBM)	MASS LOSS (LBM)	AVERAGE MASS LOSS (LBM/HR)
950	528.075	62.9508	804405.		
1005	528.059	62.9487	804402.	2.5	10.0
1020	528.053	62.9462	804379.	23.8	52.6
1035	528.044	62.9428	804348.	30.8	76.1
1050	528.045	62.9410	804325.	23.4	80.4
1105	528.022	62.9383	804325.	-.8	63.7
1120	528.024	62.9347	804276.	49.1	85.8
1135	528.001	62.9316	804272.	4.6	76.2
1150	527.989	62.9288	804255.	16.5	74.9
1205	527.982	62.9257	804225.	30.4	80.1
1220	527.971	62.9232	804210.	14.8	78.0
1235	527.956	62.9202	804194.	16.2	76.8
1250	527.962	62.9187	804166.	27.9	79.7
1305	527.946	62.9167	804165.	.9	73.9
1320	527.930	62.9136	804149.	15.6	73.0
1335	527.923	62.9109	804126.	23.4	74.4
1350	527.908	62.9079	804111.	15.4	73.6

FREE AIR VOLUME USED (CU. FT.) =2500000.
REGRESSION LINE
INTERCEPT (LBM) = 804408.
SLOPE (LBM/HR) = -76.4
VERIFICATION TEST LEAKAGE RATE UPPER LIMIT = .295
VERIFICATION TEST LEAKAGE RATE LOWER LIMIT = .195
THE CALCULATED LEAKAGE RATE = .228

CALLAWAY ILRT
LEAKAGE RATE (WEIGHT PERCENT/DAY)
TOTAL TIME ANALYSIS

TIME AND DATE AT START OF TEST: 950 108 1984
TEST DURATION: 4.00 HOURS

TIME	TEMP (R)	PRESSURE (PSIA)	MEASURED LEAKAGE RATE
950	528.075	62.9508	
1005	528.059	62.9487	.030
1020	528.053	62.9462	.157
1035	528.044	62.9428	.227
1050	528.045	62.9410	.240
1105	528.022	62.9383	.190
1120	528.024	62.9347	.256
1135	528.001	62.9316	.227
1150	527.989	62.9288	.223
1205	527.982	62.9257	.239
1220	527.971	62.9232	.233
1235	527.956	62.9202	.229
1250	527.962	62.9187	.238
1305	527.946	62.9167	.220
1320	527.930	62.9136	.218
1335	527.923	62.9109	.222
1350	527.908	62.9079	.220

MEAN OF THE MEASURED LEAKAGE RATES = .211
VERIFICATION TEST LEAKAGE RATE UPPER LIMIT = .293
VERIFICATION TEST LEAKAGE RATE LOWER LIMIT = .193
THE CALCULATED LEAKAGE RATE = .251

CALLAWAY ILRT
SUMMARY DATA

ALMAX = .200
VRATET = .243

VOLUME = 2500000.
VRATEM = .245

TIME	DATE	TEMP	PRESSURE	VPRS	VOLUME
950	108	528.075	62.9508	.2902	2500000.
1005	108	528.059	62.9487	.2893	2500000.
1020	108	528.053	62.9462	.2888	2500000.
1035	108	528.044	62.9428	.2892	2500000.
1050	108	528.045	62.9410	.2885	2500000.
1105	108	528.022	62.9383	.2882	2500000.
1120	108	528.024	62.9347	.2883	2500000.
1135	108	528.001	62.9316	.2889	2500000.
1150	108	527.989	62.9288	.2887	2500000.
1205	108	527.982	62.9257	.2888	2500000.
1220	108	527.971	62.9232	.2883	2500000.
1235	108	527.956	62.9202	.2888	2500000.
1250	108	527.962	62.9187	.2883	2500000.
1305	108	527.946	62.9167	.2878	2500000.
1320	108	527.930	62.9136	.2879	2500000.
1335	108	527.923	62.9109	.2881	2500000.
1350	108	527.908	62.9079	.2881	2500000.

APPENDIX G

ISG CALCULATIONS

ISG Calculations

Reference ANSI/ANS 56.8-1981, Appendix G

A. Test Parameters

La	= 0.2 %/day	leakage rate
P	= 62.8 psia	containment pressure
T	= 528 °R	drybulb, average temperature
Tdp	= 63 °F	dewpoint temperature
t	= 24 Hr.	test duration

B. Instrument Parameters

1. Total Absolute Pressure

No. of sensors:	1
Range:	0-100 psia
Sensitivity error (E_{P_V}):	.001 psia
Repeatability (ε_{P_V}):	.001 % of full scale

$$e_P = \pm\sqrt{\frac{(EP)^2 + (^{\varepsilon}P)^2}{\text{No. of sensors}}} = \sqrt{\frac{.000001 + .000007}{1}} = \pm\ .0014142$$

2. Water Vapor Pressure

No. of sensors:	6
Sensitivity error (E_{P_V}):	$\pm$ .10 °F
Repeatability error (ε_{P_V}):	$\mp$ .05 °F
Dewpoint temperature	$\overline{7}$8 °F
Vapor pressure change @ 47 °F:	.0094 psia/°F

E_{P_V} = (.10) (.006) = .0006

ε_{P_V} = (.05) (.006) = .0003

$$e_{pv} = \pm\sqrt{\frac{EPv^2 + {}^{\varepsilon}pv^2}{\text{No. of sensors}}} = \sqrt{\frac{.00000036 + .00000003}{6}} = .00027386$$

3. Temperature

No. of sensors	: 24
Sensitivity error (E_T)	: 0.1 °F
Repeatability error (ε_T):	.05 °F

$$e_T = \pm\sqrt{\frac{E_T2 + \varepsilon_T2}{\text{No. of sensors}}} = \pm\sqrt{\frac{.01 + .0025}{24}} = .0228217$$

C. ISG

$$ISG = \pm \frac{2400}{t} \left[2\left(\frac{e_p}{P}\right)^2 + 2\left(\frac{e_{pv}}{P}\right)^2 + \left(\frac{e_T}{T}\right)^2 \right]^{1/2}$$

$$= \pm \frac{2400}{24} \sqrt{2\left(\frac{.0014142}{62.8}\right)^2 + 2\left(\frac{.00027386}{62.8}\right)^2 + 2\left(\frac{.0228217}{528}\right)^2}$$

$$ISG = \pm \frac{2400}{24} \ (.000069199) = .0069199 \ \%/day$$

$$.25 \ La = (.25)\ (.2) = .05 > .0069199$$

APPENDIX H

LLRT SUMMARY

APPENDIX H

SUMMARY OF LOCAL LEAK RATE TEST RESULTS

Sum of measured leakages	17,318	sccm
Sum of the squares of errors	141,782	sccm
Square root of the sum of squares	376	sccm

Reported leakage rate =

= sum of measured leakages + square root of the sum of squares
= 17,318 + 376 = 17,694 = .00842%/day.

Acceptance criteria: Reported leakage < .6La

.6La = (.6)(.2) = .12%/day = 252,028 sccm

17,695 sccm (.00842%/day) < 252,028 sccm (.12%/day)

Total local leak rate is meeting the acceptance criteria.

APPENDIX I

CALLAWAY COMPUTER ILRT SUMMARY DATA

TIME 8.475

CALLAWAY ILRT DATA REDUCTION PROGRAM

ILRT TEST SUMMARY

	DATE	TIME
TEST START:	1-07-1984	8.725
TEST STOP:	1-08-1984	8.475

MASS POINT METHOD

TEST TIME HRS.	LEAK RATE %/DAY	95% CONFIDENCE LIMIT %/DAY	CONTAINMENT AIR MASS LBMS

MASS POINT METHOD

TIME HRS.	LEAK RATE %/DAY	CONFIDENCE LIMIT %/DAY	CONTAINMENT A[illegible] MASS LBMS
0.500	0.21944246E-01	0.16314017E+01	0.80485142E+06
0.750	0.10221926E+00	0.38479140E+00	0.80481804E+06
1.000	0.93562555E-01	0.22464788E+00	0.80481983E+06
1.250	0.73631534E-01	0.15510946E+00	0.80482223E+06
1.500	0.80539712E-01	0.13558574E+00	0.80480508E+06
1.750	0.42273136E-01	0.10065681E+00	0.80483973E+06
2.000	0.43185264E-01	0.87289847E-01	0.80481258E+06
2.250	0.45528712E-01	0.80153174E-01	0.80480607E+06
2.500	0.54929306E-01	0.84520869E-01	0.80478727E+06
2.750	0.69189671E-01	0.97743630E-01	0.80476340E+06
3.000	0.78059542E-01	0.10367894E+00	0.80475696E+06
3.250	0.76171066E-01	0.98030606E-01	0.80477232E+06
3.500	0.75683450E-01	0.94500325E-01	0.80476345E+06
3.750	0.83248846E-01	0.10133240E+00	0.80472711E+06
4.000	0.86471970E-01	0.10267709E+00	0.80472855E+06
4.250	0.90962621E-01	0.10599985E+00	0.80471065E+06
4.500	0.91749856E-01	0.10517449E+00	0.80471591E+06
4.750	0.92163874E-01	0.10421112E+00	0.80470916E+06
5.000	0.92532284E-01	0.10340475E+00	0.80470103E+06
5.250	0.91880838E-01	0.10175876E+00	0.80469984E+06
5.500	0.89185211E-01	0.98571885E-01	0.80470910E+06
5.750	0.87507933E-01	0.96252520E-01	0.80469828E+06
6.000	0.84400452E-01	0.92997723E-01	0.80470731E+06
6.250	0.83035302E-01	0.91070367E-01	0.80468966E+06
6.500	0.80457922E-01	0.88308003E-01	0.80469848E+06
6.750	0.79063757E-01	0.86469993E-01	0.80468414E+06
7.000	0.78601319E-01	0.85501740E-01	0.80466946E+06
7.250	0.77140478E-01	0.83730304E-01	0.80467697E+06
7.500	0.76395338E-01	0.82595546E-01	0.80466426E+06
7.750	0.75938280E-01	0.81761457E-01	0.80465554E+06
8.000	0.75389683E-01	0.80880325E-01	0.80465183E+06
8.250	0.74553698E-01	0.79780459E-01	0.80465181E+06
8.500	0.73959811E-01	0.78917286E-01	0.80464368E+06
8.750	0.73804747E-01	0.78485067E-01	0.80463105E+06
9.000	0.73374457E-01	0.77817932E-01	0.80463074E+06
9.250	0.73276100E-01	0.77483460E-01	0.80461905E+06
9.500	0.72286305E-01	0.76389804E-01	0.80463265E+06
9.750	0.70977906E-01	0.75076407E-01	0.80463713E+06
10.00	0.69862175E-01	0.73906517E-01	0.80463093E+06
10.25	0.69238676E-01	0.73135425E-01	0.80461649E+06
10.50	0.67014106E-01	0.71310728E-01	0.80465521E+06
10.75	0.65232119E-01	0.69681459E-01	0.80464537E+06
11.00	0.64767295E-01	0.69040448E-01	0.80460837E+06
11.25	0.65176059E-01	0.69280488E-01	0.80457830E+06
11.50	0.64690129E-01	0.68646110E-01	0.80459947E+06
11.75	0.64468247E-01	0.68263693E-01	0.80458728E+06

12.00	0.64398753E-01	0.68038250E-01	0.8045775[illegible]E+06
12.25	0.63549738E-01	0.67137623E-01	0.80460021E+06
12.50	0.63033612E-01	0.66515396E-01	0.80458611E+06
12.75	0.62717037E-01	0.66077562E-01	0.80457535E+06
13.00	0.62233021E-01	0.65499226E-01	0.80457816E+06
13.25	0.61545796E-01	0.64759340E-01	0.80458353E+06
13.50	0.60972814E-01	0.64117567E-01	0.80457657E+06
13.75	0.60412677E-01	0.63492032E-01	0.80457352E+06
14.00	0.60185922E-01	0.63164322E-01	0.80455569E+06
14.25	0.59809429E-01	0.62707120E-01	0.80455889E+06
14.50	0.59705776E-01	0.62506175E-01	0.80454221E+06
14.75	0.59141403E-01	0.61901942E-01	0.80456128E+06
15.00	0.58740144E-01	0.61437351E-01	0.80455054E+06
15.25	0.58640550E-01	0.61251804E-01	0.80453120E+06
15.50	0.58330295E-01	0.60875632E-01	0.80453867E+06
15.75	0.58112292E-01	0.60586402E-01	0.80453006E+06
16.00	0.58020566E-01	0.60419585E-01	0.80451878E+06
16.25	0.57560784E-01	0.59928382E-01	0.80453716E+06
16.50	0.57202194E-01	0.59524431E-01	0.80452844E+06
16.75	0.56620621E-01	0.58942646E-01	0.80454028E+06
17.00	0.56260146E-01	0.58540954E-01	0.80452392E+06
17.25	0.56315428E-01	0.58531240E-01	0.80449242E+06
17.50	0.55961474E-01	0.58141228E-01	0.80451661E+06
17.75	0.55546589E-01	0.57702676E-01	0.80451850E+06
18.00	0.55004308E-01	0.57164891E-01	0.80452596E+06
18.25	0.54523421E-01	0.56675545E-01	0.80451991E+06
18.50	0.54142927E-01	0.56269025E-01	0.80451032E+06
18.75	0.53878347E-01	0.55963713E-01	0.80449870E+06
19.00	0.52855527E-01	0.55112046E-01	0.80455951E+06
19.25	0.52379766E-01	0.54625150E-01	0.80451457E+06
19.50	0.51887467E-01	0.54126246E-01	0.80451475E+06
19.75	0.51312721E-01	0.53564021E-01	0.80452113E+06
20.00	0.50883514E-01	0.53117303E-01	0.80450717E+06
20.25	0.50453017E-01	0.52670916E-01	0.80450595E+06
20.50	0.50113808E-01	0.52302347E-01	0.80449578E+06
20.75	0.49724081E-01	0.51892767E-01	0.80449898E+06
21.00	0.49373682E-01	0.51517626E-01	0.80449354E+06
21.25	0.48805333E-01	0.50969115E-01	0.80451469E+06
21.50	0.48414450E-01	0.50561276E-01	0.80449571E+06
21.75	0.48135441E-01	0.50250240E-01	0.80448226E+06
22.00	0.47987674E-01	0.50059548E-01	0.80446559E+06
22.25	0.47665523E-01	0.49714574E-01	0.80448263E+06
22.50	0.47283317E-01	0.49320394E-01	0.80448809E+06
22.75	0.46974081E-01	0.48988617E-01	0.80447831E+06
23.00	0.46691020E-01	0.48680631E-01	0.80447356E+06
23.25	0.46215826E-01	0.48215556E-01	0.80449583E+06
23.50	0.45964658E-01	0.47936847E-01	0.80446715E+06
23.75	0.45635212E-01	0.47591794E-01	0.80447549E+06

MASS POINT METHOD

CALCULATED LEAKAGE RATE = 0.0456

95% UCL = 0.0475

TEST TIME HRS.	LEAK RATE %/DAY	95% CONFIDENCE LIMIT %/DAY	MEASURED LEAK RATE %/DAY
0.000	0.99990000E+04	0.99990000E+04	0.99990000E+04
0.250	0.34771836E+00	0.99990000E+04	0.34771836E+00
0.500	0.21944032E-01	0.99990000E+04	0.21944032E-01
0.750	0.72140976E-01	0.18564647E+01	0.14733523E+00
1.000	0.65201360E-01	0.76872455E+00	0.10516648E+00
1.250	0.49032845E-01	0.50440354E+00	0.78404797E-01
1.500	0.53744393E-01	0.41422841E+00	0.99428045E-01
1.750	0.23899080E-01	0.31890806E+00	0.26195303E-01
2.000	0.22054408E-01	0.28310497E+00	0.63398445E-01
2.250	0.22422934E-01	0.25999241E+00	0.64980239E-01
2.500	0.28938934E-01	0.25173650E+00	0.80904225E-01
2.750	0.40063735E-01	0.25341527E+00	0.99430491E-01
3.000	0.48113288E-01	0.25133251E+00	0.97545027E-01
3.250	0.48562146E-01	0.24004396E+00	0.75950778E-01
3.500	0.49704065E-01	0.23145575E+00	0.78080481E-01
3.750	0.56531904E-01	0.23208856E+00	0.10177185E+00
4.000	0.60441673E-01	0.22926601E+00	0.94338477E-01
4.250	0.65241825E-01	0.22841502E+00	0.10134922E+00
4.500	0.67404516E-01	0.22467305E+00	0.92231839E-01
4.750	0.69157339E-01	0.22103012E+00	0.91618797E-01
5.000	0.70740989E-01	0.21770634E+00	0.91884756E-01
5.250	0.71478879E-01	0.21382004E+00	0.88187567E-01
5.500	0.70622264E-01	0.20853304E+00	0.79155258E-01
5.750	0.70289275E-01	0.20420278E+00	0.81323729E-01
6.000	0.68812399E-01	0.19895177E+00	0.73447783E-01
6.250	0.68398853E-01	0.19514578E+00	0.78932701E-01
6.500	0.67046322E-01	0.19056832E+00	0.71850141E-01
6.750	0.66411051E-01	0.18699194E+00	0.75522546E-01
7.000	0.66366221E-01	0.18427704E+00	0.79080143E-01
7.250	0.65594431E-01	0.18091985E+00	0.73264390E-01
7.500	0.65268586E-01	0.17821635E+00	0.75877262E-01
7.750	0.65115760E-01	0.17584933E+00	0.76784344E-01
8.000	0.64881750E-01	0.17351605E+00	0.75765900E-01
8.250	0.64429223E-01	0.17105336E+00	0.73478468E-01
8.500	0.64120694E-01	0.16885845E+00	0.74169662E-01
8.750	0.64101041E-01	0.16708878E+00	0.76353059E-01
9.000	0.63886811E-01	0.16518357E+00	0.74335657E-01
9.250	0.63892409E-01	0.16361052E+00	0.76095267E-01
9.500	0.63279049E-01	0.16141876E+00	0.69822842E-01
9.750	0.62422712E-01	0.15903946E+00	0.66663171E-01

TOTAL TIME METHOD

TOTAL TIME METHOD

10.00	0.61671560E-01	0.15683946E+00	0.66844955E-01
10.25	0.61239013E-01	0.15504819E+00	0.69416591E-01
10.50	0.59692600E-01	0.15216214E+00	0.56767184E-01
10.75	0.58408765E-01	0.14958820E+00	0.58177523E-01
11.00	0.58002658E-01	0.14799427E+00	0.66884285E-01
11.25	0.58197298E-01	0.14714360E+00	0.73367972E-01
11.50	0.57793933E-01	0.14563759E+00	0.66285105E-01
11.75	0.57569748E-01	0.14437426E+00	0.67967393E-01
12.00	0.57453446E-01	0.14327190E+00	0.68969233E-01
12.25	0.56807444E-01	0.14161292E+00	0.62044692E-01
12.50	0.56380633E-01	0.14022787E+00	0.64168693E-01
12.75	0.56088090E-01	0.13902526E+00	0.65427550E-01
13.00	0.55681818E-01	0.13772482E+00	0.63522793E-01
13.25	0.55134248E-01	0.13629791E+00	0.61116144E-01
13.50	0.54659481E-01	0.13497823E+00	0.61523071E-01
13.75	0.54190299E-01	0.13369075E+00	0.61064252E-01
14.00	0.53946435E-01	0.13268058E+00	0.63772840E-01
14.25	0.53602952E-01	0.13158001E+00	0.61984755E-01
14.50	0.53446181E-01	0.13071443E+00	0.64346351E-01
14.75	0.52978979E-01	0.12951862E+00	0.59400140E-01
15.00	0.52620131E-01	0.12846313E+00	0.60545264E-01
15.25	0.52466878E-01	0.12766118E+00	0.63333979E-01
15.50	0.52173978E-01	0.12671619E+00	0.60875041E-01
15.75	0.51944769E-01	0.12586085E+00	0.61539753E-01
16.00	0.51803731E-01	0.12512351E+00	0.62679047E-01
16.25	0.51415421E-01	0.12412017E+00	0.58342093E-01
16.50	0.51094290E-01	0.12320716E+00	0.59034758E-01
16.75	0.50620896E-01	0.12214072E+00	0.56045965E-01
17.00	0.50294691E-01	0.12125113E+00	0.58090227E-01
17.25	0.50251440E-01	0.12070284E+00	0.62694949E-01
17.50	0.49934956E-01	0.11984937E+00	0.57677380E-01
17.75	0.49576631E-01	0.11896158E+00	0.56547530E-01

TOTAL TIME METHOD

18.00	0.49130430E-01	0.11798935E+00	0.54525493E-01
18.25	0.48723170E-01	0.11707153E+00	0.54767464E-01
18.50	0.48382299E-01	0.11623853E+00	0.55572358E-01
18.75	0.48119696E-01	0.11550450E+00	0.56680299E-01
19.00	0.47342579E-01	0.11423426E+00	0.46391000E-01
19.25	0.46928677E-01	0.11335239E+00	0.52749107E-0
19.50	0.46502080E-01	0.11246647E+00	0.52045313E-0
19.75	0.46017864E-01	0.11152769E+00	0.50423660E-0
20.00	0.45629948E-01	0.11070308E+00	0.51874111E-01
20.25	0.45240431E-01	0.10988548E+00	0.51414354E-01
20.50	0.44912173E-01	0.10914460E+00	0.52265897E-01
20.75	0.44549995E-01	0.10837383E+00	0.51176449E-01
21.00	0.44214255E-01	0.10764046E+00	0.51339739E-01
21.25	0.43730849E-01	0.10675293E+00	0.47768238E-01
21.50	0.43365566E-01	0.10600185E+00	0.49845435E-01
21.75	0.43075931E-01	0.10534304E+00	0.51116561E-01
22.00	0.42876297E-01	0.10479493E+00	0.52794944E-01
22.25	0.42560821E-01	0.10411975E+00	0.49918109E-01
22.50	0.42205058E-01	0.10340584E+00	0.48639874E-01
22.75	0.41898493E-01	0.10275346E+00	0.49386355E-01
23.00	0.41610175E-01	0.10212781E+00	0.49465437E-01
23.25	0.41192455E-01	0.10136395E+00	0.46077279E-01
23.50	0.40925215E-01	0.10077417E+00	0.49226464E-01
23.75	0.40606027E-01	0.10013069E+00	0.47661940E-01

CALCULATED LEAKAGE RATE = 0.0406

95% UCL = 0.10013

CALLAWAY ILRT DATA REDUCTION PROGRAM TERMINATED