BEST ESTIMATE POST TEST PREDICTION

FOR LOFT NUCLEAR EXPERIMENT L3-6

by

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1.0 Introduction

This document contains the Yankee Atomic Electric Company post test prediction of the coupled system thermal-hydraulic response for the Loss of Fluid Test (LOFT) System during Loss of Coolant Experiment (LOCE) L3-6.

The RELAP4/Mod3[1] and RELAP5/Mod[2] computer codes were used to calculate the thermal-hydraulic behavior in the LOFT system during LOCE L3-6.

The analytical models used to perform this prediction should be recognized as "best estimate" predictive mechanisms.

2.0 Model Description for RELAP4/Mod3

2.1 Calculational Overview

The code used for the post test analysis presented in this section of the report is RELAP4/Mod3 version YAEC-05B.

Two update changes were made to the code; one to represent the behavior of the LOFT steam flow control valve in the secondary side of the steam generator, another to allow the use of different contraction coefficients for subcooled and two-phase critical flow.

A listing of the input description and update diagrams is given in Appendix A.

2.2 Blowdown Model

The RELAP4/Mod3 LOFT system model used to calculate blowdown during LOCE L3-6 is described in this section.

A schematic of the LOFT system is given in Figure 1.

The model used for LOCE L3-6 is a modification of the EG&G LOFT L3-1 model (Reference 3). The following changes were made to the base nodalization (Reference 3) for this analysis:

1. The break location was moved from the broken loop cold leg to the intact loop cold leg and the new break spool piece was modeled.

2. The accumulator was removed.

3. Primary coolant injection flows were added to properly account for the system mass inventory.

4. For modeling two-phase degradation behavior, data that describe the pump two-phase head and torque characteristics are needed. The new LOFT head and torque multipliers based on experimetnal data, presented by EG&G in Reference 4 has been used.

5. A new volume (33) representing the pipe which connects the steam generator secondary steam dome to the steam relief valve was added to the nodalization of the steam generator secondary. Complete phase separation was used in this volume.

6. Two junctions (45 and 43) instead of one were used to represent the feedwater inlet and the auxiliary feedwater inlet, respectively.

7. Six junctions were used to model the leak through the steam flow relief valve; one before the valve cycled (junction 41) and a combination of 5 valves and 5 trips throughout the remainder of the transient.

8. High pressure injection system (HPSI) location was moved from the intact cold leg into the downcomer.

9. Only one volume was used to represent the core. A bypass volume representing 5% of the total core flow was added to the reactor vessel.

10. Phase separation was removed from all volumes except reactor vessel volumes, pressurizer and steam generator secondary.

11. The critical flow models specified for the junctions were the Henry Fauske model for the subcooled region and Moody model for the two phase region. Multipliers of 1.0 and 0.6 were applied for subcooled and saturated break flow, respectively.

A brief description of each control volume is given in Table 1. In specifying the system initial conditions, i.e., pressure, temperature, flow and power, the actual initial conditions of the LOFT facility at the test initiation were input to RELAP4 model within the bounds of measurement error and heat balance consistency (5).

A list of measured versus RELAP4 initial conditions are given in Table 2.

3.0 Comparison of Experimental Results in the RELAP4/Mode 3 Post Test Calculations.

This section presents comparisons between the experimental data provided by EG&G (Reference 6) and the post test predictions calculated by RELAP4. Short term (0 to 200 sec) and long term (0 to 2400 sec) results are presented. The selection of the parameters provided in this report was based on the availability and quality of the data, the correspondence between modeled volumes and physical locations of measurements, and the overall importance of the parameter in assessing the capability of th RELAP4 code.

Some results are presented without comparison with expermiental data when those data were unavailable.

Table 3 presents measured versus predicted (RELAP4) sequence of events for experiment L3-6.

3.1 Pressure

Comparison between calculated versus measured LOFT pressures are presented in Figures 2 through 7 for short-term plots (0 - 200 sec) and in Figures 19 through 24 for long term plots (0-2400 sec).

Good agreement is achieved between the calculated pressure in the primary system and the measured one up to 945 seconds. After 945 seconds, RELAP4 under predicts the data. At 1300 seconds, RELAP 4 predicts a 30 psia repressurization of the system. This is due to a change in break flow and break quality. Following the repressurization, the pressure in the primary system drops again until it reaches 330 psia at 2031.5 seconds.

In the secondary side of the steam generator, by carefully monitoring the leak through the steam relief valve, good agreement is achieved until 945 seconds. At 945 seconds, the pressure in the secondary side of the steam generator exceeds the primary system pressure. In the LOFT experiment, the two systems become decoupled at this point while in the RELAP4 calculation, the secondary pressure follows the primary pressure.

3.2 Differential Pressure

Differential pressures across core, pump, and steam generator intact loop are presented in Figures 13 through 15 for short (0 - 200 sec) and in Figures 29 through 31 for long term (0 - 2400 sec) results.

3.3 Fluid Temperature

Temperatures in intact loop hot leg and temperatures in the steam generator inlet and outlet plenums are presented in Figures 16 and 17.

The LOFT system reached saturation at the cold leg at 40 seconds while RELAP4 predicted saturation in the cold leg at 90 seconds in the transient. After reaching saturation, RELAP4 predicted the LOFT data well until 945 seconds. The temperatures are underpredicted (Figures 37 and 38) after 945 seconds and seem to follow the pressure prediction response.

3.4 Density

Densities in broken loop cold and hot legs and intact loop cold and hot legs are presented in Figures 9 through 12 for short term (0 - 200 sec) and in Figures 25 through 28 for long term (0 - 2400 sec) response. Good agreement with data is achieved.

3.5 Mass Flow Rate

The comparison between calculated versus measured break flow is presented in Figure 39. The RELAP4 results are within the measurement error band.

3.6 Liquid Mass in the System

Four plots for liquid mass in the reactor vessel (Figure 33), liquid mass in steam generator primary side (Figure 34), liquid mass in hot and cold leg, intact loop (Figure 35), and liquid mass in broken loop (Figure 36) are presented. Since data on LOFT liquid mass inventory are not available, no comparisons to the data have been made.

3.7 Liquid Levels

Level in the pressurizer is presented in Figure 18. RELAP4 calculated a delay of 3 seconds in emptying the pressurizer. This may have been caused by an initial lower level in the LOFT pressurizer as compared to the value used in the RELAP4 calculations.

The level in the core is presented in Figure 32. Again, data are not available but the LOFT instruments did not measure core uncovery. RELAP4 calculates uncovery of the core at 1300 seconds, recovery at 1500 seconds and finally uncovers again at 1550 seconds.

We are using Wilson bubble rise in the core. It seems that a homogeneous model in the core may have been more appropriate for the case where main coolant pumps are still available. This assumption would not have shown core uncovery, instead would show high voiding of the core.

4.0 References

1. Yankee Atomic Electric Company WREM based PWR-ECCS Evaluation Model (version YAEC-05B), YAEC 1160, July 1978.

2. Victor H. Ramsom et al, RELAP5/MOD 1 Code Manual (DRAFT)

3. W. H. Grush and M. S. Shiuko, Best Estimate Prediction for LOFT Nuclear Experiments L3-1, EGG-LOFT-5033, November 1979

4. EG&G presentation to NRC on January 15, 1981 (RELAP 5 Calculations of L3-5 and L3-6)

5. Glenn E. McCreery, Quick-Look Report on LOFT Nuclear Experiments L3-6/L8-1, EGG-LOFT-5318, December 1980

6. LOFT L3-6 Data Tapes

Table 1. RELAP4 Blowdown System Model Description

Control Volume	Description
1	Nuclear Core
2	Core Bypass
3	Steam generator secondary steam dome
4 & 5	Upper Plenum
6 & 7	Intact loop hot leg
8 & 13	Steam generator inlet plenum and outlet plenum
9 & 12	Straight section of steam generator tubes
10 & 11	Curved sections of steam generator tubes
14	Steam generator outlet piping
15	Piping leading to the tee preceding the coolant pumps.
16	Piping from tee to primary coolant pumps
17	Primary coolant pumps
18 & 19	Intact loop cold leg
20	Upper annulus at the vessel inlet
21	Downcomer
22	Lower plenum
23 & 24	Broken loop cold leg
25,26,27 & 28	Broken loop hot leg
29 & 30	Reflood assist bypass piping
31	Pressurizer surge line
32	Pressurizer
33	Piping connecting the steam generator secondary steam dome to the steam relief valve
34	ECC injection line
35	Steam generator secondary downcomer
36	Steam generator secondary shroud region
37	Containment

Table 2. Initial Conditions for LOCE L3-6

Parameter	Measured Value	Input Value for RELAP 4
Primary Coolant System		
Mass flow rate (x 10^6 lbm/hr)	3.8±0.05	3.8
Hot leg pressure (psia)	215.67±20.3	2156.62
Cold leg temperature (°F)	544.5±2.0	544.5
Hot leg temperature (°F)	579.1±3.2	579.5
Primary coolant pump injection flow (gpm)	1.55±0.25	1.55
Reactor Vessel		
Power level (MW)	50±1	50
Steam Generator Secondary Side		
Water level (in)	8.7±1.2	8.7
Water temperature (°F)	517.4±1.4	507.0
Pressure (psia)	807.86±8.7	809.27
Mass Flow Rate (lbm/sec)	61.3±0.2	61.3
Pressurizer		
Pressure (psia)	2161.07±36.26	2155.11
Liquid level (in)	46.5±4.3	46.5
ECCS		
Initiation pressure (psia)	1778.17±20.31	1778.7

Table 3. Chronology of Events - Experimental Data Versus Test Predictions

Sequence of Events for LOCE L3-6

EVENT	TIME AFTER LOCE INITIATION — MEASURED DATA (seconds)	TIME AFTER LOCE INITIATION — PREDICTION DATA
Reactor scrammed	-5.8+0.2	-5.8
LOCE initiated	0.0	0.0
HPSI "A" tripped on	3.6-0.2	2.2
Pressurizer emptied	20.2-0.2	23.9
Upper Plenum fluid satured	28.5±0.2	30.0
Intact loop hot leg voiding initiated	29.4±5.0	30.0
Intact loop cold leg voiding initiated	31.4±5.0	90.0
End of subcooled break flow	44.2±0.2	90.0
Steam generator secondary auxiliary feed pump started	73.4±0.2	73.4
Steam generator secondary steam control valve opened	88.8+0.2	88.7
Steam generator secondary steam control valve closed	99.6±0.2	101.2
Primary system pressure became less than secondary system pressure	930.0±30.0	940.0
Steam generator secondary auxiliary feed pump shut down	1856.0±5.0	1856.0
Primary coolant pumps tripped off	2371.4	2031.5

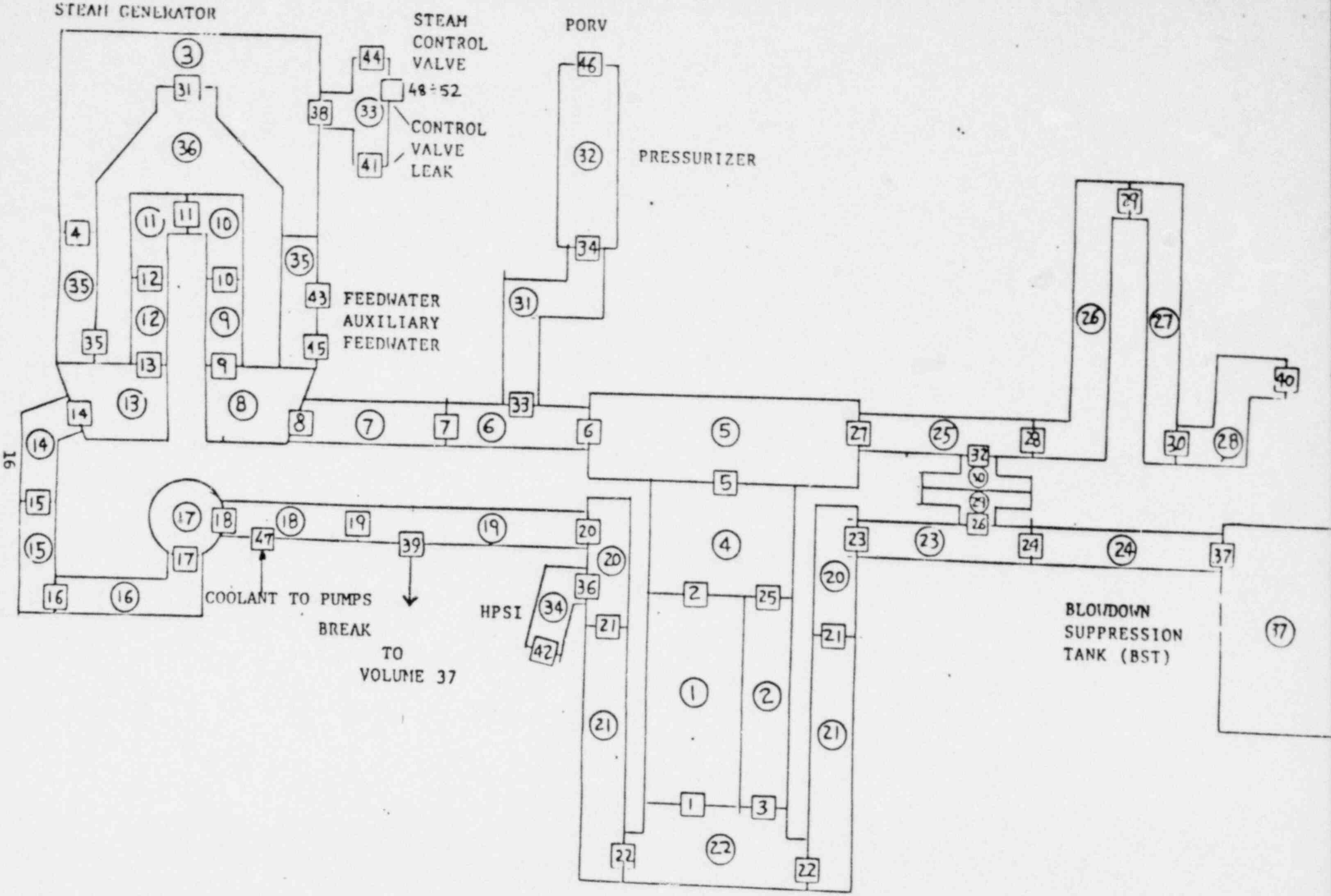

Figure 1
RELAP 4 LOFT Nodalization

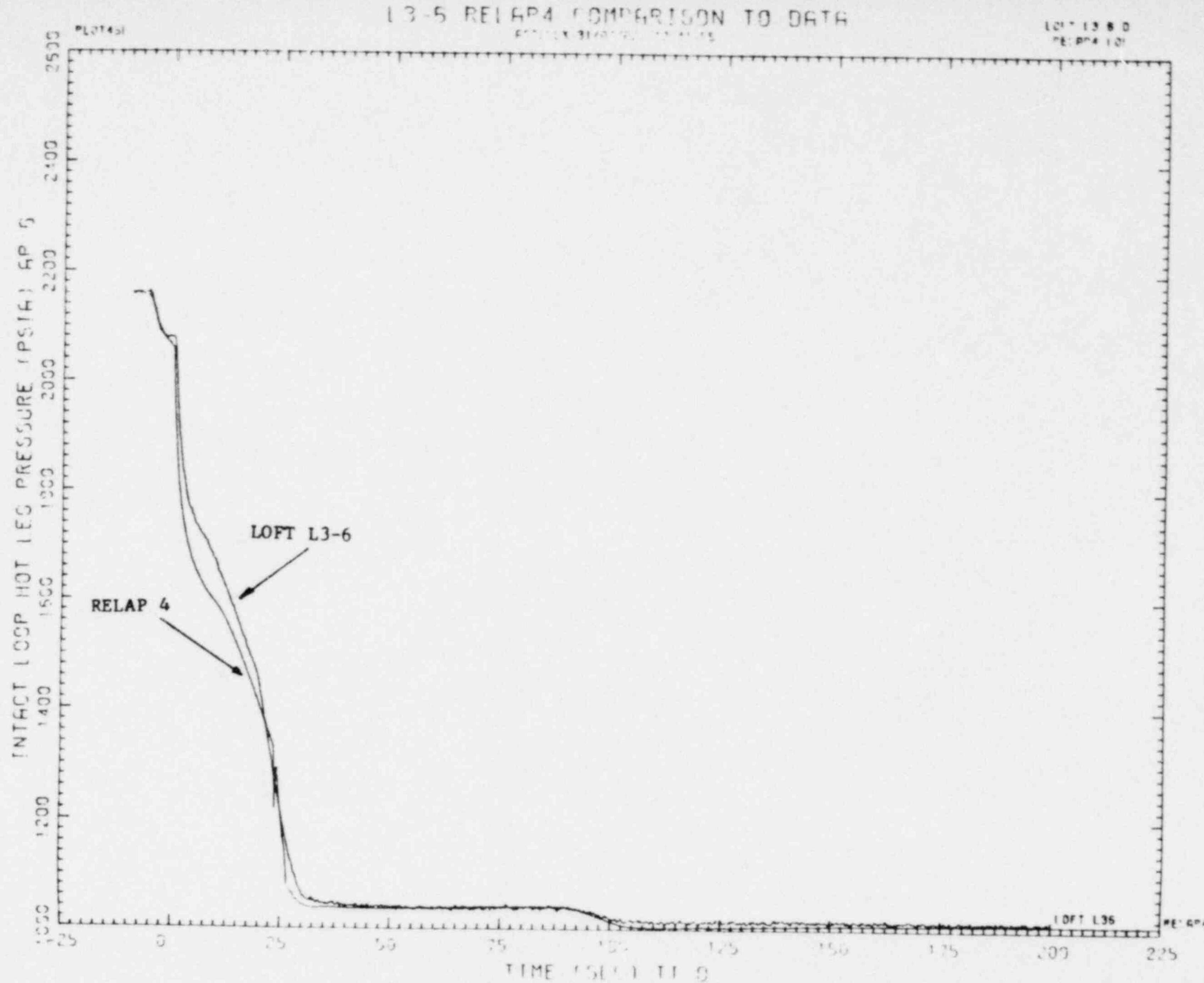

Figure 2
Intact Loop Hot Leg Pressure
(0 ÷ 200 sec)

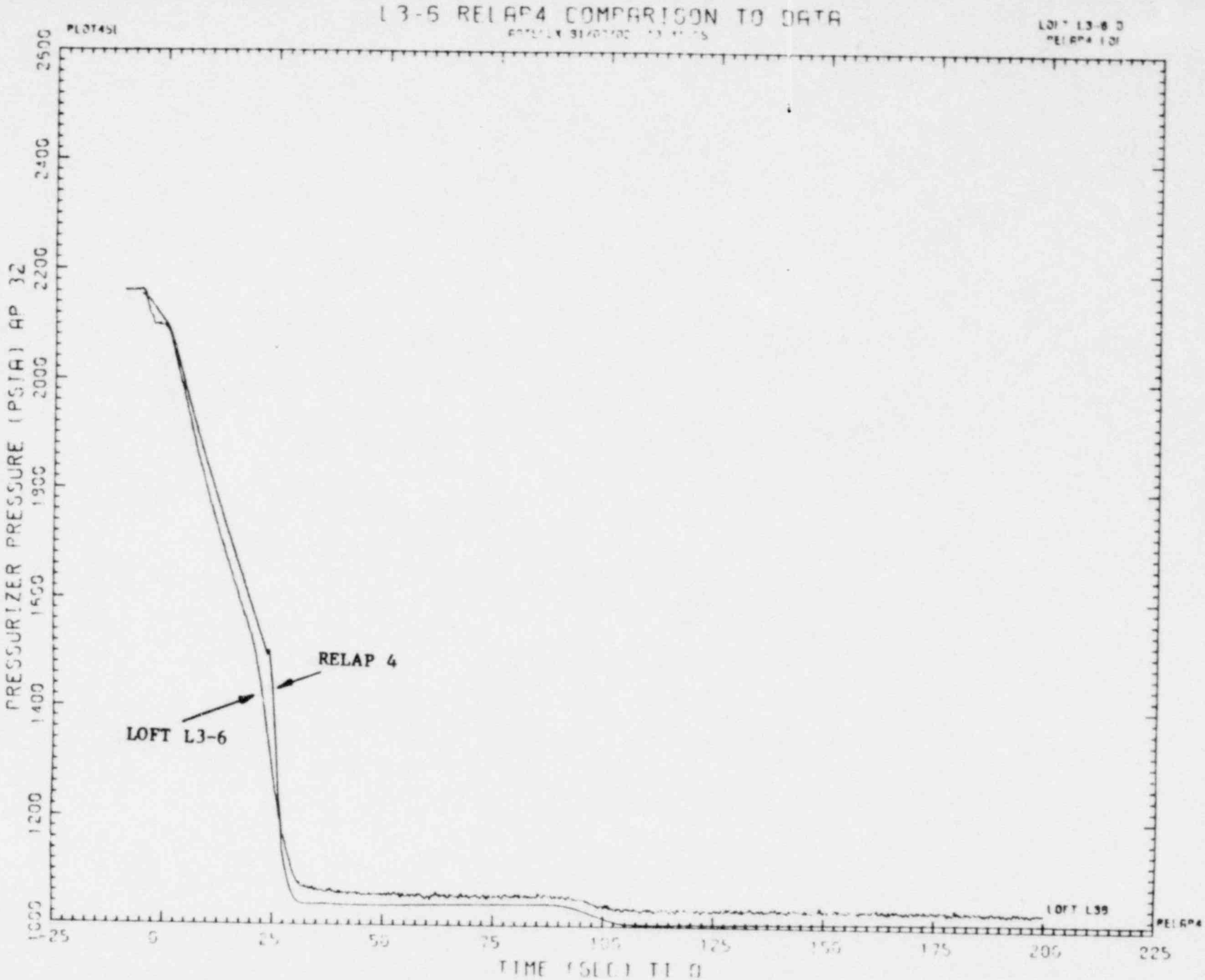

Figure 3
Pressurizer Pressure
(0 ÷ 200 sec)

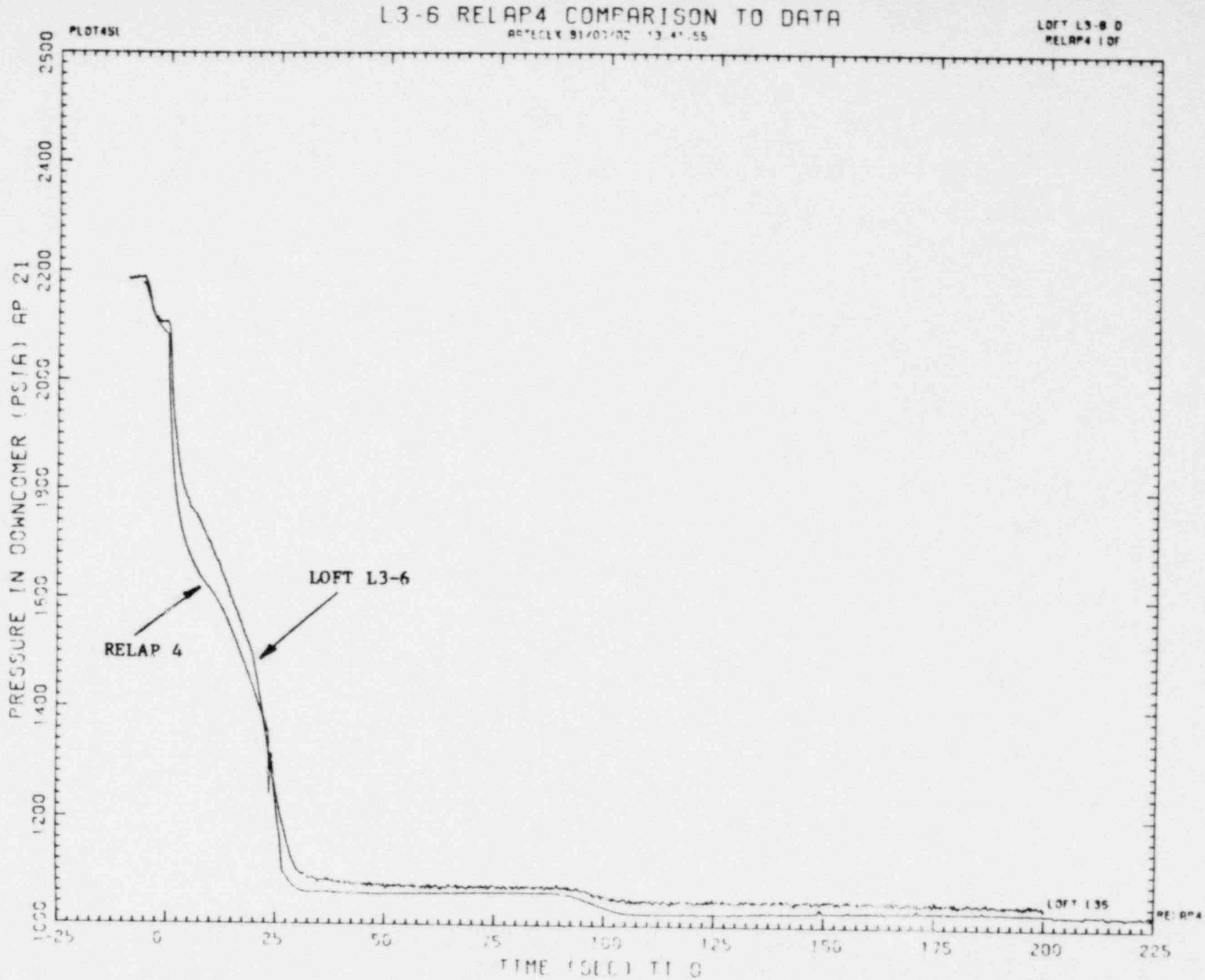

Figure 4
Pressure in Downcomer
(0 ÷ 200 sec)

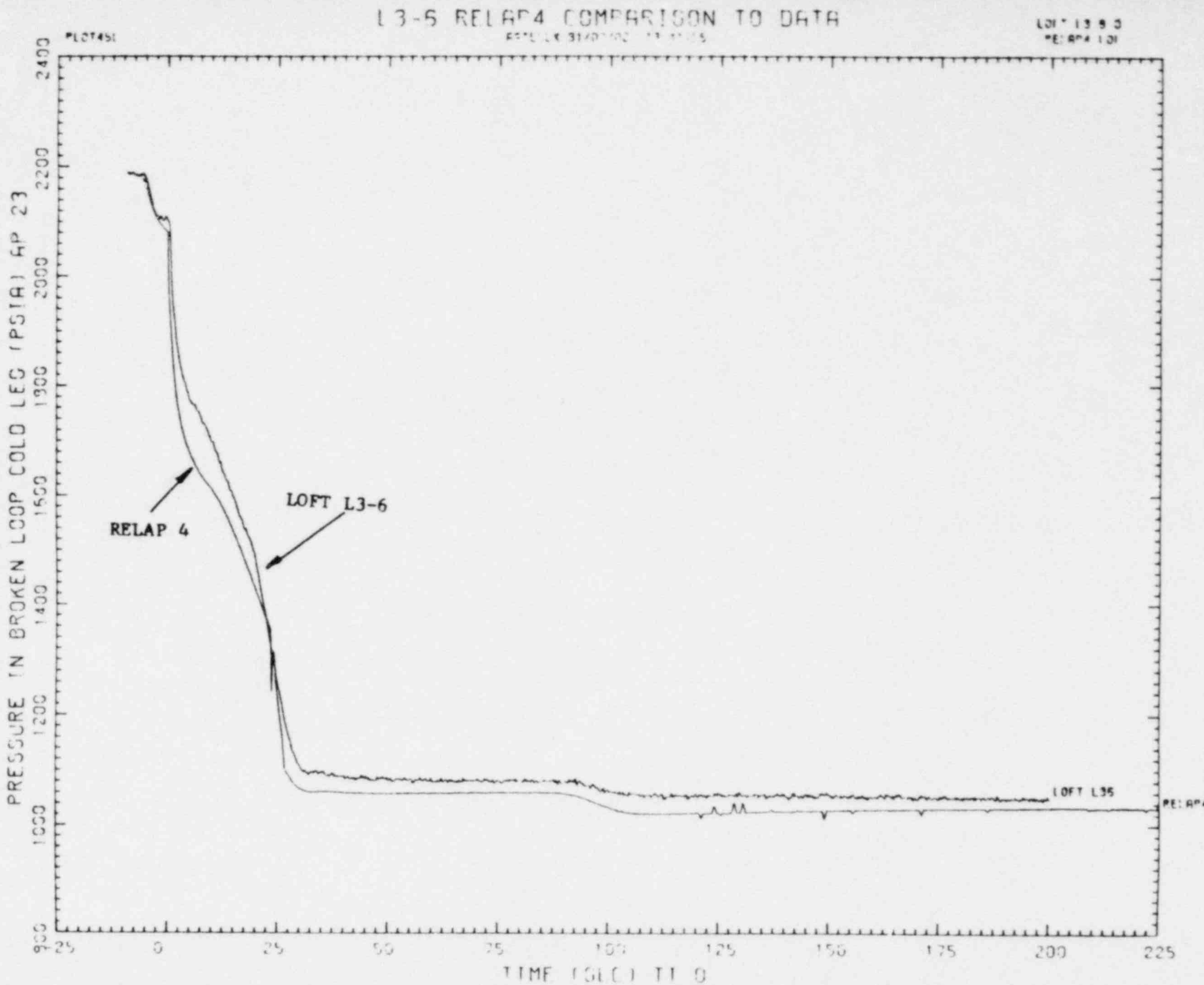

Figure 5
Pressure in Broken Loop Cold
Leg (0 ÷ 200 sec)

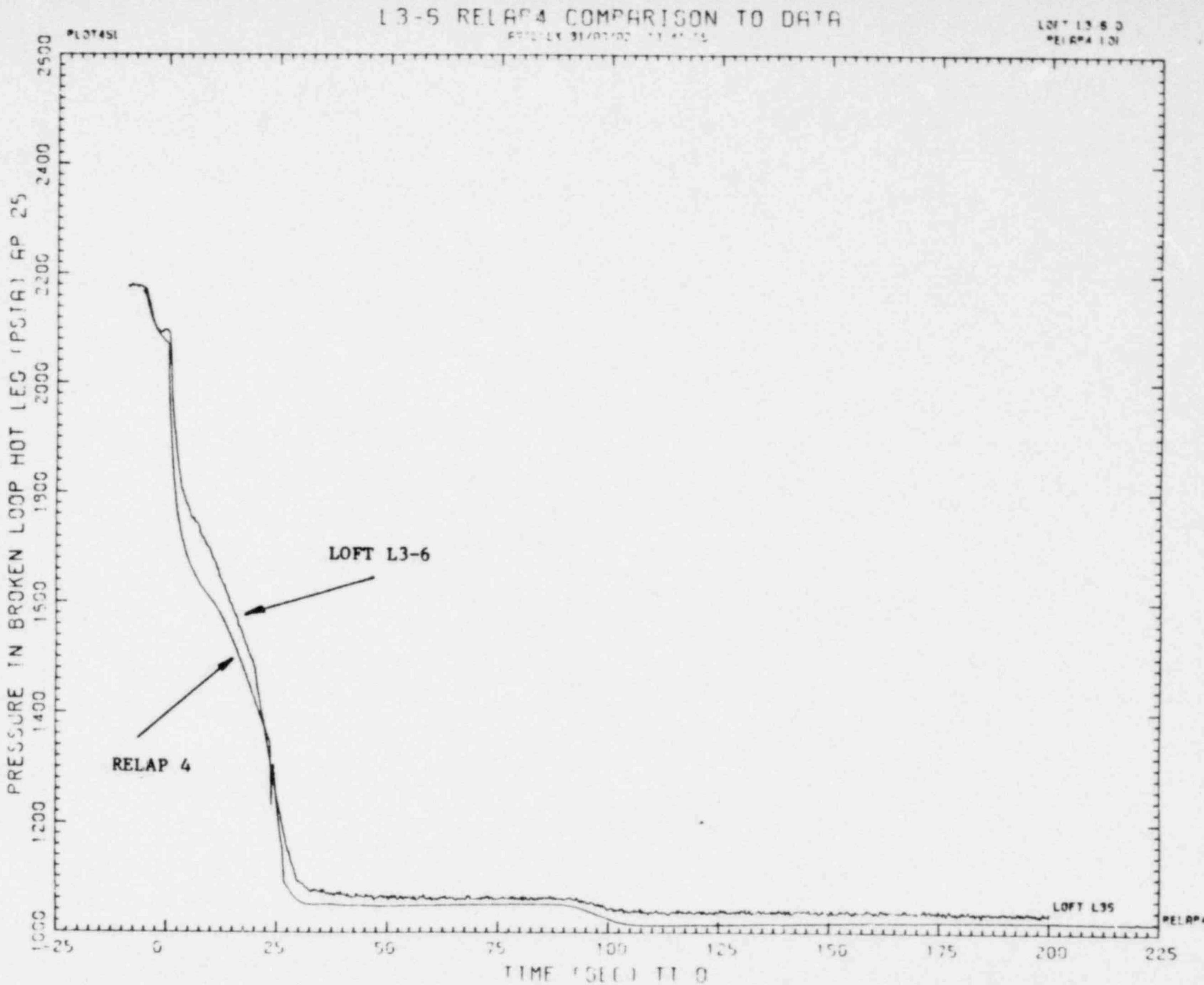

Figure 6
Pressure in Broken Loop Hot Leg
(0 ÷ 200 sec)

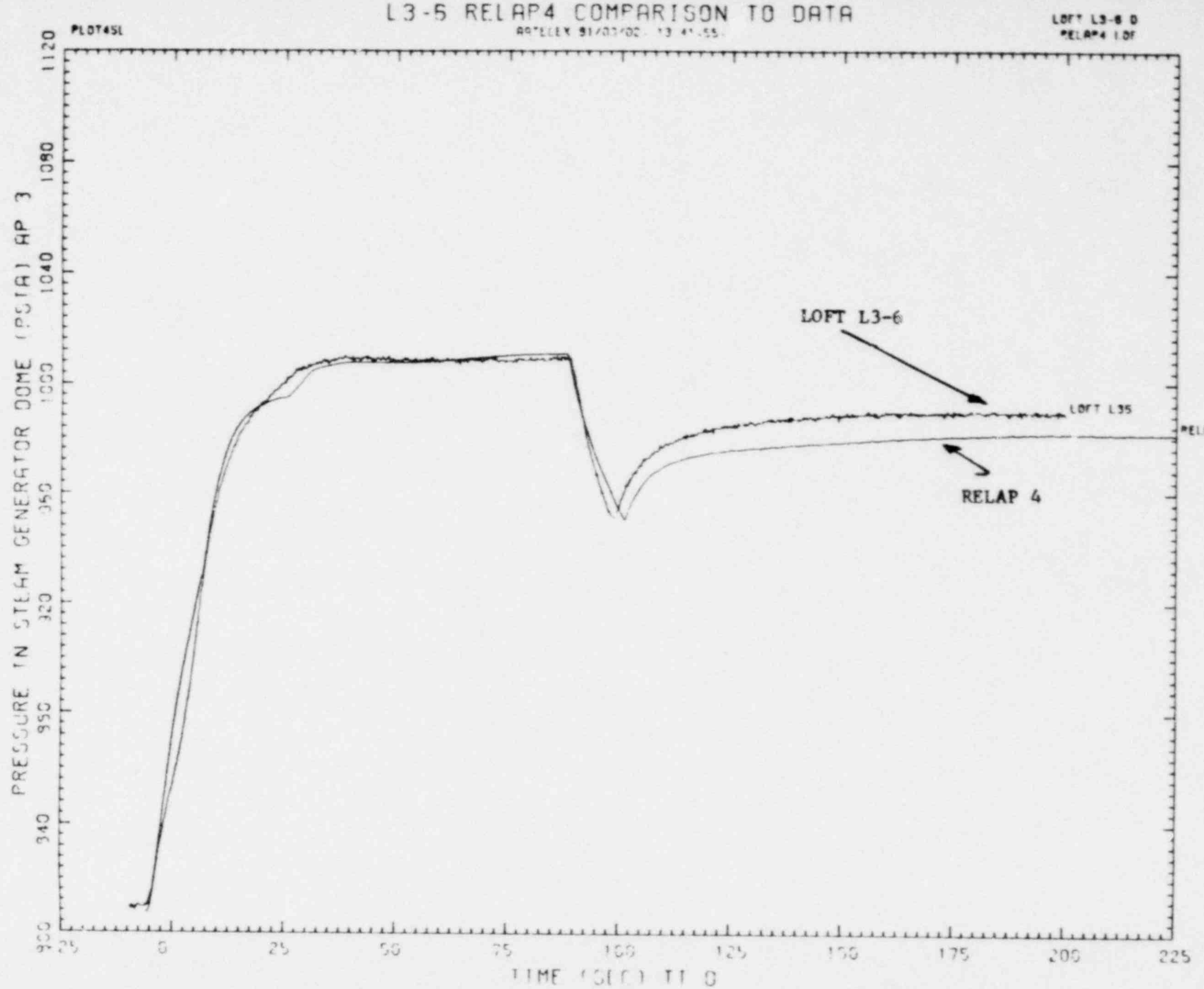

Figure 7
Pressure In Steam Generator Dome
(0 ÷ 200 sec)

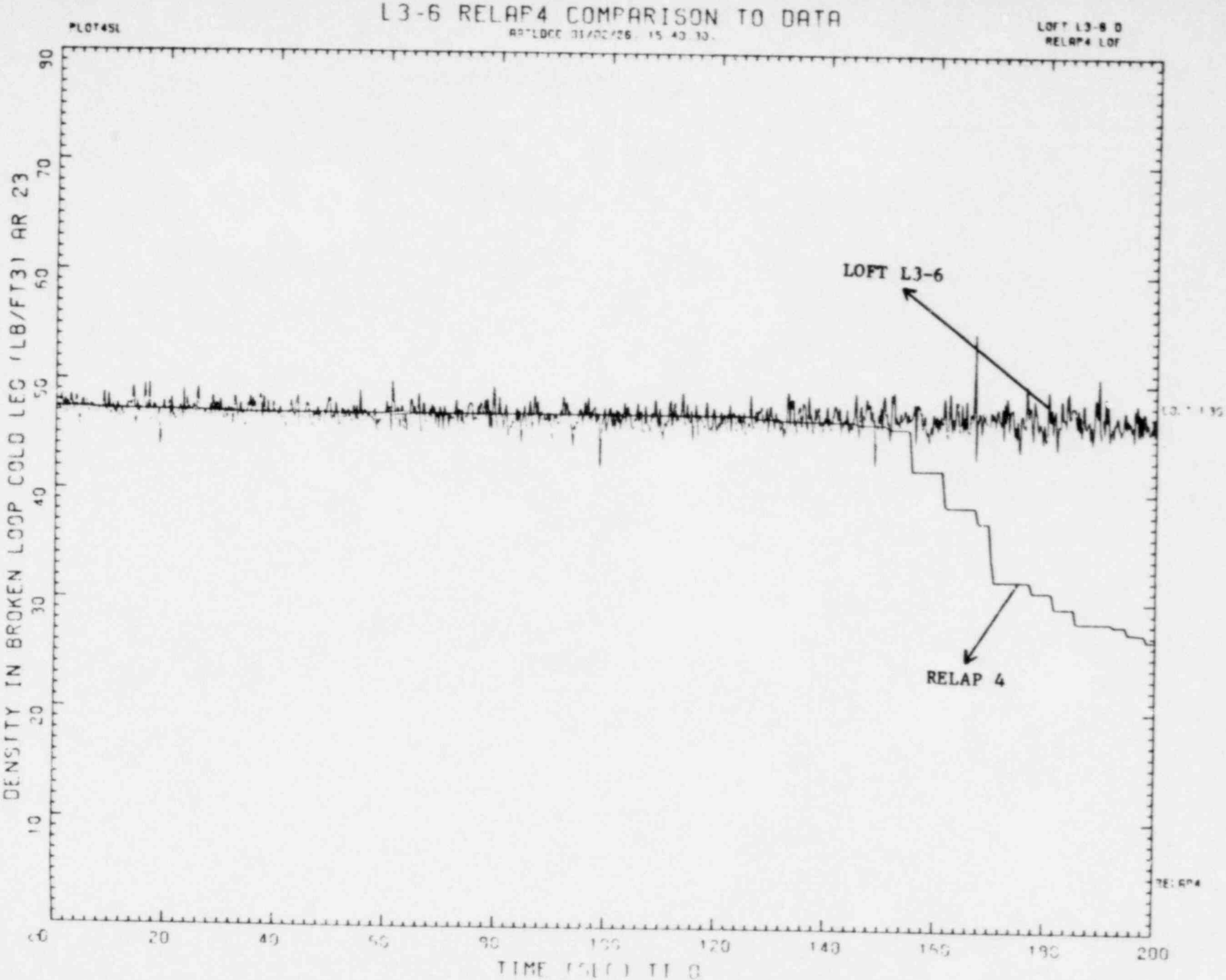

Figure 8
Density in Broken Loop Cold Leg
(0 ÷ 200 sec)

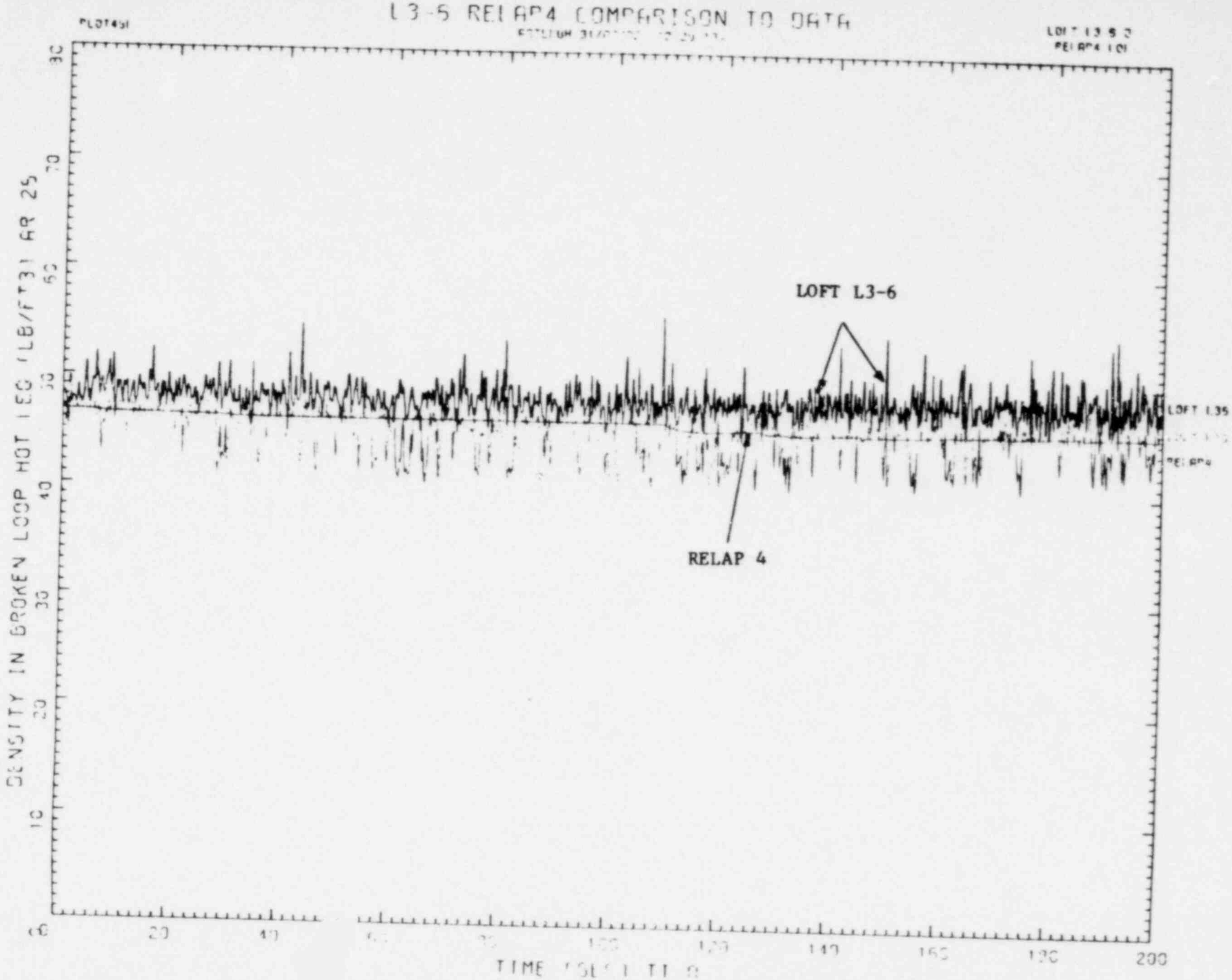

Figure 9
Density in Broken Loop Hot Leg
(0 ÷ 200 sec)

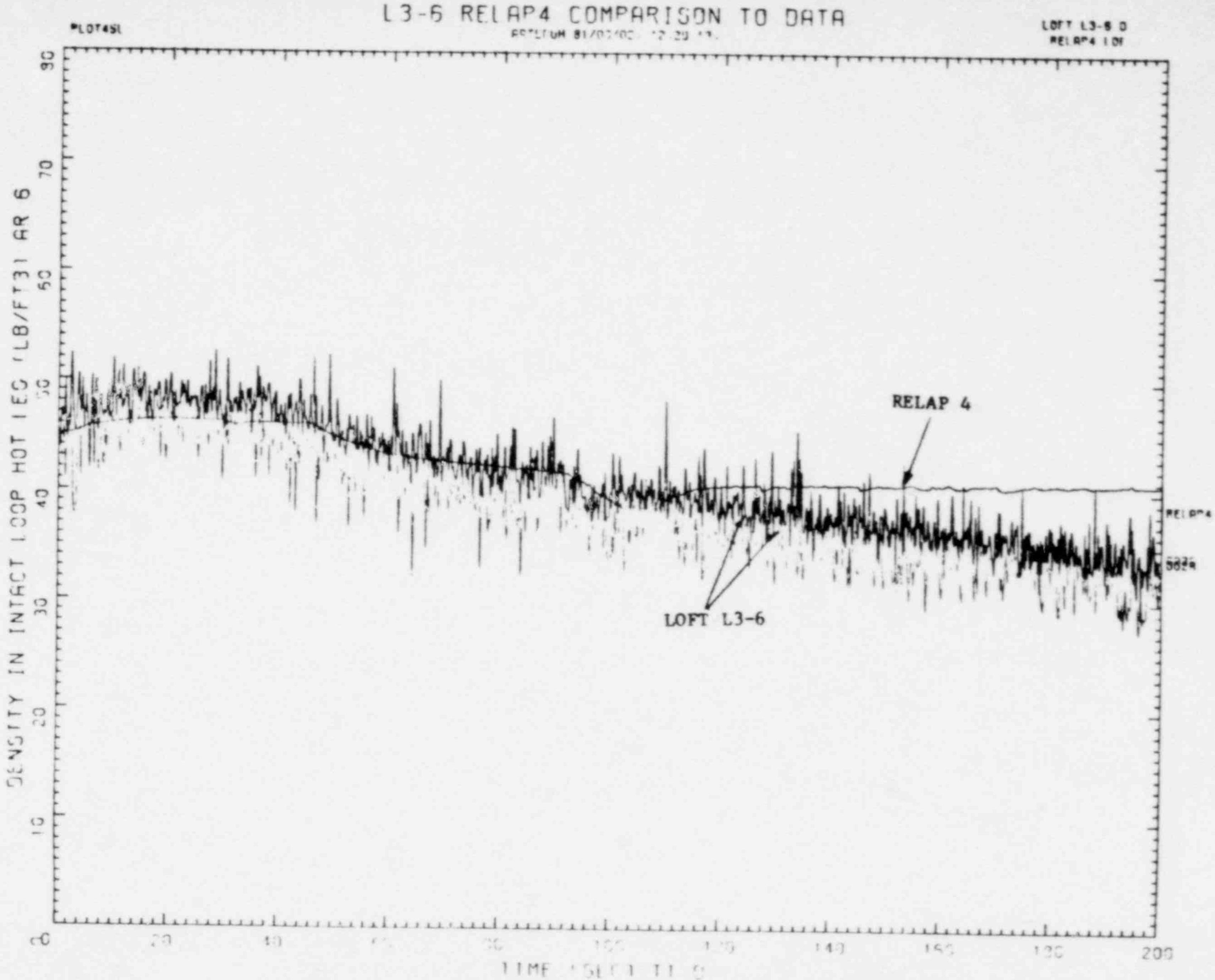

Figure 10
Density in Intact Loop Hot Leg
(0 ÷ 200 sec)

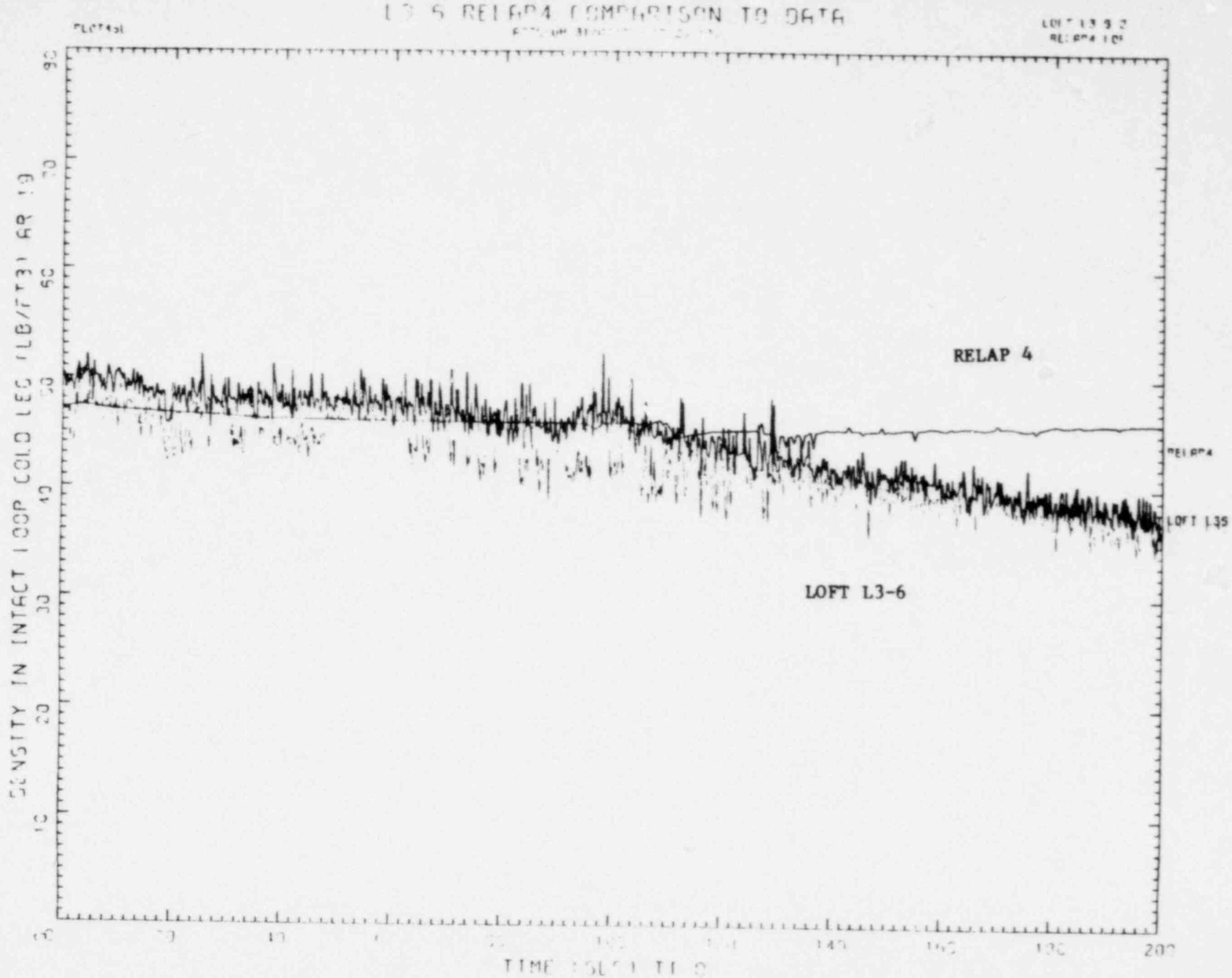

Figure 11
Density in Intact Loop Cold Leg
(0 - 200 sec)

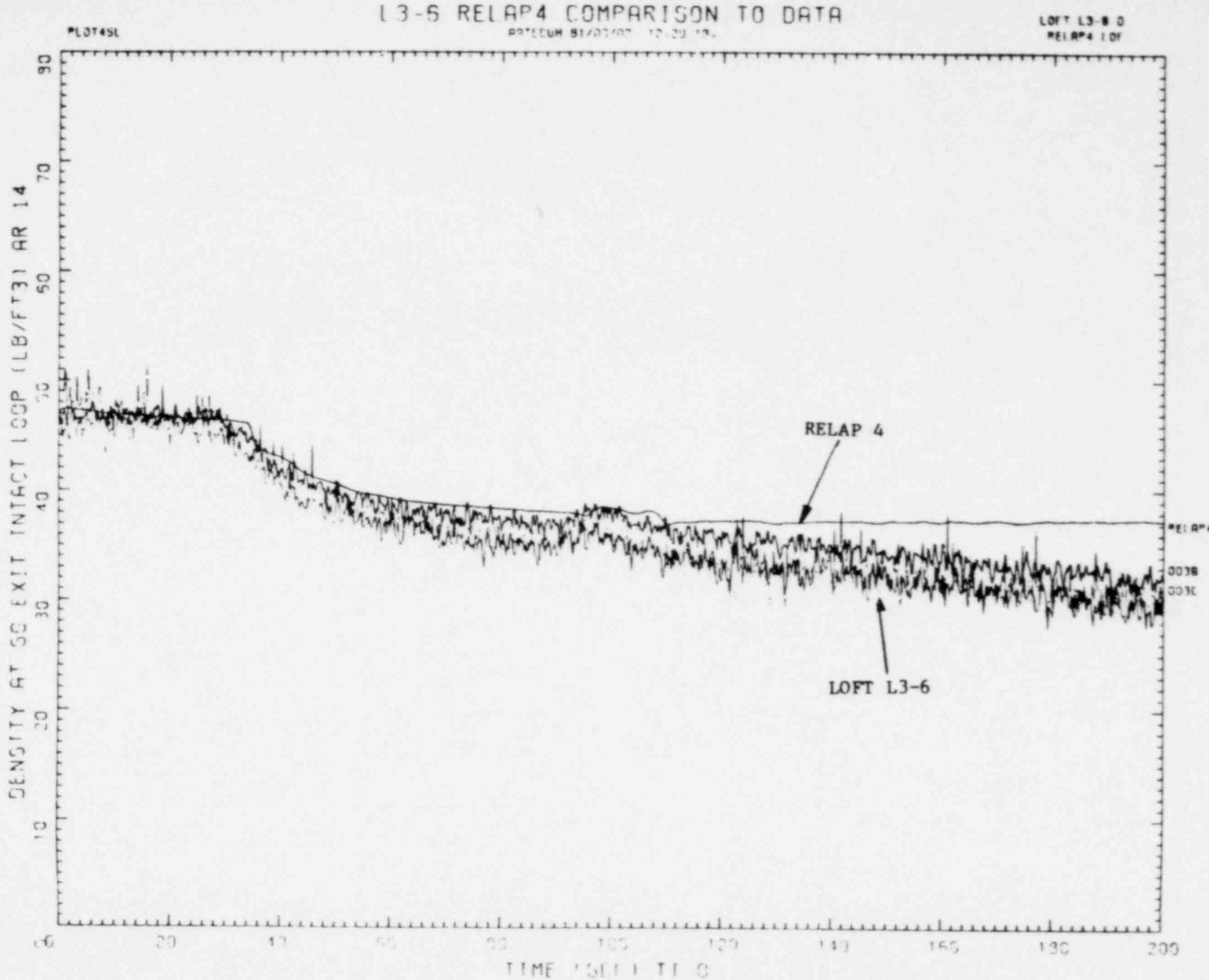

Figure 12
Density at Steam Generator Exit Intact Loop
(0 ÷ 200 sec)

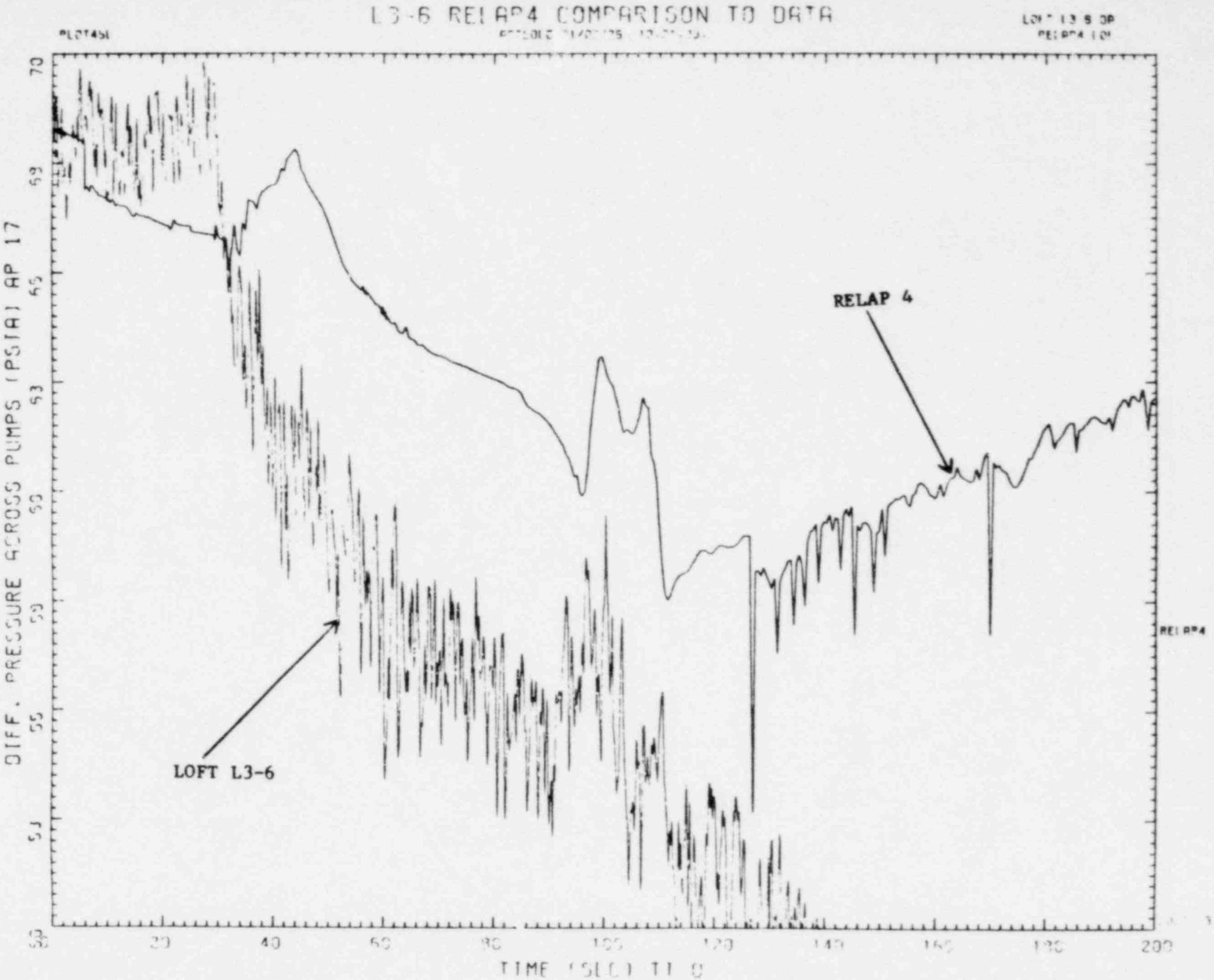

Figure 13
Differential Pressure Across Pumps
(0 ÷ 200 sec)

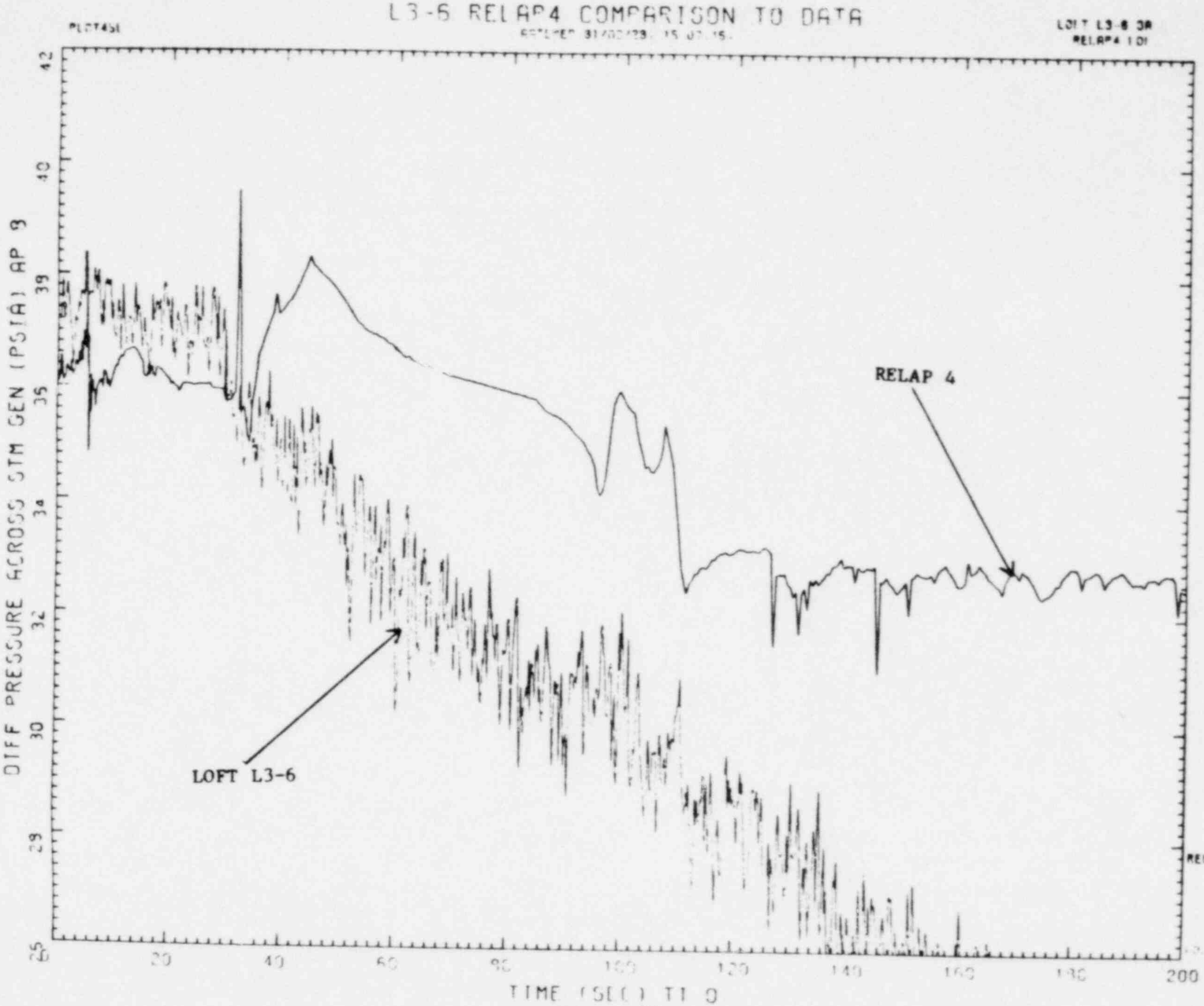

Figure 14
Differential Pressure Across Steam Generator
(0 ÷ 200 sec)

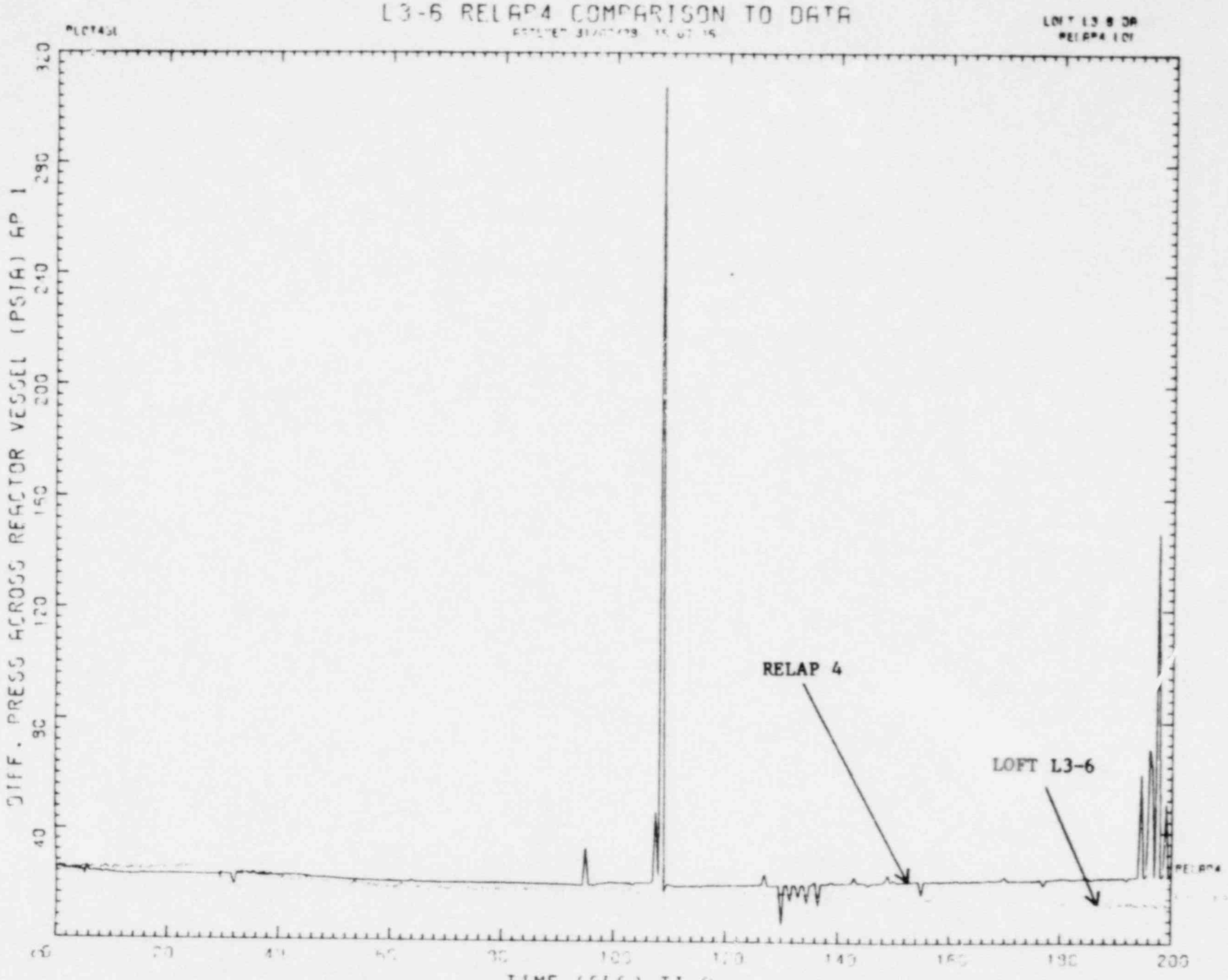

Figure 15
Differential Pressure Across Reactor Vessel
(0 - 200 sec)

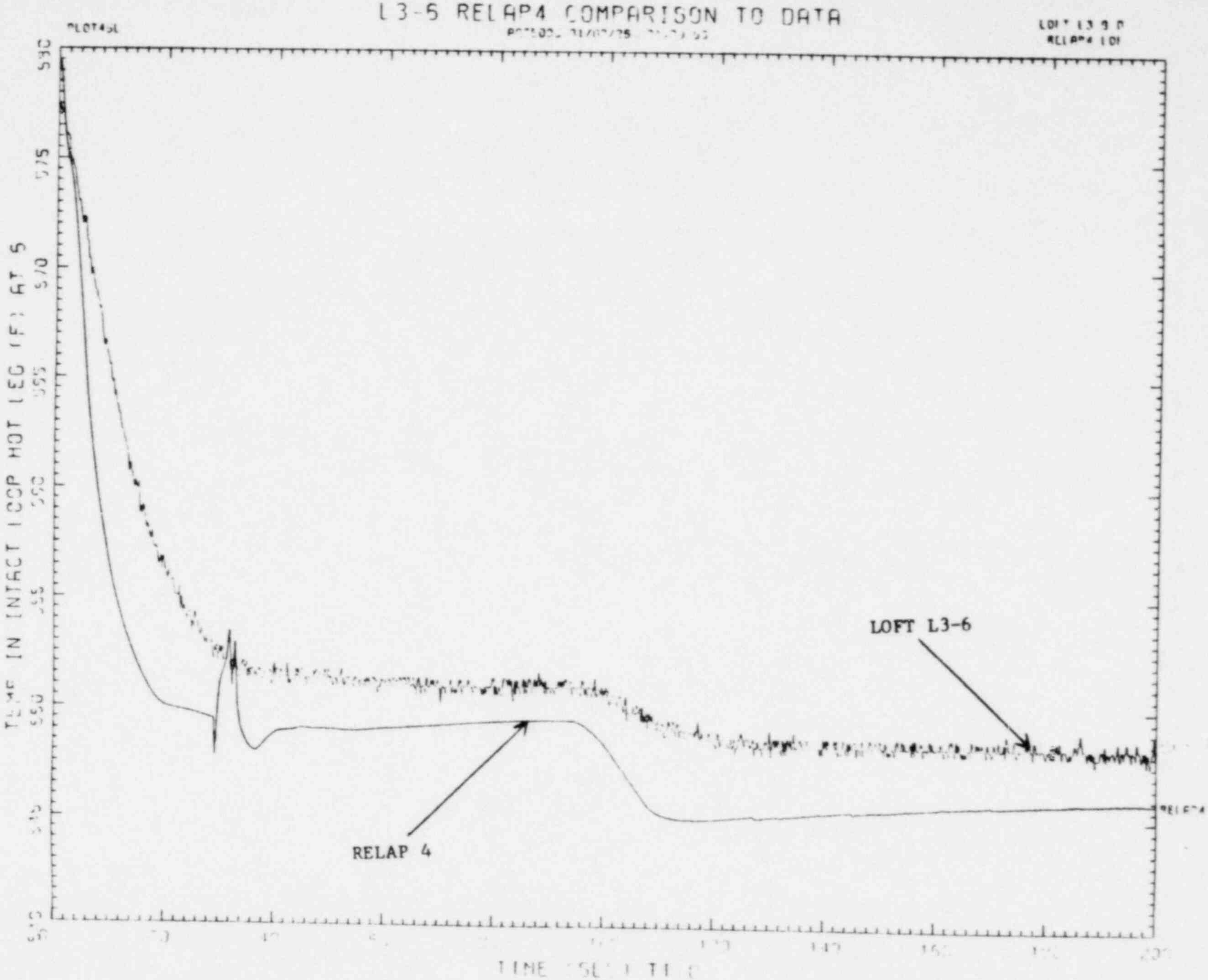

Figure 16
Temperature in Intact Loop Hot Leg
(0 ÷ 200 sec)

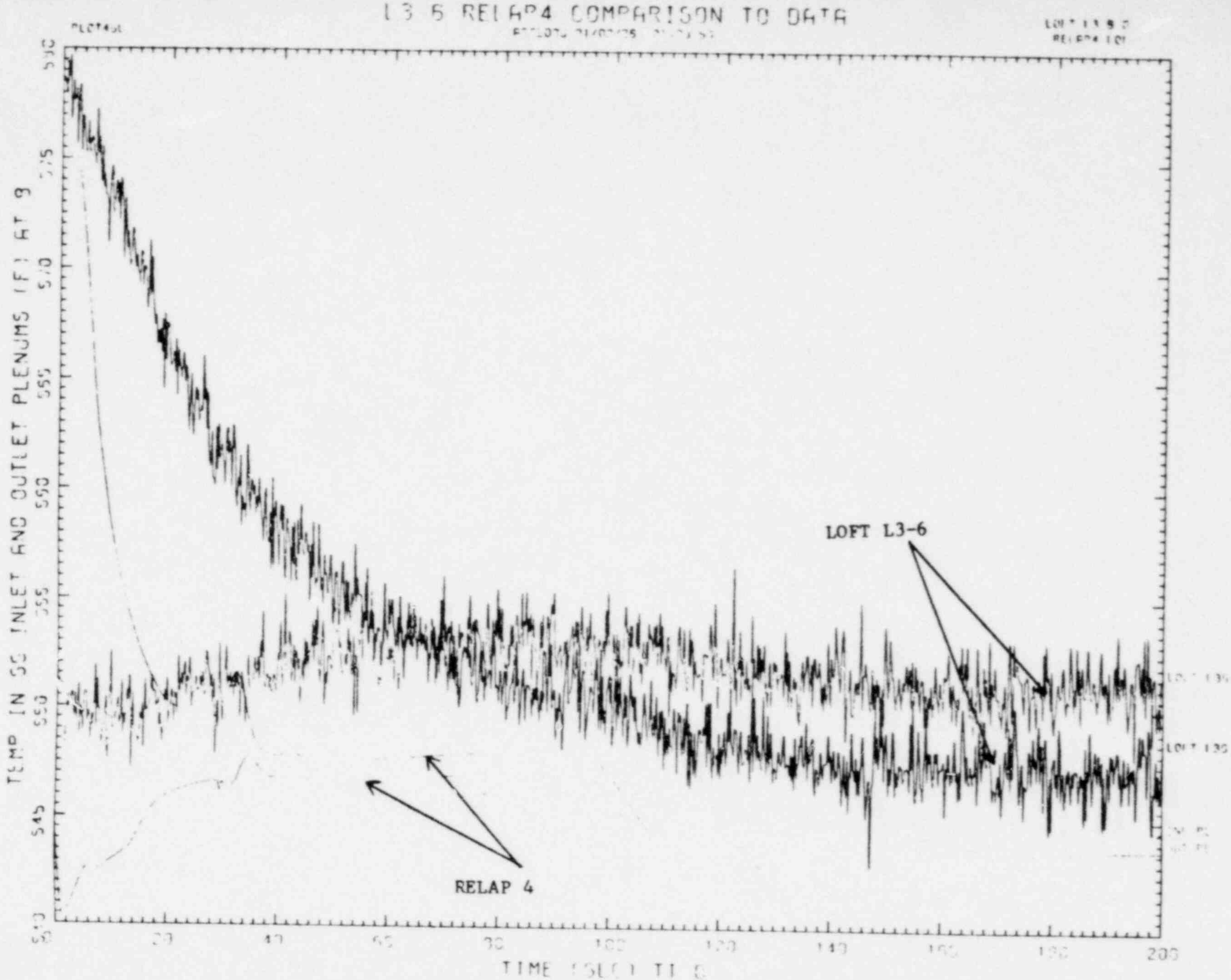

Figure 17
Temperature at Inlet and Outlet
Plenums in Steam Generator, Intact Loop
(0 – 200 sec)

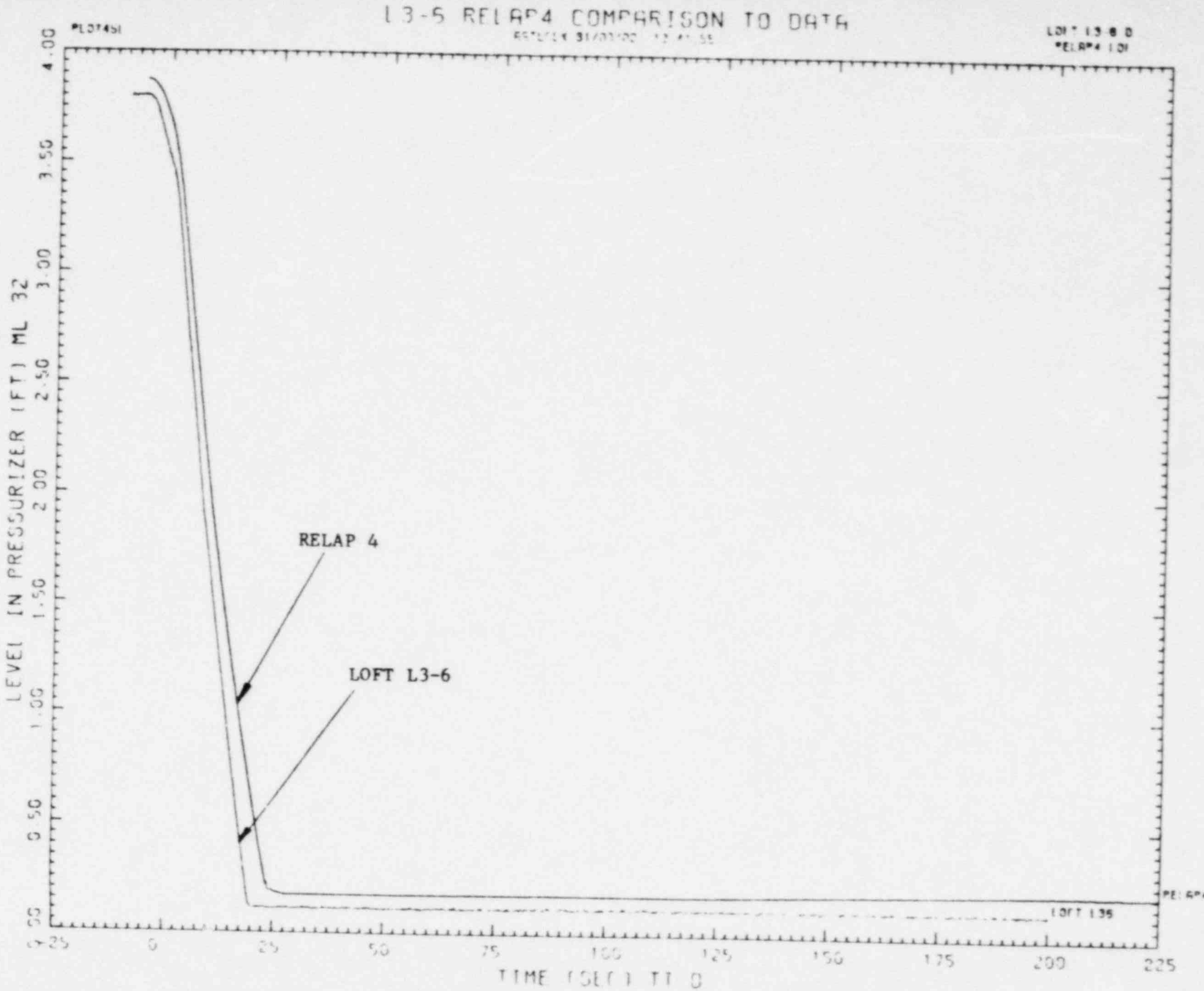

Figure 18
Level in Pressurizer
(0 ; 200 sec)

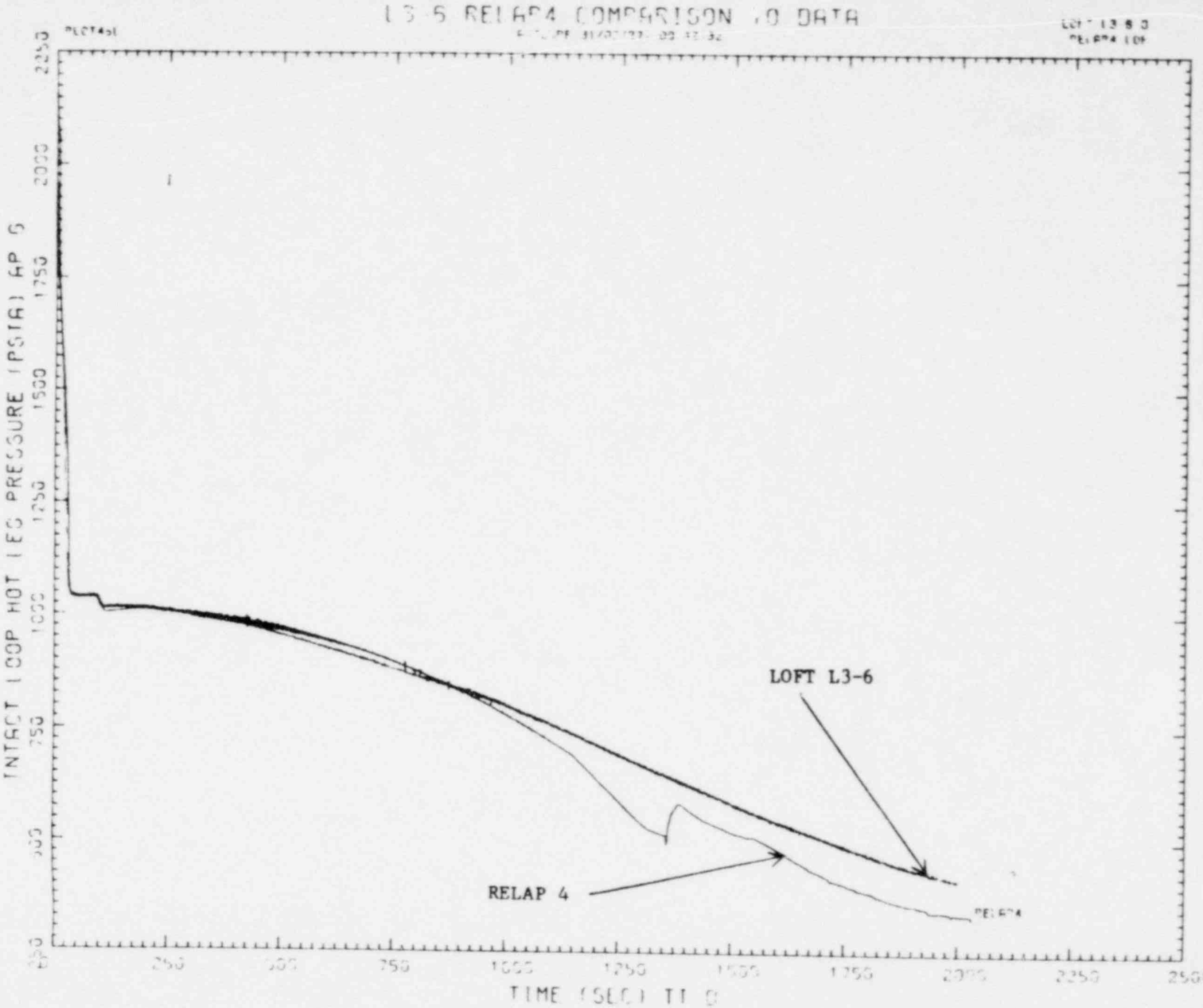

Figure 19
Intact Loop Hot Leg Pressure
(0 ÷ 2400 sec)

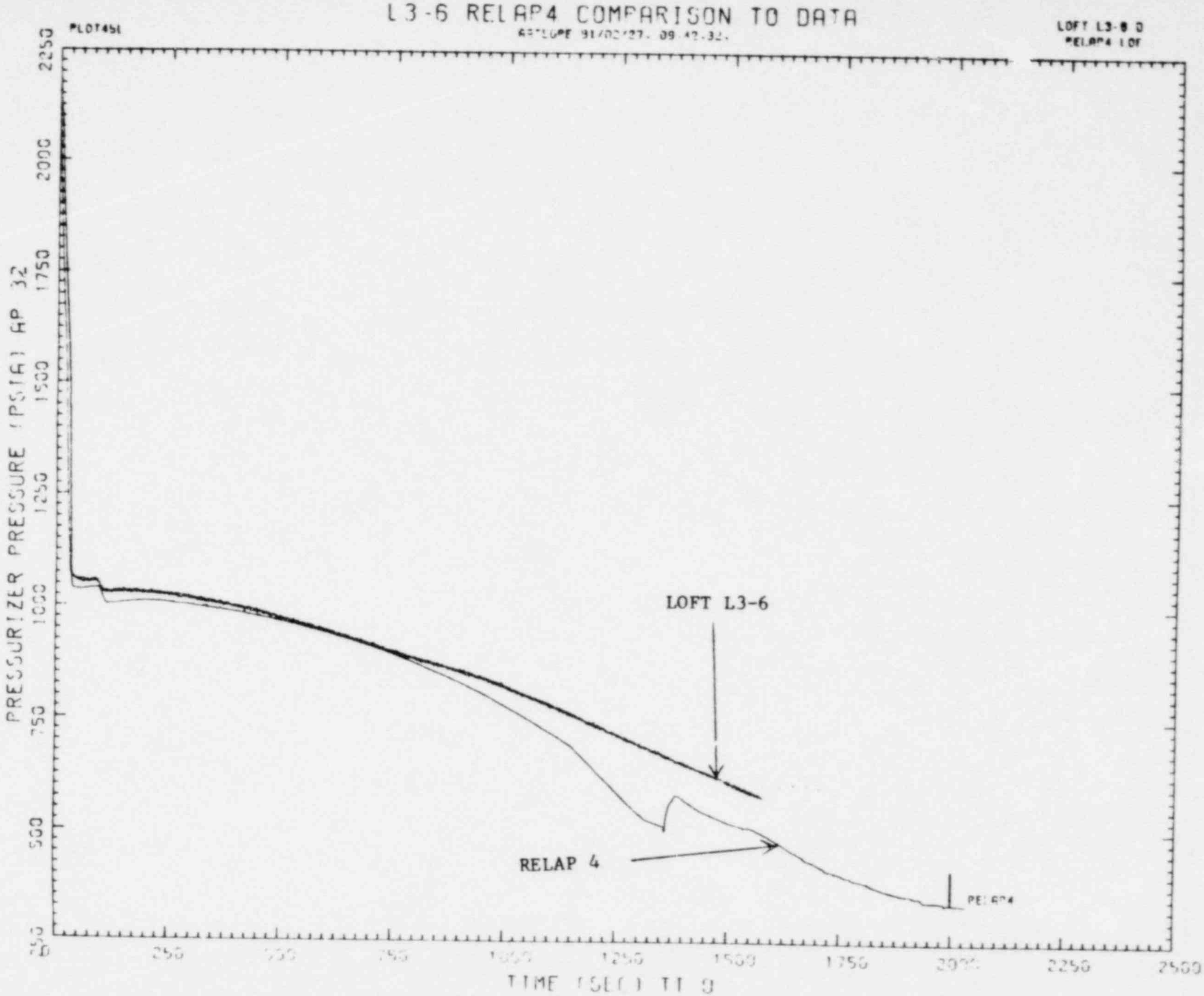

Figure 20
Pressurizer Pressure
(0 ÷ 2400 sec)

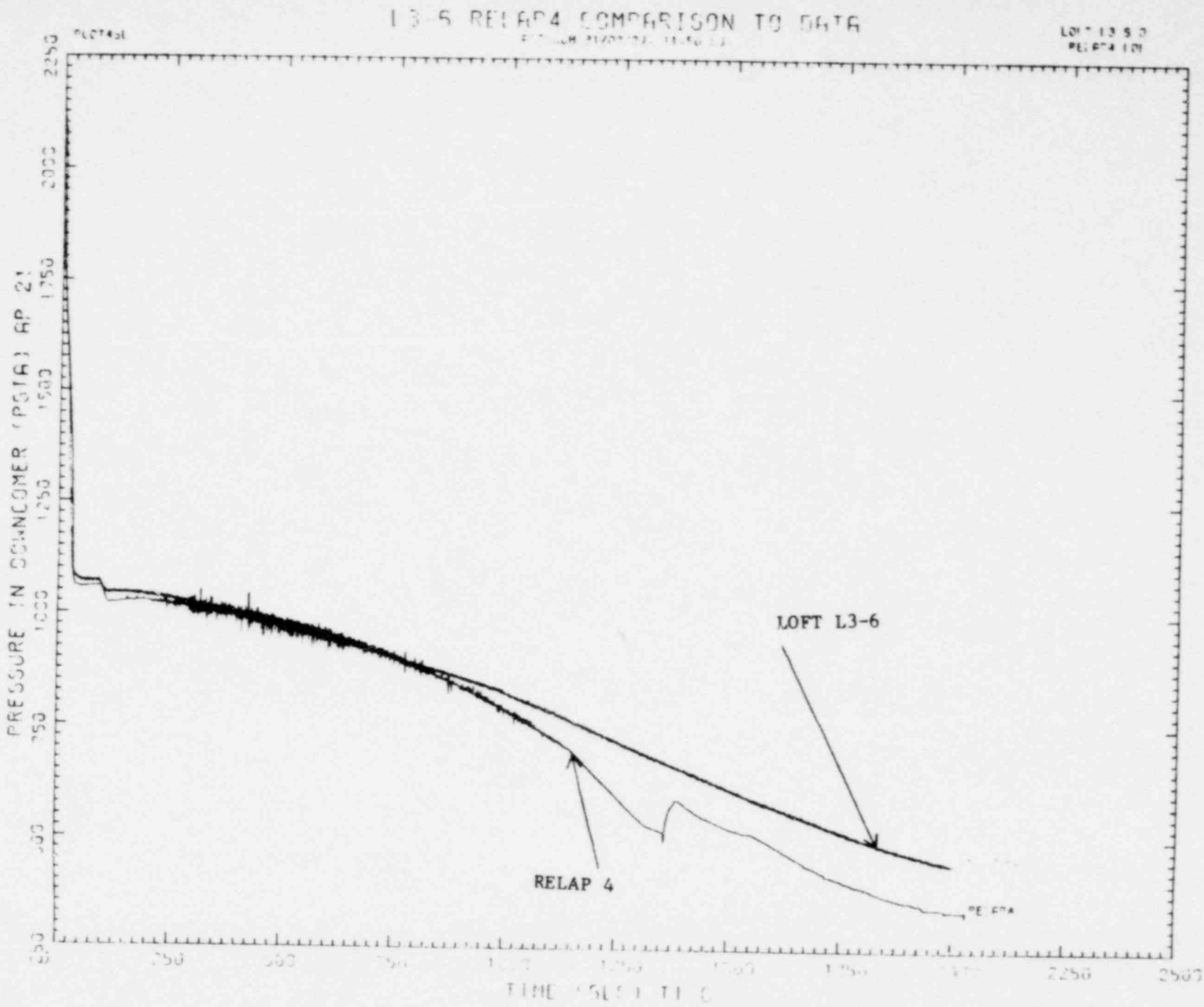

Figure 21
Pressure in Downcomer
(0 ÷ 2400 sec)

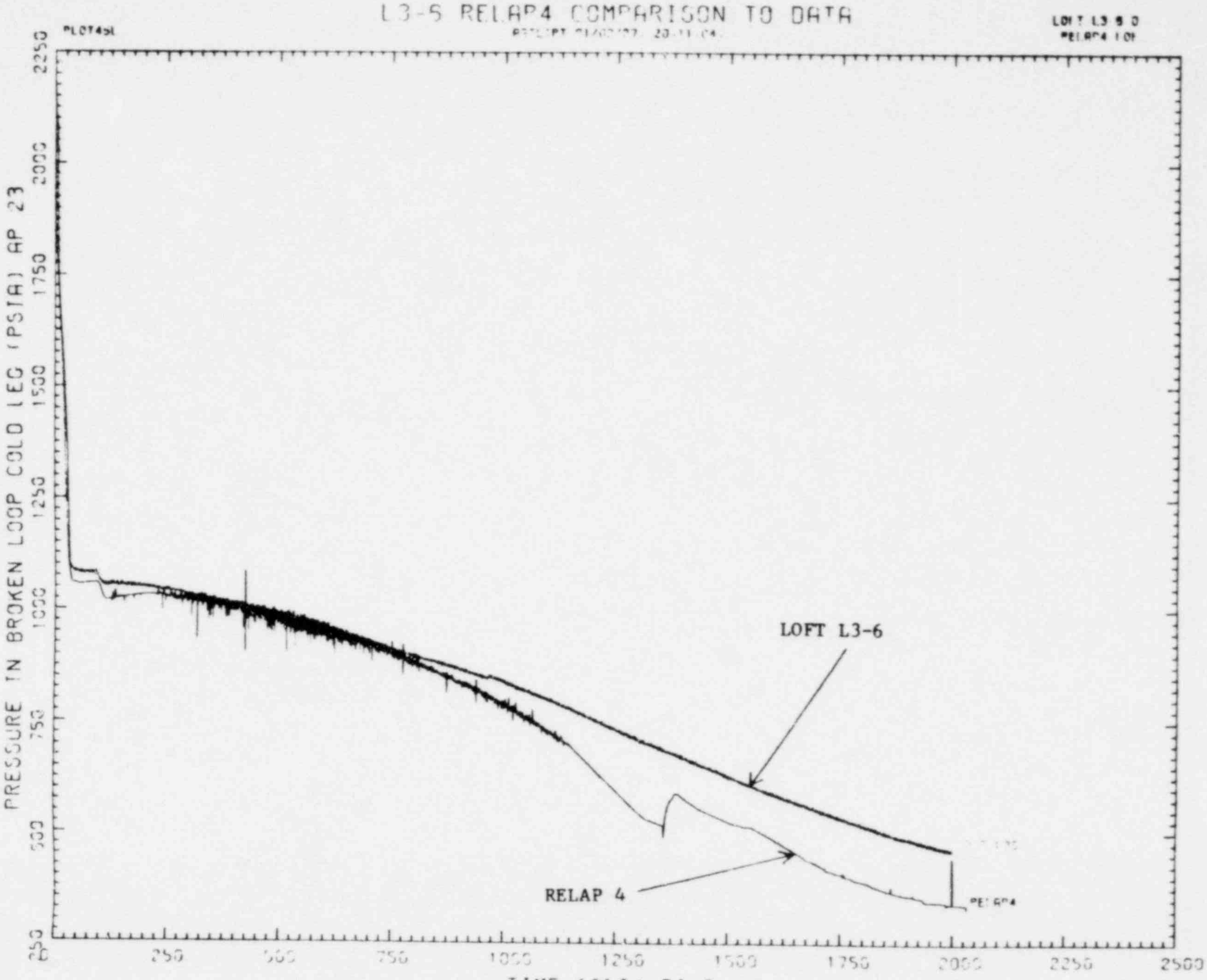

Figure 22
Pressure in Broken Loop Cold Leg
(0 ÷ 2400 sec)

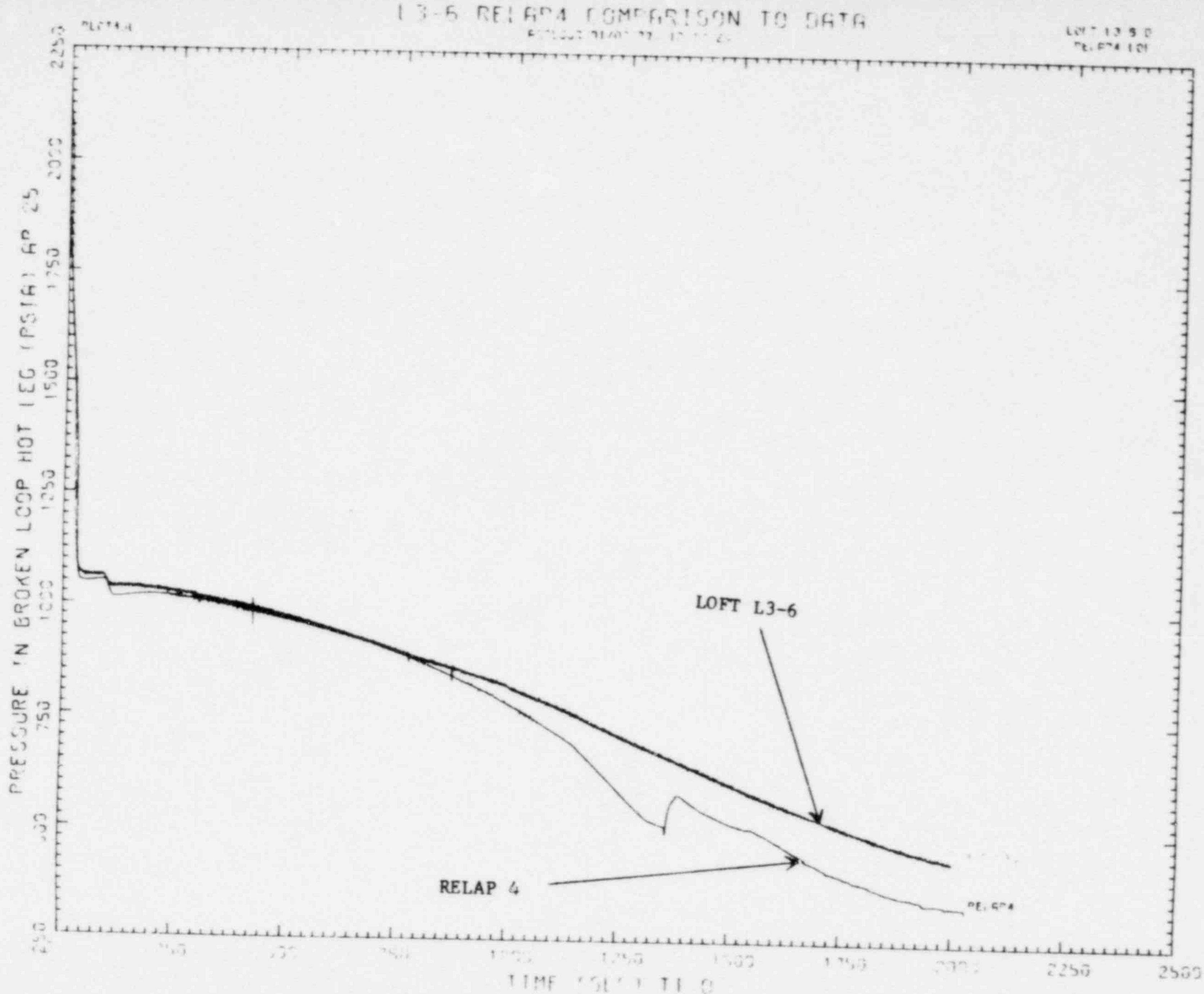

Figure 23
Pressure in Broken Loop Hot Leg
(0 ÷ 2400 sec)

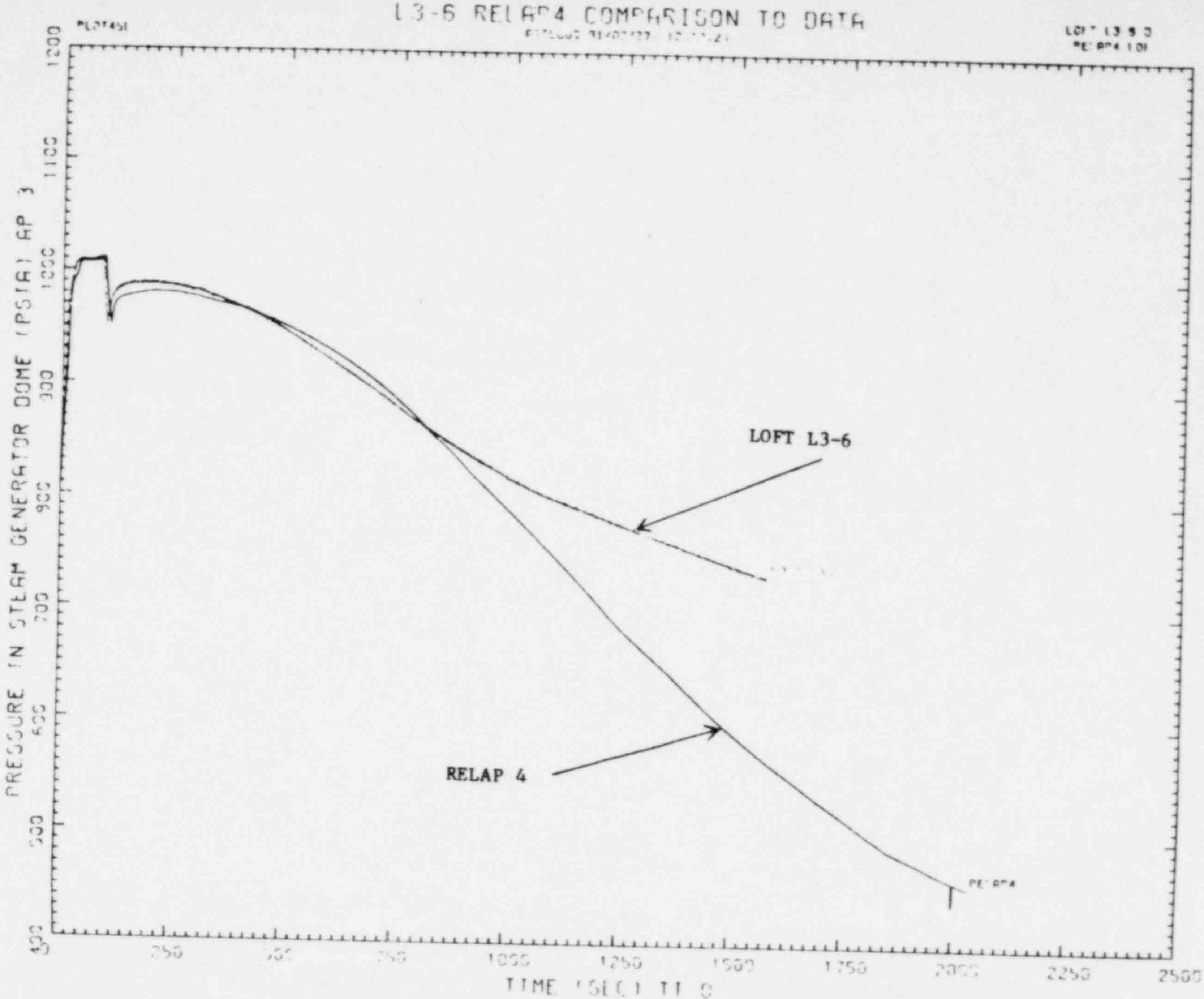

Figure 24
Pressure in Steam Generator Dome
(0 ÷ 2400 sec)

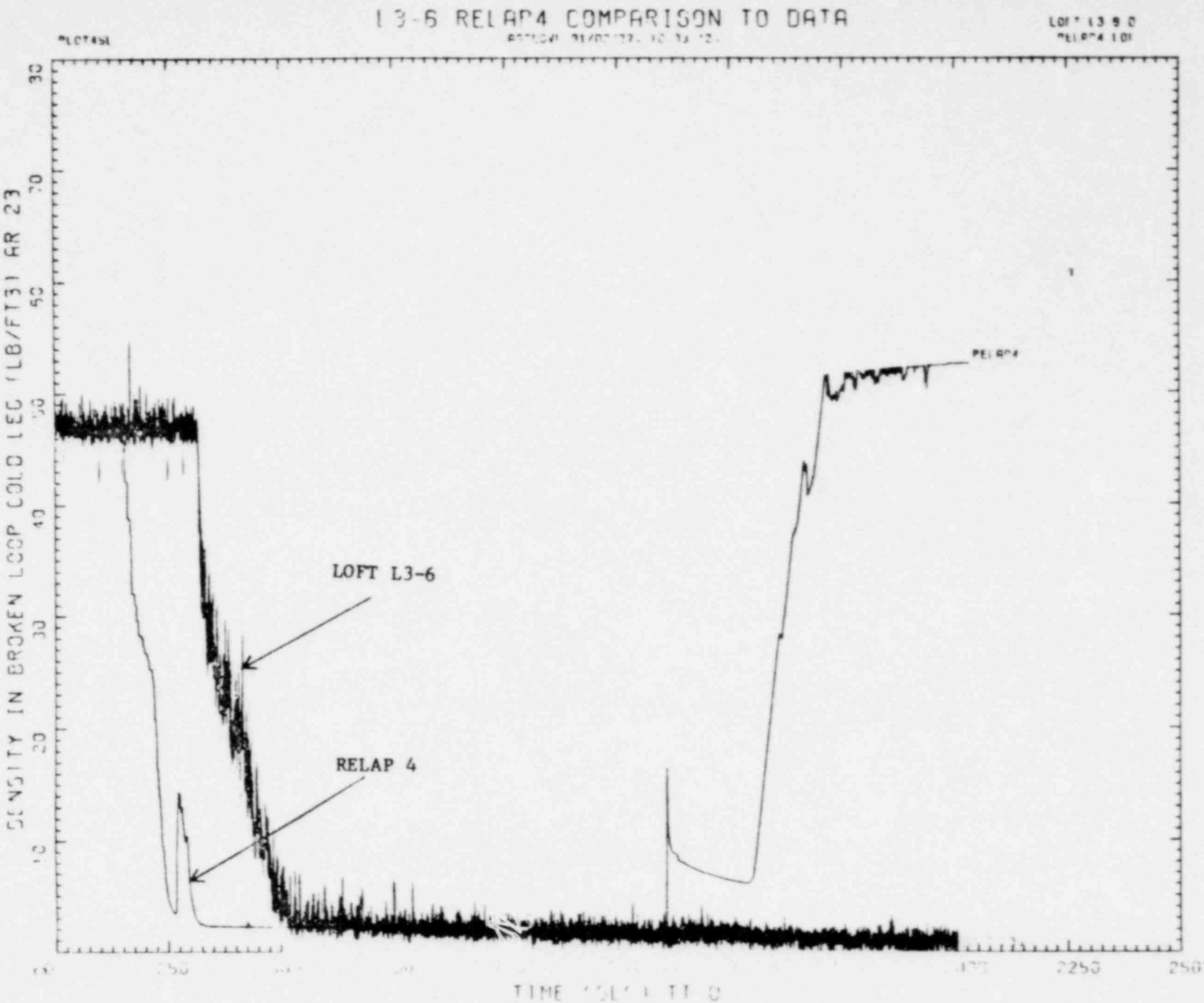

Figure 25
Density in Broken Loop Cold Leg
(0 ÷ 2400 sec)

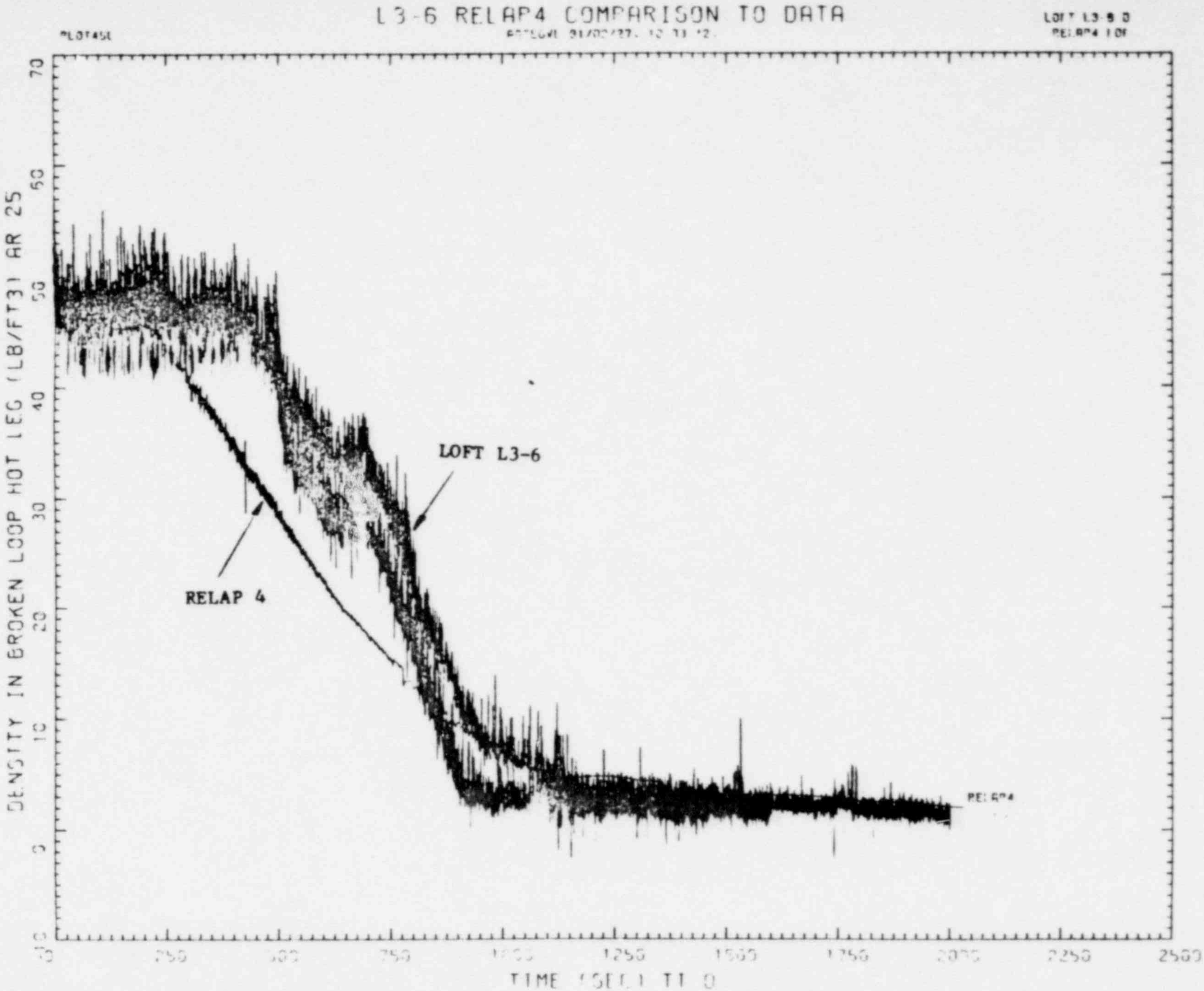

Figure 26
Density in Broken Loop Hot Leg
(0 - 2400 sec)

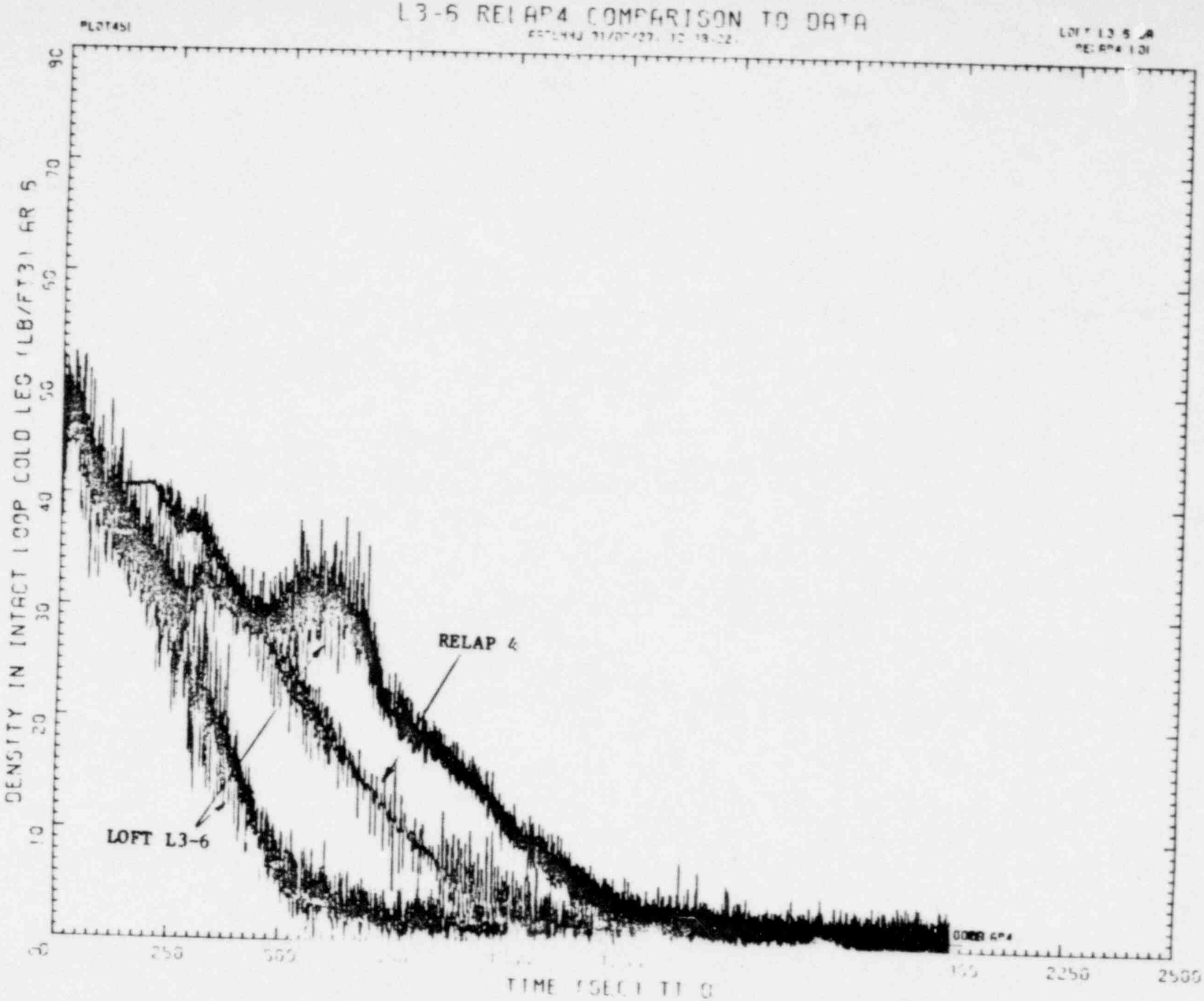

Figure 27
Density in Intact Loop Hot Leg
(0 - 2400 sec)

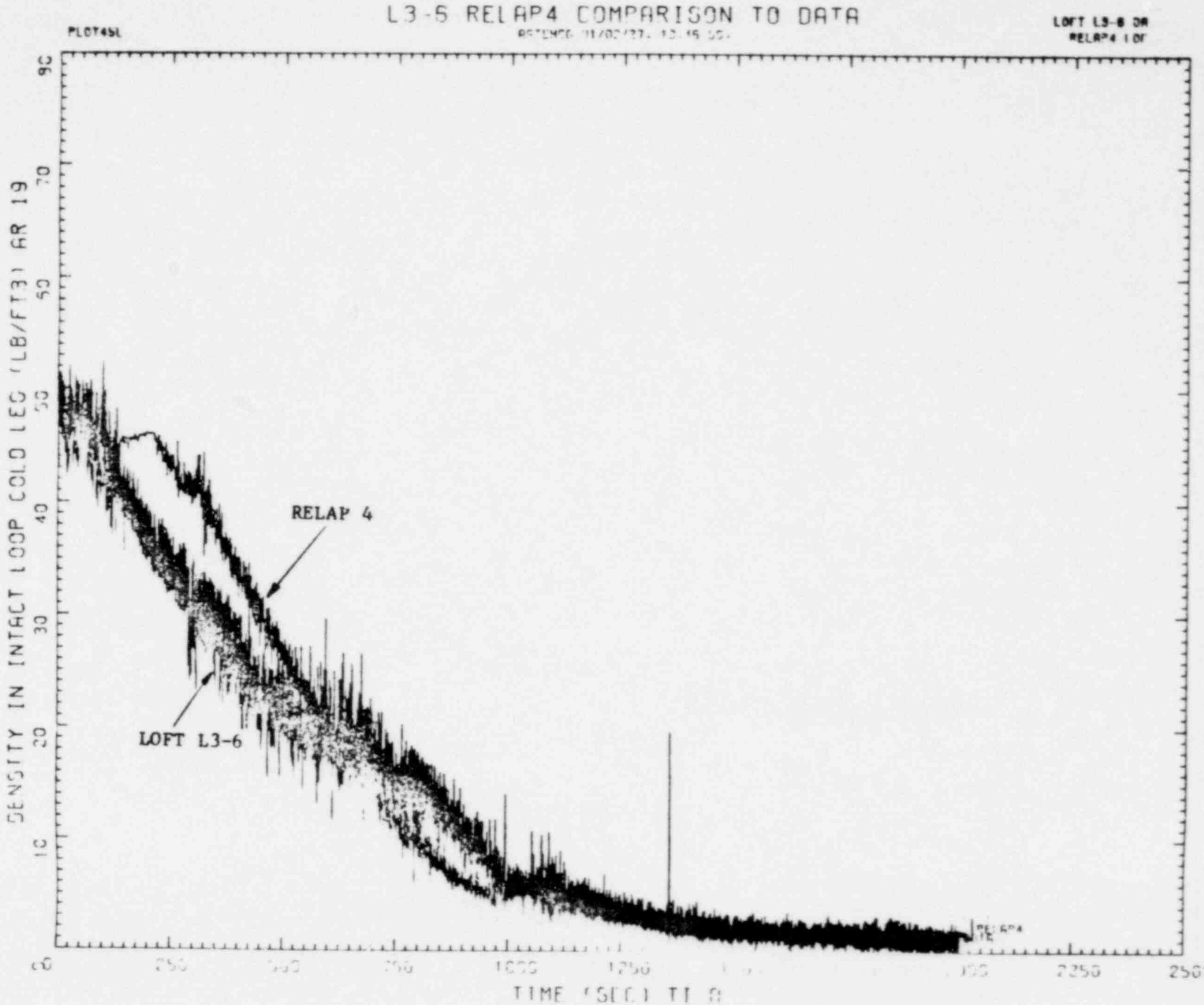

Figure 28
Density in Intact Loop Cold Leg
(0 - 2400 sec)

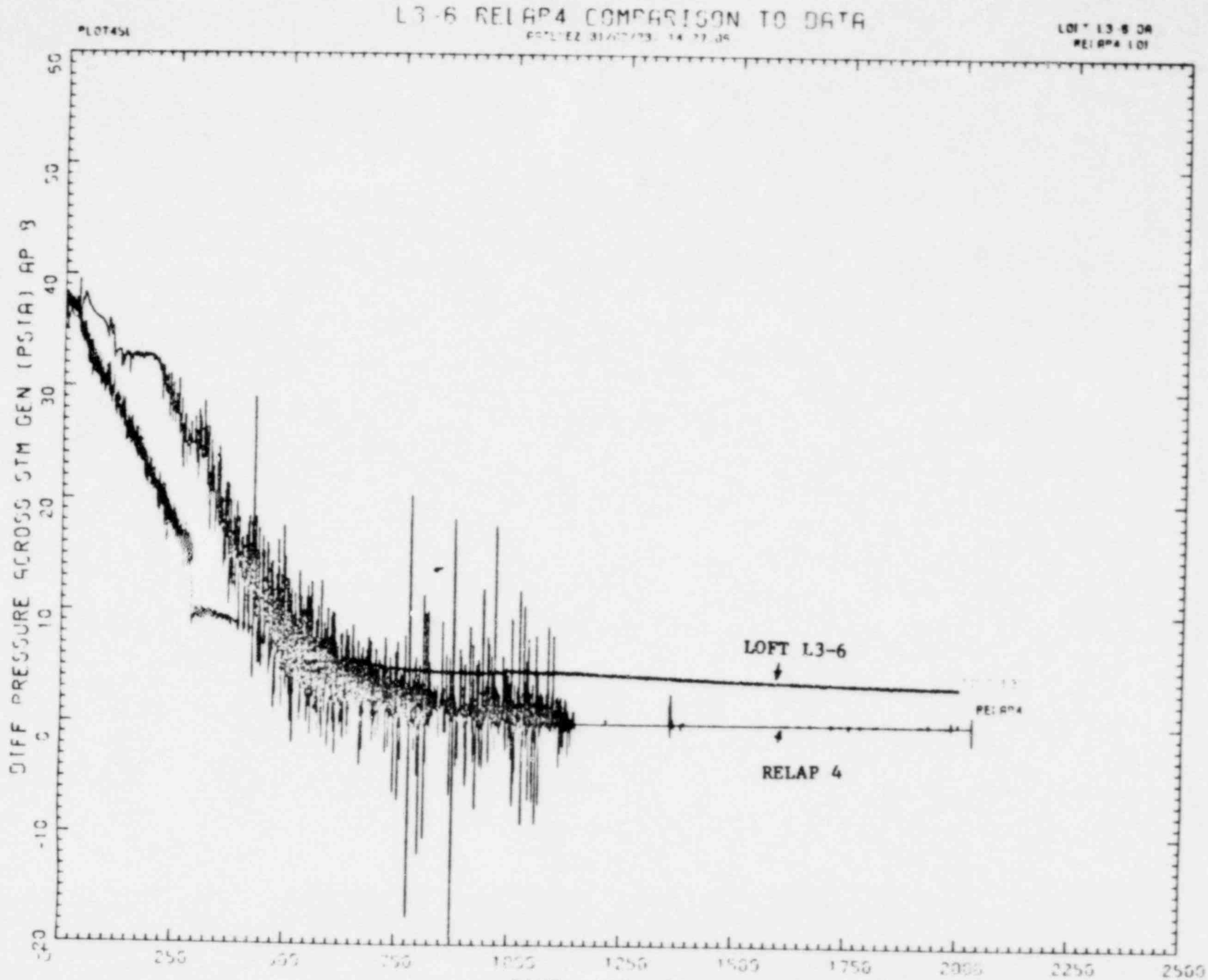

Figure 29
Differential Pressure Across
Steam Generator
(0 - 2400 sec)

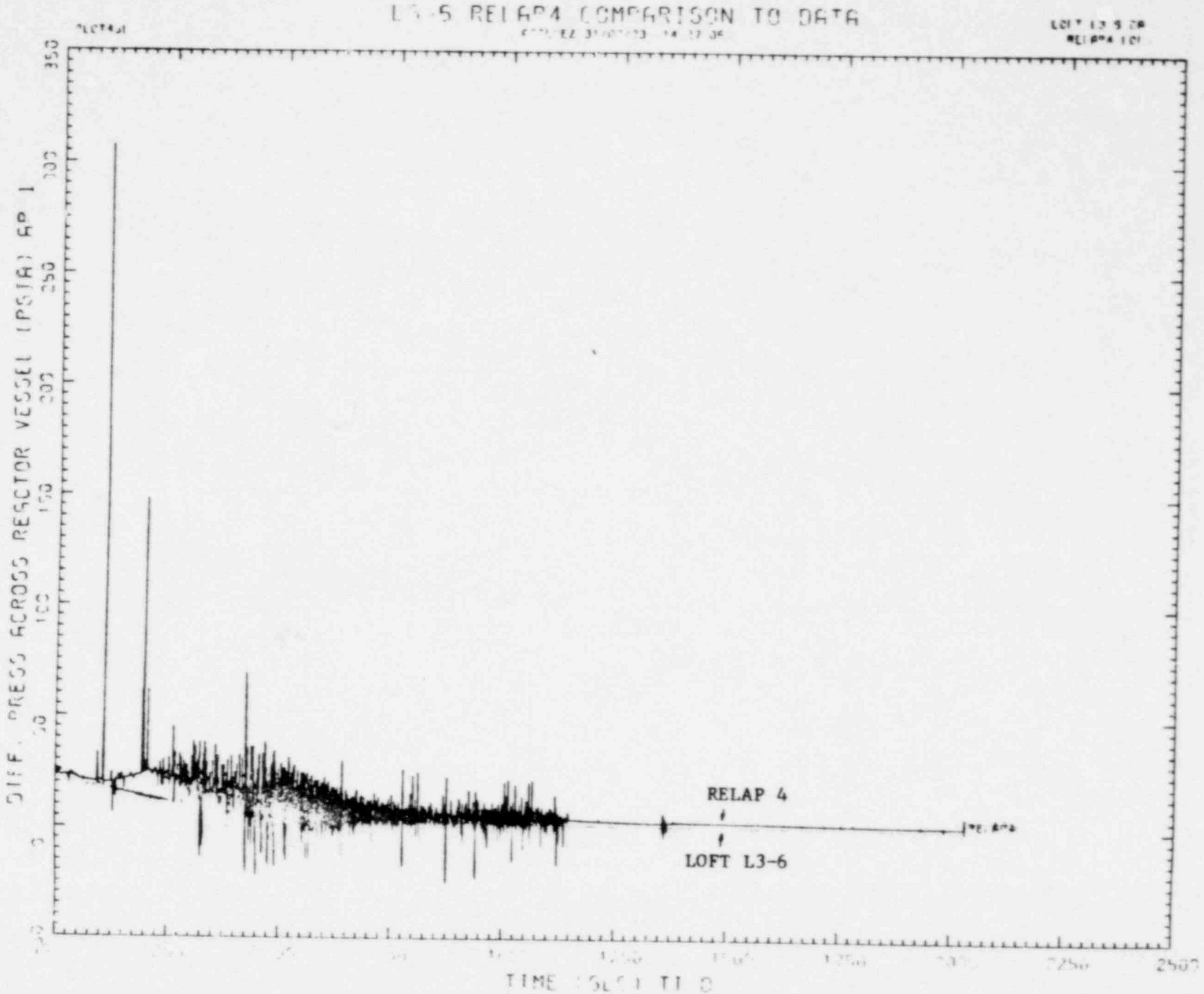

Figure 30
Differential Pressure Across
Reactor Vessel
(0 - 2400 sec)

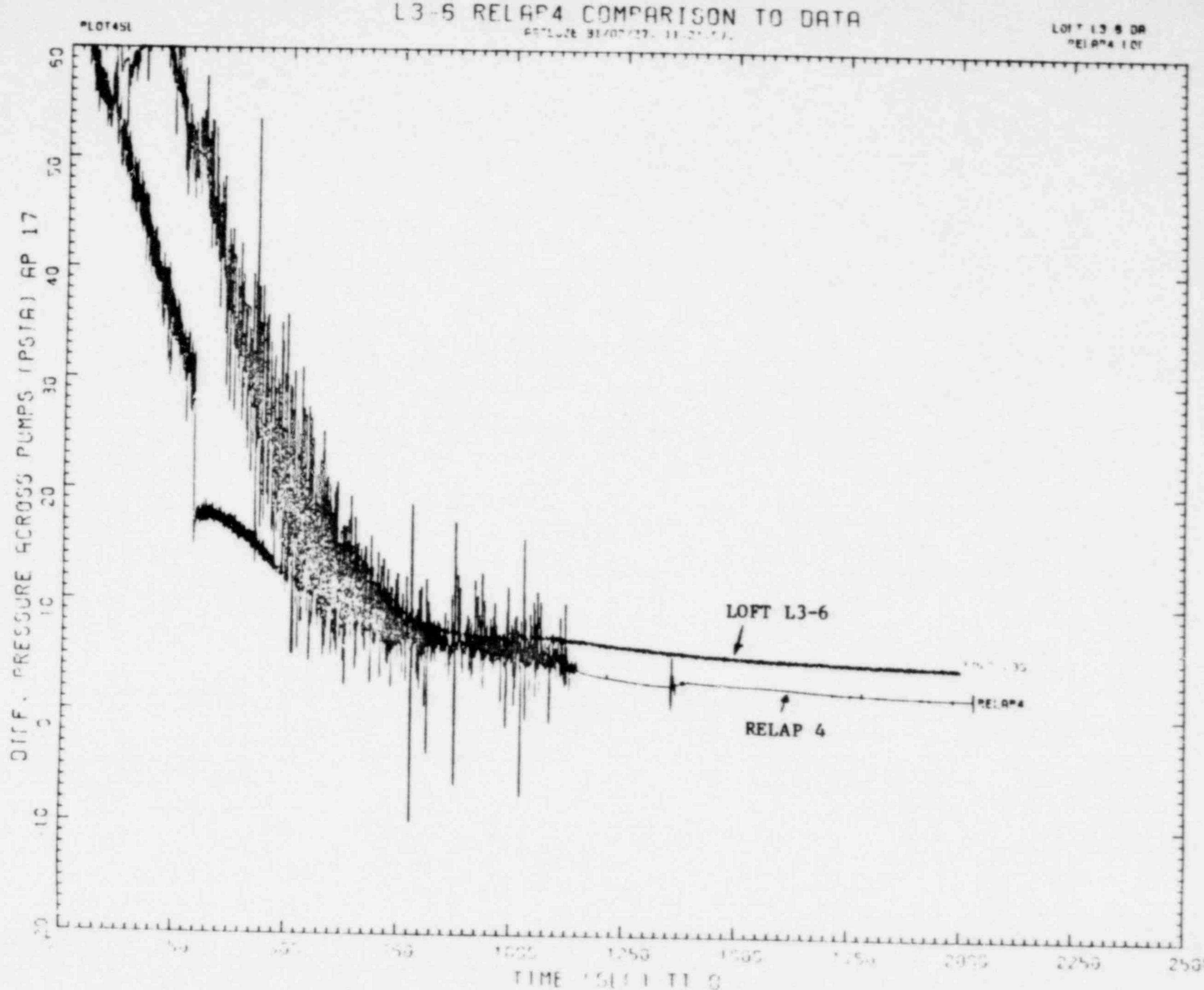

Figure 31
Differential Pressure Across Pumps
(0 - 2400 sec)

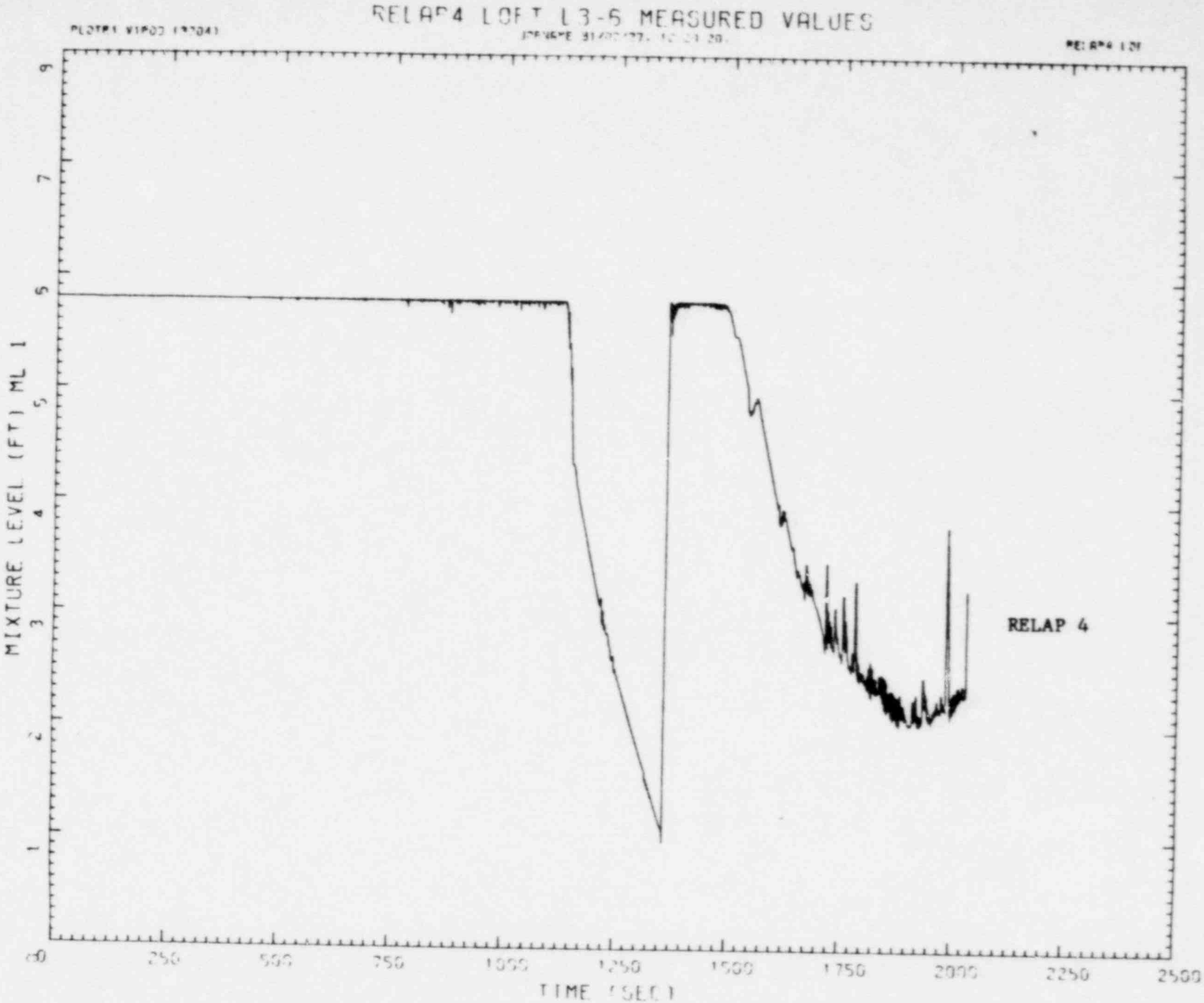

Figure 32
Liquid Level in Core
(0 - 2400 sec)

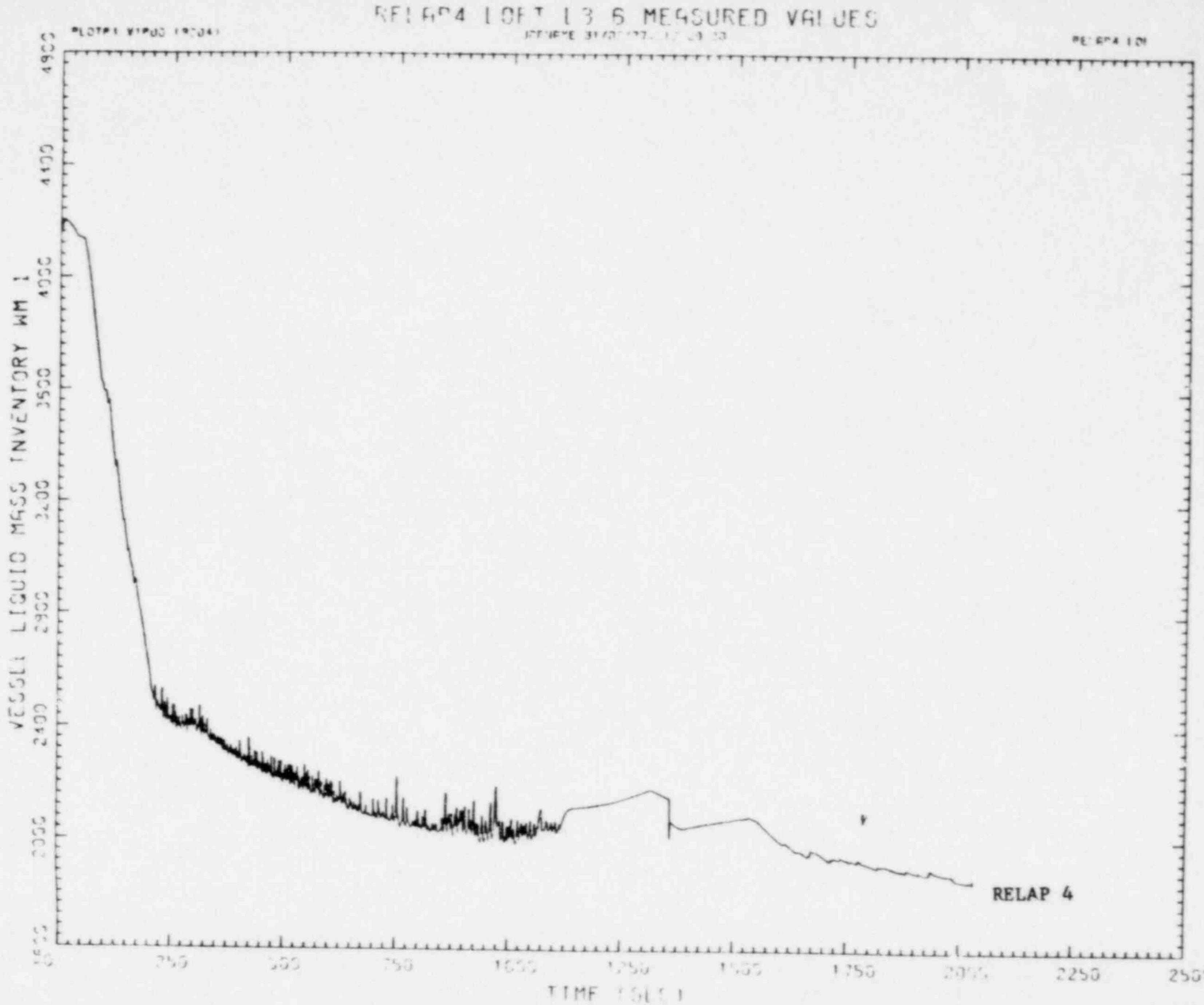

Figure 33
Liquid Mass in Reactor Vessel
(0 - 2400 sec)

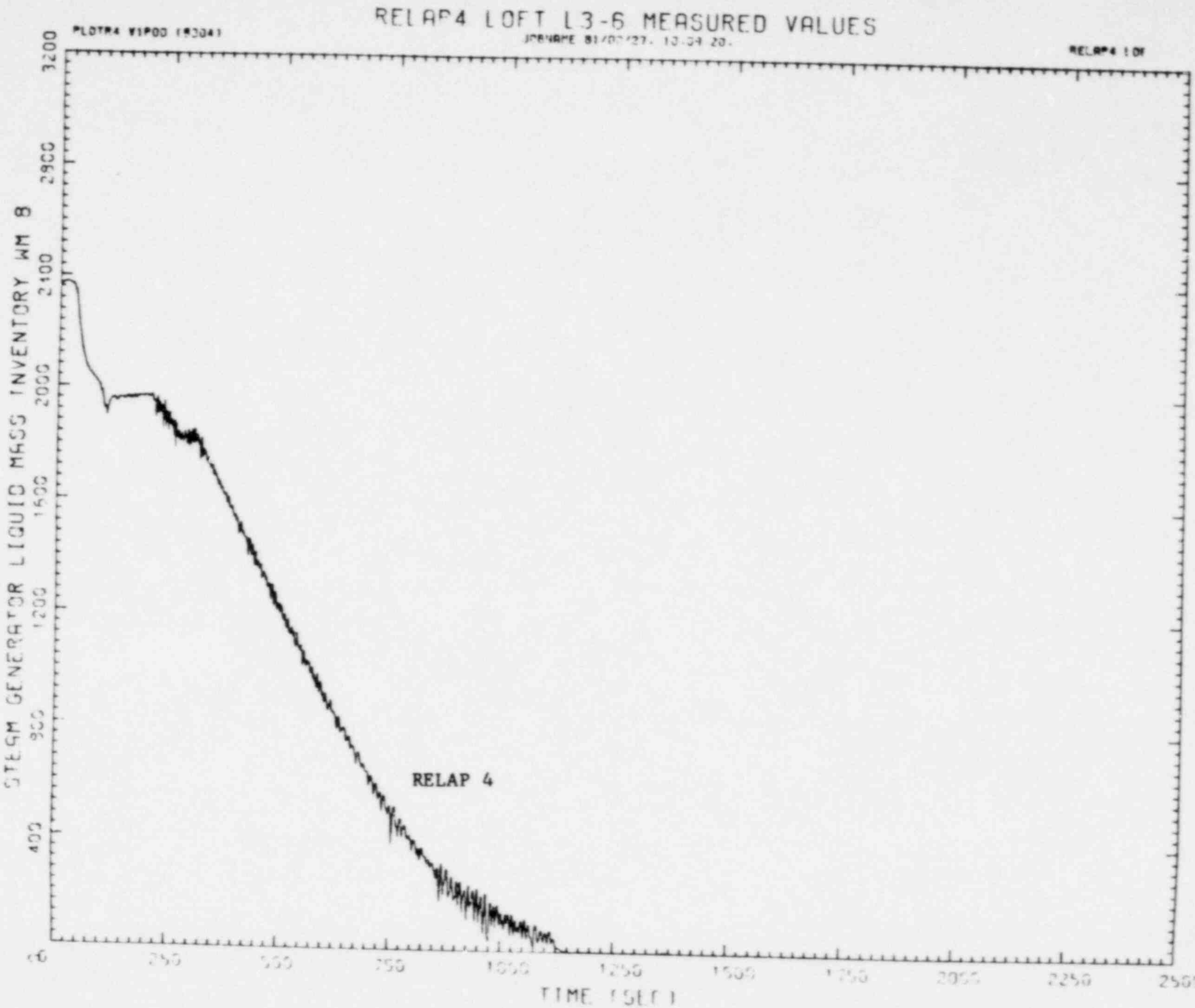

Figure 34
Liquid Mass in Steam Generator,
Primary Side
(0 - 2400 sec)

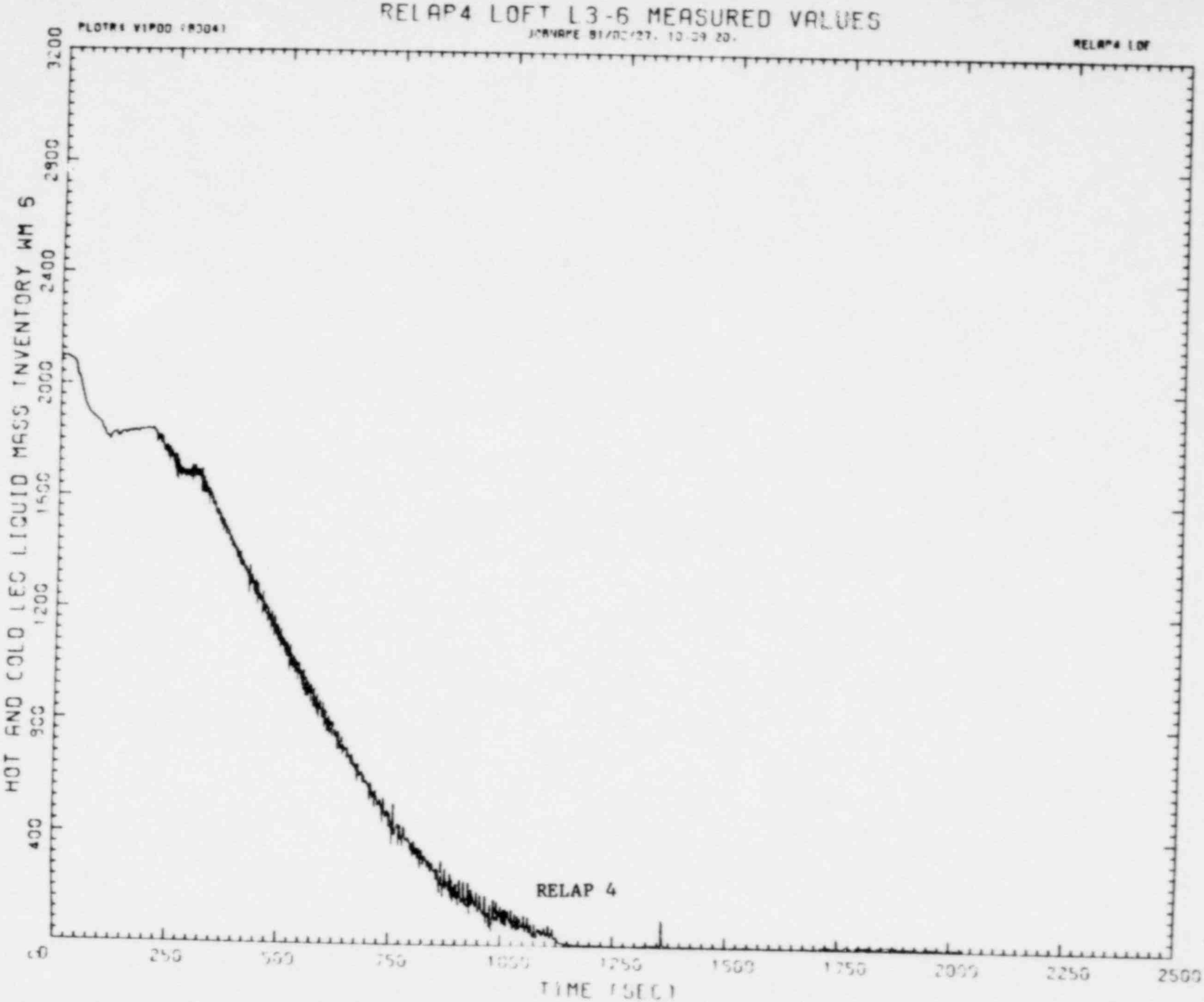

Figure 35
Liquid Mass in Hot and Cold Leg,
Intact Loop
(0 - 2400 sec)

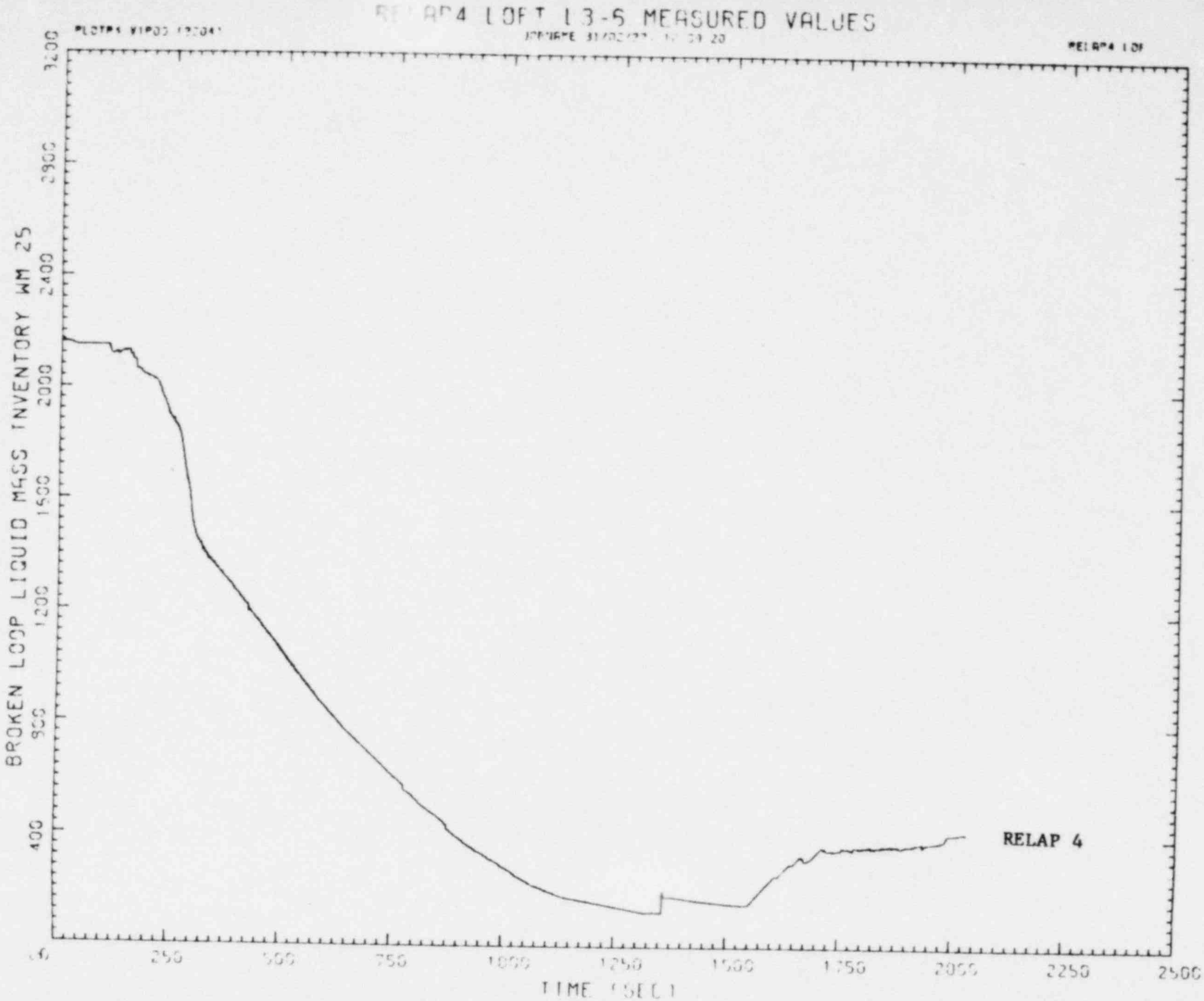

Figure 36
Liquid Mass in Broken Loop
(0 - 2400 sec)

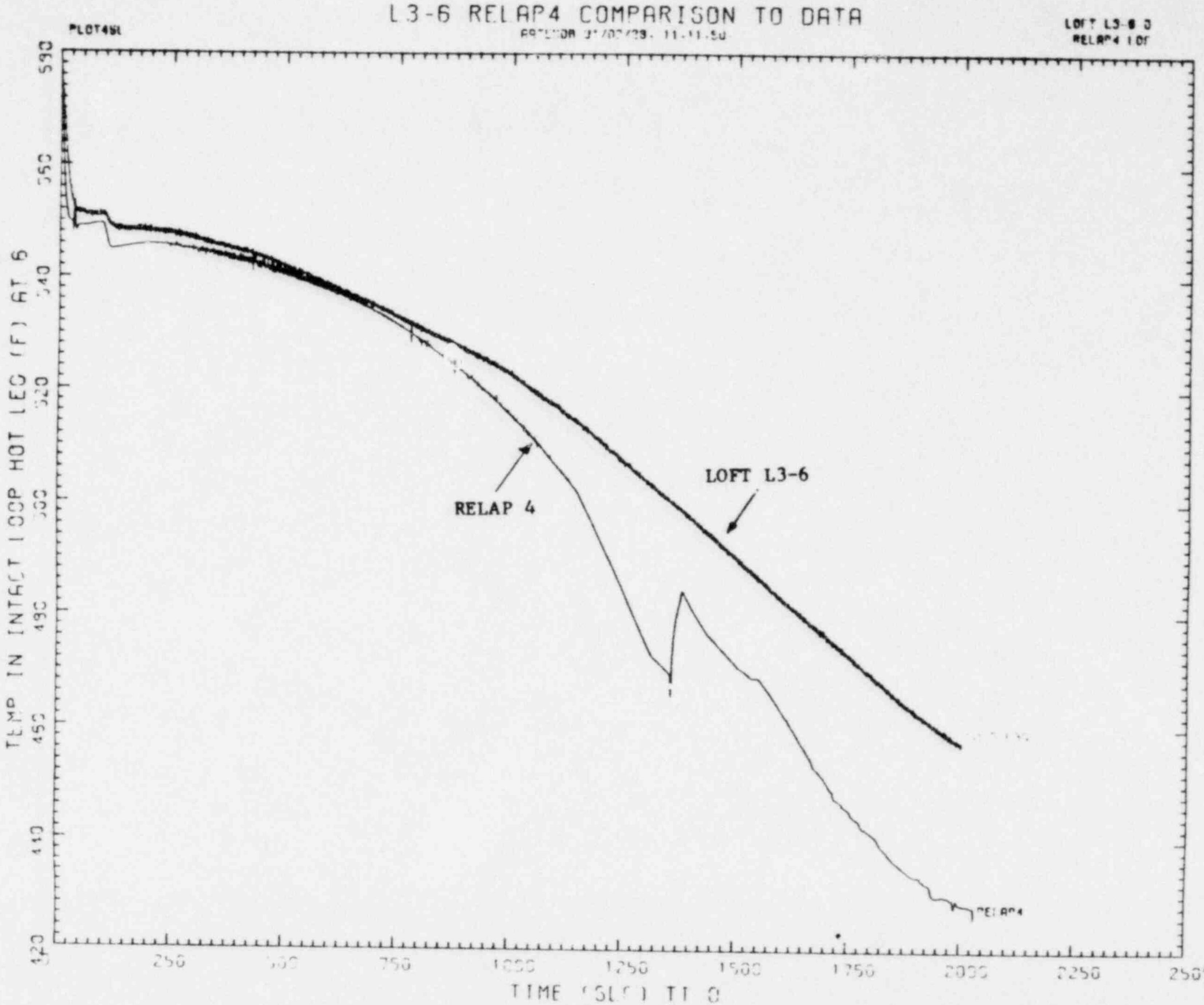

Figure 37
Temperature in Intact Loop Hot Leg
(0 - 2400 sec)

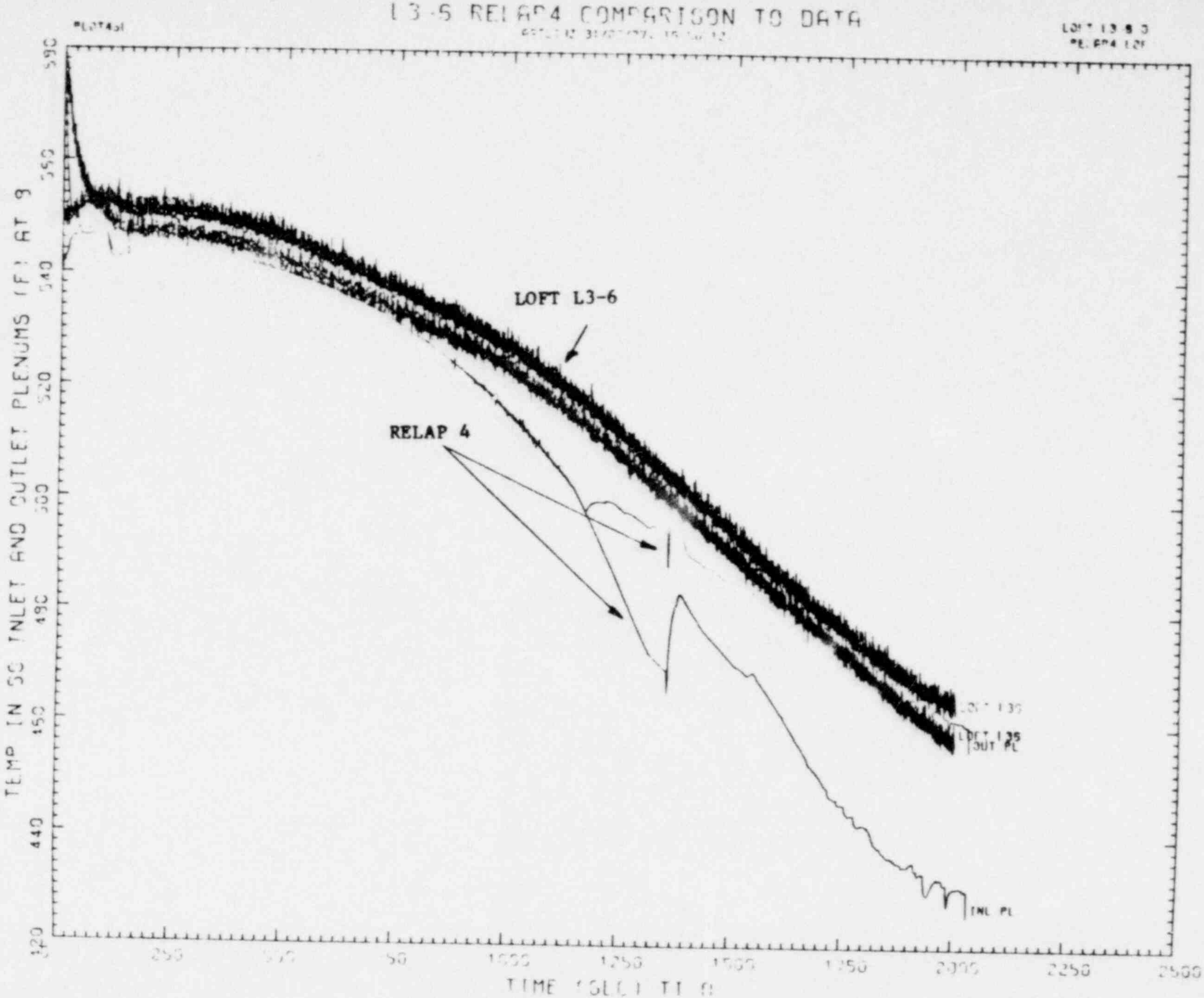

Figure 38
Temperature at Inlet and
Outlet Plenums in Steam Generator
(0 - 2400 sec)

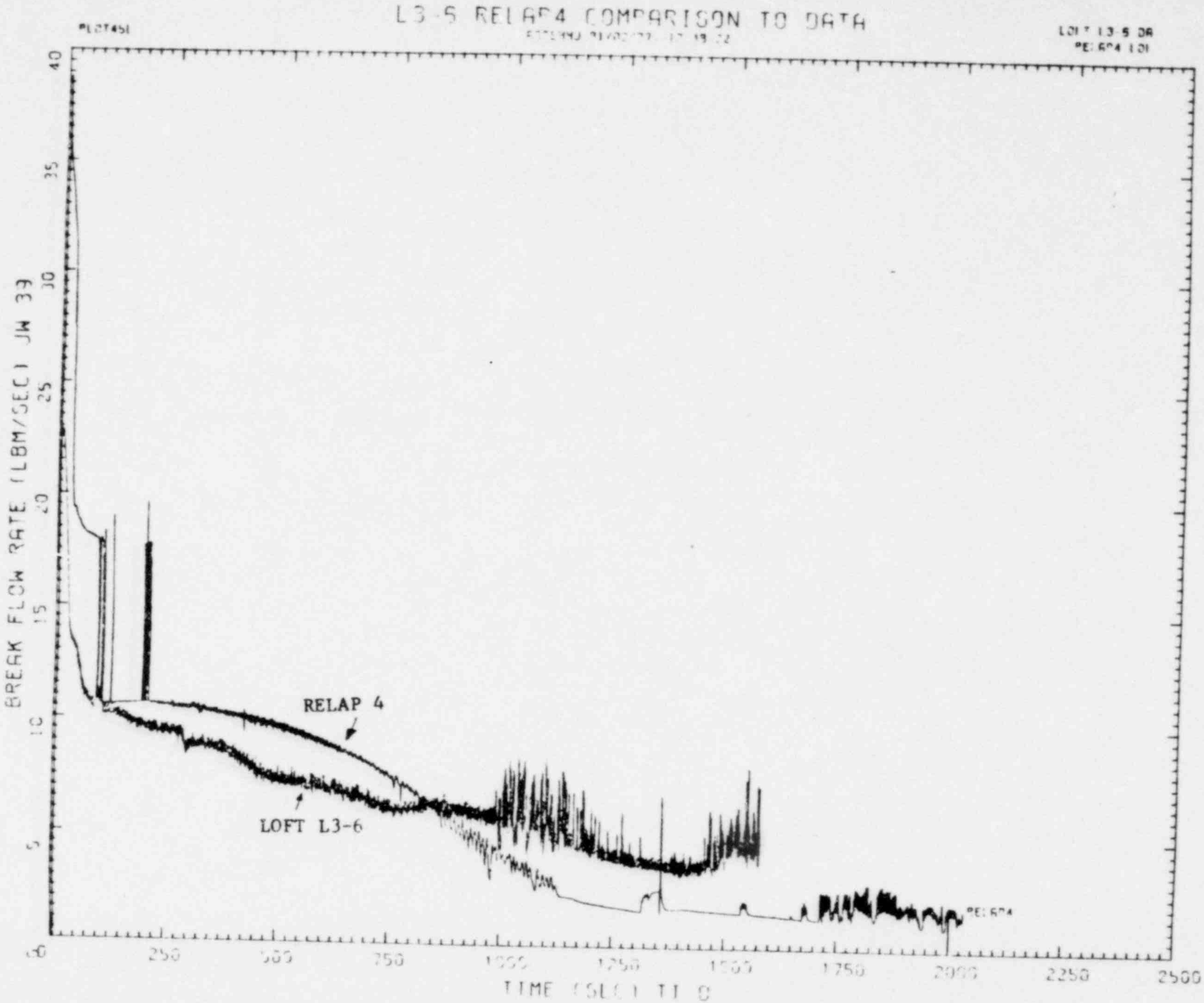

Figure 39
Break Flow
(0 - 2400 sec)

5.0 APPENDIX A

```
*C COMZ
*ID LS7227
*I COCI.31
      3       ,DADT,VAVPOS
*C COML
*ID LS7228
*D COML.175
      LENGTH(J)=(5*MAXJUN+3)*NLFLT+8*MAXJUN*NLINT
*C FLOS
*ID BHLS
*I FLOS.339
      IF(I.NE.99) GO TO 85
      DADTO = 0.05
C
C     IN THE FOLLOWING CARDS THE LOGIC TO TRIP THE SPECIAL STEAM
C     VALVE IS IMPLEMENTED
C
      IF(TRIP(5,XXXX)) GO TO 999
      GO TO 886
  999 IF(DADT.LT.0.0.AND.P(K).GE.930.) DADT =0.0
      IF(P(K).LE.920.0) DADT = -DADTO
      IF(P(K).GE.1030.0) DADT =DADTO
      IF(P(K).LE.1020.0.AND.DADT.GT.0.0) DADT = 0.0
      VAVPOS = VAVPOS+DADT*DT
       IF(VAVPOS.LT.0.0) VAVPOS = 0.0
      IF(VAVPOS.GT.1.0) VAVPOS = 1.0
  886 VALCOF = .366455*VAVPOS**3-.280043*VAVPOS**2+.151757*VAVPOS-
     $            .00047633
      IF(VAVPOS.LT.0.1) VALCOF = .00643*VAVPOS+.01157
      IF(VAVPOS.LT.0.016) VALCOF = .72938*VAVPOS
      IF(VAVPOS.LE.0.0) VALCOF = 0.0
      IF(P(K).GE.400.) WP(I) = VALCOF*P(K)
      IF(P(K).LT.400.) WP(I) = 1.149*VALCOF*SQRT(P(K)**2-(200.)**2)
      ESUBK(I) = ZERO
      FSUBK(I) = -UNEEXT
      GO TO 270
   85 CONTINUE
*I RJW1.237
     3    ,DADT,VAVPOS
*I INJU.257
      DADT=0.0
      VAVPOS=0.646934
*I COCI.31
     3    ,DADT,VAVPOS
*D COML.175
      LENGTH(J)=(5*MAXJUN+3)*NLFLT+8*MAXJUN*NLINT


*C FLOS
*IDENT RCH
*I FLOS.434
      AA1 = 1.0
*B FLOS.440
      AA1 = A1
*D FLOS.441,FLOS.442
      WTHMIN = -AA1*AJ*LEAK(H,PLL,I,DER,TCHOK,TTPL)
      WTHMAX =  AA1*AJ*LEAK(H,PLK,I,DER,TCHOK,TTPK)
```

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YANKEE ATOMIC ELECTRIC COMPANY
****************************************************
**          SOFTWARE CONTROL LIBRARY              **
****************************************************
** PERM.FILE NAME     : TP15V05                   **
** MODIFICATION LEVEL: V05.00                     **
** DESCRIPTION        : STEAM TABLE(TAPE15)       **
** INSTALLED DATE     : 02/26/80                  **
** TODAY'S DATE       : 02/27/81                  **
** TIME OF RUN        : 17.53.06.                 **
****************************************************
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LISTING OF INPUT DATA FOR CASE 1

```
* RELAP4 LOFT L3-6 MEASURED VALUES * STEAM LEAKS * CURD,60 ON MODDY * CONT LEAK
010001  -2   9   9   18   37   4   2   52   1   10   1   5  16   8   5  3  0  0
010002    50.0         1.0
010003    1   0   1   1
020000  AP 6  AP 3  JW 44  JW 39  JW 41  JC 39  JW 47  JX 39  AP 19
     *     T I M E    S T E P    D A T A
030010   2          10          2          0          0.1        0.001       5.0
030020   3          10          2          0          0.05       0.0002      6.0
030030   2          10          2          0          0.10       0.001      27.0
030040   5         100        100          0          0.050      0.0001     29.5
030050   2         100        250          0          0.001      0.00004     30.5
030060   5          10          1          0          0.1      0.001     50.0
030070   2          10          2          0          0.10     0.001     62.0
030080  40         100         50          0          0.001      0.00004    63.0
030090   2          10          2          0          0.100      0.0004   3000.0
*            T R I P    D A T A
040010   1   1   0   0    0.0    0.0    *END
040020   2   1   0   0    79.2   0.0    *START AUX FEEDWATER
040030  11   1   0   0    5.8    0.0    *BREAK
040040   4   1   0   0    0.0    0.0    *START FEEDWAT
040050   5   1   0   0    0.0    0.0    *STEAM FLOW
040060   1  -6   3   0    0.336  0.0    *STOP                LEVEL
040070   7  -4   6   0    1778.17   0.0    *HPIS
040080  12   1   0   0    0.0       0.1    *SCRAM
040090  10   1   0   0    1.9    0.0    *OPTIONAL BREAK
040100   6  -4   6   0    330.0    0.0    *TRIP PUMPS
040110   3   4   33   0    1010.5 0.0    *CLOSE STEAM CONTROL VALVE LEAK
040120   8   8   3   0    900.0    0.0    *OPEN LEAK
040130   9   1   0   0    48.0     0.0    *START COOLANT INJECTION TO PRIMARY PUMPS
040140  13   4   33   0    1010.5    1.9   * START SECOND LEAK 50;
040150  14   4   33   0    1010.5   1.9   * START SECOND LEAK 40;
040160  15   4   33   0    1010.5   1.9   * START SECOND LEAK 30;
040170  16   4   33   0    1010.5   13.0   * START SECOND LEAK 20;
040180  17   4   33   0    1010.5   1.9   * START SECOND LEAK 10;
*
*                VOLUME       DATA
*
*                B=BUBBLE   INDEX+TRIP INDICATOR  D=VOLUME DATA RETRIEVAL
*VOL.N      B D          PRESSURE           TEMP        QUAL        *REPRESENTS
050011      2 0          2173.026971        563.2349  -1.          * CORE
050021      2 0          2175.068550         544.50    -1.          *CORE BYPASS
050031      4 0          807.57153           -1.0      0.           *SG SEC STEAM DOME
050041      2 0          2169.76737798        579.50      -1.          *PLENUM ABOVE FUEL
050051      2 0          2167.66495        579.50      -1.         *HOT LEG UPPER PLENUM
050061      0 0          2156.62140          579.50      -1.         *I L H L
050071      0 0          2152.814975       579.50      -1.         *I L H L VENTURI
050081      0 0          2143.63722        579.50      -1.         *SG INLET PLENUM
050091      0 0          2140.32858        563.8700 -1.       *SG TUBES INLET
050101      0 0          2137.20385        555.8045 -1.       *SG TUBES
050111      0 0          2135.73802        549.1860 -1.       *SG TUBES
050121      0 0          2135.52782        545.310000 -1.       *SG TUBES OUTLET
050131      0 0          2136.17831        544.50      -1.         *SG OUTLET PLENUM
050141      0 0          2124.20889        544.50      -1.         *I L C L
050151      0 0          2121.93712        544.50      -1.         *I L C L
050161      0 0          2116.790092        544.50      -1.         *PUMP INLET
050171      0 0          2152.17855        544.50      -1.         *REACTOR COOLANT PUMP
050181      0 0          2184.76275        544.50      -1.         *PUMP OUTLET
050191      0 0          2181.634650        544.50      -1.         *I L C L
050201      2 0          2177.808688        544.50      -1.         *RV INLET ANNULUS
050211      2 0          2178.818790         44.50      -1.         *RV DOWNCOMER
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050251    0 0        2178.34434       541.11       -1.        *H L C L
050241    0 0        2178.38434       541.11       -1.        *H L C L -NEAR BREAK
050251    0 0        2168.80695       551.91        -1.        *H L H L
050261    0 0        2167.11760       551.91       -1.        *R L H L -SG SIMULATOR
050271    0 0        2167.80128       551.91        -1.        *R L H L -SG TO PUMP
050281    0 0        2169.57405                 551.91     -1.        *R L H L -PUMP U
050291     0 0       2177.90000       541.11       -1.     * B L C L - RABV
050301    0 0        2168.55782       551.91       -1.        *R L H L -RABV
050311    0 0        2156.12322       579.50       -1.        *PZR  SURGE LINE
050321    2 0        2155.11082       -1.          0.        *PZR
050341    0 0        2179.24809        150.         -1.        *HPSI INJ PIPE
050351    0 0        809.2745         507.444    -1.        *SG SEC DOWNCOMER
050361    1 0        808.92015        -1.0        .0290085 *SG SEC SHROUD REGION
050371    4   1    17.5    181.0     0.10
050331    4 0        808.92197        -1.0        1.0       *STEAM PIPE
*
*     LEVEL CALCULATION
060000    22  1   4    5
*
*                        BUBLE RISE GRADIENT AND VELOCITY
060011             0.71              -1.0                                  *STM GEN SECONDARY
060021             0.80              -1.0                                  *WILSON
060031             0.80              -1.0                                  *WILSON
060041             0.80              1.E+0
*
*                                         VOLUME  GEOMETRY  DATA
*
*VOL.N         VOL          HGHT          LEV          F    FLW AR       EQ.DIA      ELEV
050012    10.3135       5.8           5.8           0   1.7599      0.09131     -12.256
050022      .9368        5.8           5.8           0   .1616        .0098       -12.256
050032     139.7        11.26         3.7353        0   12.4         2.3682       10.17
050042     13.708       5.171         5.171         0   2.5898       1.10        -6.456
050052     17.353       3.952         3.952         0   2.1878       1.609       -1.285
050062      8.152       0.932         0.932         0   0.6827       0.932       -0.466
050072      6.088       2.422         2.422         0   0.8056       1.068       -0.534
050082     11.045       2.234         2.234         0   7.9412       1.462        0.312
050092     7.7260       4.751         4.751         0   1.6762       0.0335       2.546
050102     5.9748       4.207         4.207         0   1.6762       0.0335       7.297
050112     5.9748       4.207         4.207         0   1.6762       0.0335       7.297
050122     7.7260       4.751         4.751         0   1.6762       0.0335       2.546
050132     11.045       2.234         2.234         0   7.9412       1.462        0.312
050142     2.057        2.375         2.375         0   0.8056       1.068       -0.487
050152     4.438        3.809         3.809         0   0.6827      0.932       -4.296
050162     4.494        2.174         2.174         0   0.6827      0.932       -4.296
050172     7.571        2.476         2.476         0   0.7882      0.398       -2.122
050182     8.878        0.708         0.708         0   0.6827      0.586       -0.394
050192     3.224        0.932         0.932         0   0.6827      0.932       -0.466
050202     5.932        2.368         2.368         0   2.7871      0.109       -1.285
050212     22.103       15.080        15.080        0   1.5272      0.217       -16.365
050222     19.446       4.109         4.109         0   2.1090      1.10        -16.365
050232     5.100        0.932         0.932         0   0.6827      0.932       -0.466
050242     6.612        0.932         0.932         0   0.6827      0.932       -0.466
050252     5.504        0.932         0.932         0   0.6827      0.932       -0.466
050262     9.590        11.070        11.070        0   1.0608      1.210       -0.169
050272     11.719       15.346        15.346        0   1.0608      1.216       -4.445
050282     0.574        4.318         4.318         0   9.008-2     0.339       -4.148
050292     6.508        2.065         2.065         0   0.0176      1.250       0.466
050302    6.369     2.896    2.896    0      0.0176     1.250     -0.365
050312     0.302        4.35          4.35          0   1.556-2     0.181         0.466
050322    30.10     5.634     3.5716    0      0.0844     2.783     4.020
050342    3.8138     7.889     7.889     0      0.CA007     1.0+0     -7.300
050352     7.000           0.667        0.667        0   2.3          0.3273      3.504
050362     88.95        13.51         13.0951       0   9.0          0.181        3.504
050372    3000.0       11.0      0.0          1.60       11.0       -0.07
050332     41.0            .7970        1.0E-4         0   .4989        .7970       21.43
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C70201    1
*
*                     JUNCTION DATA
*
          *****JUNCTION DATA *********
*JUNCT.     IN   OUT  PUMP VLV  IN.FL-RATE
080011      22   01    0    0   1002.923        *INLET PLANE BOTTOM OF FUEL
080021      01   04    0    0   1002.923        * EXIT TO UPPER PLENUM
080031       22  2    0    0   52.827          *CORE BYPASS INLET
080041       3  35    0    0   507.8210         *SG SEC.STEAM DOME TO DWNCMR
080051      04   05    0    0   1055.55         *OUTLET PLENUM TO UPPER PLENUM
080061      05   06    0    0   1055.55         *INTACT LOOP OUTLET NOZZLE
080071      06   07    0    0   1055.55         *ILHL-DWNSTREAM OF SURGE LINE
080081      07   08    0    0   1055.55         *SG PLENUM INLET
080091      08   09    0    0   1055.55         *SG TUBE SHEET INLET
080101      09   10    0    0   1055.55         *SG TUBES
080111      10   11    0    0   1055.55         *SG TUBES
080121      11   12    0    0   1055.55         *SG TUBES
080131      12   13    0    0   1055.55         *SG TUBE SHEET EXIT
080141      13   14    0    0   1055.55         *SG OUTLET NOZZLE
080151      14   15    0    0   1055.55         *PIPING SG TO PUMPS
080161      15   16    0    0   1055.55         *BRANCH PIPING TO PUMPS
080171      16   17   -1    0   1055.55         *PUMP SUCTION
080181      17   18    1    0   1055.55         *PUMP DISCHARGE
080191      18   19    0    0   1055.55         *INT. COLD LEG
080201      19   20    0    0   1055.55         *INT. CL.INLET NOZZLE
080211      20   21    0    0   1055.55         *ANNULUR TO DWNCMR
080221      21   22    0    0   1055.55         *DOWNCOMER TO LOWER PLENUM
080231       20 23    0    0   0.0             *BLCL-NOZZLE
080241       23 24    0    0   0.0             *BLCL-MEASUREMENT LOCATION
080251        2  4    0    0   52.827          *CORE BYPASS OUTLET
080261       23 29    0    0   0.0             *BLCL-TEE TO BABY
080271       06 25    0    0   0.0             *BLHL-NOZZLE
080281       25 26    0    0   0.0             *BLHL-CONTRACTION
080291       26 27    0    0   0.0             *BLHL-SG SIMULATOR
080301       27 28    0    0   0.0             *BLHL-PUMP SIMULATOR
080311       36 3     0    0   569.1214        *SG SEC.SHROUD TO STEAM DOME
080321       25 30    0    0   0.0             *BLHL-TEE TO BABY
080331       31 06    0    0   0.0             *SURGE LINE CNNECTION TO HL
080341       32 31    0    0   0.0             *PZR INLET
080351       35 36    0    0   569.1214        *SG SEC.DWNCMR TO SHROUD
080361       34 20    0    0   0.0             *ACCUMULATOR INJECTION PIPE
080371    24    37    0    2    0.0          *BREAK IN COLD LEG
080381       19 37    0    1    0.0          *BREAK ORIFICE
080391        3  33   0    0   61.3         *STEAM PIPE INLET
080411        0  33   4    4    0.0          *STEAM CONTROL VALVE LEAK
080421        0  34   2    0    0.0          * HPIS INJECTION
080431        0  35   3    0   61.3          *FEED WATER FLOW
080441       33  0    1    0   61.3         *STEAM FLOW
080451        0 35    1    0    0.0          *AUX FEEDWATER
080461       32  0    1    3    0.0          *LEAK PATH OUT OF PZR REI VLV
080471       28  0    1    2    0.0          *B L H L - BREAK LOCATION
080471    0   15    5    5    0.0   * SECOND SG LEAK
080481    0   33    4    6    0.0   *LEAK 501
080491    0   33    4    7    0.0   *LEAK 401
080501    0   33    4    8    0.0   *LEAK 301
080511    0   33    4    9    0.0   *LEAK 201
080521    0   33    4   10    0.0   *LEAK 101
*JUNCT      AREA     ELEVATION INERTIA   K-FWD     K-REV
080012   1.0512    -12.256   2.5369   1.5728   1.2776
080022   1.2472    -6.456    2.0278   0.7890   0.8889
080032   .1615    -12.256 88.071   6.32169   6.32169
080042   2.3              10.17    1.9034  0.1921    0.1921
080052    0.9896     -1.284    2.312    0.1891    0.3401
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UMU07P      0.5560      0.0        15.280     0.4740      0.4600
UMU08P      0.5560      1.510      4.491      1.4000      1.5400
UMU09P      1.0202      2.548      1.001      0.3187      0.4490
UMU10P      1.0202      7.297      2.754      0.02        0.02
UMU11P      1.0202      10.55      2.587      0.02626     0.02626
UMU12P      1.0202      7.297      2.754      0.02        0.02
UMU13P      1.0202      2.548      1.001      0.4990      0.3187
UMU14P      0.5560      1.510      1.371      1.091       1.2660
UMU15P      0.0827      -0.047     0.048      0.1555      0.1633
UMU16P      0.0827      -3.430     9.581      0.9319      1.0596
UMU17P      0.7881      -2.122     6.509      0.001       0.001
UMU18P      0.7881      0.0        8.179      0.001       0.001
UMU19P      0.0009      0.0        13.114     0.4277      0.3041
UMU20P      0.0827      0.0        6.500      1.0150      0.9527
UMU21P      1.5272      -1.245     4.576      0.0883      0.1362
UMU22P      20.743      -15.105    4.821      330.33      76.642
UMU23P      0.0827      0.0        9.388      0.9782      1.0582
UMU24P      0.5814      0.0        11.110     6.54508     14.05848
UMU25P   .1615   -0.456   39.843   0.2717    6.2717
UMU26P      0.4176      0.466      24.223     0.45760     1.24700
UMU27P      0.0827      0.0        9.415      0.7621      1.20314
UMU28P      0.0900      0.0        40.231     1.33201     1.08959
UMU29P      0.2060      10.292     11.519     11.63868    11.63868
UMU30P      0.0400      -3.979     132.751    8.78208     8.78208
UMU31P      1.7778      16.25      1.2047     0.0911      0.0911
UMU32P      0.4175      0.0        19.338     0.45780     1.24700
UMU33P      0.0156      0.448      78.330     1.0         8.62
UMU34P      0.0156      4.225      74.890     10.24       6.62
UMU35P      5.0128      3.614      2.1999     2.319       2.319
UMU36P      0.0645      0.0        645.99     8.0045      8.0045
UMU37P   2.22-3   0.0   15.180   0.015    0.415
UMU38P   2.22-3   0.0   72.82    2.93     2.93
UMU39P      .4989              21.43      82.36      .%          1.0
UMU41P      1.0                21.43      82.36      1.5         1.5
UMU42P      1.0                0.0        0.0        1.0         1.0
UMU43P      1.0                10.0       1.0        1.0         1.0
UMU44P      1.0                21.43      1.0        1.0         1.0
UMU45P   1.0   10.0   1.0   1.0   1.0
UMU46P      0.0069             8.634      5.7        0.001       0.001
UMU40P      0.0900             0.0        40.914     0.94883     0.94883
UMU47P   1.0   0.0   1.0   1.0   1.0
UMU48P    0.5   21.43   1.0   1.0   1.0
UMU49P    0.4   21.43   1.0   1.0   1.0     *LEAK 801
UMU50P    0.3   21.43   1.0   1.0   1.0     *LEAK 901
UMU51P    0.2   21.43   1.0   1.0   1.0     *LEAK 201
UMU52P    0.1   21.43   1.0   1.0   1.0     *LEAK 101
*********
*JUNC*      IA    J    IC   NUP    DIAM.    CCOEF   I    M
UMU01J       0    0    0    0     2.2040    1.0    11    2
UMU02J       0    0    0    0     2.1167    1.0    11    1
UMU03J       0    0    0    0    0.0    1.0    11    0
UMU04J       0    0    0    0     1.7113    1.0    11    0
UMU05J       0    0    0    0     1.1225    1.0    11    0
UMU06J       1    0    0    0     0.9323    1.0    11    0
UMU07J       1    0    0    0     0.6799    1.0    11    0
UMU08J       1    0    0    0     0.9017    1.0    11    0
UMU09J       0    0    0    0     2.0       1.0    11    2
UMU10J       0    0    0    0     2.0       1.0    11    3
UMU11J       1    0    0    0     1.4160    1.0    11    3
UMU12J       0    0    0    0     2.0       1.0    11    3
UMU13J       0    0    0    0     2.0       1.0    11    1
UMU14J       1    0    0    0     0.9017    1.0    11    0
UMU15J       0    0    0    0     0.9323    1.0    11    0
UMU16J       1    0    0    0     0.9323    1.0    11    0
UMU17J       0    0    0    0     0.7833    1.0    11    0
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080199       1    0    0    0    0.9323   1.0   11    0
080209       1    0    0    0    0.9323   1.0   11    0
080219       0    0    0    0    3.0420   1.0   11    0
080229       0    0    0    0    2.4010   1.0   11    0
080239       1    0    0    0    0.9323    .0   11    0
080249       1    0    0    0    0.3386   1.0   11    0
080259       0    0    0    0    0.0   1.0   11    0
080269       0    0    0    0    0.7083   1.0   11    0
080279       1    0    0    0    0.9323   1.0   11    0
080289       0    0    0    0    0.3594   1.0   11    0
080299       1    0    0    0    0.5278   1.0   11    0
080309       1    0    0    0    0.3594   1.0   11    0
080319       1    0    0    0    1.5392   1.0   11    0
080329       0    0    0    0    0.7083   1.0   11    0
080339       0    0    0    3    0.1408   1.0   11    0
080349       0    0    0    0    0.1408   1.0   11    0
080359       1    0    0    0    0.2188   1.0   11    0
080369       1    0    0    3    0.2917   1.0   11    0
080379     1    0    0    0    0.0931    0.0   11    0
080399       1    0    0    0    0.0    0.60   11    0
080389       1    0    0    0    .7970    1.0   11    0
080419       1    0    0    0    0.0      1.0   11    0
080429       0    0    0    3    0.2865   1.0   11    0
080439       0    0    0    3    1.0    1.0   11    0
080449       0    0    0    3    1.0      1.0   11    0
080459   0    0    0    3    1.0    1.0    11    0
080469       0    0    0    0    0.0931   1.0   11    0
080409       1    0    0    0    0.3386  1.0   11    0
080479   1    0    0    0    0.0    1.0    11    0
080489   1    0    0    0    0.0    1.0    11    0
080499   1    0    0    0    0.0    1.0    11    0
080509   1    0    0    0    0.0    1.0    11    0
080519   1    0    0    0    0.0    1.0    11    0
080529   1    0    0    0    0.0    1.0    11    0
*                      PRIMARY  COOLANT  PUMPS
*             PUMP DESCRIPTION BASED ON CE/EPRI/SEMISCALE DATA (12/77)
090011     1    6    0    1    0    3550.   0.88440 10000.    315.    738.
090012     580. 38.31 383.59490R 0.  17.06408  102.2631  0.
*
*             PUMP HEAD TWO PHASE DIFFERENCE CURVE MULTIPLIER
*
091001  *10  0.0  0.0  0.1  *0.025  0.195  0.180  0.20  0.455  0.372  0.57
091002  0.5  0.74  0.735  0.86  0.8  0.85  0.9  0.725  1.0  0.0
*             PUMP TORQUE TWO PHASE DIFFERENCE CURVE MULTIPLIER
092001  *10  0.0  0.0  0.11  0.005  0.195  0.186  0.31  0.304  0.5  0.3
092002  0.6  0.292  0.725  0.28  0.8  0.18  0.9  0.0  1.0  *0.4
*                        PUMP STOP DATA CARDS
095011      0.0        0.0  0.0
*             PUMP   CURVE   SET   INPUT   INDICATOR    CARDS
100000      16    0    0    16
*             PUMP HEAD SINGLE PHASE DATA CARDS
101011      1    1   6 0.  1.4036    0.14061    1.3636     0.30963    1.3186
101012              .59396  1.2328    .7902     1.1336     1.         1.0000
101021      1    2   8 0.  *.07       .2        *.5         .4        *.25
101022              .57554   0.       .74032     .2583      .77348     .3778
101023              .86313  .0326   1.        1.0000
101031  1   3    6  *1.  2.4722    *.80574    2.0470    *.6009    1.831
101032            *.40683 1.620     *.200171   1.4705     0.        1.4036
101041  1   4    8  *1.   2.4722    *.82297    1.9968    *.63352    1.5897
101042            *.45530 1.3274    *.27109    1.1909    *.17716    1.0005
101043            *.04073 1.0150    0.         .934279
101051  1   5   7 0.       .25       .2         .28        .4         .34
101052             .0118    .2768    .59703     .9588     .793467   .6992
101053               1.        1.0000
101061  1   6   10 0.      .934279   .081009    .9330      188509   .8963
```

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101084                1.        1.000
101071  1  7   6 -1.      -1.       -.8        -.03       -.6        -.3
101072            -.4     -.05      -.2        .19        0.         .25
101081  1  6   6 -1.      -1.       -.6        -.97       -.6        -.95
101082            -.4     -.48      -.2        -.8        0.         -.67
*                 PUMP TORQUE SINGLE PHASE DATA CARDS
101091  2  1   6 0.       .6032     .1930      .6395      .303       .7369
101092            .59552  .8391     .99782     .9998      1.         1.000
101101  2  2   7 0.       -.67      .4         -.25       .5         .15
101102            .737285 .526566   .768089    .006594    .86723     .74360
101103            1.      1.0000
101111  2  3   6 -1.      1.9843    -.80096    1.394      -.60038    1.0975
101112            -.40686 .822      -.19928    .0608      0.         .6032
101121  2  4   8 -1.      1.9846    -.82230    1.8948     -.63671    1.6024
101122            -.45853 1.597     -.207023   1.4302     -.170107   1.3879
101123            -.08931 1.3081    0.         1.23361
101131  2  5   4 0.       -.48      .4         -.25       .5         0.
101132            1.      .3589
101141  2  6  10 0.       1.23361   .090643    1.1965     .188569    1.1096
101142            .27349  1.0016    .458669    .8088      .57448     .7807
101143            .73816  .6134     .76852     .5889      .870057    .4877
101144            1.      .3809
101151  2  7   4 -1.      -1.       -.3        -.9        -.1        -.5
101152            0.      -.45
101161  2  8   4 -1.      -1.       -.25       -.9        -.08       -.8
101162            0.      -.67
*                 PUMP HEAD DIFFERENCE CURVE DATA
104011  1  1   7 0        0.        .1         .83        .2         1.09
104012            .5      1.04      .7         1.01       .9         .94
104013            1.00    1.00
104021  1  2   8 0.       0.        .1         -.04       .2         0.
104022            .3      .100      .8         .81        .8         .67
104023            .9      .8        1.00       1.00
104031  1  3  10 -1.      -1.16     -.9        -1.25      -.8        -1.77
104032            -.7     -2.30     -.6        -2.70      -.5        -2.91
104033            -.4     -2.67     -.25       -1.69      -.1        -.5
104034            0       0
104041  1  4  10 -1.      -1.16     -.9        -.78       -.8        -.5
104042            -.7     -.31      -.6        -.17       -.5        -.08
104043            -.35    0         -.2        .05        -.1        .08
104044            0       .11
104051  1  5   6 0        0.        .2         -.34       .4         -.65
104052            .6      -.93      .8         -1.19      1.0        -1.47
104061  1  6  10 0        .11       .1         .13        .25        .15
104062            .4      .13       .5         .07        .6         -.04
104063            .7      -.23      .8         -.51       .9         -.91
104064            1.0     -1.47
104071  1  7   2 -1.      0.        0.         0.
104081  1  8   2 -1.      0.        0.         0.
*                 PUMP  TORQUE  DIFFERENCE  CURVE  DATA
104091  2  1   6 0.       .6032     .1930      .6395      .303       .7369
104092            .59552  .8331     .99782     .9229      1.         1.000
104101  2  2   7 0.       -.67      .4         -.25       .5         .15
104102            .737285 .526586   .768049    .006594    .86723     .74360
104103            1.      1.000
104111  2  3   6 -1.      1.9843    -.80096    1.394      -.60038    1.0975
104112            -.40686 .822      -.19928    .0608      0.         .0032
104121  2  4   8 -1.      1.9843    -.82243    1.8398     -.63371    1.6824
104122            -.45853 1.567     -.207023   1.4362     -.170107   1.3879
104123            -.08931 1.3081    0.         1.23361
104131  2  5   4 0.       -.48      .4         -.25       .5         0.
104132            1.      .3589
104141  2  6  10 0.       1.23361   .090603    1.1965     .188569    1.1096
104142            .27349  1.0416    .458669    .8088      .57448     .7807
```

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        100162   2   8   *-1.       -1.       -.25      -.9       -.08      -.8
        *            0.         -.07
        *              PUMP  VARIABLE  INERTIA  MODEL
        *        VALVE INPUT
        *
110010      -11    0    0    0.0  0.   0.
110020      -10    0    0    0.0  0.   0.                 * HLCL BREAK
110030      -10    0    0    0.0  0.   0.                 * HLHL BREAK
110040       3    0    0    0.0  0.   0.                  * BRUV BREAK
110050     -9    0    0    0.0   0.   0.                  *STEAM CONTROL VALVE LEAK
110060     -13    0    0    0.0   0.   0.                * COOLING WATER TO PRIMARY PUMPS
110070     -14    0    0    0.0   0.   0.    *LEAK 501
110080     -15    0    0    0.0   0.   0.    *LEAK 401
110090     -16    0    0    0.0   0.   0.    *LEAK 301
110100     -17    0    0    0.0   0.   0.    *LEAK 201
        *                                    *LEAK 101
        *
        *            LEAK   TABLES
120100        3   11        12.3  0.0  0.0  0.050      1.0  149  1.0
        *
        *         FILL CURVES
        *
        *              HPIS
130200       4    7      1      1     100.      85.
130201     0.0  12.0   112.3   12.0   1312.3  5.0     2500.  5.0
        *         FEEDWATER
130300    3   4   0   0   802.   403.08090
130301      0.    61.3
130302      5.     0.0
130303      4000.0       0.0
130100    5   2   0   0   802.0   90.0          *AUX FEEDWATER
130101      0.        0.
130102      1.0       1.108
130103      1775.0    1.108
130104      1776.8    0.
130105      4000.     0.
        *
        *          LEAK FROM STEAM GENERATOR DOME
130400  -8   8   1   0   200.0   400.5                      *
130401      485.9       -0.12
130402      652.65     -0.264
130403      900.0    -2.0
130404      980.0    -3.5
130405      990.0    -4.50
130406     999.7    -8.000
130407     1000.5    -0.90
130408     1012.5    -0.98
        *
        *
        *
        *      SECOND LEAK FROM STEAM GENERATOR DOME
130900    -2    9    0    0   802.0    90.0
130901    0.0   0.216050
130902    4000.0   0.216050
        *
        *              REACTOR  KINETICS  DATA
        *       KINETICS  CONSTANTS  DATA  CARD
        *           -1                   -3           -4           -5
140000          MODAL        IPOWN      MOVL        RHOIN        DOPF
        *            5            0      371.875      0.0          1.0
        *                 REACTIVITY   COEFFICIENTS  DATA
        *            -1           -2           -3           -4
                  VOIDT        FIRST       ALPHIH        ALPHTA
```

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140020   0.445300  0.339700     0.0      0.0
140030   0.158530  0.091000     0.0      0.0
*              SCRAM    TABLE
141000   -14     12
141001        0.0         0.0        0.8       -0.5        0.59      -3.13
141002        0.65       -3.05       0.95      -6.27       0.83      -8.72
141003        0.9        -12.        0.97     -17.12       1.125    -20.67
141004        1.233      -22.1       1.3      -22.78       1.4      -23.17
141005        1.6        -23.32     60.0      -23.32
*                     DENSITY   COEFFICIENT  TABLE
142000        -10        0.00      -44.20       0.50      -28.00
142001                   0.60      -16.00       0.70      -11.00
142002                   0.80       -5.00       0.90       -2.00
142003                   1.00        0.00       1.10        2.00
142004                   1.20        5.40       1.30       11.00
*                     DOPPLER   COEFFICIENT    TABLE
143000         -8        400.        2.673      700.        2.109
143001                   1100.       1.515     1500.        0.000
143002                   1900.       0.441     2300.       -0.001
143003                   2000.      -0.579     3300.       -1.110
*************************  RPN = MISU8     100MXOL31  ****************************
*                  HEAT  SLAB  DATA
*               W1    W2    W3    W4    W6    W7      W8            W9         W10
*               VL    VR    CM    SB    ML    MR      AMTL          AMTR       VOLS
150011          0     01    1     0     2     2       0.0          263.30     2.315
150021          0     1     1     1     2     2       0.0          263.30     2.315
150031          0     1     1     1     2     2       0.0          263.30     2.315
150041          06    0     3     0     2     2      15.9            0.0      5.267
150051          09    36    2     0     2     2     845.390       1051.48     3.8728
150061          10    36    2     0     2     2     845.390       1051.48     3.8728
150071          11    36    2     0     2     2     845.390       1051.48     3.8728
150081          12    36    2     0     2     2     845.390       1051.48     3.8728
150091          13    0     3     0     2     2      15.9            0.0      5.267
150101          21    0     4     0     2     2     232.319          0.0     40.93
150111          20    0     4     1     2     2      41.6816         0.0      7.946
150121          22    0     5     0     2     2      33.9308         0.0      5.055
150131          0     22    6     0     2     2       0.0           70.       2.720
150141          0     04    7     0     2     2       0.0          556.27     5.794
150151          0     05    7     1     2     2       0.0          398.18     4.100
150161          05    0     8     0     2     2      41.9288         0.0      6.988
*           W 11        W 12        W 13        W 14        W 15        W 16
*           MUML        MUMR        UMEL        UMER        CML         CMR
150012    0.0         0.0         0.0         0.0         0.0         5.5   0.  0.  0.   1
150022    0.0         0.0         0.0         0.0         0.0         5.5   0.  0.  2.75 1
150032    0.0         0.0         0.0         0.0         0.0         5.5   0.  0.  5.5  1
150042    0.0         0.0         0.0         0.0         0.0         0.0
150052    0.0         0.0         0.0         0.0         4.751       1.533
150062    0.0         0.0         0.0         0.0         4.207       2.125
150072    0.0         0.0         0.0         0.0         4.207       2.833
150082    0.0         0.0         0.0         0.0         4.751       2.125
150092    0.0         0.0         0.0         0.0         0.0         0.0
150102    0.0         0.0         0.0         0.0         0.0         0.0
150112    0.      0.      0.      0.      0.      0.
150122    4.9583      0.0         0.0         0.0         0.0         0.0
150132    0.0         0.3131      0.0         0.0         0.0         0.0
150142    0.0         0.1797      0.0         0.0         0.0         0.0
150152    0.0         0.0         0.0         0.0         0.0         0.0
150162    0.0         0.0         0.0         0.0         0.0         0.0
*                   NATURAL  CIRCULATION  STM  GEN  SECONDARY
*                   CORE  SLAB  DATA
*              W1     W2     W3     W4     W5          W6
*              ISLB          NOUT          CLTI        WFRAC
160010         1      5      7      8    2.025-3     0.37630
160020         2      5      7      8    2.025-3     0.44508
160030         3      5      7      8    2.025-3     0.15853
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*                          SCDR  GEOMETRY  INPUT                  .135 .01 .0 .0
*             IG   IGAP   MR    IN   NUX      XU          XH             PF
170101        2            3    1     6       0.0         0.01920585     1.0 *FUEL
170102              1           2     1                   0.0003125      0.0 *GAP
170103              0           3     2                   0.002025       0.0 *CLAD
170201        2            2    5     4       0.01675     0.002083       0.0 *S G TUBES
170202              0           5     4                   0.002082       0.0
170301        2            2    4     4       2.25        0.0208         0.0 *S G PLENA
170302              0           4     4                   0.2709         0.0
170401        2            2    4     3       1.45813     0.05556        0.0 *AR V FILLER/
170402              0           4     3                   0.11111        0.0 *BARREL
170501        2            2    4     3       1.54167     0.05556        0.0 *LOWER HEAD
170502              0           4     3                   0.11111        0.0
170601        1            2    4     6       0.0         0.024976234    0.0 *LCBP
170602              0           4     6                   0.012988117    0.0
170701        1            2    4     6       0.0         4.944444-3     0.0 *SUPPORT
170702              0           4     6                   3.472222-3     0.0
170801        2            2    4     3       1.25        0.05556        0.0 *UPPER HEAD
170802              0           4     3                   0.11111        0.0
*****************************OPEN = MTLU1   ID = WXGL31   CY = 1 ****************
*                          MATERIAL  PROPERTIES  DATA
*                          THERMAL  CONDUCTIVITY  DATA
*                          UO
*                          MATERIAL  PROPERTIES  DATA
*                          THERMAL  CONDUCTIVITY  DATA
                                URANIUM  OXIDE
180101     20     0.32009879+2     0.48918227+1
180102            0.24034293+3     0.37441094+1
180103            0.50807598+3     0.30360007+1
180104            0.80700902+3     0.25575848+1
180105            0.10453421+4     0.22132108+1
180106            0.13236751+4     0.19550778+1
180107            0.15820082+4     0.17560877+1
180108            0.18403413+4     0.16000493+1
180109            0.20986743+4     0.14769278+1
180110            0.23570073+4     0.13800592+1
180111            0.26153404+4     0.13068880+1
180112            0.28736734+4     0.12542912+1
180113            0.31320065+4     0.12575030+1
180114            0.33903395+4     0.13117020+1
180115            0.36486726+4     0.13822821+1
180116            0.39070056+4     0.14742965+1
180117            0.41653387+4     0.15943612+1
180118            0.44236717+4     0.17511313+1
180119            0.46820048+4     0.19559311+1
180120            0.49403378+4     0.22235775+1
*
                          G A P
180200         6    32.  .082 600.  .138 1000.  .17 1500.  .207 2000.  .241 5400.  .431
*
                          ZIRCONIUM
180301     20     0.32009879+2     0.71050812+1
180302            0.19500613+3     0.78403186+1
180303            0.35920237+3     0.85170430+1
180304            0.52279862+3     0.91552271+1
180305            0.68639487+3     0.97768400+1
180306            0.84999111+3     0.10395653+2
180307            0.10135874+4     0.11038237+2
180308            0.11771836+4     0.11721963+2
180309            0.13407799+4     0.12467002+2
180310            0.15043761+4     0.13293324+2
180311            0.16679723+4     0.14220401+2
180312            0.18315686+4     0.15269703+2
180313            0.19951648+4     0.16459701+2
180314            0.21587611+4     0.17010865+2
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180316          0.24859548+0    0.21626508+2
180317          0.26459548+0    0.23131070+2
180318          0.28131461+0    0.25226011+2
180319          0.29767423+0    0.27683174+2
180320          0.31803386+0    0.30420728+2
*                        304 STAINLESS STEEL
180401      -2   0.  8.2928    800. 12.28522
*                        INCONEL  600
180501      -5   0.  8.4 200.  9.1 400. 9.8  600. 10.9 800. 12.0
*                        VOLUMETRIC  HEAT  CAPACITY  DATA
*                         URANIUM  OXIDE
190101      15   32.  34.65 122. 38.35 212. 40.45   392. 43.55
190102            752.  46.80 2012. 51.35 2732. 52.65 3092. 56.55
190103          3452.   63.05 3812. 72.60 4352. 84.70 4532. 94.25
190104          4712.   98.15 4892. 100.10 5144. 101.40
*                        GAP
190200      2    32.  .000075   5400. .000075
*                        ZIRCONIUM
190301      9     32.  25.92       212.    28.755  392.       30.375 572. 31.59
190302              932.  33.615  1292.   35.235  1742. 38.855 1743.  35.235
190304            3360.  35.235
*                   304  STAINLESS  STEEL
 190401     -6      300. 44.89 400. 45.025 500. 45.19  600. 45.42
190402              700. 45.785 800. 46.265
*                        INCONEL  600
190501      -5      0.   51.39 200. 57.44 400. 61.80 600.   63.59 800. 65.59
*                   LINEAR  EXPANSION  COEFFICIENT  DATA
200101      -2                                                         * URANIUM OXIDE
200102                32.  3.7752-6  6000. 1.4440-5
200201      -2                                                         * GAP
200202                32.  0.0        6000. 0.0
200301      -4                                                         * ZIRCONIUM
200302                77.  3.1711-6  1478. 4.5051-6 1493. 5.3900-6
200303           5000.  5.3900-6
200401      -2                                                         * 304 SS
200402           0. 0.  5000. 0.
200501      -2                                                         * INCONEL 600
200502           0. 0.  5000. 0.
             ***************************************************************
*
*
             ***************************************************************
250001  1  2  3  0.0469  0.0
260001  0  0  0  0  0  0  0  0  0  0.0  0
270001  -20
270002  5000.0    0.0
270003  2147.0    45.294
270004  2102.0    50.1963
270005   2057.0    55.043
270006   2012.0    62.434
270007   1967.0    72.2337
270008   1922.0    83.252
270009   1877.0    97.444
270010   1832.0    118.757
270011   1787.0    146.916
270012   1742.0    180.09
270013   1697.0    242.01
270014   1652.0    317.093
270015   1607.0    411.360
270016   1562.0    521.551
270017   1517.0    641.533
270018   1472.0    771.309
270019   1427.0    905.462
270020   1382.0    1044.328
270021   1337.0    1185.1220
```

	270028	1202.0	1618.528
658	270029	1112.0	1905.01
659	280001	=24	
660	280002	16.5	0.0
661	280003	16.5	45.299
662	280004	16.5	50.1963
663	280005	16.5	55.093
664	280006	16.5	62.439
665	280007	16.5	7 .2337
666	280008	16.5	.252
667	280009	16.5	97.944
668	280010	19.0	118.757
669	280011	25.0	146.916
670	280012	28.0	186.09
671	280013	27.8	242.41
672	280014	29.0	317.093
673	280015	35.0	411.364
674	280016	50.0	521.551
675	280017	67.0	641.533
676	280018	76.0	771.309
677	280019	75.2	905.982
678	280020	71.0	1044.328
679	280021	64.0	1185.1228
680	280022	56.5	1327.1412
681	280023	37.5	1472.833
682	280024	26.0	1618.528
683	280029	16.5	1905.01
684	290001	=24	
685	290002	5000.0	0.0
686	290003	2147.0	45.299
687	290004	2102.0	50.1963
688	290005	2057.0	55.093
689	290006	2012.0	62.439
690	290007	1967.0	72.2337
691	290008	1922.0	83.252
692	290009	1877.0	97.944
693	290010	1832.0	118.757
694	290011	1787.0	146.916
695	290012	1742.0	186.09
696	290013	1697.0	242.41
697	290014	1652.0	317.093
698	290015	1607.0	411.364
699	290016	1562.0	521.551
700	290017	1517.0	641.533
701	290018	1472.0	771.309
702	290019	1427.0	905.982
703	290020	1382.0	1044.328
704	290021	1337.0	1185.1228
705	290022	1292.0	1327.1412
706	290023	1247.0	1472.833
707	290028	1202.0	1618.528
708	290029	1112.0	1905.01
709	300001	=24	
710	300002	15.2	0.0
711	300003	15.2	45.299
712	300004	15.2	50.1963
713	300005	15.2	55.093
714	300006	15.2	62.439
715	300007	15.2	72.2337
716	300008	15.2	83.252
717	300009	15.2	97.944
718	300010	16.5	118.757
719	300011	25.2	146.916
720	300012	28.0	186.09

723	300015	34.7	411.404
724	300016	50.0	521.551
725	300017	64.4	641.533
726	300018	73.6	771.309
727	300019	78.4	905.482
728	300020	72.7	1044.328
729	300021	66.5	1189.1228
730	300022	54.0	1327.1412
731	300023	39.4	1472.033
732	300024	26.1	1618.5240
733	300025	15.2	1769.61
734	.		