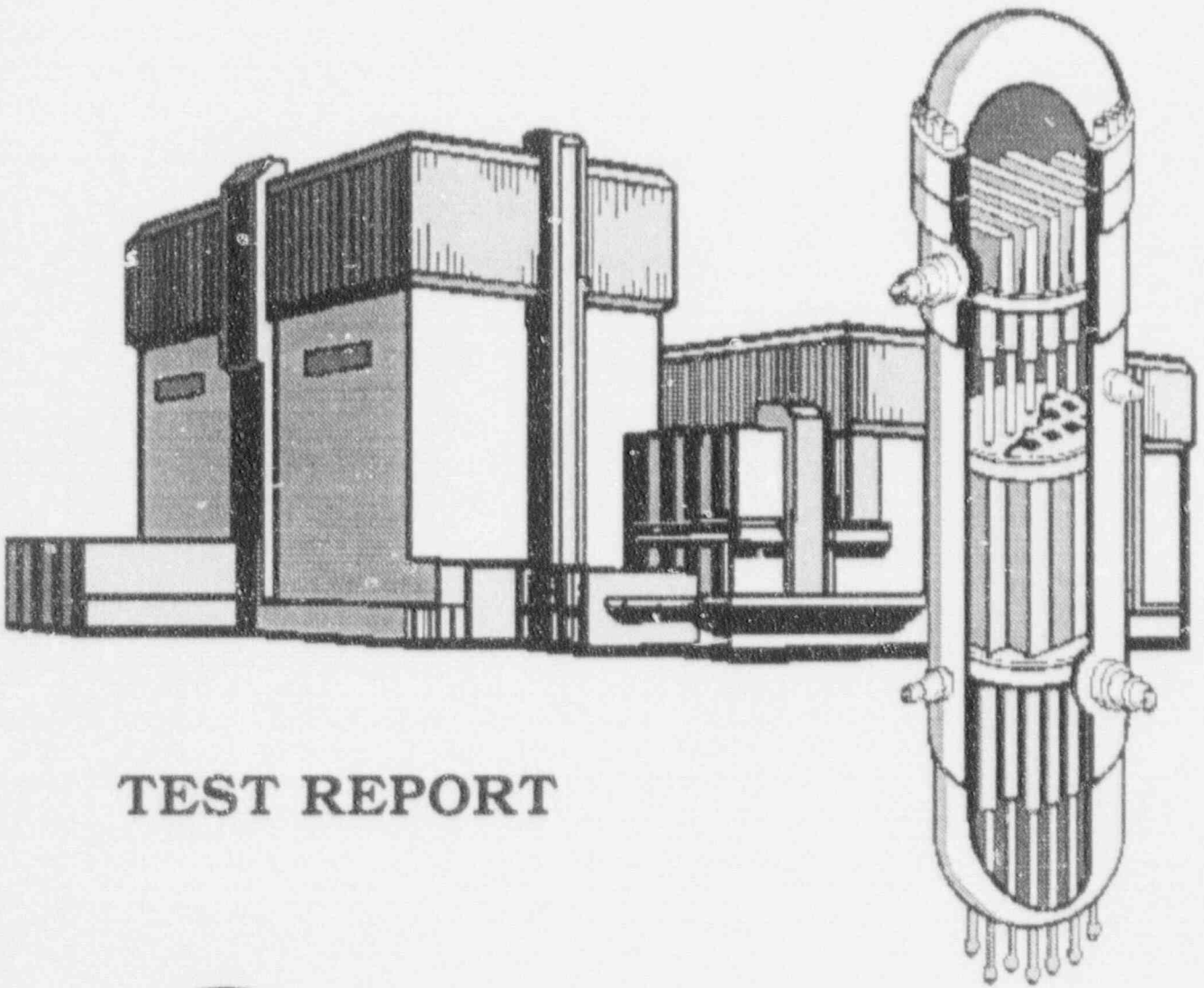
BRUNSWICK
NUCLEAR PROJECT

REACTOR CONTAINMENT BUILDING
INTEGRATED LEAKAGE RATE



TEST REPORT

General Physics Corporation

CAROLINA POWER & LIGHT COMPANY

Brunswick Nuclear Project

Unit 2

REACTOR CONTAINMENT BUILDING INTEGRATED LEAKAGE RATE TEST REPORT

December 1, 1991

GENERAL PHYSICS CORPORATION
GP-R-263122

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I. INTRODUCTION

The Reactor Building Integrated Leakage Rate "Type A" Test is performed to demonstrate that leakage through the primary reactor containment systems and components penetrating primary containment do not exceed the allowable leakage rates specified in the Plant Technical Specifications.

The purpose of this report is to provide information pertinent to the activities related to the preparation, test performance, and reporting of the Brunswick Nuclear Project Unit 2 Integrated Leakage Rate Test (ILRT).

Highlights of activities and events which occurred prior to and during the ILRT are presented in Section II, Test Synopsis.

Section III, Test Data Summary, contains data and results necessary to demonstrate containment atmosphere stabilization, acceptable leakage rate, and successful verification test. In addition, plots provided in Appendices B and C supply a visual history of containment atmospheric conditions beginning with the 9.75-hour ILRT test period and ending with the verification test.

Information in Section IV, Analysis and Interpretation, supplies the technical details associated with the ILRT computer program and its associated hardware as well as the instrumentation used during the ILRT.

Section V, References, lists the documents used for the conduct of the ILRT.

The successful periodic Type A and verification test were performed according to the requirements of the Brunswick Unit 2 Technical Specifications and 10CFR50, Appendix J. The test method used is the Absolute Method described in ANSI/ANS 56.8-1987, "Containment System Leakage Testing Requirements."

Leakage rates were calculated using the Total Time Analysis equations from BN-TOP-1, Rev. 1, 1972, during the Type A and verification tests. Mass Point Analysis as described in ANSI/ANS 56.8-1987, was run concurrently for informational purposes. The test results are reported in accordance with the requirements of 10CFR50, Appendix J, Section V.B.3.

II. TEST SYNOPSIS

Prior to containment pressurization on November 30, 1991, site personnel were engaged in prerequisite activities for the conduct of the ILRT. Local leakage rate testing was completed and those components with excessive leakage were repaired and retested. The results of the local leakage rate tests are presented in Appendix G.

The following discussion highlights some of the activities that were essential to the successful and timely completion of the ILRT. These items are presented in chronological order.

A. Pre-pressurization Activities

These activities included completing local leakage rate tests, ILRT procedure review and finalization, ILRT computer program checkout and linkup to the Fluke Data Acquisition System, and ILRT instrumentation operability checks. Calculations were performed to verify sensor weighting factors and volume assignments as input to a sensor failure analysis.

The ILRT test procedure was reviewed against the requirements of the Plant Technical Specifications; 10CFR50, Appendix J; BN-TOP-1, Rev. 1, 1972; and ANSI/ANS 56.8-1987.

The ILRT instrumentation was calibrated prior to the ILRT as recommended by ANSI N45.4-1972, Section 6.2 and 6.3. Final ILRT instrumentation operability checks and in-situ checks, as specified in ANSI/ANS 56.8-1987, Section 4.2.3.1, were performed to ensure that all instrumentation was operating correctly. Calibration records for the ILRT instrumentation system components are retained at the plant.

B. Test Summary Time-Line

Phase	Timeframe	Duration
Pressurization	From: 1859 on 11/30/91 To: 0530 on 12/1/91	10.5 hours
Stabilization	From: 0530 on 12/1/91 To: 1100 on 12/1/91	5.5 hours
ILRT Test	From: 1100 on 12/1/91 To: 2045 on 12/1/91	9.75 hours
Verification Test Stabilization	From: 2045 on 12/1/91 To: 2145 on 12/1/91	1 hour
Verification Test	From: 2145 on 12/1/91 To: 0245 on 12/2/91	5 hours

C. Containment Pressurization

Containment pressurization started at 1859 on November 30, 1991 using two 1500 scfm portable diesel-driven 100% oil-free air compressors. Containment pressurization was stopped twice due to problems with reactor level instrumentation at 2305 - 2335 on November 30, 1991 to allow reactor level to stabilize, and again at 0150 on December 1, 1991 to fill reactor vessel level indication reference legs.

Pressurization recommenced at 0332 on December 1, 1991. The pressurization rate was maintained at approximately 7 psi per hour until

containment pressure reached 48 psig. At this time the pressurization rate was reduced to approximately 3 psi per hour. The compressors were stopped when containment pressure reached approximately 50.84 psig at 0528 on December 1, 1991. This was within the procedural limits of 49 +2,-0 psig.

During pressurization, a containment walkdown was performed to identify potential leakage. No measurable leakage was observed. The pressurization, ILRT, and verification test were performed without the use of drywell fans. No unexpected temperature stratification was observed.

D. Containment Atmosphere Stabilization

The stabilization phase was started at 0530 on December 1, 1991. By 0930 on December 1, 1991, the temperature stabilization criteria of BN-TOP-1 and ANSI/ANS 56.8 had been met. By 1100 on December 1, 1991, the containment air mass had also stabilized with consistent mass changes of less than 3 pounds per hour.

E. ILRT Test Period

The ILRT was officially started with the 1100 data point on December 1, 1991 after the stabilization criteria had been met. Within 4 hours, the containment measured leakage rates, as determined by both the Mass Point and Total Time Analyses, had stabilized at a value of between 0.28 - 0.25% wt. per day. The total time leakage at the 95% UCL dropped below the acceptance criteria at hour 5. The test was continued beyond the 6 hour minimum to allow sufficient room for the addition of B&C penalties.

The ILRT was successfully completed at 2045 on December 1, 1991. The maximum allowable leakage rate (L_a) for the containment is 0.5 % wt. per day with a test acceptance limit of 0.375 % wt. per day (0.75 L_a). The Mass Point and Total Time Analyses were run concurrently on the General Physics ILRT Computer Program. The containment leakage rate data met all the requirements of BN-TOP-1, Rev. 1, necessary to end the test in less than 24 hours. During the ILRT and verification test, sensor data was continuously monitored and plotted in order to detect sensor malfunctions. The leakage rate results are as follows:

	Mass Point Analysis % wt./day	Total Time Analysis % wt./day
Calculated Leakage Rate	0.2663*	0.2735*
95 % Upper Confidence Leakage Rate	0.2694*	0.3265*
20 Point Mean Calculated		0.2537
20 Point Mean Measured		0.2730

* Does not include penalties for nonstandard alignments and water level changes

F. Verification Test

A successful verification test was conducted following the ILRT. At 2045 on December 1, 1991, a leakage rate of 4.3486 scfm was imposed on the primary containment and allowed to stabilize for one hour. The verification phase started at 2145 on December 1, 1991 and was completed at 0245 on December 2, 1991. The 4.3486 scfm leakage imposed (L_o) on the existing containment leakage was slightly less than L_a (0.500 % wt./day) at 0.4871 % wt. per day.

The verification test results are presented below:

	Mass Point Analysis % wt./day	Total Time Analysis % wt./day
Leakage Rate (L_{am})	0.2663	0.2735
Imposed Leak (L_o)	0.4871	0.4871
Lower Limit: $L_o + L_{am} - 0.25\ L_a$	0.6284	0.6356
Composite Leakage (L_c)	0.7007	0.6922
Upper Limit: $L_o + L_{am} + 0.25\ L_a$	0.8784	0.8856

III. TEST DATA SUMMARY

A. Plant Information

Owner	Carolina Power & Light Company
Plant	Brunswick Unit 2
Location	Southport, North Carolina
Containment Type	BWR Mark I
NSSS Supplier, Type	General Electric BWR-4
Containment Description	Steel lined, reinforced concrete, "light bulb" shaped drywell with torus shaped suppression chamber connected by a vent system. Vacuum breakers are provided between the suppression chamber and both the drywell and reactor building.
Date Test Completed	December 1, 1991

B. Technical Data

Containment Net Free Volume	294,981 cubic feet
Design Pressure	62 psig
Design Temperature	300°F Drywell, 220°F Torus
Calculated Peak Accident Pressure	49.0 psig

C. Test Results - Type A

Hold Test Results

Test Method: Absolute
Test Pressure: 50.5 psig
Acceptance Criteria: 75% L_a (.375% wt./day)

	Total Time	Mass Point
Calculated Leakage Rate, L_{am}	0.2735% wt./day	0.2663% wt./day
Leakage Rate at 95% Upper Confidence Limit	0.3265% wt./day	0.2694% wt./day

Verification Test Results

Imposed Leak: 4.3486 scfm (0.4871% wt./day)

	Total Time	Mass Point
Leakage Rate (L_{am})	0.2735% wt./day	0.2663% wt./day
Imposed Leak (L_o)	0.4871% wt./day	0.4871% wt./day
Lower Limit: $L_o + L_{am} - 0.25\ L_a$	0.6356% wt./day	0.6284% wt./day
Composite Leakage (L_c)	0.6922% wt./day	0.7007% wt./day
Upper Limit: $L_o + L_{am} + 0.25\ L_a$	0.8856% wt./day	0.8784% wt./day

Report Printouts

The report printouts of the ILRT and verification test calculations are provided for the Total Time and Mass Point Analyses in Appendices B and C. Stabilization data is also provided in Appendix A.

D. Test Results - Type B and C Tests

A summary of local leakage rate test results since the ILRT in 1990 are included in Appendix G.

E. Integrated Leakage Rate Measurement System

1. Absolute Pressure

Quantity	1
Manufacturer	Heise
Type	Series 10, Quartz Manometer
Range	0-75 psia
Accuracy	+/- 0.006% reading + 0.0027% f.s.
Sensitivity	+/- 0.001 psia
Repeatability	+/- 0.001 psia
Resolution	0.001 psia

2. Drybulb Temperature

Quantity	24
Manufacturer	Rosemount
Type	78-S 100 ohm platinum resistance temperature detectors (RTD)
Range, calibrated	32 to 120°F
Accuracy	+/- 0.02°F
Sensitivity	+/- 0.01°F

3. Dewpoint Temperature

Quantity	10
Manufacturer	Foxboro
Type	Model 2781 Dewcell
Range, calibrated	-32 to 93°F dewpoint
Accuracy	+/- 1.5°F
Sensitivity	+/-1°F

4. Verification Flow

Quantity	1
Manufacturer	Brooks
Type	Model 1110 Rotameter
Range	1.0 to 10.0 scfm
Accuracy	+/- 1% full scale

5. Readout Device

Quantity	1
Manufacturer	Fluke
Type	Model 2285B
Repeatability	+/- 0.54°F
Resolution	+/- 0.01°F

The Instrumentation Selection Guide (ISG) value from ANSI/ANS 56.8-1987 based on the above ILRT instrumentation configuration and a 9.75 hour test is 0.012 % wt./day.

The sensor locations and volume fractions as installed for the ILRT are shown in Appendix H.

F. Information Retained at Plant

The following information is available for review at the Brunswick Nuclear Project site:

1. Access control procedures used to control access to the containment during testing.
2. A listing of containment penetrations, including the total number, penetration size, and function.
3. A listing of normal operating instrumentation used for the leakage rate test.
4. A system lineup (at time of test), showing required valve positions and status of piping systems.
5. A log of events from initial survey of containment to restoration of tested systems.
6. Documentation of instrumentation calibrations and standards, including a sensor failure analysis.
7. Data to verify temperature stabilization criteria as established by test procedure (Appendix A).
8. The working copy of the test procedure that includes signature sign-offs of procedural steps.
9. The procedure and data that verifies completion of penetration and valve testing, including as-found leak rates, corrective action, and final leak rates.
10. Computer printouts of ILRT data and automated data acquisition printouts along with a summary description of the computer program.
11. A listing of test exceptions including changes in the containment system boundaries.

12. Description of malfunctions, repairs, and methods used to redistribute volume weighting fractions to operating instrumentation.
13. A review of confidence limits of test results with accompanying computer printouts.
14. Description of the method of leakage rate verification.
15. ILRT data plots obtained during the test.
16. The P&IDs of pertinent systems.

IV. ANALYSIS AND INTERPRETATION

The upper 95% confidence limit (UCL) Total Time and Mass Point leakage rates calculated during the ILRT were less than the test acceptance criteria of 0.75 L_a (0.375 % wt./day). Additions to the calculated leakage rates must be made to account for penetration paths not exposed to the ILRT pressure and for changes in the net free containment volume due to changes in containment water levels. These additions are discussed below.

A. Type C Penalties

Penetration paths not exposed to the ILRT pressure and the corresponding minimum pathway leakage rates are as follows:

System	Containment Isolation Valves	Leakage Rate (SCFH)
Drywell Drains	G16-F003 G16-F019	0.089 0.548
Electrical Penetrations	Total	3.458
Feedwater	B21-F010B B21-F032A/E421-F006	1.920 7.889
RBCCW	RCC-V28/V52 RCC-SV-1222B RCC-SV-1222C	0.089 0.089 0.089
RECIRC	B32-V22 B32-V30 B32-F019/F020	0.020 0.089 0.735
RHR	E11-F008/F009	0.175
RWCU	G31-F001	0.089

The total applicable local leakage rate Type C penalty addition is 15.279 scfh which is equivalent to 0.028 % wt. per day.

B. Volume Change Corrections

The following volumes were monitored for liquid level changes which would affect the containment net free volume:

Vessel	Level Change	Volume Change
Reactor Vessel	-3.6 inches	+775 ft^3
Torus	0 inches	0
Drywell Floor Drain Tank	0 gallons	0
Drywell Equip. Drain Tank	0 gallons	0

This represents a net increase in containment net free volume which is accounted for in the calculated leakage rates and no additional correction is required.

C. As Left ILRT Results

The as left ILRT leakage rate including the required additions is as follows:

	Mass Point Analysis (% wt./day)	Total Time Analysis (% wt./day)
95% UCL Leakage Rate	0.2694	0.3265
Type C Penalties	0.028	0.028
Volume Change	0.0	0.0
As Left 95% UCL Leakage Rate	0.2974	0.3545

The as left Total Time and Mass Point 95% UCL leakage rates are less than the test acceptance criteria value of 0.75 L_a (0.375 % wt./day).

D. As Found ILRT Results

The leakage savings due to repairs and/or adjustments to containment penetrations and isolation valves prior to performance of the ILRT was calculated to be 26.384 scfh or 0.049% wt. per day. (Refer to Appendix G)

The as found ILRT leakage rate is as follows:

	Mass Point Analysis (% wt./day)	Total Time Analysis (% wt./day)
As Left 95% UCL Leakage Rate	0.2914	0.3485
Leakage Savings	0.049	0.049
As Found 95% UCL Leakage Rate	0.3404	0.3975

The as found Total Time and Mass Point 95% UCL leakage rates are less than the maximum allowable leakage rate L_a of 0.500% wt. per day.

V. REFERENCES

A. Brunswick Unit 2 Periodic Test Procedure, PT-20.5, Integrated Primary Containment Leak Rate Test.

B. Brunswick Unit 2 Technical Specifications

C. Brunswick Unit 2 Updated Final Safety Analysis Report.

D. Code of Federal Regulations, Title 10, Part 50, Appendix J, Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors.

E. ANSI N45.4-1972, Leakage-Rate Testing of Containment Structures for Nuclear Reactors.

F. Bechtel Topical Report BN-TOP-1, Rev. 1, 1972, Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants.

G. ANSI/ANS 56.8-1987, Containment System Leakage Testing Requirements.

APPENDIX A

STABILIZATION PHASE DATA

STABLIZATION MODE
OPTIONS

1 - MANUAL DATA ENTRY
2 - PARAMATER GRAPHS
3 - SENSOR PLOTS
4 - SENSOR DIFFERENTIALS
5 - ANSI STABILIZATION CRITERIA
6 - BN-TOP-1 STAB.CRITERIA
7 - ANSI CRITERIA PRINTOUT
8 - BN-TOP-1 CRITERIA PRINTOUT
9 - REPRINT CURRENT DATA POINT
P - PASS WORD MENU
0 - FLASH OFF

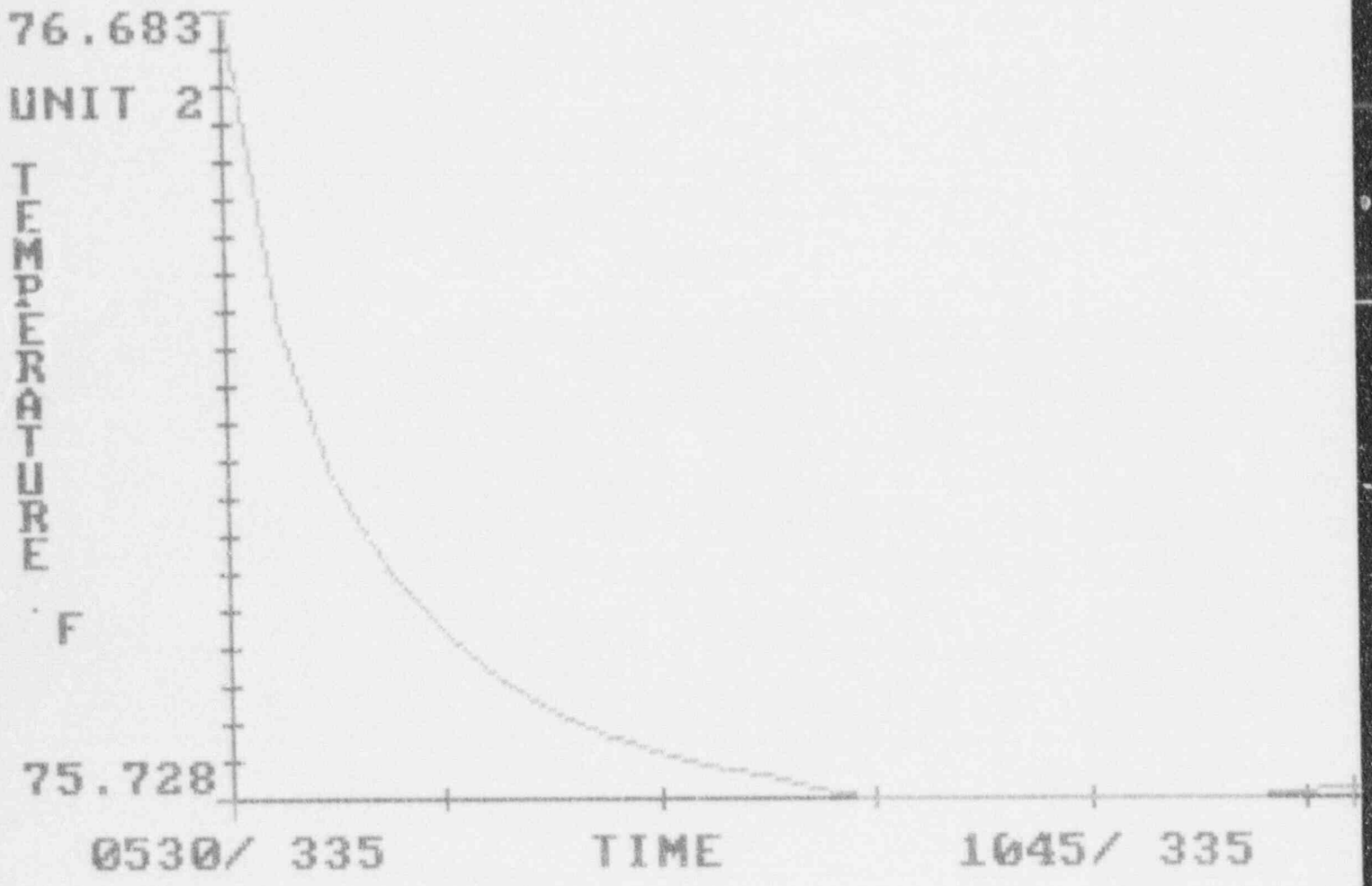
TIME : 1045
MODE SUMMARY

# OF DATA POINTS =	22
MODE DURATION (IN HRS) =	5.25
TOT TIME MEASURED LEAK =	0.2012
TOT TIME CALCULATED LEAK =	0.1898
TOT TIME 95% UCL =	0.5440
MASS PT LEAK =	0.2244
MASS PT 95% UCL =	0.2498

ANSI TEMPERATURE STABLIZATION CRITERIA MET
BN-TOP TEMPERATURE STABLIZATION CRITERIA MET

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	75.741/ +0.002	AVG PRESS:	65.002/ -0.000
MASS:	96663.83/ -0.992	AVG DEW PRESS:	0.3164/+0.0005
		TOTAL PRESS:	65.319/ +0.000



BN-TOP-1 STABLIZATION CRITERIA

TIME	TEMP	BN dT	BN dT2
5.25	75.7406	0.0059	0.0100
5.00	75.7388	0.0034	0.0324
4.75	75.7309	-0.0047	0.0362
4.50	75.7295	-0.0137	0.0274
4.25	75.7302	-0.0205	0.0352
4.00	75.7277	-0.0294	0.0434
3.75	75.7287	-0.0402	0.0603
3.50	75.7281	-0.0553	0.0831
3.25	75.7287	-0.0761	0.1043
3.00	75.7320	-0.1021	0.1299
2.75	75.7402	-0.1346	0.1861
2.50	75.7569	-0.1811	0.3531
2.25	75.7712	-0.2694	0.7152
2.00	75.7864	-0.4482	0.0000
1.75	75.8091	0.0000	0.0000
1.50	75.8387	0.0000	0.0000
1.25	75.8808	0.0000	0.0000
1.00	75.9362	0.0000	0.0000
0.75	76.0094	0.0000	0.0000
0.50	76.1192	0.0000	0.0000
0.25	76.3101	0.0000	0.0000
0.00	76.6828	0.0000	0.0000

STABILIZATION ANSI56.8

TIME	TEMP	56.8 1 HR F/HR	56.8 4 HR F/HR	4-1 HR
5.25	75.741	0.014	0.046	0.032
5.00	75.739	0.015	0.065	0.050
4.75	75.731	0.003	0.091	0.088
4.50	75.729	0.002	0.128	0.126
4.25	75.730	0.002	0.190	0.188
4.00	75.728	0.006	0.313	0.308
3.75	75.729	0.015	0.000	-0.015
3.50	75.728	0.038	0.000	-0.038
3.25	75.729	0.056	0.000	-0.056
3.00	75.732	0.071	0.000	-0.071
2.75	75.740	0.090	0.000	-0.090
2.50	75.757	0.107	0.000	-0.107
2.25	75.771	0.144	0.000	-0.144
2.00	75.786	0.197	0.000	-0.197
1.75	75.809	0.263	0.000	-0.263
1.50	75.839	0.368	0.000	-0.368
1.25	75.881	0.563	0.000	-0.563
1.00	75.936	0.980	0.000	-0.980
0.75	76.009	0.000	0.000	0.000
0.50	76.119	0.000	0.000	0.000
0.25	76.310	0.000	0.000	0.000

AVG. DATA VALUES UNIT # 2

DATE	TIME	T(I)	P(I)	DT(I)	VP(I)	MASS(I)
335	0.00	76.683	65.145	65.145	0.307	96706.39
335	0.25	76.310	65.095	65.229	0.308	96699.62
335	0.50	76.119	65.078	65.205	0.308	96707.88
335	0.75	76.009	65.065	65.285	0.308	96708.77
335	1.00	75.936	65.056	65.331	0.309	96708.01
335	1.25	75.881	65.048	65.346	0.309	96706.73
335	1.50	75.839	65.042	65.379	0.310	96704.97
335	1.75	75.809	65.036	65.490	0.311	96701.92
335	2.00	75.786	65.032	65.511	0.311	96700.17
335	2.25	75.771	65.028	65.543	0.311	96695.77
335	2.50	75.757	65.024	65.591	0.312	96693.16
335	2.75	75.740	65.022	65.604	0.312	96693.77
335	3.00	75.732	65.019	65.642	0.312	96690.22
335	3.25	75.729	65.017	65.661	0.313	96688.29
335	3.50	75.728	65.014	65.726	0.313	96682.93
335	3.75	75.729	65.012	65.720	0.313	96680.72
335	4.00	75.728	65.009	65.809	0.314	96676.16
335	4.25	75.730	65.008	65.869	0.315	96673.63
335	4.50	75.729	65.005	65.900	0.315	96669.92
335	4.75	75.731	65.005	65.937	0.316	96669.07
335	5.00	75.739	65.003	65.974	0.316	96664.82
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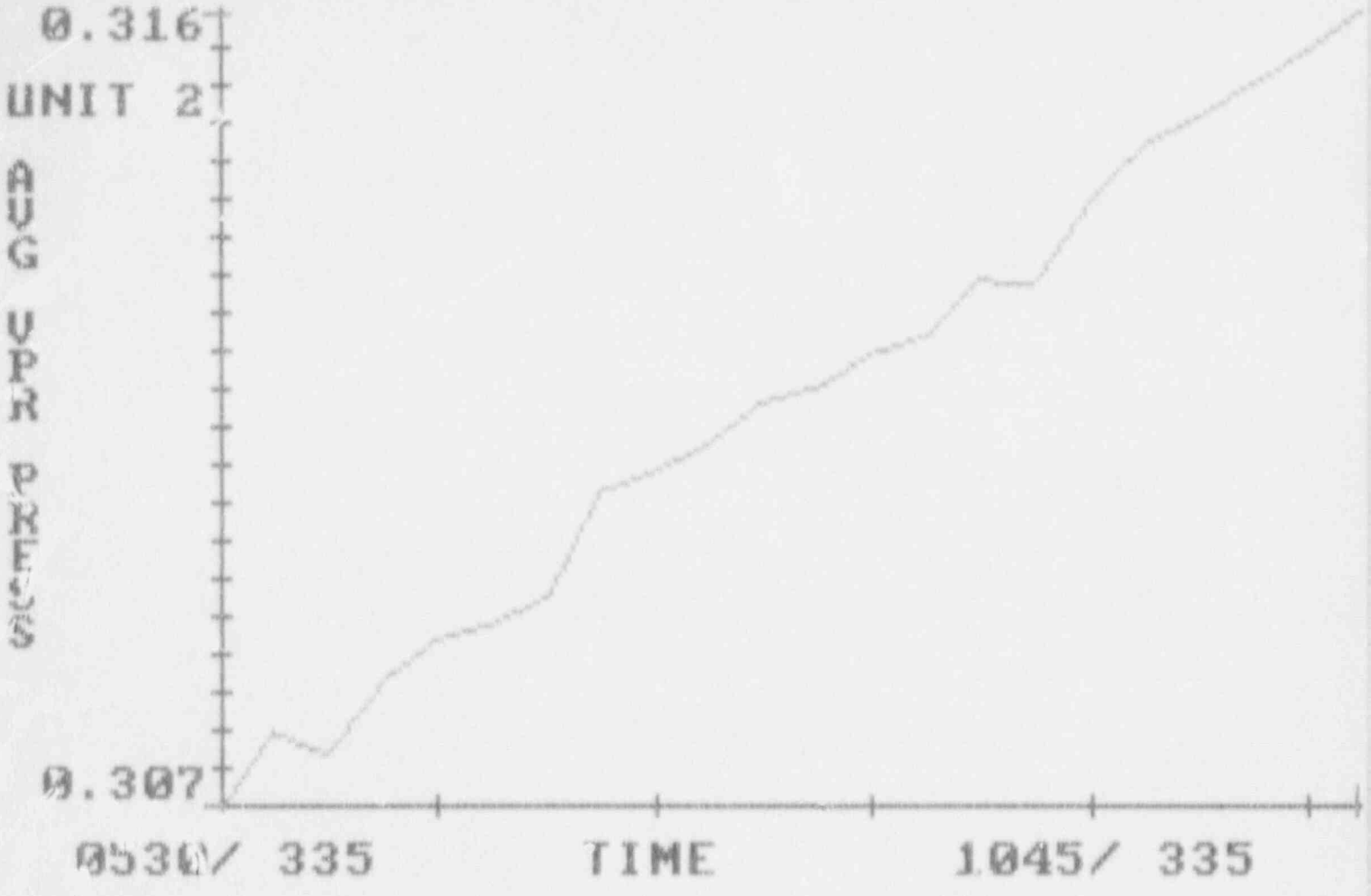
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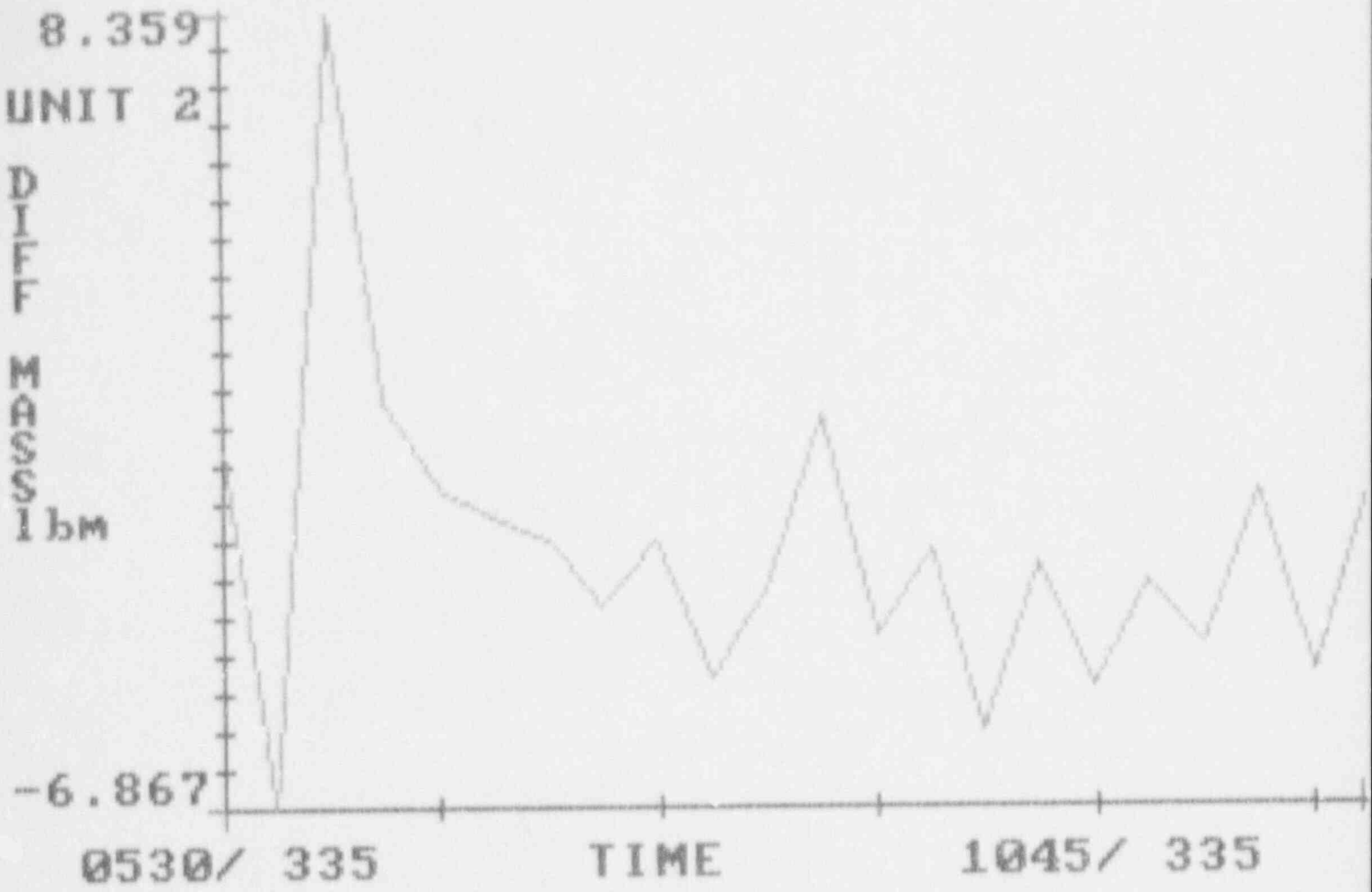
1045/ 335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DIFF MASS lbm
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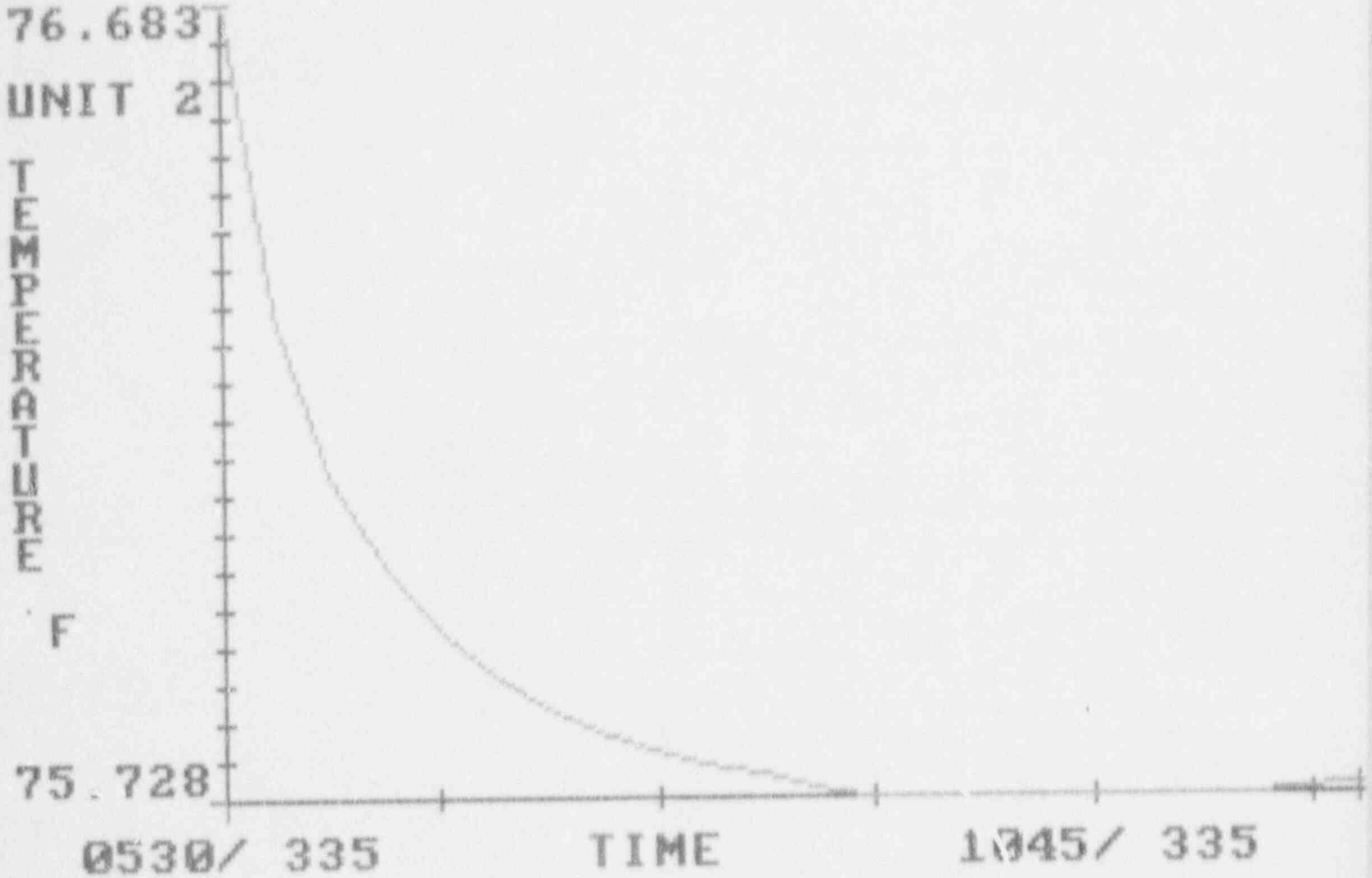
TIME
1045/ 335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F
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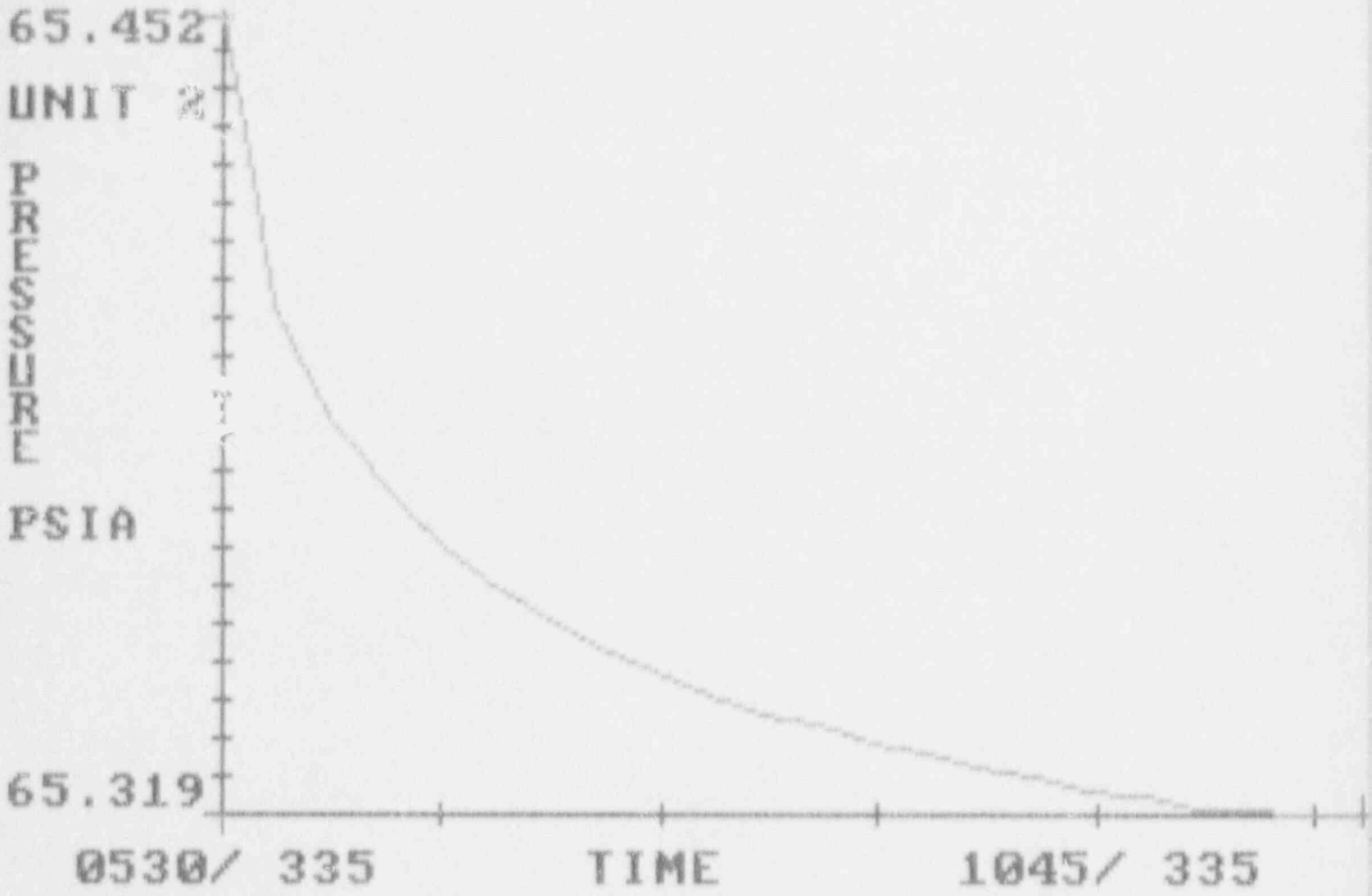
1045/ 335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PSIA
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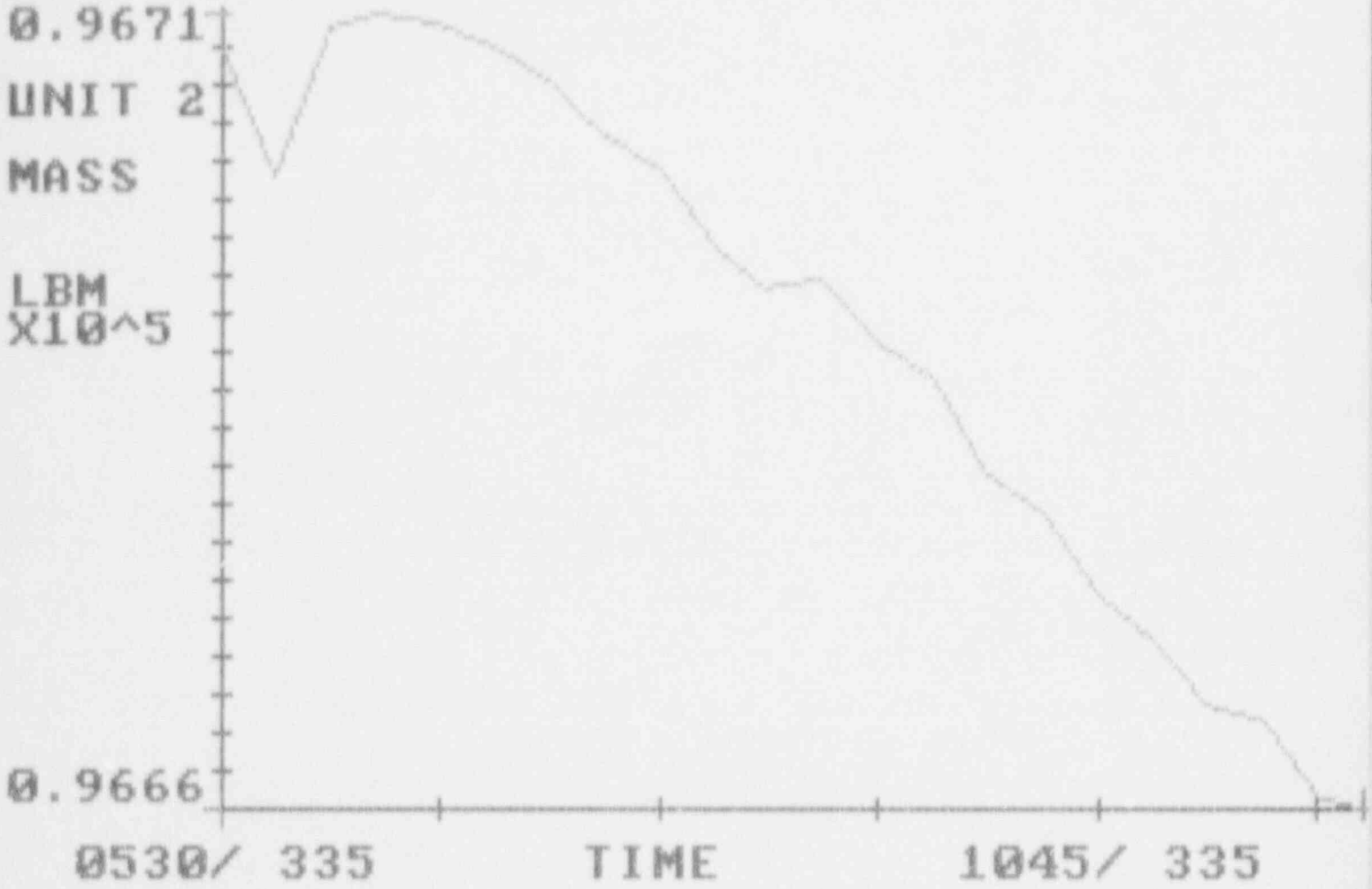
0530/ 335
TIME
1045/ 335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UNIT 2
MASS
LBM
X10^5
0.9666
0530/ 335
TIME
1045/ 335

APPENDIX B

ILRT TEST DATA AND PLOTS

TEST MODE

PLEASE SELECT THE OPTION
YOU WISH TO USE:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

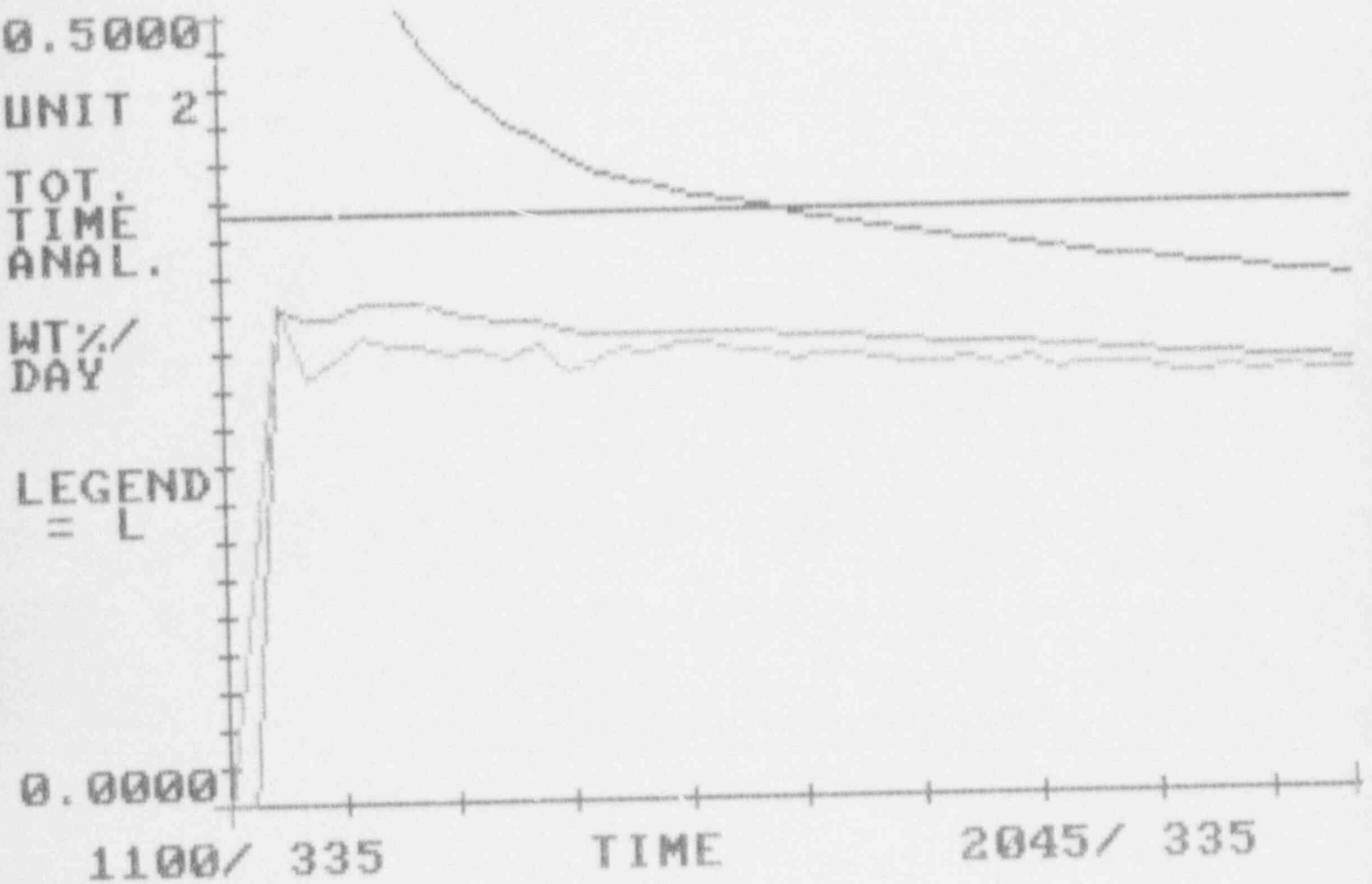
SELECTED OPTION=

TEST DATA 2045

# OF DATA POINTS	= 40
MODE DURATION (IN HOURS)	= 9.75
TOT TIME MEASURED LEAK	= 0.2675
TOT TIME CALCULATED LEAK	= 0.2735
TOT TIME 95% UCL	= 0.3265
MASS POINT LEAK	= 0.2663
MASS POINT 95% UCL	= 0.2694
75% La	= .375
MASS	= 96554.98

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	76.301 / +0.016	AVG PRESS:	64.997 / -0.000
MASS:	96554.98 / -3.297	AVG DEW PRESS:	0.3343 / +0.0010
		TOTAL PRESS:	65.331 / +0.001



DATE	TOTAL TIME	MEAS.LEAK RATE	CALC. LEAK RATE	95%UCL
335	0.00	0.000	0.000	0.000
335	0.25	0.140	0.000	0.000
335	0.50	0.318	0.318	0.000
335	0.75	0.269	0.307	1.205
335	1.00	0.282	0.309	0.681
335	1.25	0.297	0.317	0.562
335	1.50	0.291	0.316	0.511
335	1.75	0.291	0.316	0.481
335	2.00	0.283	0.311	0.459
335	2.25	0.288	0.309	0.444
335	2.50	0.282	0.306	0.430
335	2.75	0.290	0.306	0.421
335	3.00	0.273	0.300	0.410
335	3.25	0.277	0.297	0.401
335	3.50	0.287	0.297	0.396
335	3.75	0.284	0.297	0.390
335	4.00	0.289	0.297	0.386
335	4.25	0.289	0.297	0.383

PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

DATE	TOTAL TIME	MEAS.LEAK RATE	CALC. LEAK RATE	95%UCL
335	4.50	0.284	0.296	0.379
335	4.75	0.284	0.296	0.375
335	5.00	0.277	0.294	0.371
335	5.25	0.282	0.293	0.368
335	5.50	0.283	0.292	0.365
335	5.75	0.279	0.291	0.362
335	6.00	0.276	0.290	0.359
335	6.25	0.277	0.289	0.356
335	6.50	0.279	0.288	0.354
335	6.75	0.273	0.286	0.351
335	7.00	0.280	0.286	0.349
335	7.25	0.271	0.284	0.347
335	7.50	0.272	0.283	0.344
335	7.75	0.272	0.282	0.342
335	8.00	0.272	0.281	0.340
335	8.25	0.265	0.280	0.338
335	8.50	0.266	0.278	0.335
335	8.75	0.268	0.277	0.333

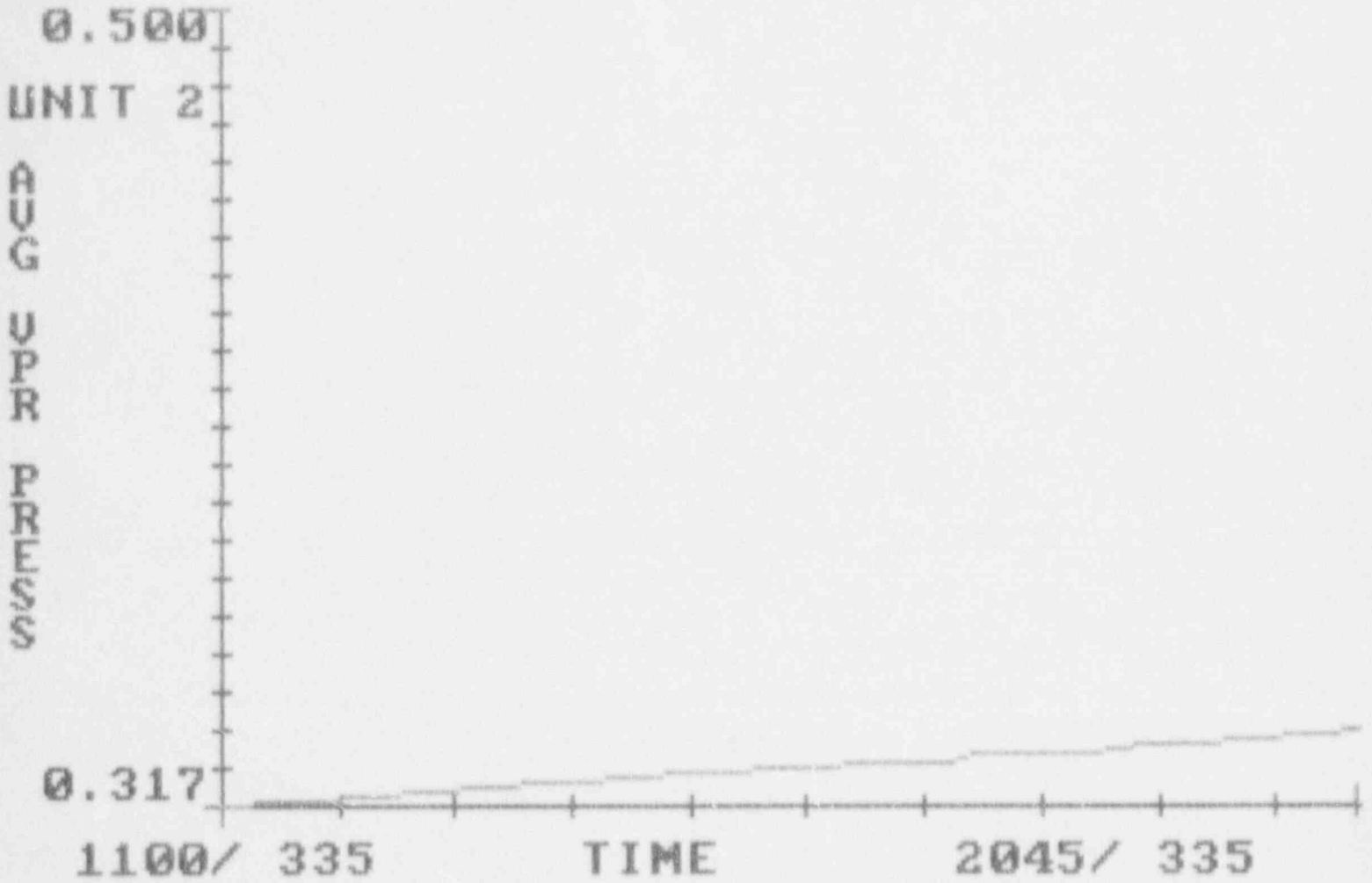
PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

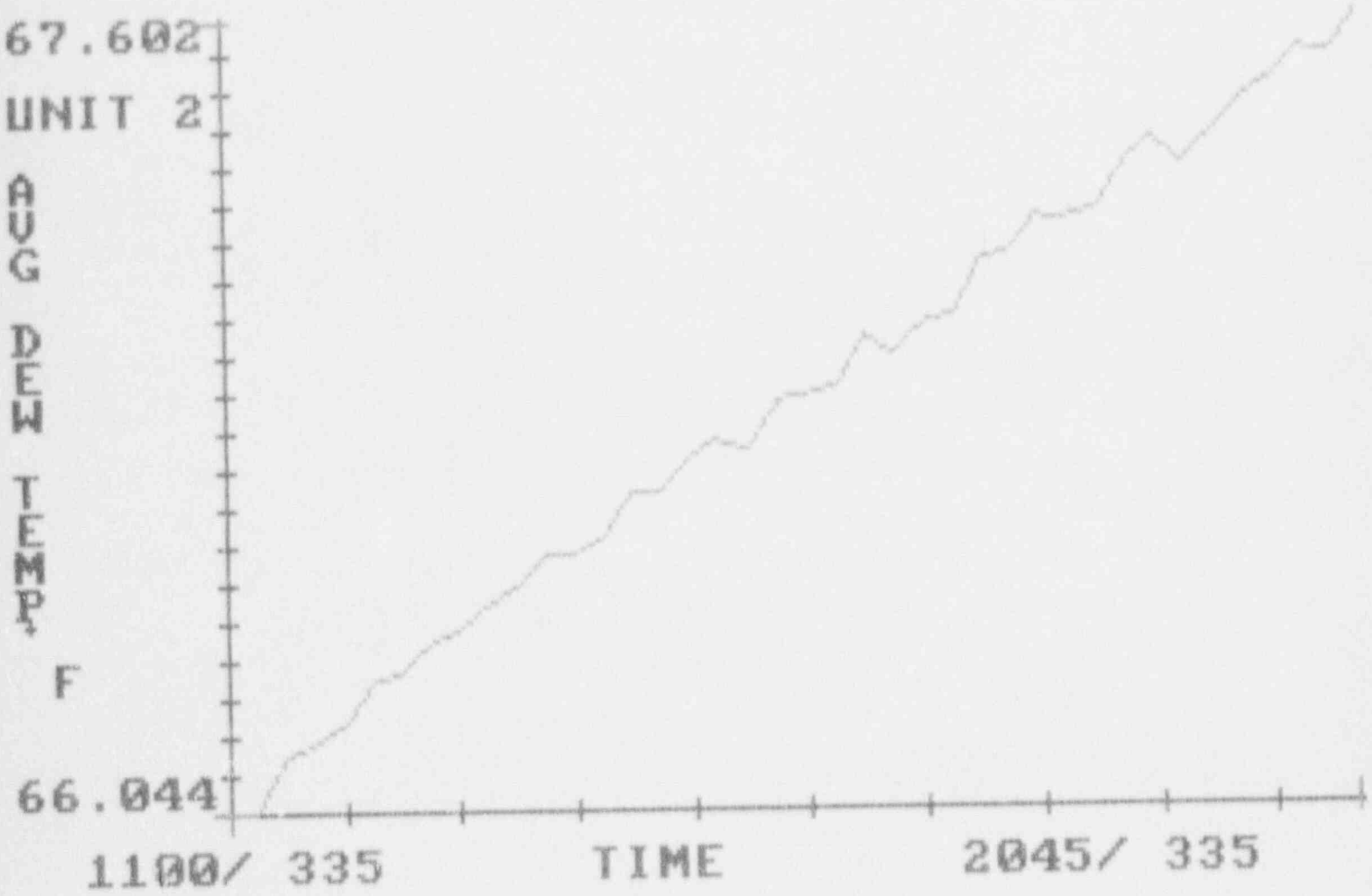
TOTAL TIME DATE	TIME	MEAS.LEAK RATE	CALC. LEAK RATE	95%UCL
335	9.00	0.267	0.276	0.332
335	9.25	0.268	0.275	0.330
335	9.50	0.268	0.274	0.328
335	9.75	0.267	0.273	0.327

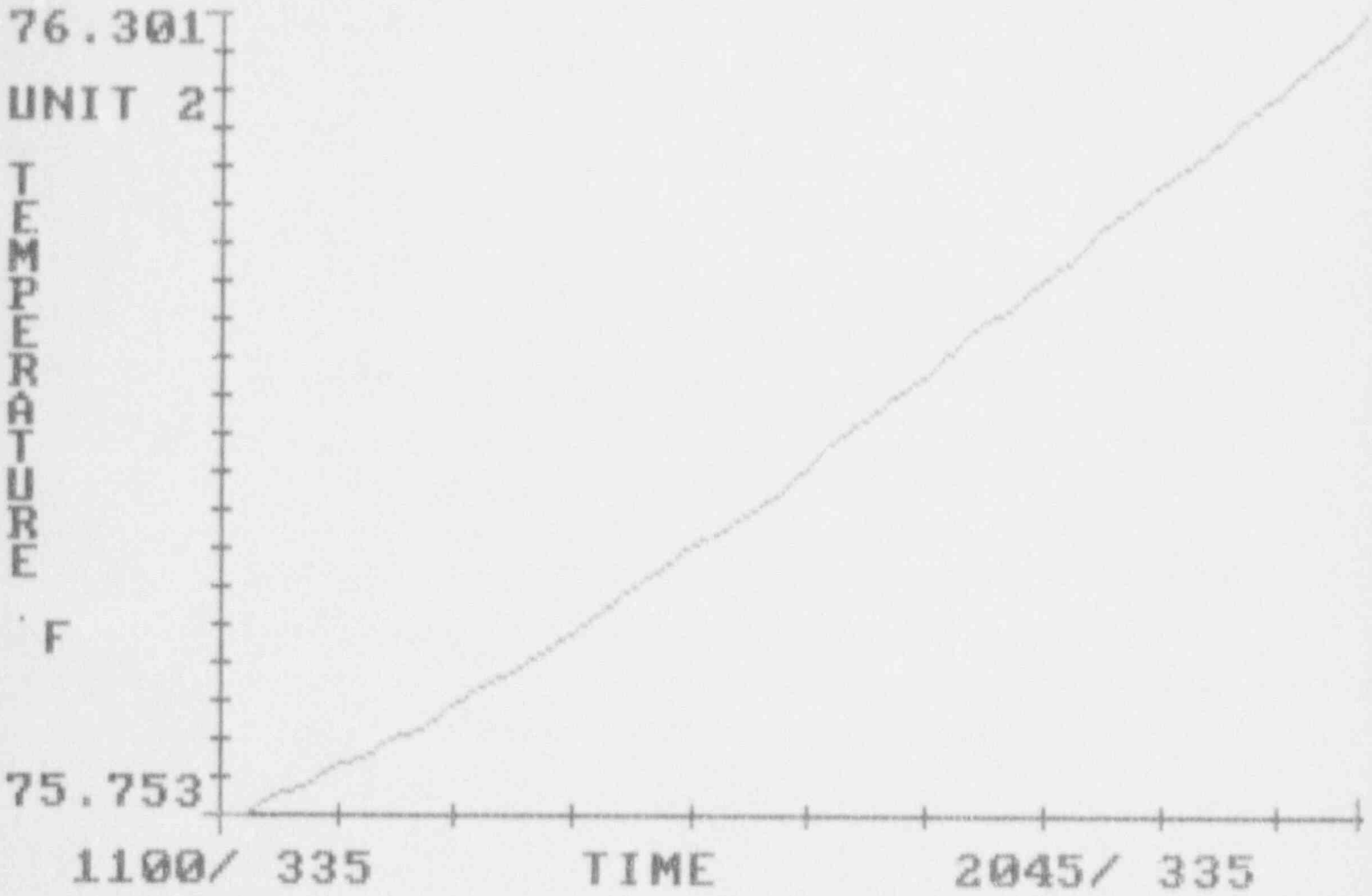
PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

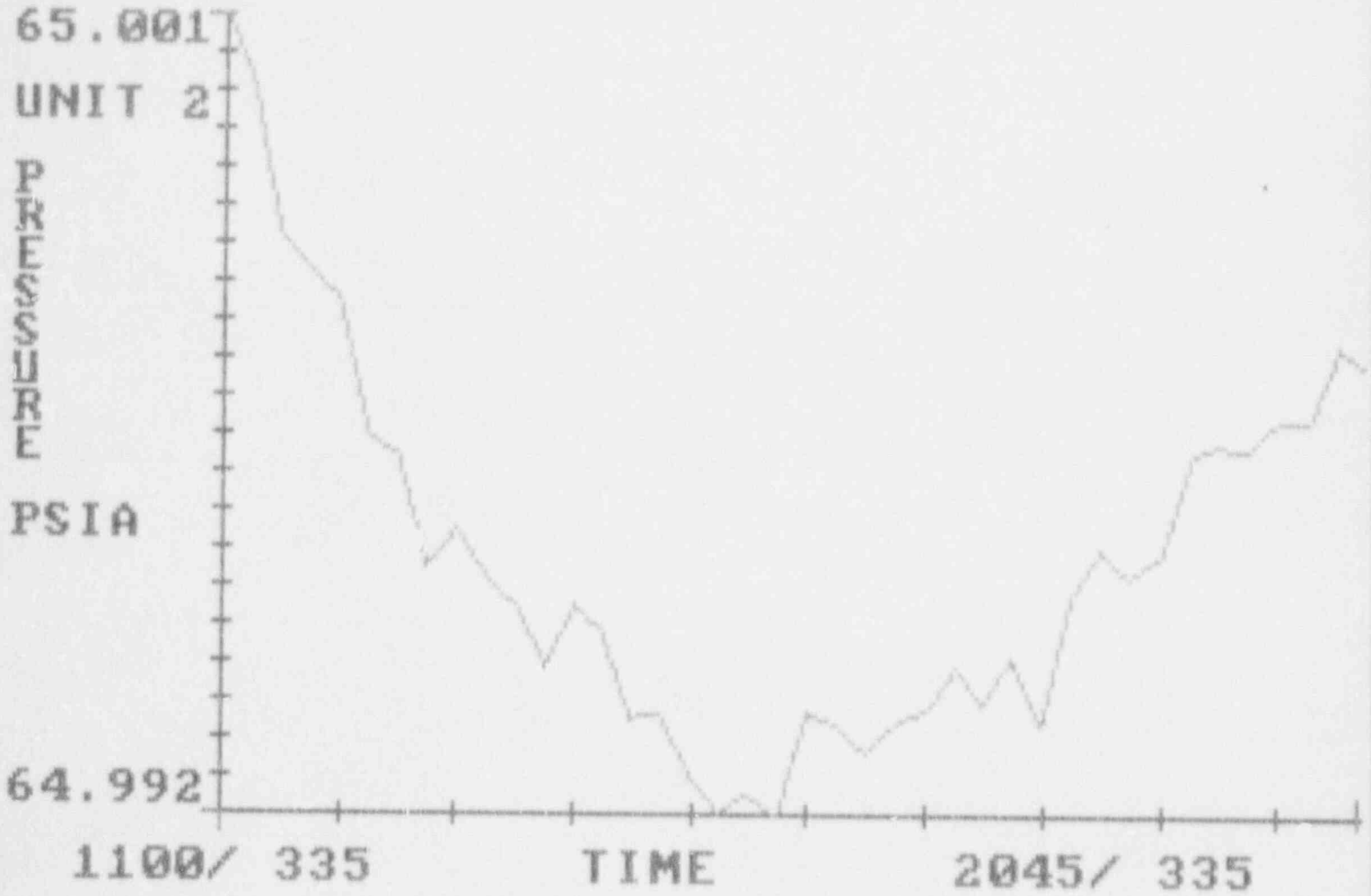
AVG. DATA VALUES UNIT # 2

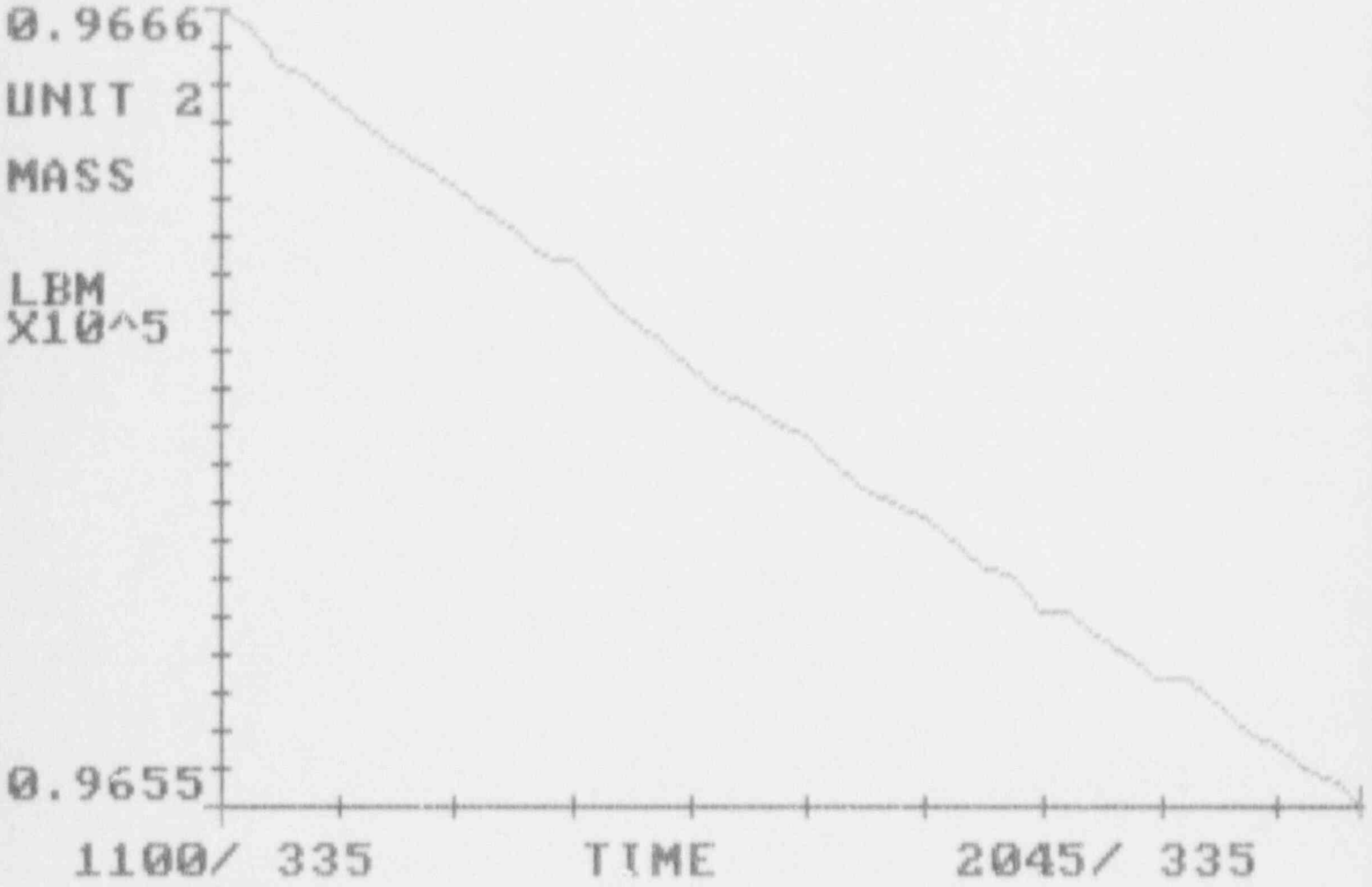
DATE	TIME	T(I)	P(I)	DT(I)	VP(I)	MASS(I)
335	0.00	75.753	65.001	66.047	0.317	96660
335	0.25	75.755	65.001	66.044	0.317	96659
335	0.50	75.767	64.999	66.148	0.318	96654
335	0.75	75.773	64.998	66.182	0.318	96652
335	1.00	75.788	64.998	66.215	0.319	96649
335	1.25	75.794	64.996	66.299	0.320	96645
335	1.50	75.807	64.996	66.319	0.320	96642
335	1.75	75.812	64.995	66.377	0.320	96639
335	2.00	75.828	64.995	66.402	0.321	96637
335	2.25	75.842	64.995	66.451	0.321	96634
335	2.50	75.852	64.994	66.486	0.322	96632
335	2.75	75.866	64.993	66.549	0.322	96628
335	3.00	75.878	64.994	66.548	0.322	96627
335	3.25	75.893	64.994	66.577	0.323	96624
335	3.50	75.908	64.993	66.672	0.324	96620
335	3.75	75.922	64.993	66.665	0.324	96617
335	4.00	75.936	64.992	66.734	0.324	96613
335	4.25	75.948	64.992	66.775	0.325	96610
335	4.50	75.961	64.992	66.753	0.325	96609
335	4.75	75.974	64.992	66.845	0.326	96606
335	5.00	75.984	64.993	66.860	0.326	96604
335	5.25	76.013	64.993	66.877	0.326	96600
335	5.50	76.027	64.992	66.974	0.327	96597
335	5.75	76.042	64.993	66.940	0.327	96595
335	6.00	76.054	64.993	66.994	0.327	96593
335	6.25	76.074	64.993	67.014	0.328	96590
335	6.50	76.090	64.993	67.118	0.329	96587
335	6.75	76.100	64.994	67.135	0.329	96586
335	7.00	76.120	64.993	67.206	0.330	96581
335	7.25	76.133	64.994	67.199	0.330	96581
335	7.50	76.156	64.995	67.213	0.330	96578
335	7.75	76.169	64.995	67.307	0.331	96575
335	8.00	76.185	64.995	67.353	0.331	96572
335	8.25	76.198	64.996	67.313	0.331	96572
335	8.50	76.215	64.996	67.364	0.332	96569
335	8.75	76.234	64.996	67.434	0.332	96565
335	9.00	76.249	64.996	67 470	0.333	96563
335	9.25	76.268	64.996	67.532	0.333	96560
335	9.50	76.285	64.997	67.519	0.333	96558
335	9.75	76.301	64.997	67.602	0.334	96555


0.500
UNIT 2
AVG UPR PRESS
0.317
1100/ 335
TIME
2045/ 335


67.602
UNIT 2
AVG DEW TEMP
F
66.044
1100/ 335
TIME
2045/ 335


76.301
UNIT 2
TEMPERATURE
F
75.753
1100/ 335
TIME
2045/ 335


65.001
UNIT 2
PRESSURE
PSIA
64.992
1100/ 335
TIME
2045/ 335


0.9666
UNIT 2
MASS
LBM
X10^5
0.9655
1100/ 335
TIME
2045/ 335

TEST MODE

PLEASE SELECT THE OPTION
YOU WISH TO USE:

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

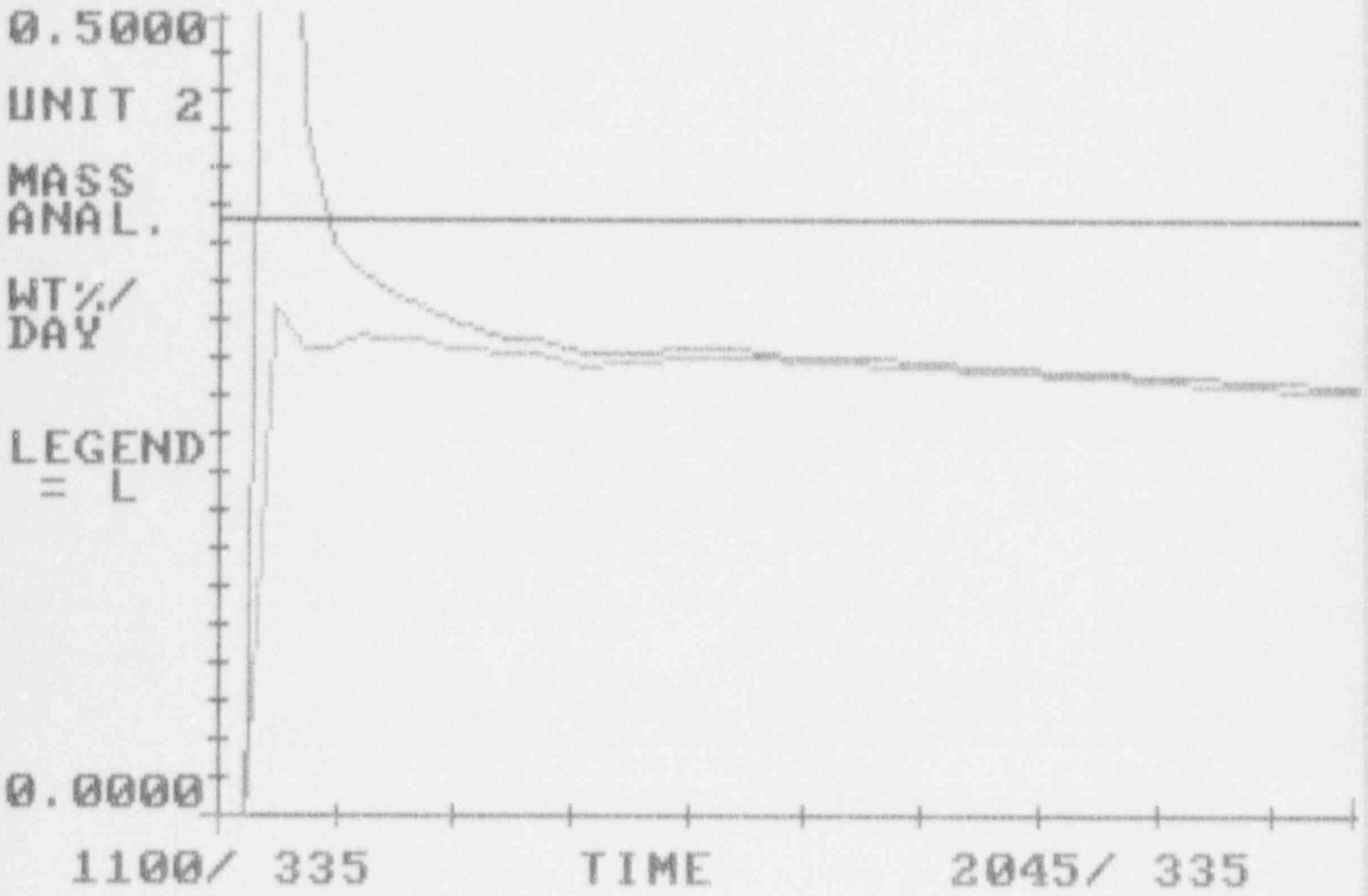
SELECTED OPTION=

TEST DATA 2045

# OF DATA POINTS	= 40
MODE DURATION (IN HOURS)	= 9.75
TOT TIME MEASURED LEAK	= 0.2675
TOT TIME CALCULATED LEAK	= 0.2735
TOT TIME 95% UCL	= 0.3265
MASS POINT LEAK	= 0.2663
MASS POINT 95% UCL	= 0.2694
75% La	= .375
MASS	= 96554.98

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	76.301 / +0.016	AVG PRESS:	64.997 / -0.000
MASS:	96554.98 / -3.297	AVG DEW PRESS:	0.3343 / +0.0010
		TOTAL PRESS:	65.331 / +0.001



MASS POINT DATE	TIME	CALC. LEAK RATE	95% UCL
335	0.00	0.000	0.000
335	0.25	0.000	0.000
335	0.50	0.319	1.196
335	0.75	0.292	0.434
335	1.00	0.292	0.358
335	1.25	0.301	0.341
335	1.50	0.300	0.328
335	1.75	0.299	0.319
335	2.00	0.294	0.310
335	2.25	0.293	0.306
335	2.50	0.290	0.300
335	2.75	0.291	0.300
335	3.00	0.284	0.294
335	3.25	0.282	0.290
335	3.50	0.283	0.291
335	3.75	0.284	0.291
335	4.00	0.286	0.292
335	4.25	0.287	0.293

PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

MASS POINT DATE	TIME	CALC. LEAK RATE	95% UCL
335	4.50	0.287	0.292
335	4.75	0.286	0.290
335	5.00	0.284	0.289
335	5.25	0.284	0.288
335	5.50	0.283	0.287
335	5.75	0.282	0.286
335	6.00	0.281	0.284
335	6.25	0.280	0.283
335	6.50	0.279	0.282
335	6.75	0.278	0.281
335	7.00	0.278	0.281
335	7.25	0.276	0.280
335	7.50	0.275	0.278
335	7.75	0.274	0.277
335	8.00	0.273	0.277
335	8.25	0.272	0.275
335	8.50	0.270	0.274
335	8.75	0.269	0.273

PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

MASS POINT DATE	TIME	CALC. LEAK RATE	95% UCL
335	9.00	0.268	0.272
335	9.25	0.268	0.271
335	9.50	0.267	0.270
335	9.75	0.266	0.269

PRESS # OF PAGE DESIRED:1,2,3,4,5,6,7 OR OTHER KEY FOR MAIN MENU

APPENDIX C
VERIFICATION TEST DATA AND PLOTS

VERIFICATION MODE
OPTIONS:

TIME= 0245
TEST SUMMARY

1 - MANUAL DATA ENTRY
2 - PARAMETER GRAPHS
3 - SENSOR PLOTS
4 - TREND ANALYSIS
5 - REPRINT CURRENT DATA PT
6 - SENSOR DIFFERENTIALS

P - PASS WORD MENU

SELECTED OPTION =

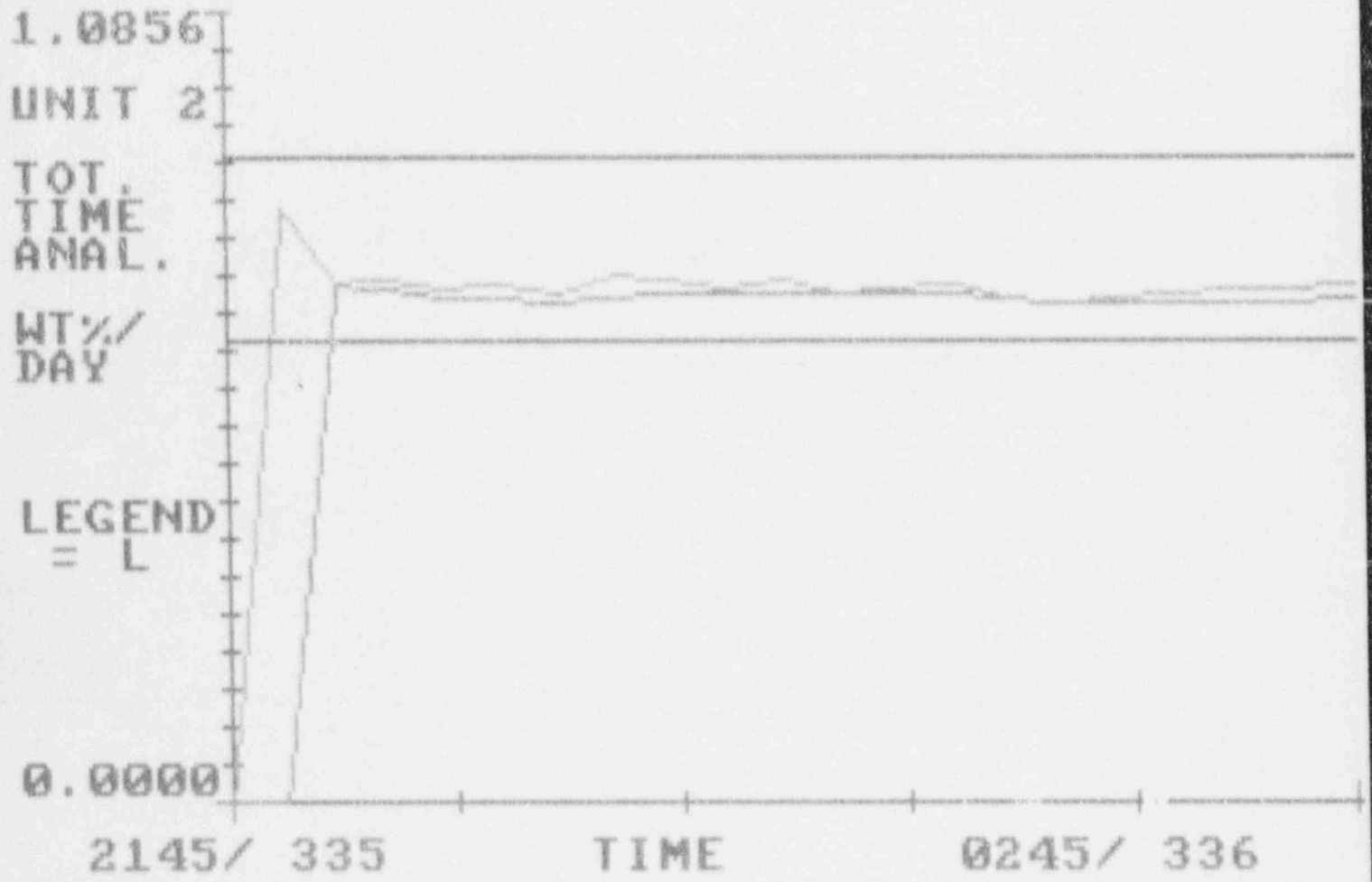
# OF DATA POINTS	= 21
MODE DURATION (IN HOURS)	= 5
TOT TIME MEASURED LEAK	= 0.7135
TOT TIME CALCULATED LEAK	= 0.6922
MASS PT LEAK	= 0.7007
IMPOSED LEAK	= 0.4871
TOT TIME UPPER LIMIT	= 0.8856
TOT TIME LOWER LIMIT	= 0.6356
MASS PT UPPER LIMIT	= 0.6784
MASS PT LOWER LIMIT	= 0.6284

TOT TIME VERIFICATION CRITERIA HAS BEEN MET

MASS PT VERIFICATION CRITERIA HAS BEEN MET

POINT SUMMARY: CURRENT VALUE/DIFFERENCE FROM PREVIOUS POINT

AVG TEMP:	76.672/ +0.018	AVG PRESS:	64.928 / -0.003
MASS:	96386.23/ -8.430	AVG DEW PRESS:	0.3429/ +0.0005
		TOTAL PRESS:	65.271 / -0.003

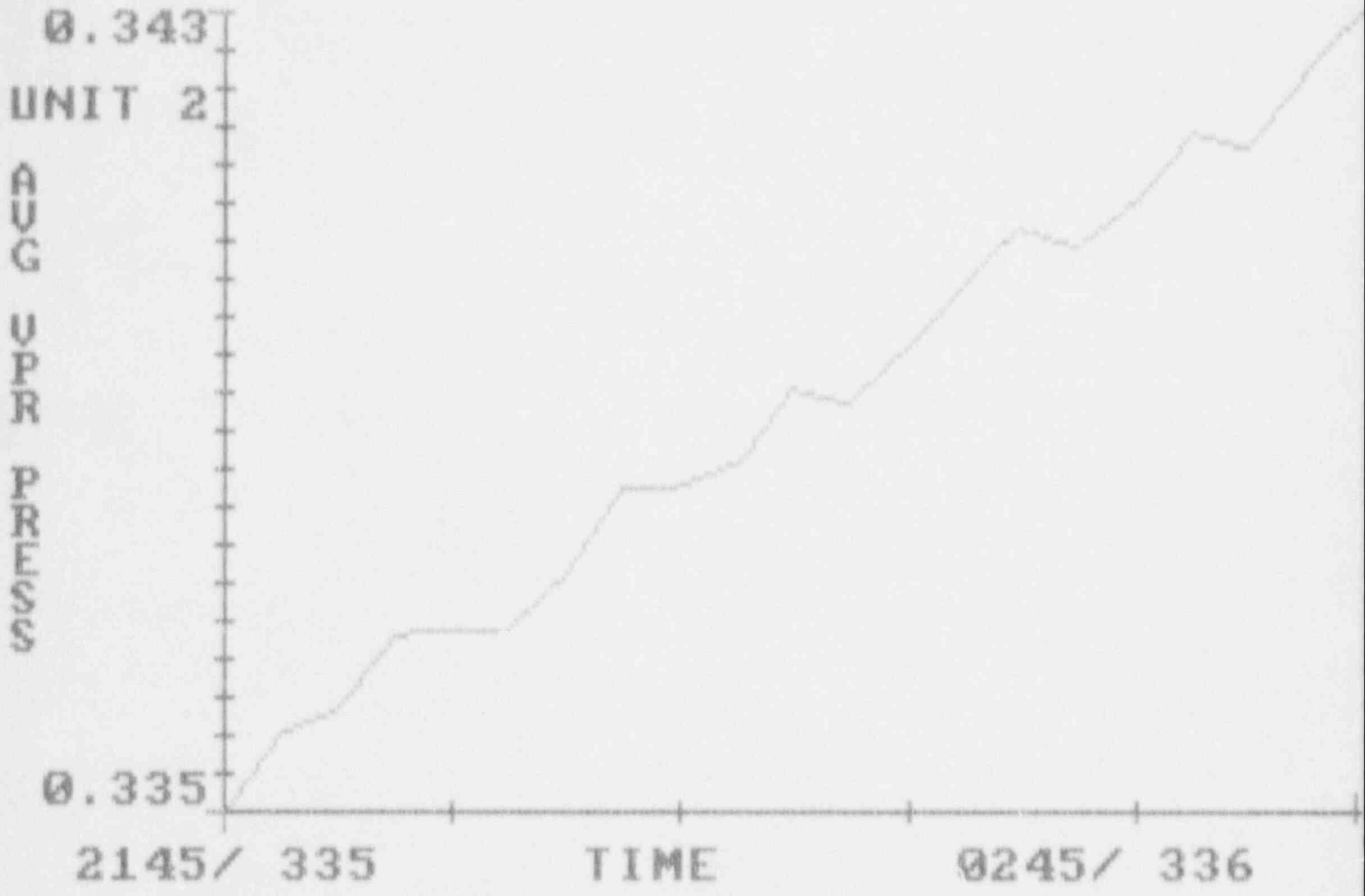


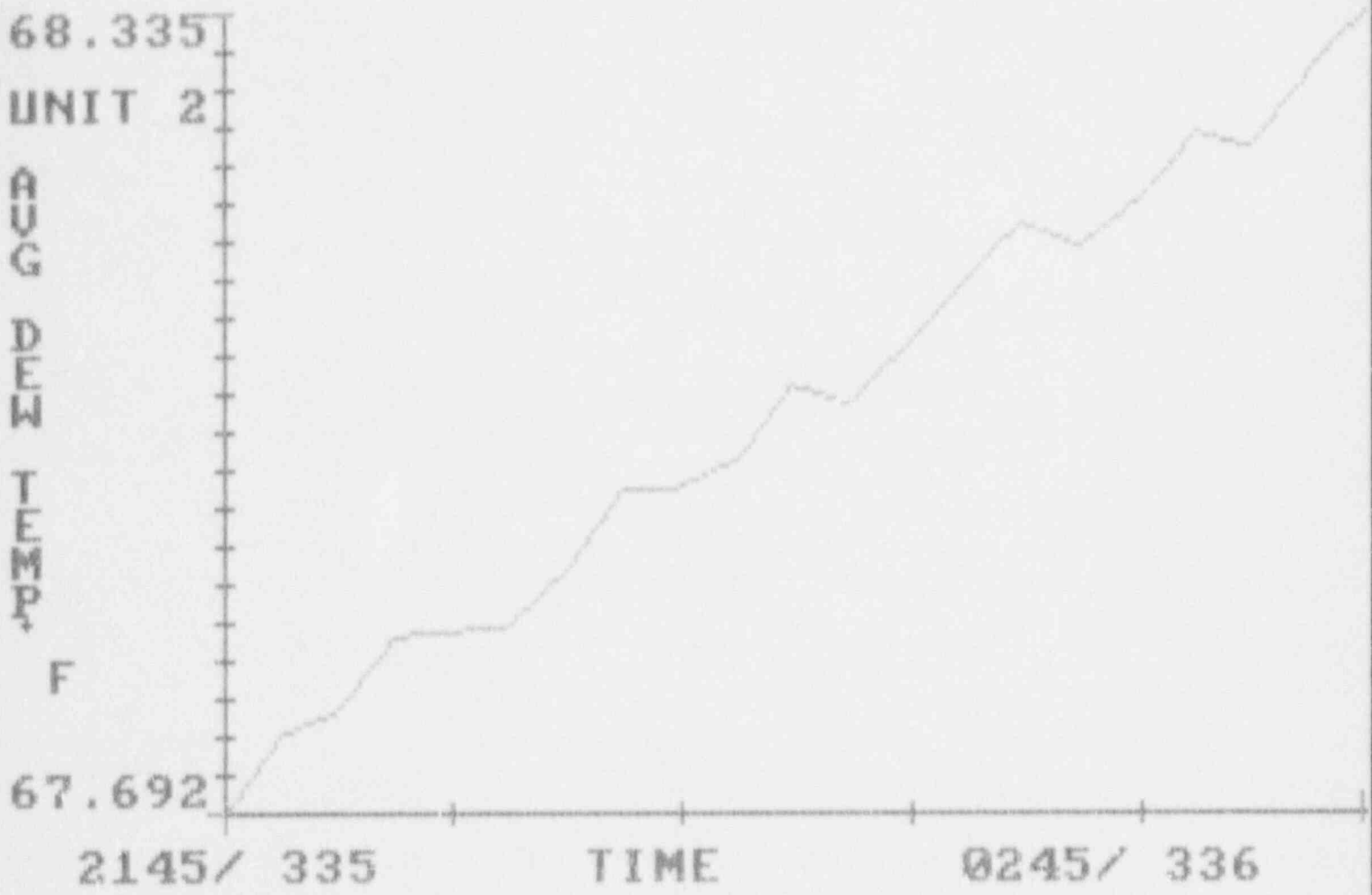
AVG. DATA VALUES UNIT # 2

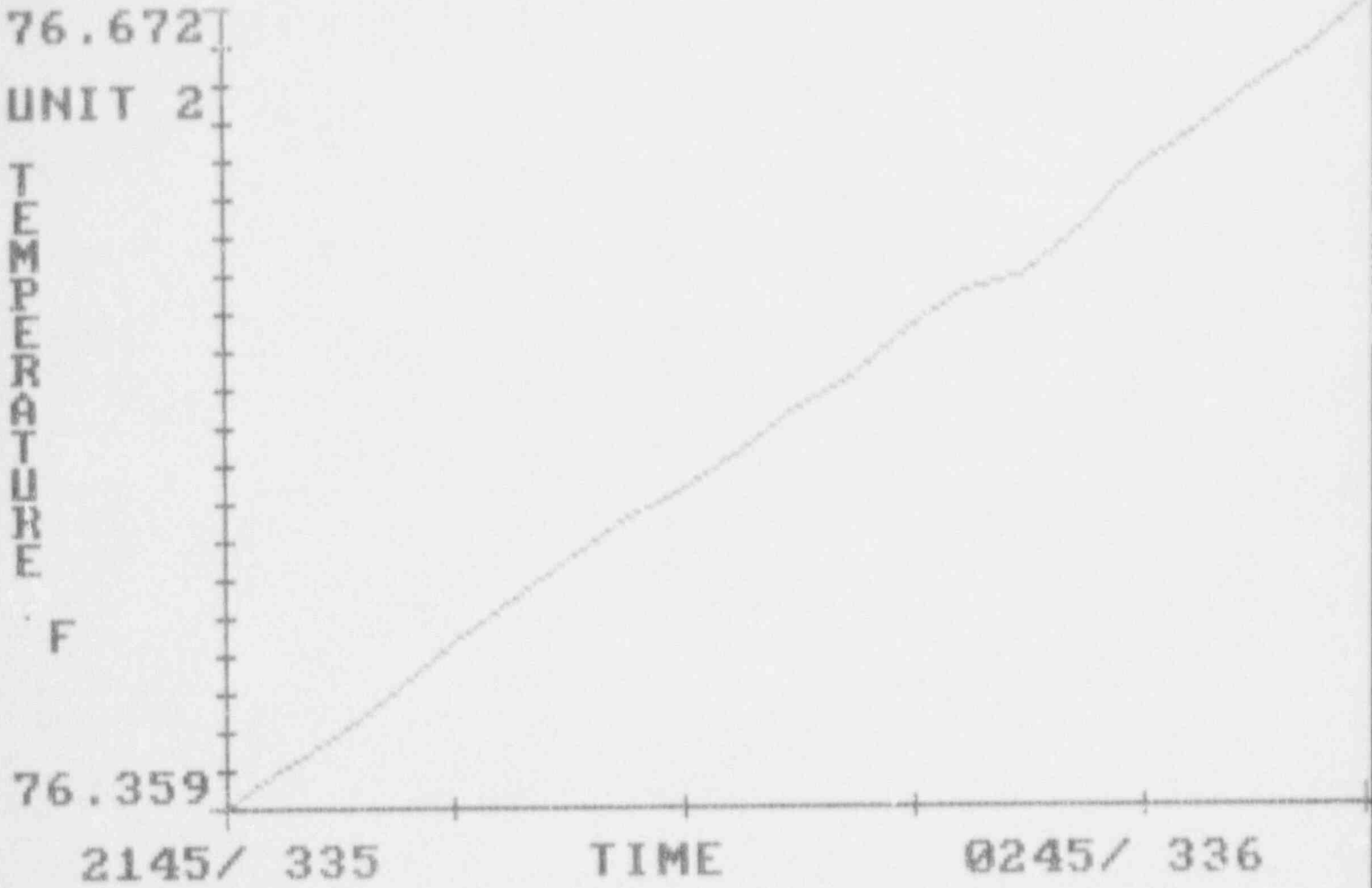
DATE	TIME	T(I)	P(I)	DT(I)	VP(I)	MASS(I)
335	0.00	76.359	64.987	67.692	0.335	96529.72
335	0.25	76.375	64.983	67.753	0.336	96521.50
335	0.50	76.389	64.981	67.775	0.336	96515.29
335	0.75	76.406	64.978	67.834	0.337	96507.90
335	1.00	76.424	64.976	67.840	0.337	96501.19
335	1.25	76.440	64.973	67.842	0.337	96493.88
335	1.50	76.454	64.970	67.883	0.338	96487.26
335	1.75	76.472	64.966	67.954	0.338	96478.44
335	2.00	76.484	64.963	67.954	0.338	96471.94
336	2.25	76.498	64.961	67.976	0.339	96465.59
336	2.50	76.516	64.957	68.037	0.339	96457.05
336	2.75	76.527	64.955	68.023	0.339	96451.91
336	3.00	76.547	64.952	68.068	0.340	96444.29
336	3.25	76.562	64.949	68.120	0.340	96436.30
336	3.50	76.567	64.947	68.167	0.341	96432.77
336	3.75	76.585	64.945	68.149	0.341	96426.09
336	4.00	76.608	64.942	68.185	0.341	96418.10
336	4.25	76.623	64.938	68.240	0.342	96409.86
336	4.50	76.640	64.935	68.230	0.342	96401.57
336	4.75	76.654	64.932	68.292	0.342	96394.66
336	5.00	76.672	64.928	68.335	0.343	96386.23

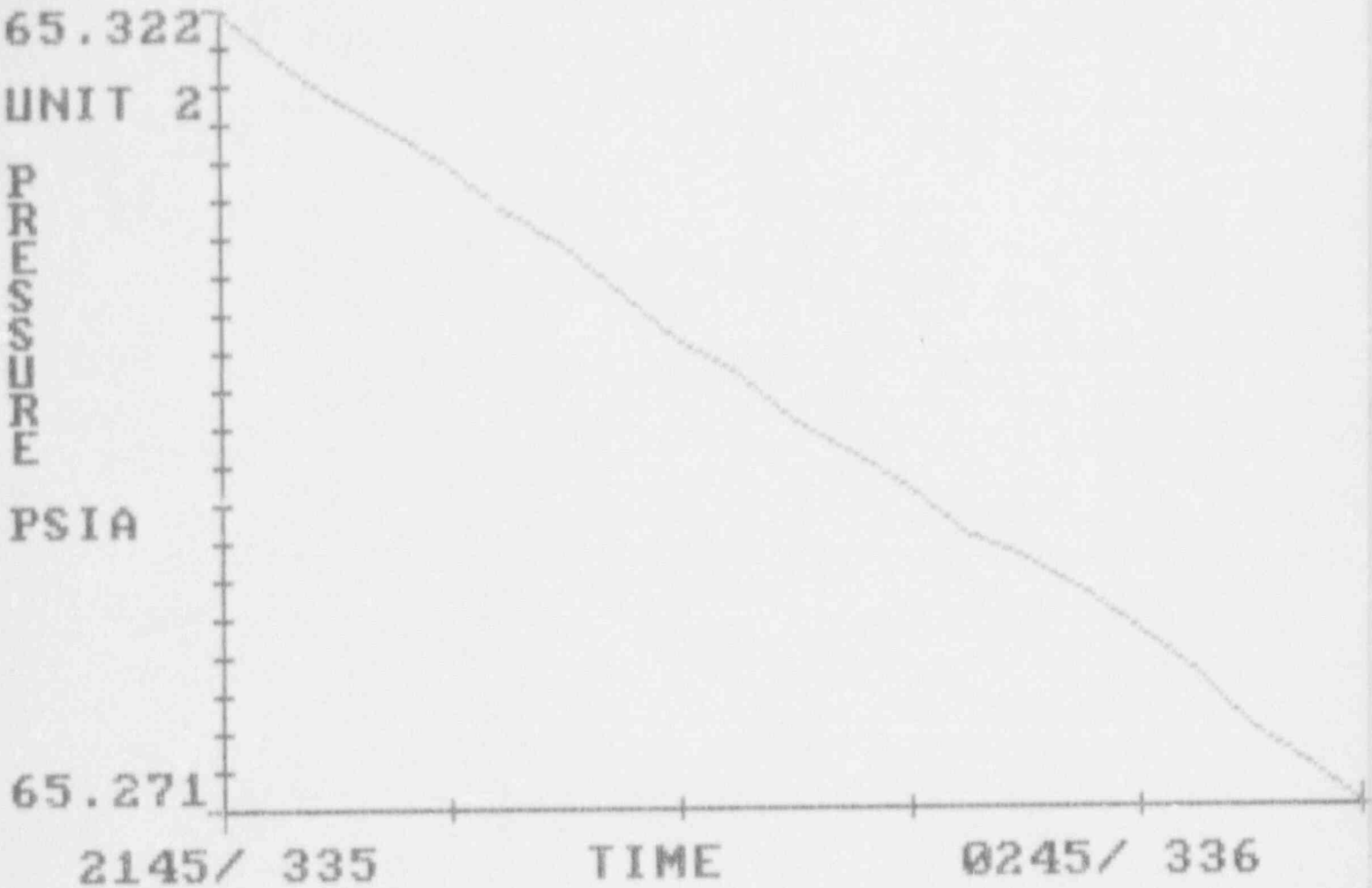
TOTAL TIME UNIT # 2

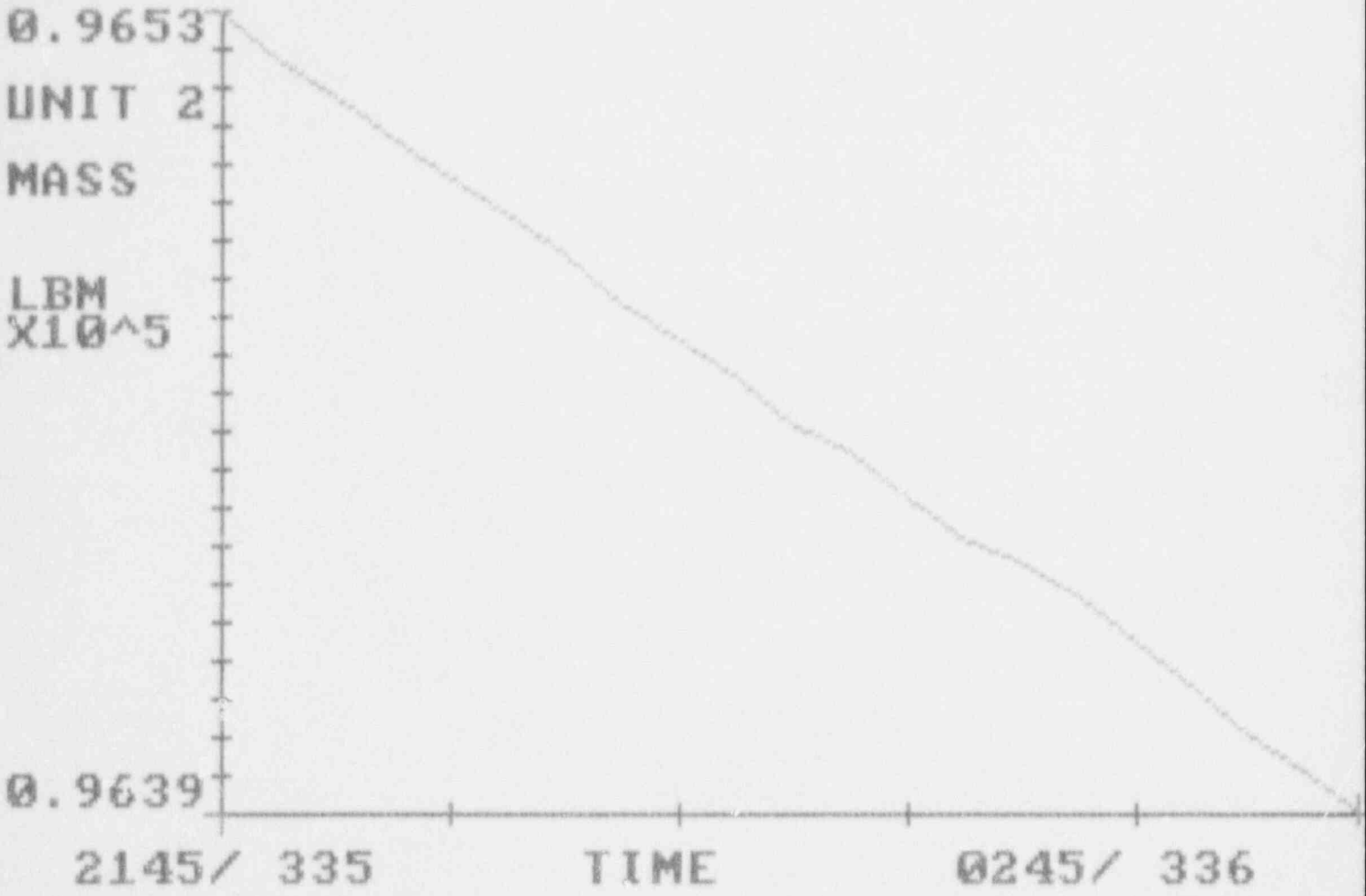
DATE	TIME	TTLM	LMCALC	SL	LAM	L95
335	0.00	0.0000	0.0000	0.0000	0.0000	0.0000
335	0.25	0.8164	0.0000	0.0000	0.0000	0.0000
335	0.50	0.7170	0.7170	0.0000	0.7179	1.2111
335	0.75	0.7228	0.7053	1.1211	0.7136	0.7899
335	1.00	0.7091	0.6939	0.8754	0.7031	0.7409
335	1.25	0.7127	0.6925	0.8273	0.7037	0.7262
335	1.50	0.7037	0.6881	0.7965	0.6992	0.7151
335	1.75	0.7285	0.6978	0.8036	0.7121	0.7306
335	2.00	0.7183	0.7001	0.7951	0.7135	0.7276
336	2.25	0.7085	0.6982	0.7833	0.7098	0.7215
336	2.50	0.7225	0.7020	0.7825	0.7141	0.7246
336	2.75	0.7035	0.6988	0.7727	0.7084	0.7187
336	3.00	0.7080	0.6980	0.7671	0.7068	0.7156
336	3.25	0.7145	0.6993	0.7653	0.7084	0.7160
336	3.50	0.6922	0.6947	0.7568	0.7017	0.7111
336	3.75	0.6870	0.6899	0.7488	0.6956	0.7061
336	4.00	0.6938	0.6877	0.7439	0.6928	0.7024
336	4.25	0.7011	0.6876	0.7421	0.6935	0.7020
336	4.50	0.7079	0.6890	0.7427	0.6961	0.7041
336	4.75	0.7069	0.6901	0.7427	0.6977	0.7050
336	5.00	0.7135	0.6922	0.7445	0.7007	0.7079

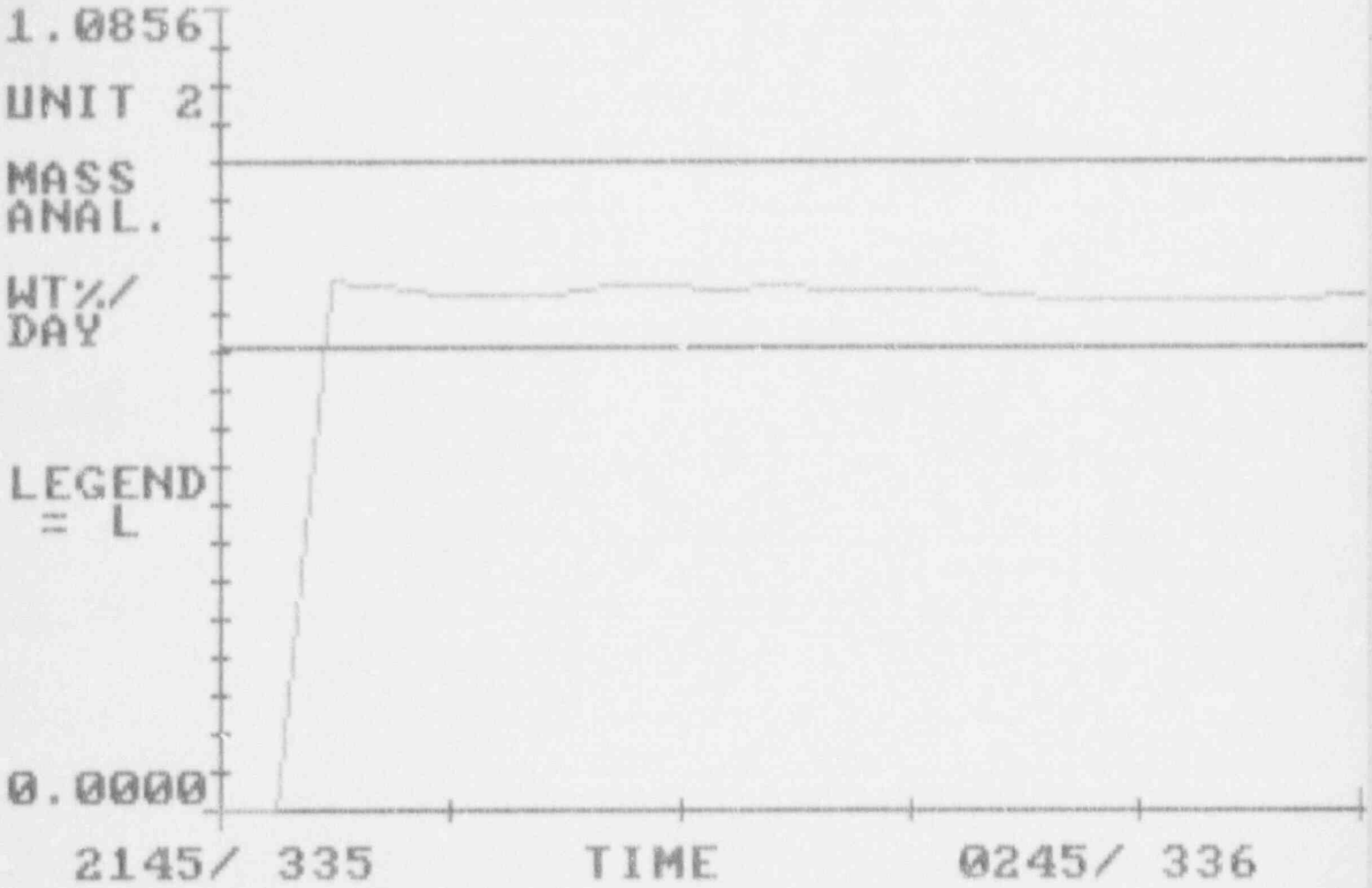

0.343
UNIT 2
AVG VPR PRESS
0.335
2145/ 335
TIME
0245/ 336

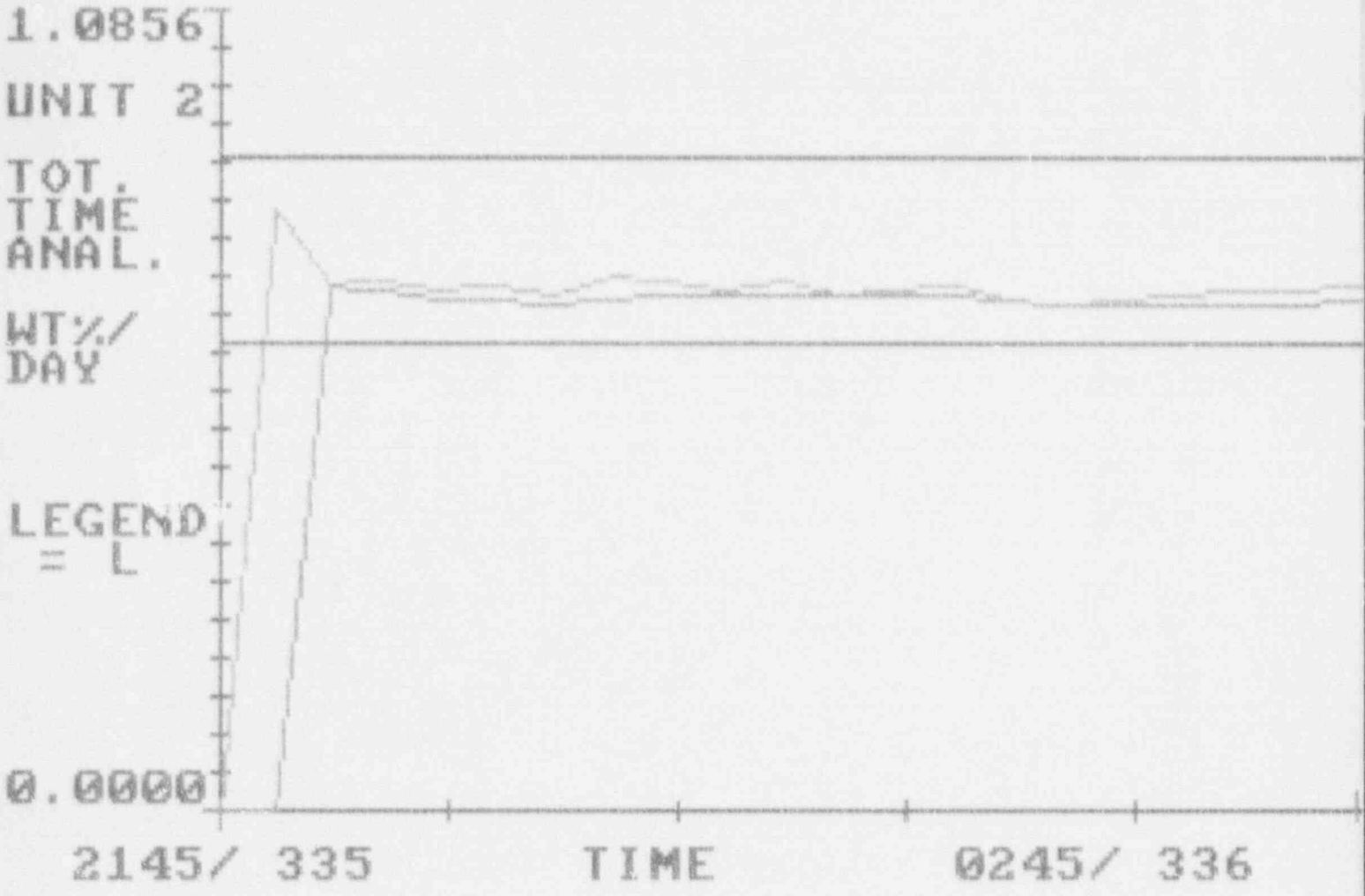

68.335
UNIT 2
AVG DEW TEMP
F
67.692
2145/ 335
TIME
0245/ 336


76.672
UNIT 2
TEMPERATURE
F
76.359
2145/ 335
TIME
0245/ 336


65.322
UNIT 2
PRESSURE
PSIA
65.271
2145/ 335
TIME
0245/ 336


0.9653
UNIT 2
MASS
LBM
X10^5
0.9639
2145/ 335
TIME
0245/ 336


1.0856
UNIT 2
MASS
ANAL.
WT%/
DAY
LEGEND
= L
0.0000
2145/ 335
TIME
0245/ 336


1.0856
UNIT 2
TOT.
TIME
ANAL.
WT%/
DAY
LEGEND
= L
0.0000
2145/ 335
TIME
0245/ 336

APPENDIX D

INSTRUMENT SELECTION GUIDE CALCULATION

INSTRUMENT SELECTION GUIDE CALCULATION

A. TEST PARAMETERS

La = 0.5%/day
P = 64.9 psia
T = 536°R
T_{dp} = 67°F
t = 9.75 hours

B. INSTRUMENT PARAMETERS

1. Total Absolute Pressure

No. of Sensors = 1
Range: 0 - 75 psia
Sensor sensitivity error (E): +/- 0.001 psia
Measurement system error (*e*):
Resolution: 0.001 psia
Repeatability: +/- 0.001 psia

$e = +/- ((0.001)^2 + (0.001)^2)^{1/2}$
$e = +/- 0.001414$ psia

$e_p = +/- ((0.001)^2 + (0.001414)^2)^{1/2} /(1)^{1/2}$
$e_p = +/- 0.00173$ psia

2. Water Vapor Pressure

No. of Sensors = 10
Sensor sensitivity error (E): +/- 0.01°F
Measurement system error (*e*):
Resolution: 0.01°F
Repeatability: +/- 0.054°F

$e = +/- ((0.01)^2 + (0.054)^2)^{1/2}$
$e = +/- 0.055$°F

At a dewpoint of 67°F, the equivalent water vapor pressure change (as determined from steam tables) is 0.10115 psia/°F.

E = +/- 0.01°F (0.0115 psia/°F)
E = +/- 0.00015 psia

e = +/- 0.055°F (0.0115 psia/°F)
e = +/- 0.00063 psia

$e_{pv} = +/- ((0.00015)^2 + (0.00063)^2)^{1/2} /(10)^{1/2}$
e_{pv} = +/- 0.00021 psia

3. Temperature

No. of Sensors = 24
Sensor sensitivity error (E): +/- 0.01°F
Measurement system error (e):
Resolution: 0.01°F
Repeatability: +/- 0.054°F

$e = +/- ((0.01)^2 + (0.054)^2)^{1/2}$
e = +/- 0.055°F = +/- 0.055°R

$e_T = +/- ((0.01)^2 + (0.055)^2)^{1/2} /(24)^{1/2}$
e_T = +/- 0.01141°R

4. Instrumentation Selection Guide Formula

$ISG = +/- 2400/t\ (2(e_p/P)^2 + 2(e_{pv}/P)^2 + 2(e_T/T)^2)^{1/2}$

$ISG = +/- (2400/9.75)\ (2(0.00173/64.9)^2 + 2(0.00021/64.9)^2$

$+ 2(0.01141/536)^2)^{1/2}$

ISG = +/- 0.012%/day

No sensors were removed from the data sort during any of the testing. The ISG was recalculated to reflect actual test duration and average parameters. The ISG value is substantially less than the value of 0.25 L_a (0.125 %/day).

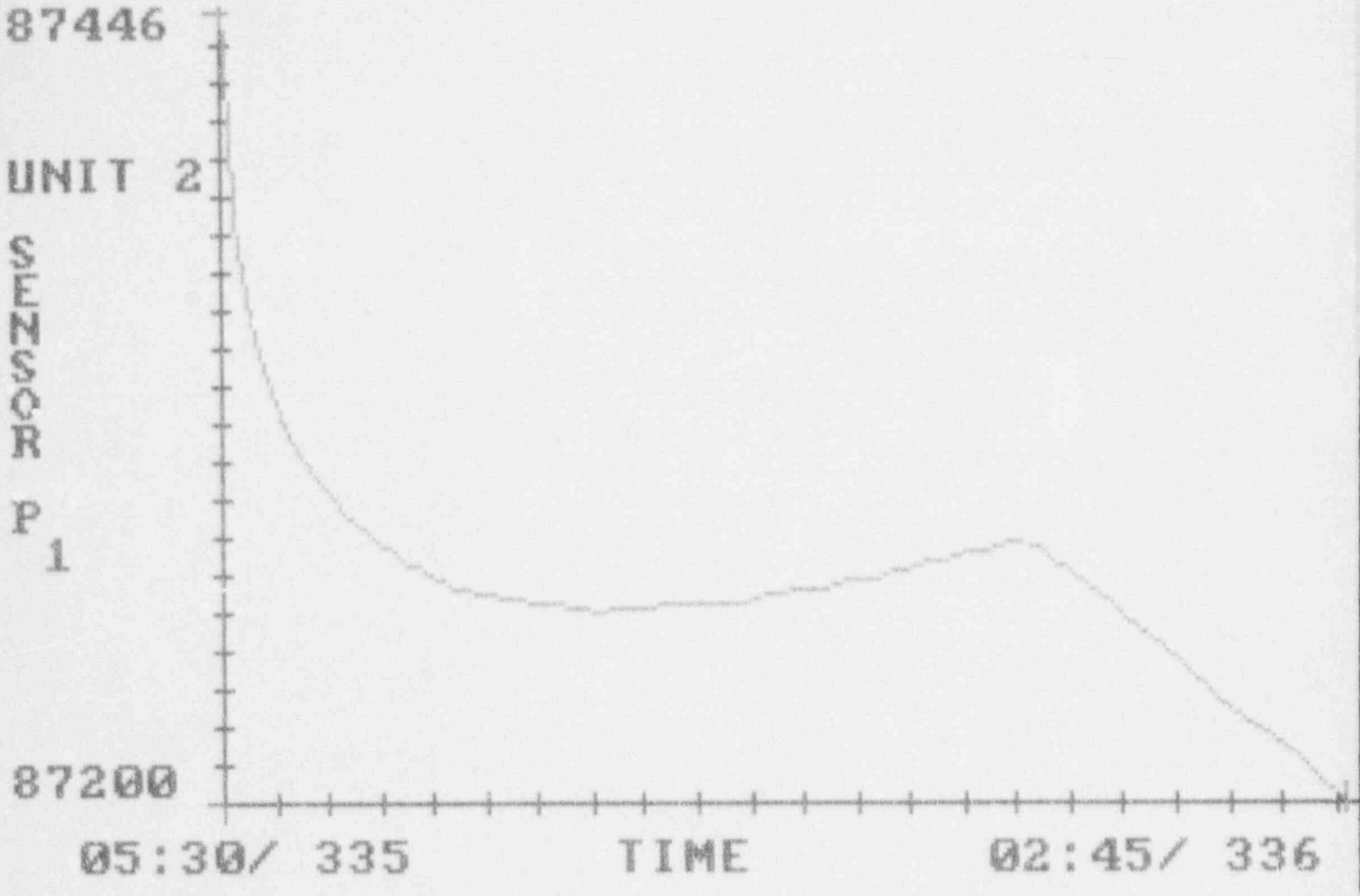
APPENDIX E

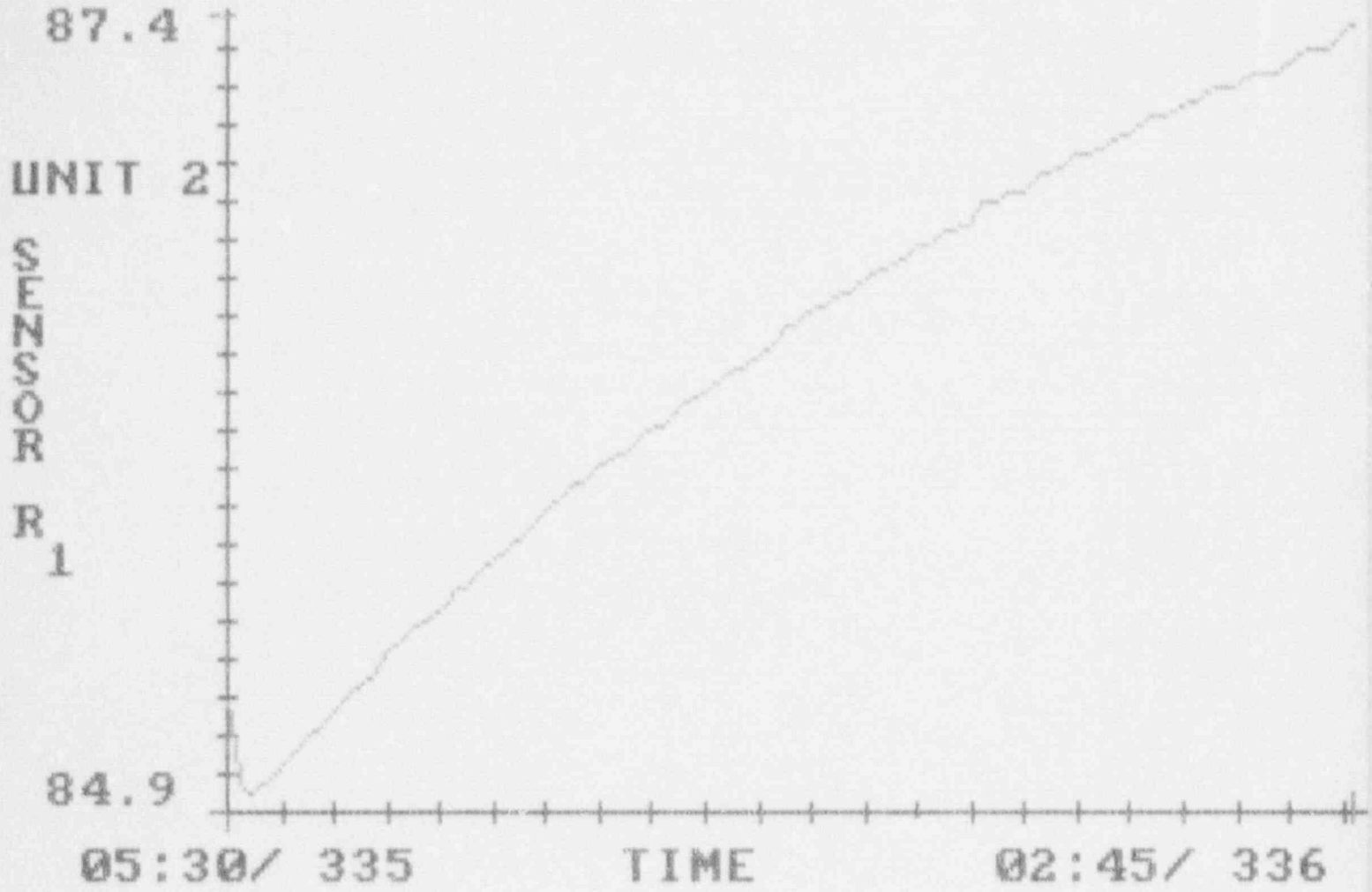
SENSOR FAILURE DATA AND PLOTS

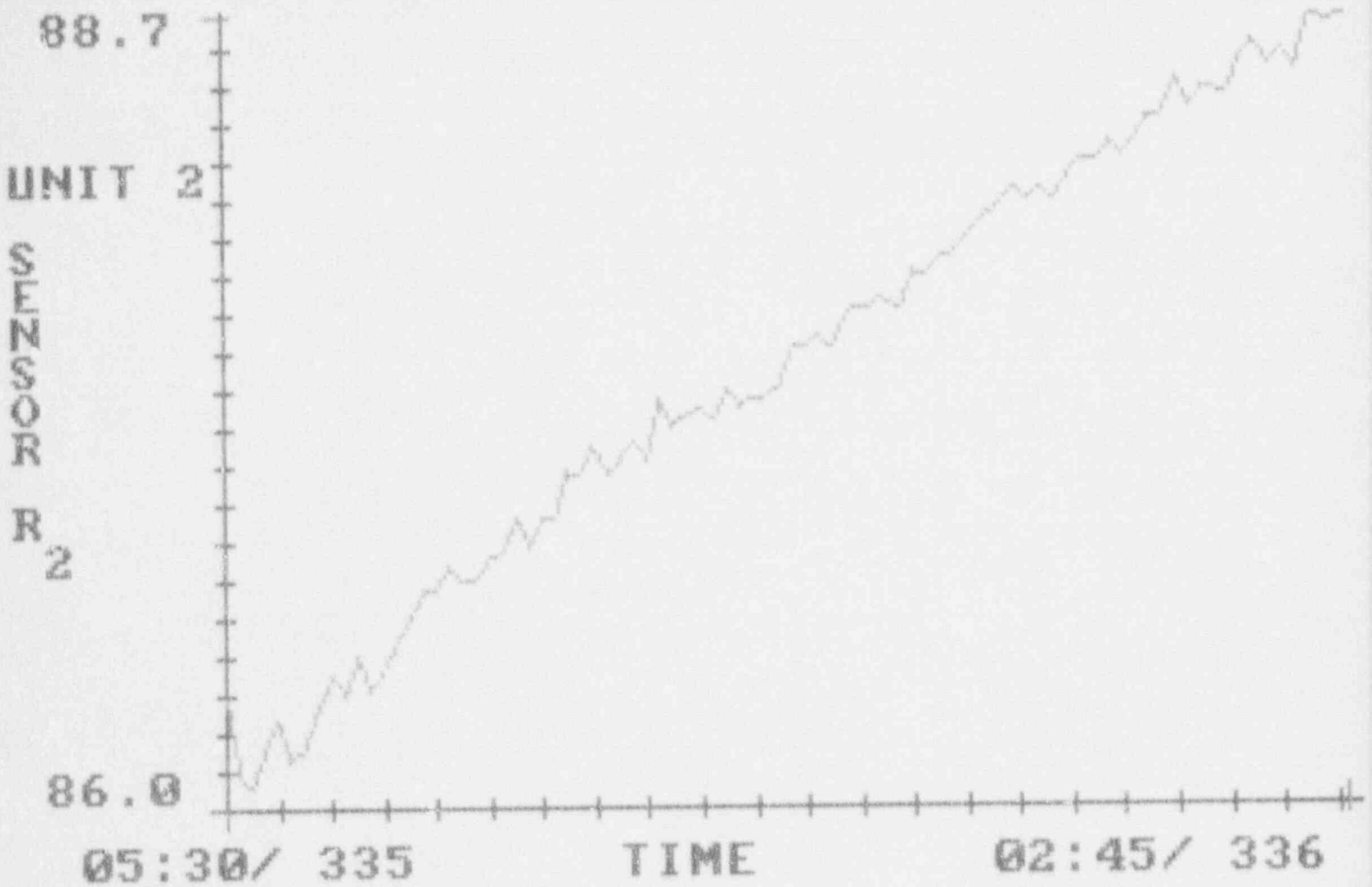
SENSOR FAILURE DATA AND PLOTS

During the early hours of pressurization, DPE-5 (dewcell #5) behaved erratically for a brief period (two data points; at one point dropping to -185°F; at another, -205°F). However, since the sensor was located very close to the building spray header being used to pressurize the drywell, and since the dewcell had performed well in the latter half of the pressurization phase, it was not removed from the data sort.

All sensors performed acceptably during the stabilization test and verification test portions of the ILRT. Subsequently, the post-test ISG is calculated with the same number of sensors as the pre-test ISG. No sensors were deleted from the data calculations.


87446
UNIT 2
SENSOR P 1
87200
05:30/ 335
TIME
02:45/ 336


87.4
UNIT 2
SENSOR R1
84.9
05:30/ 335
TIME
02:45/ 336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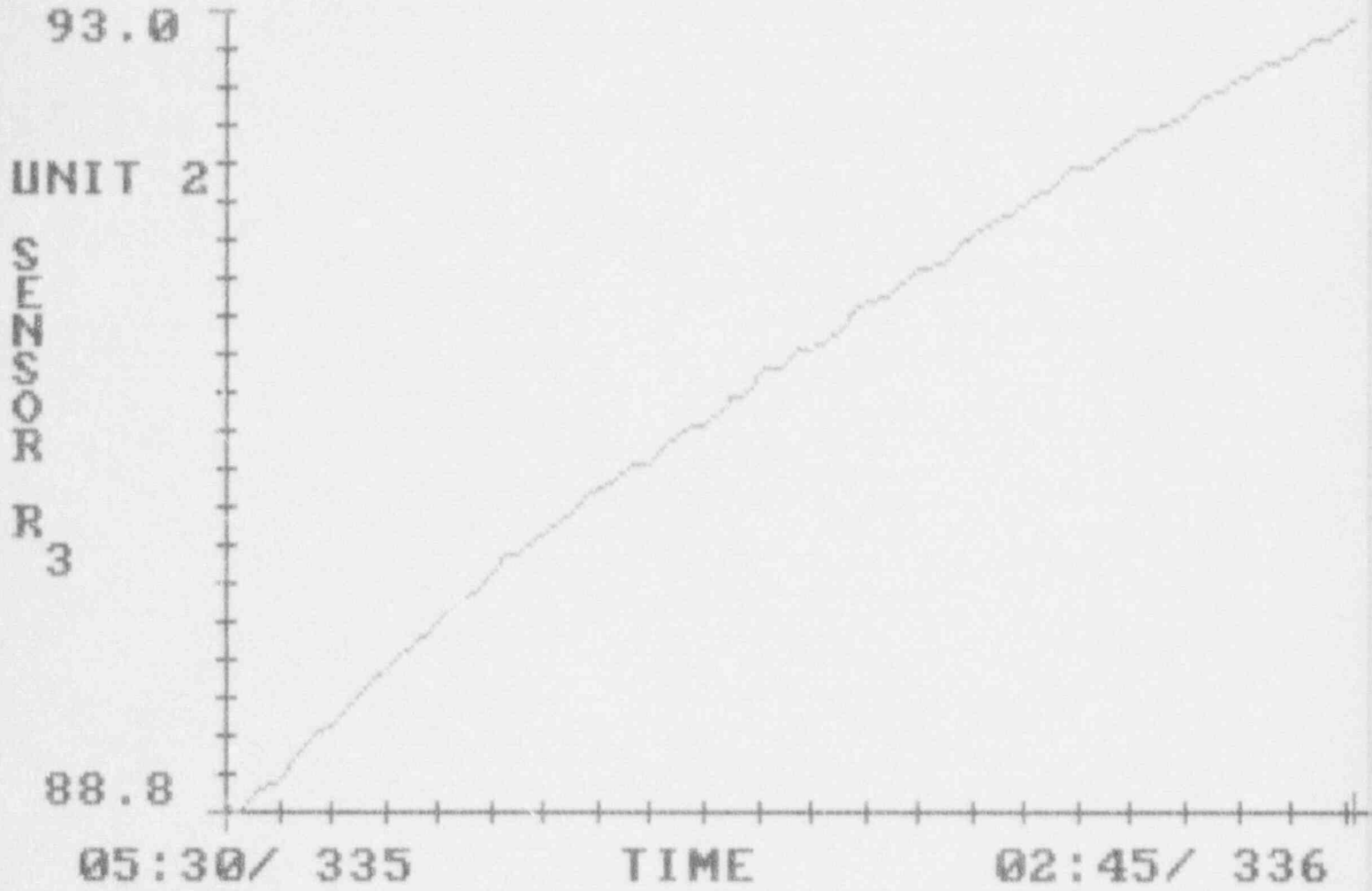
SENSOR
R2
86.0
05:30/ 335
TIME
02:45/ 336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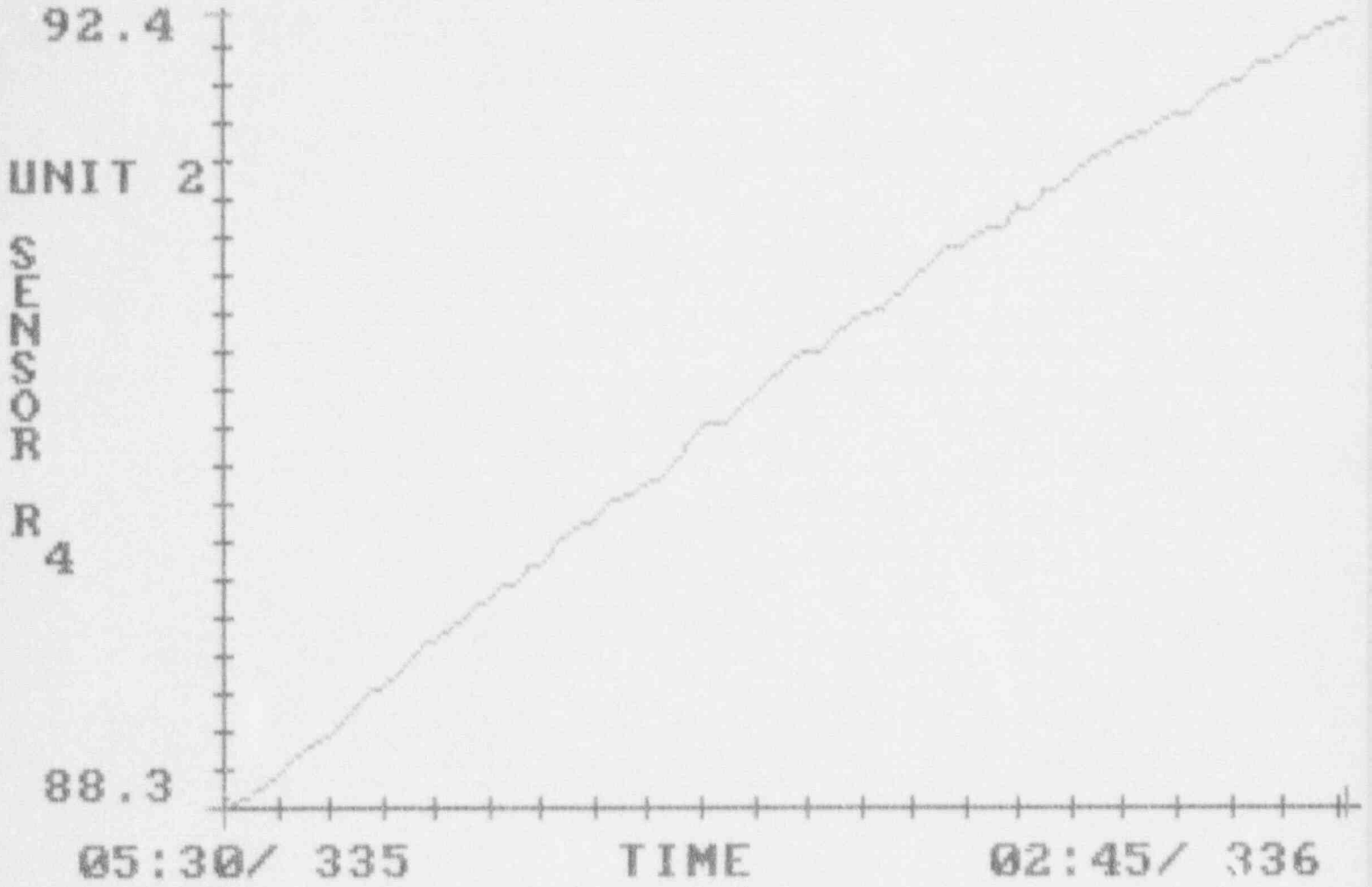
88.8
05:30/ 335
TIME
02:45/ 336


92.4
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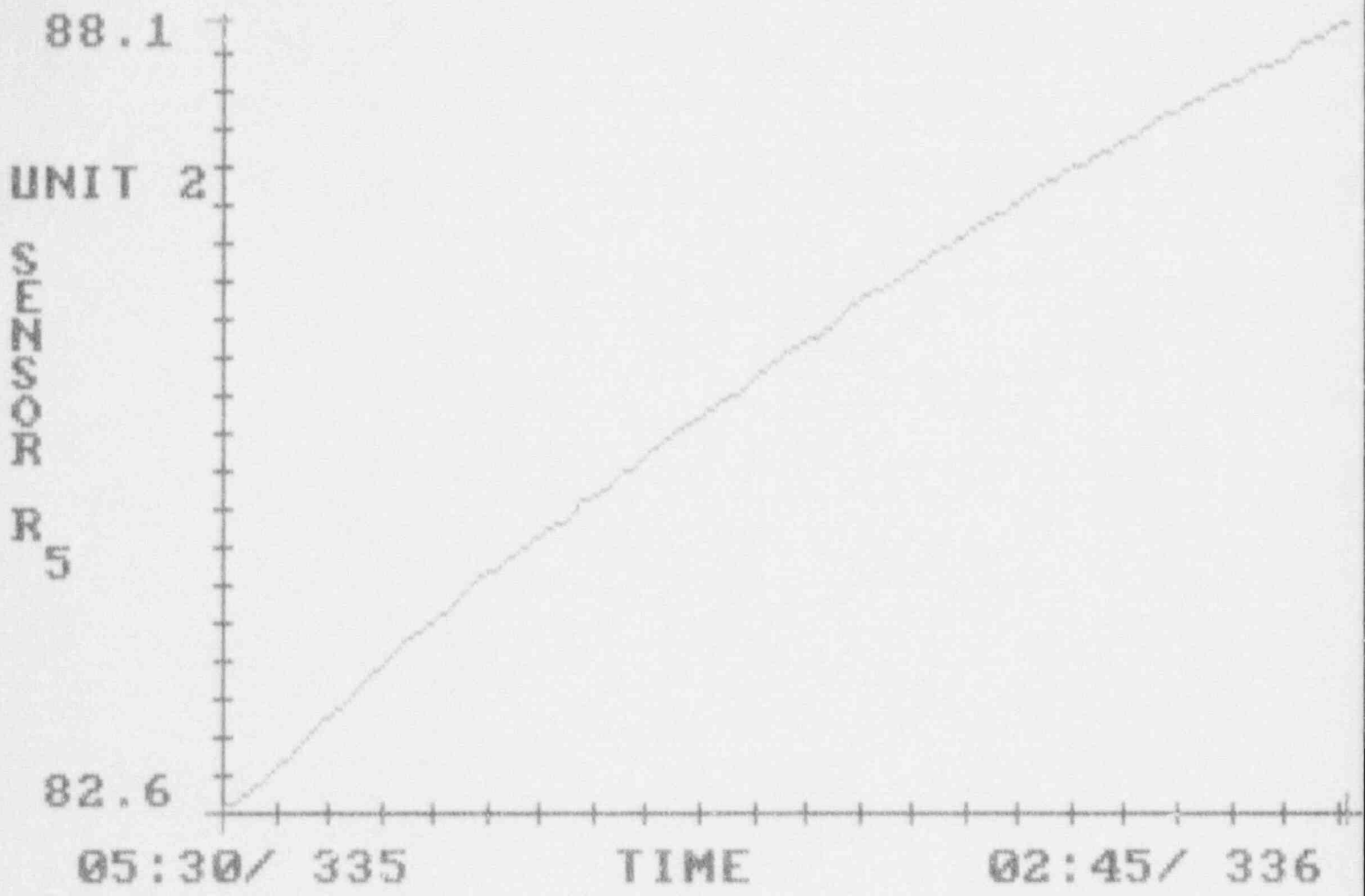
R 4
88.3
05:30/ 335
TIME
02:45/ 336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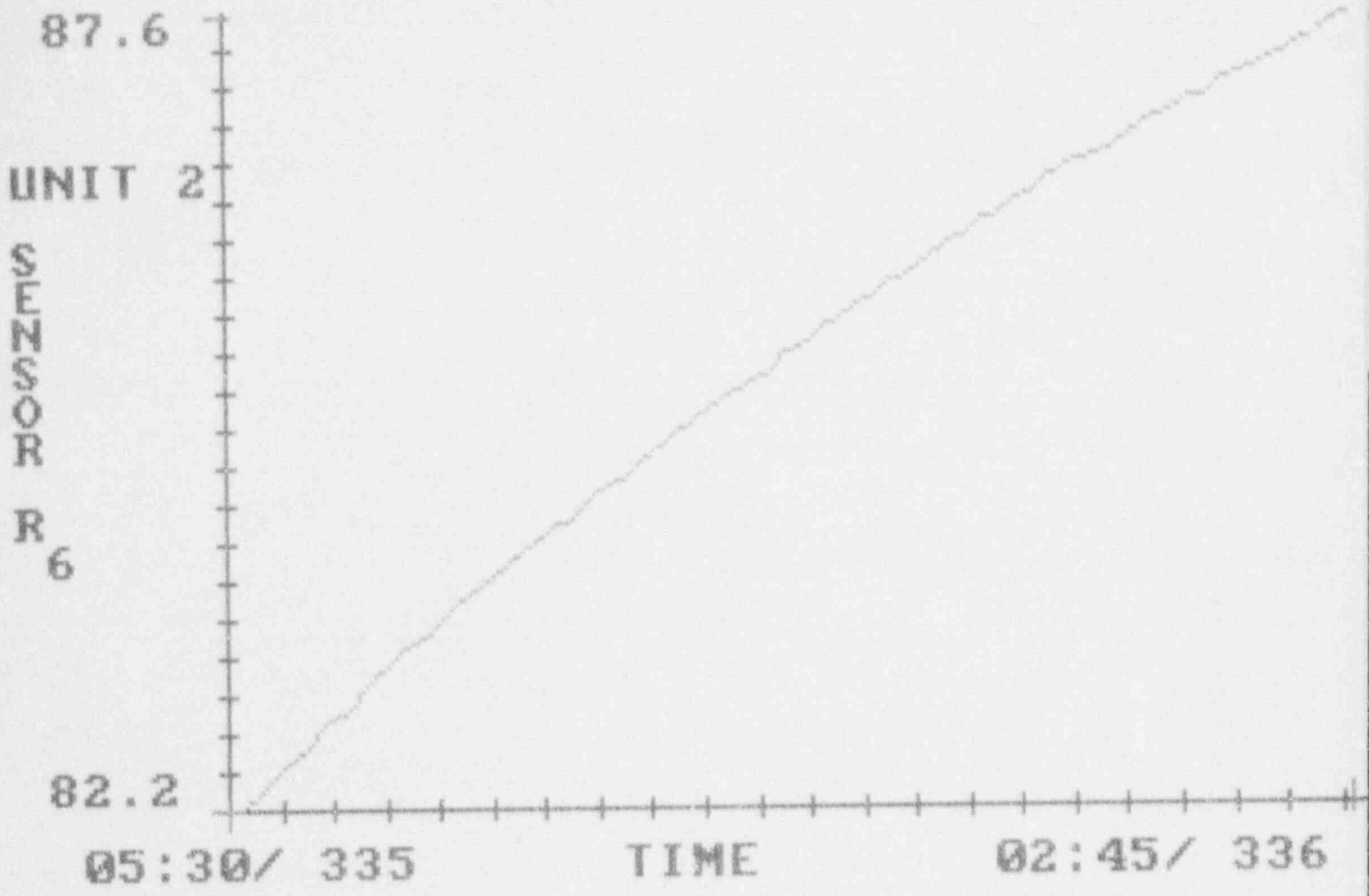
R5
82.6
05:30/ 335
TIME
02:45/ 336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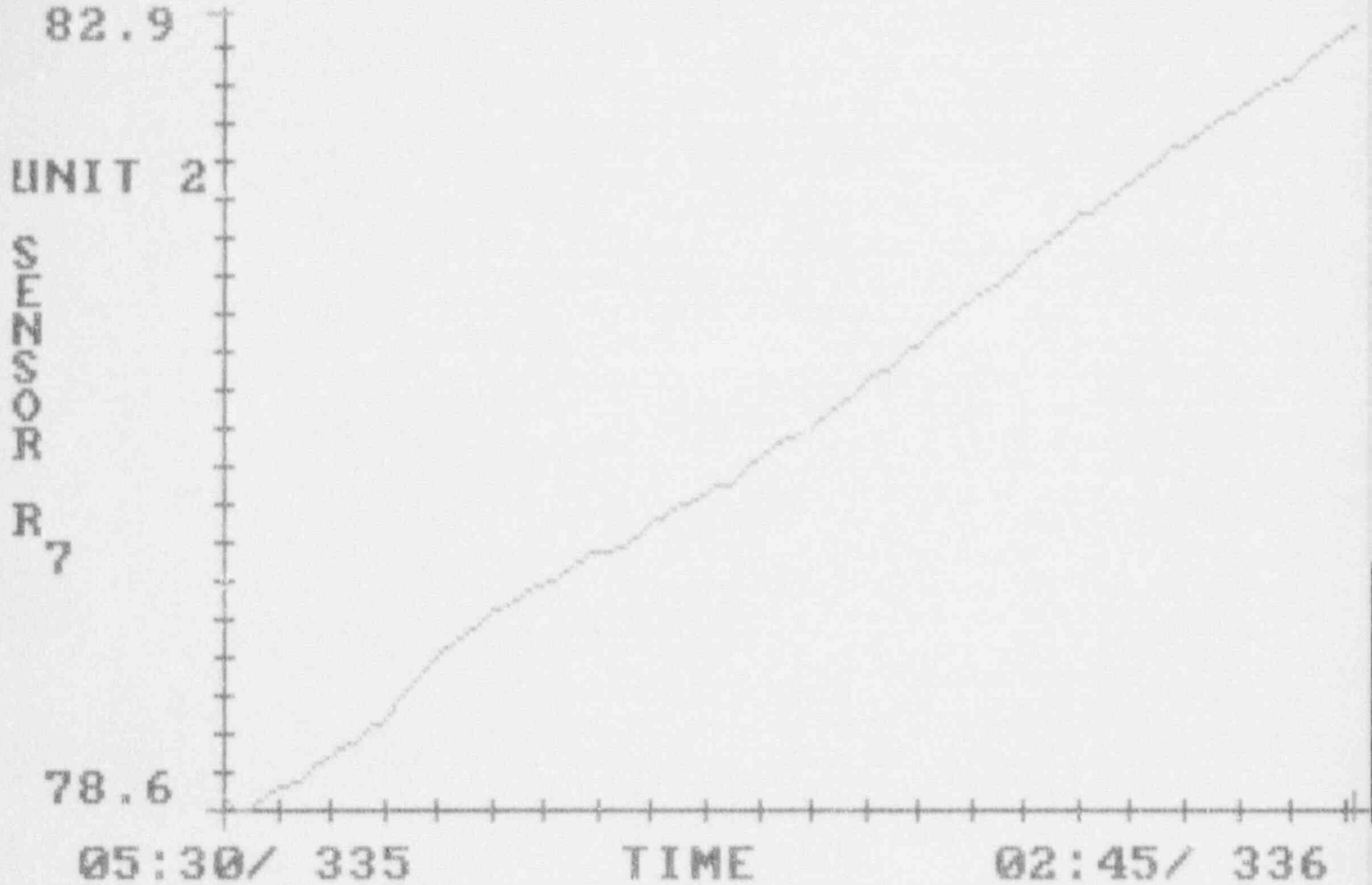
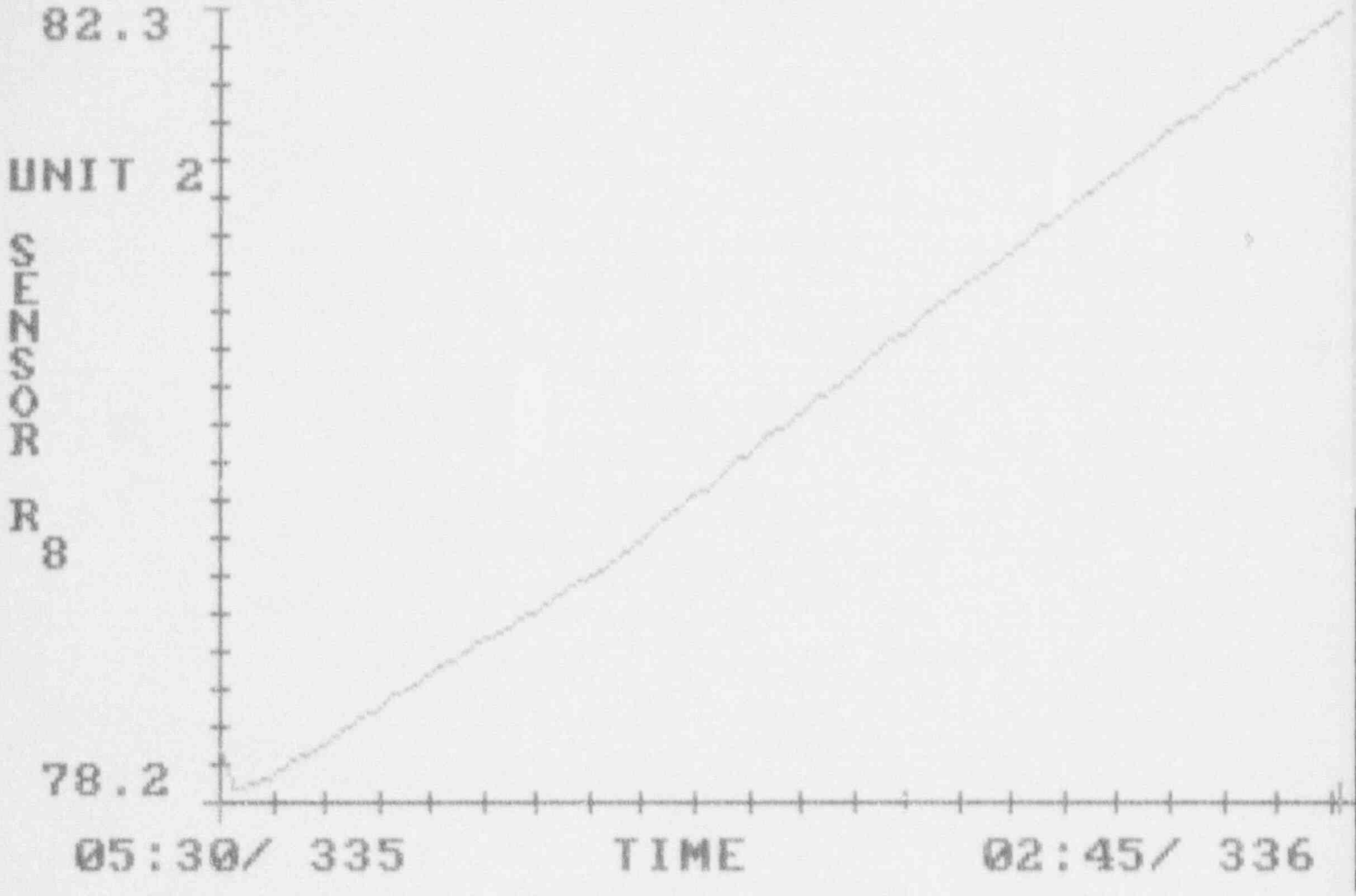
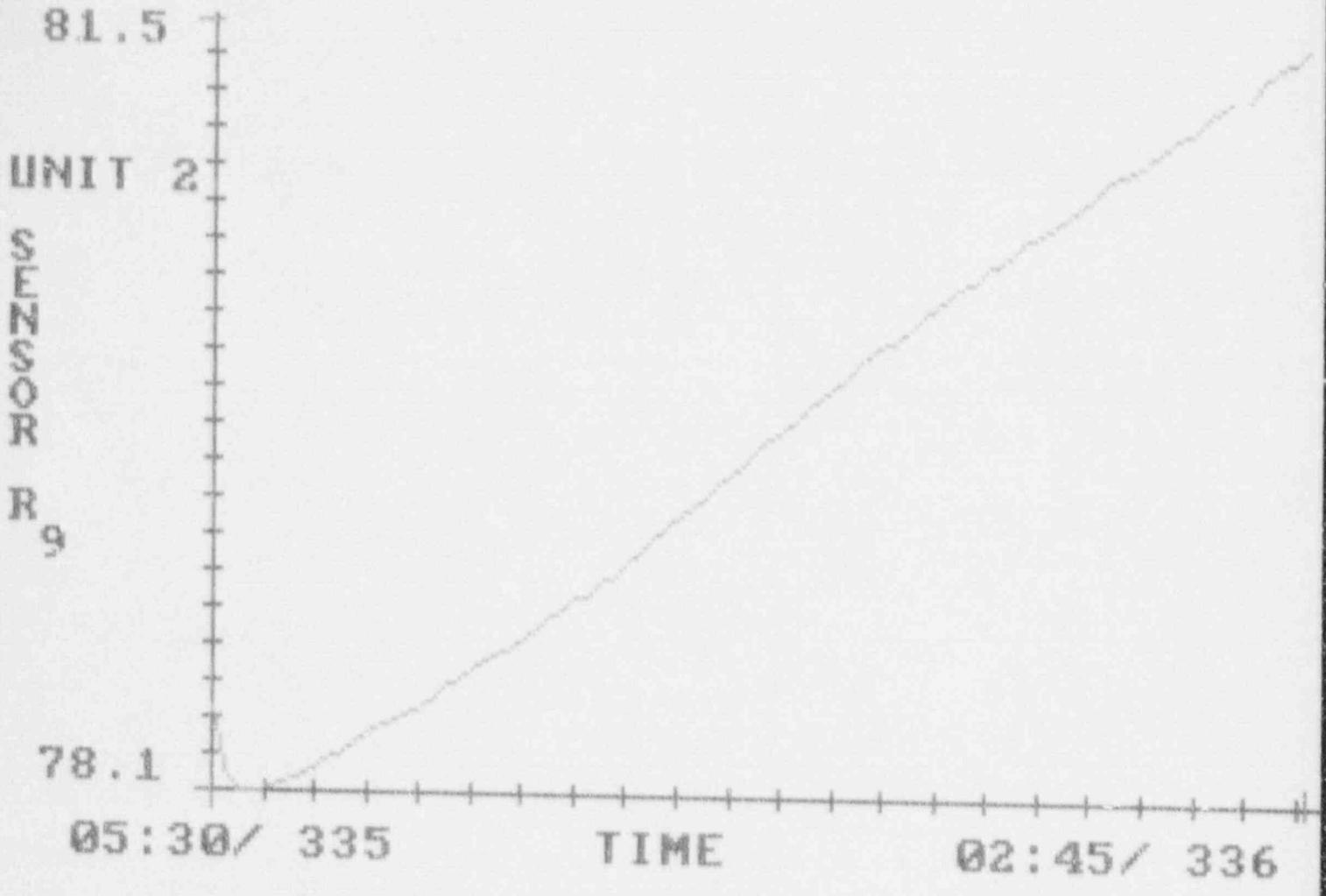
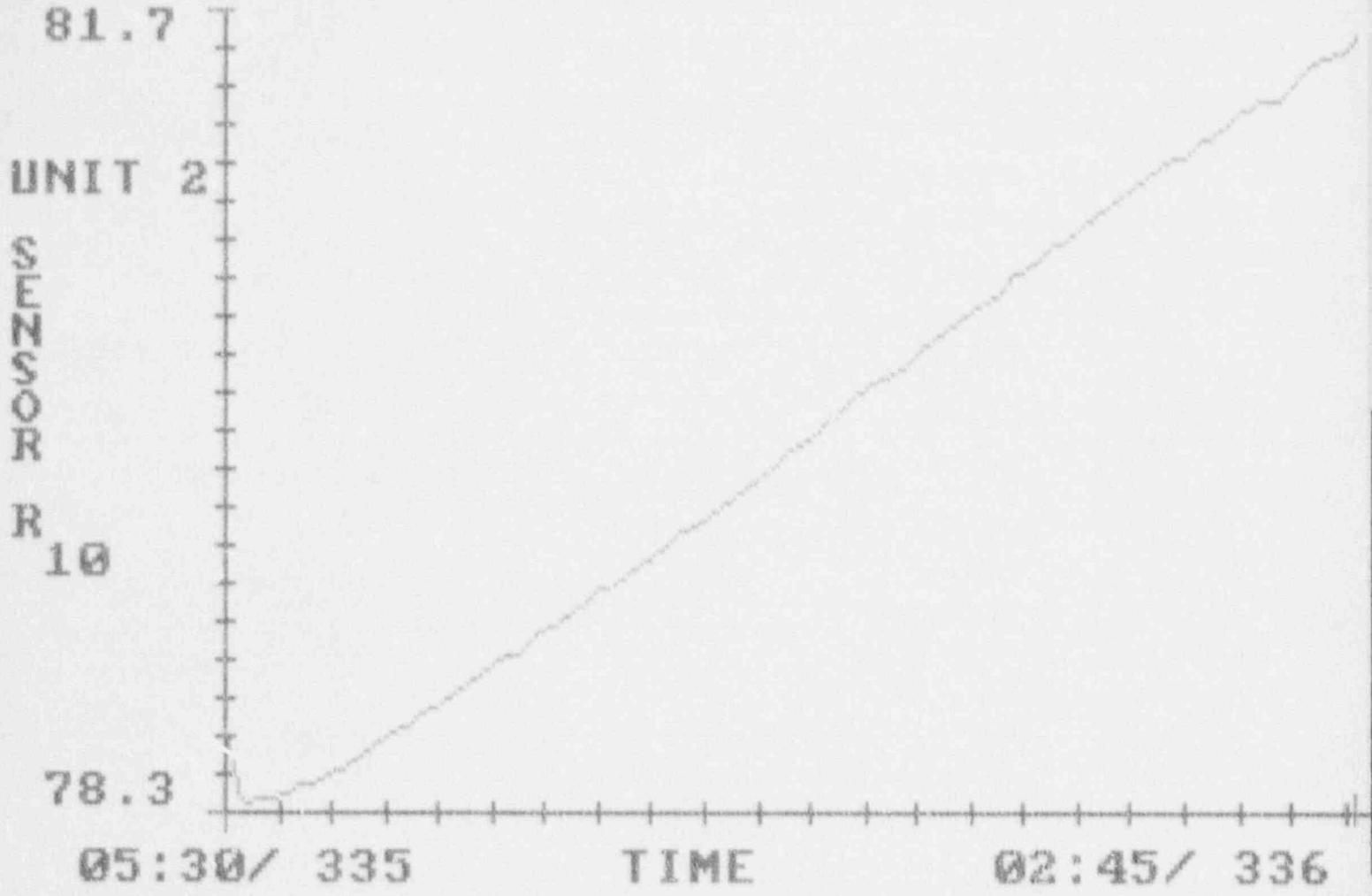
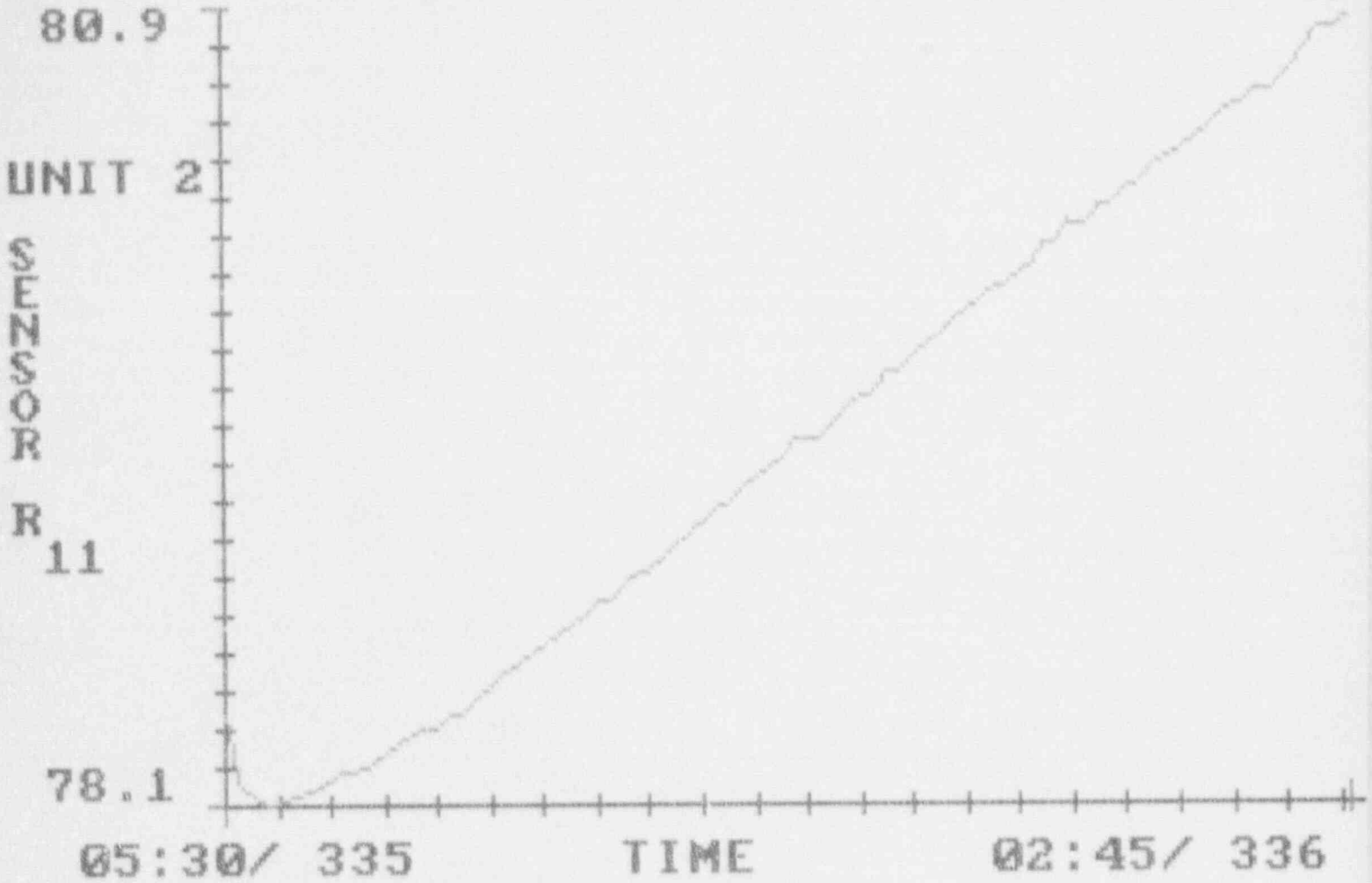
UNIT 2
SENSOR
R6
82.2
05:30/ 335
TIME
02:45/ 336


82.9
UNIT 2
SENSOR
R7
78.6
05:30/ 335
TIME
02:45/ 336


82.3
UNIT 2
SENSOR R8
78.2
05:30/ 335
TIME
02:45/ 336


81.5
UNIT 2
SENSOR
R9
78.1
05:30/ 335
TIME
02:45/ 336


81.7
UNIT 2
SENSOR R
10
78.3
05:30/ 335
TIME
02:45/ 336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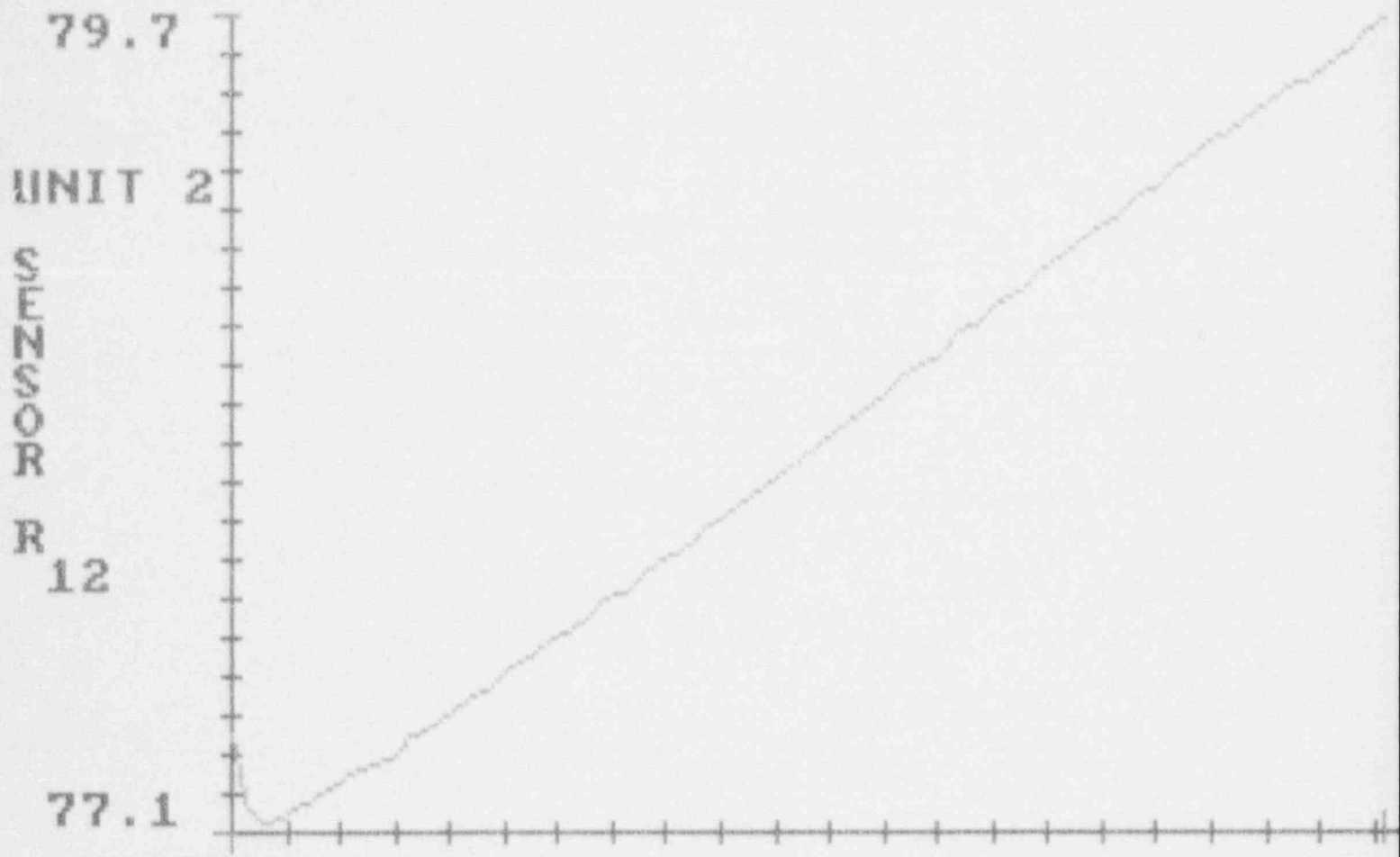
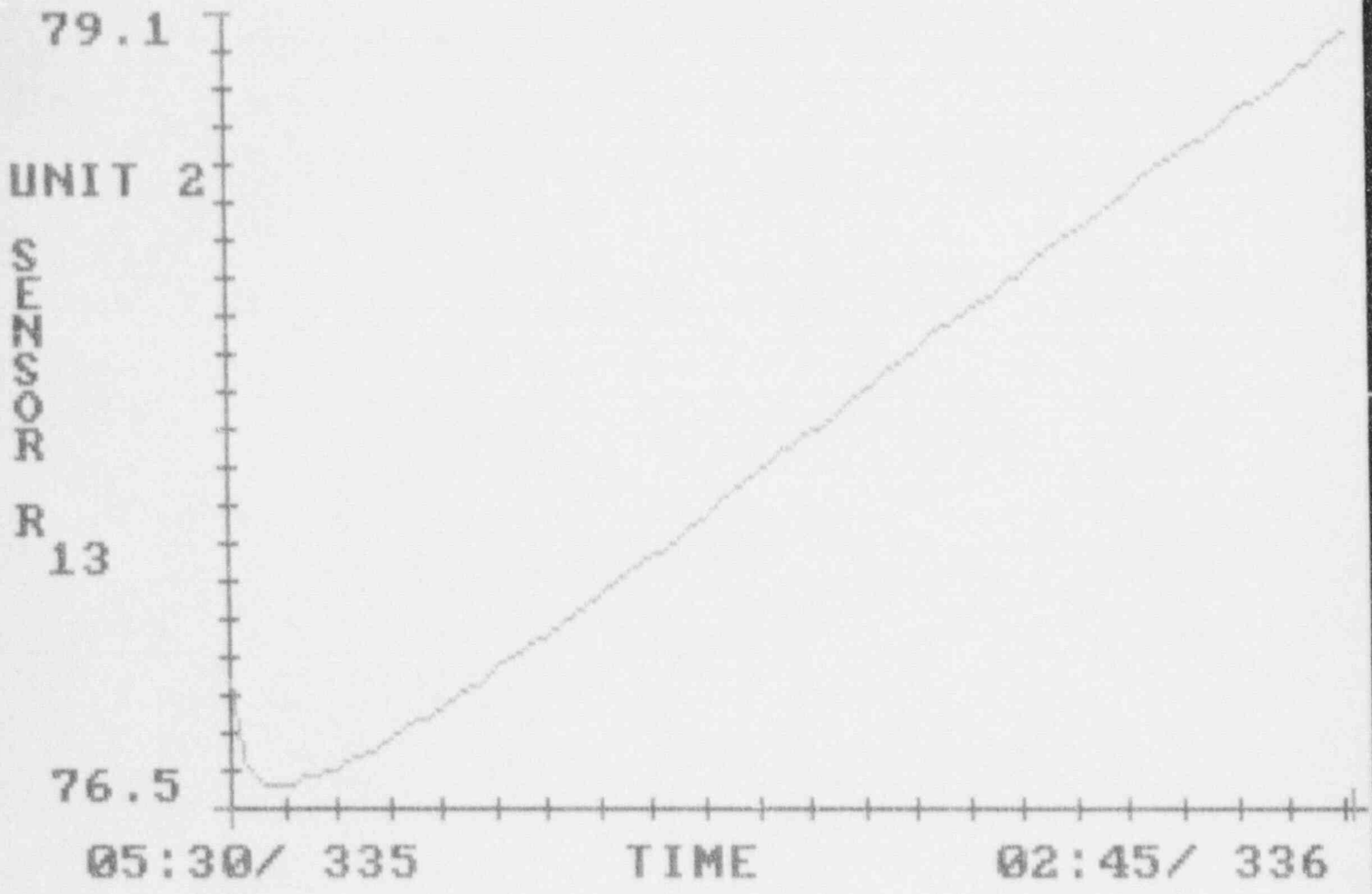
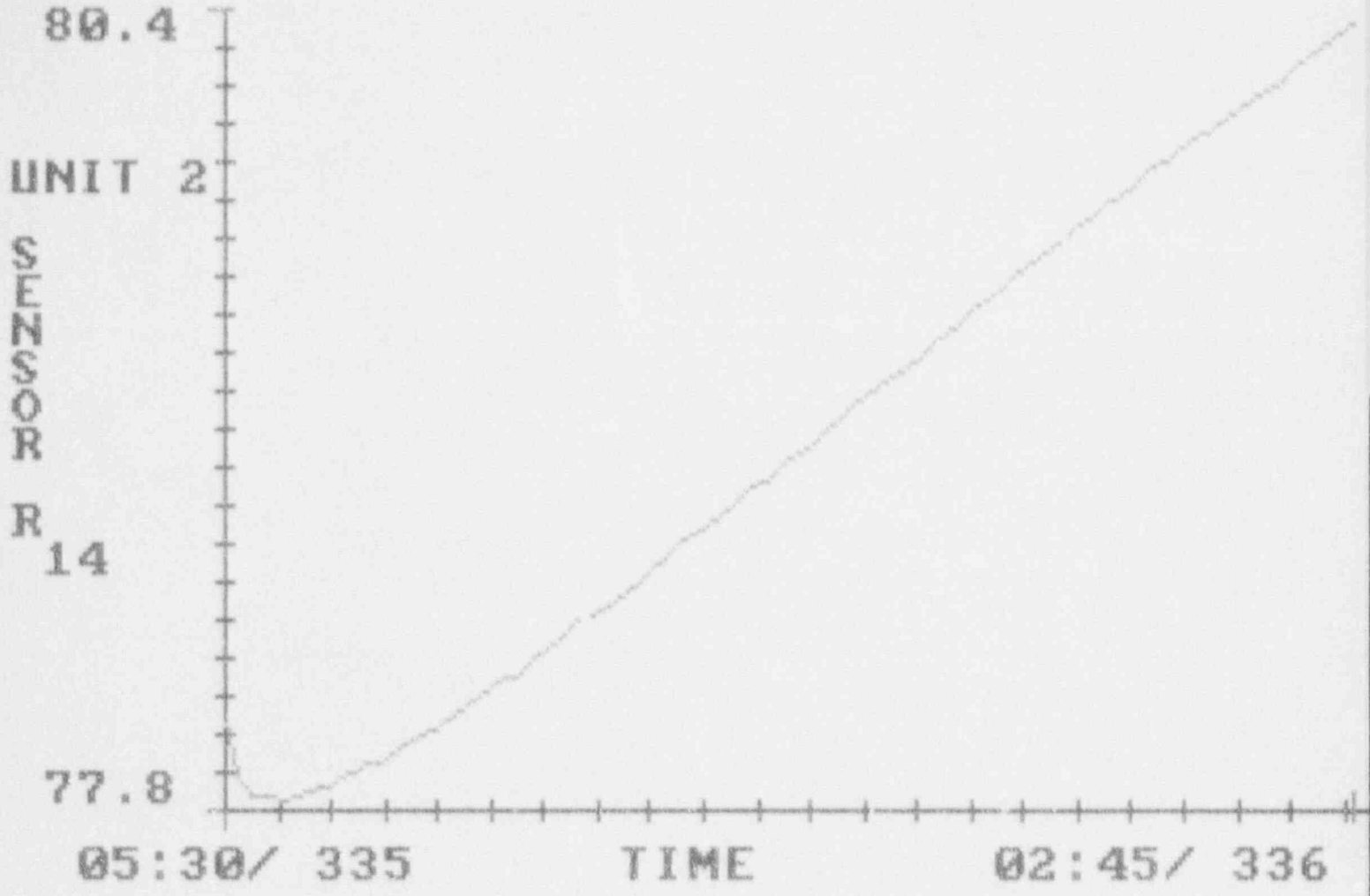
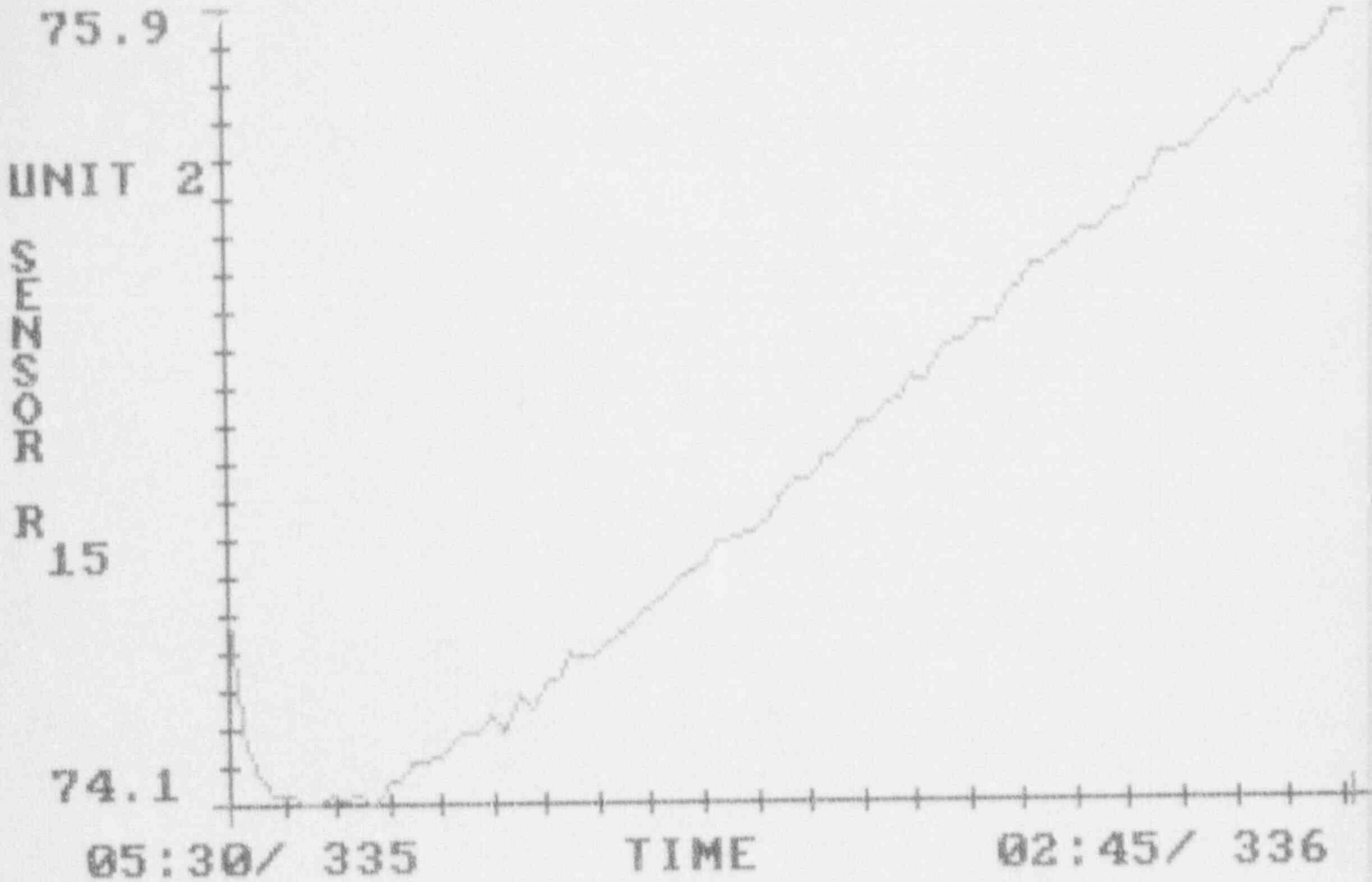
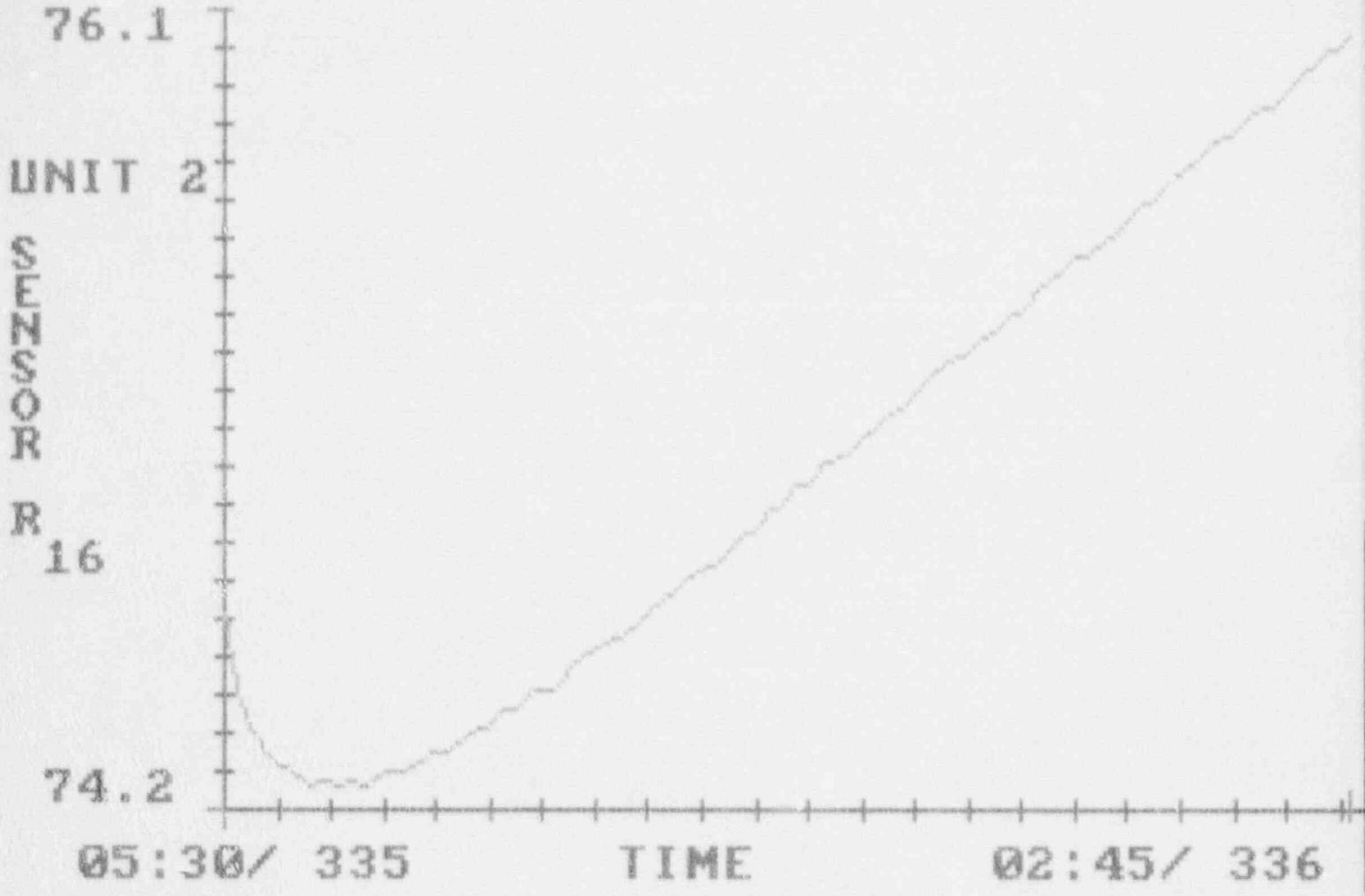
R
11
78.1
05:30/ 335
TIME
02:45/ 336

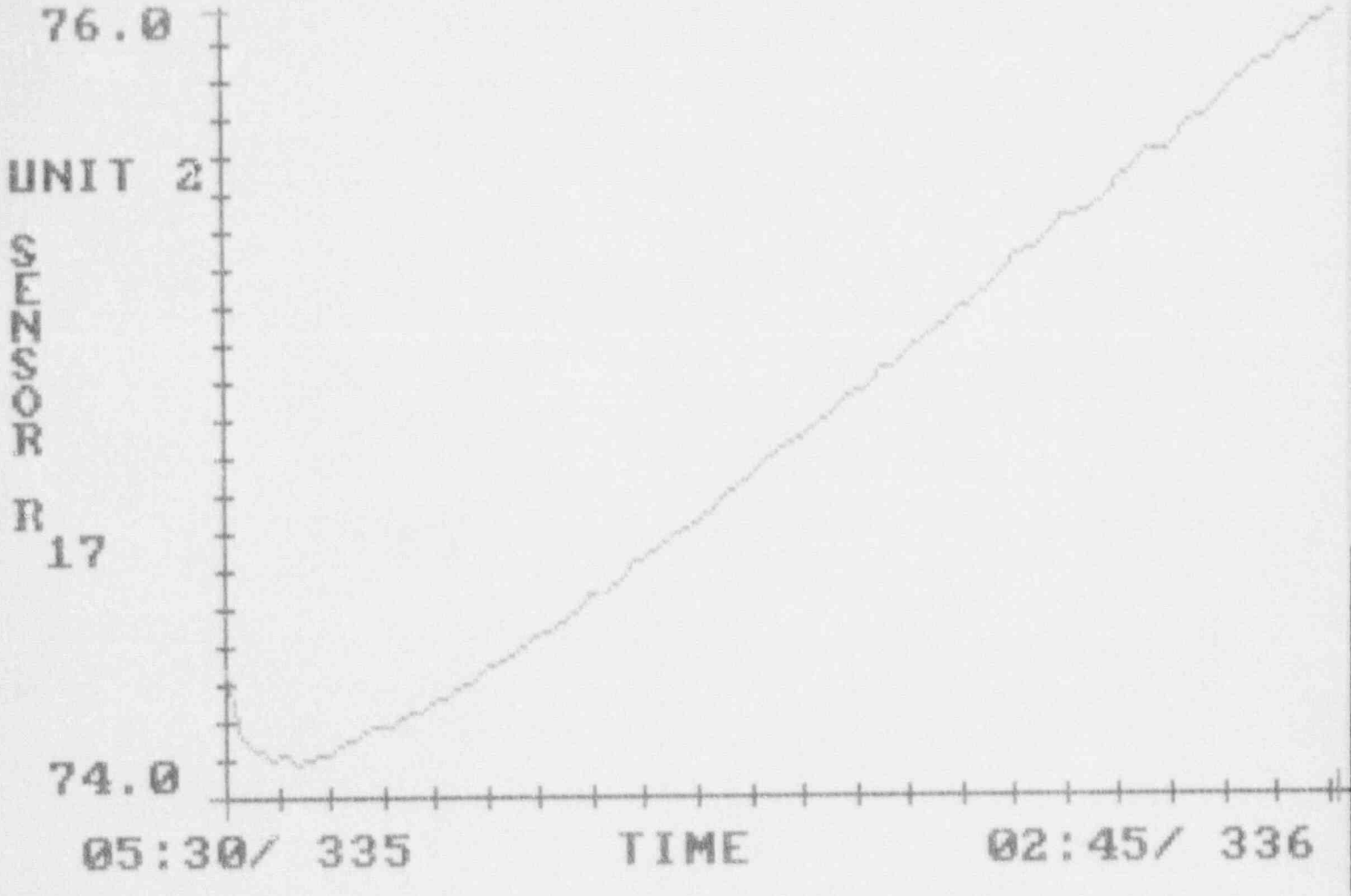

79.7
UNIT 2
SENSOR
R
12
77.1
05:30/ 335
TIME
02:45/ 336

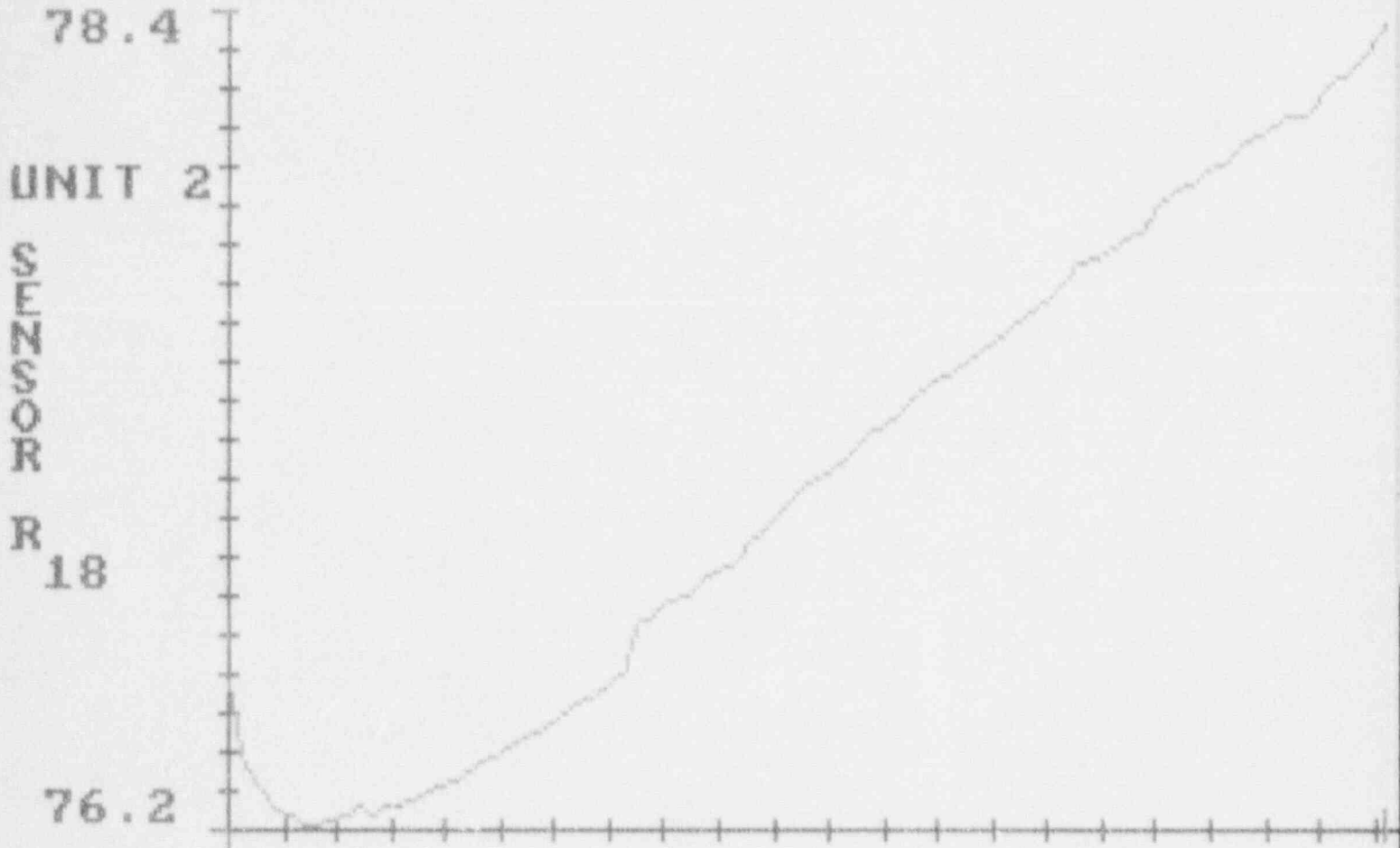

79.1
UNIT 2
SENSOR
R
13
76.5
05:30/ 335
TIME
02:45/ 336

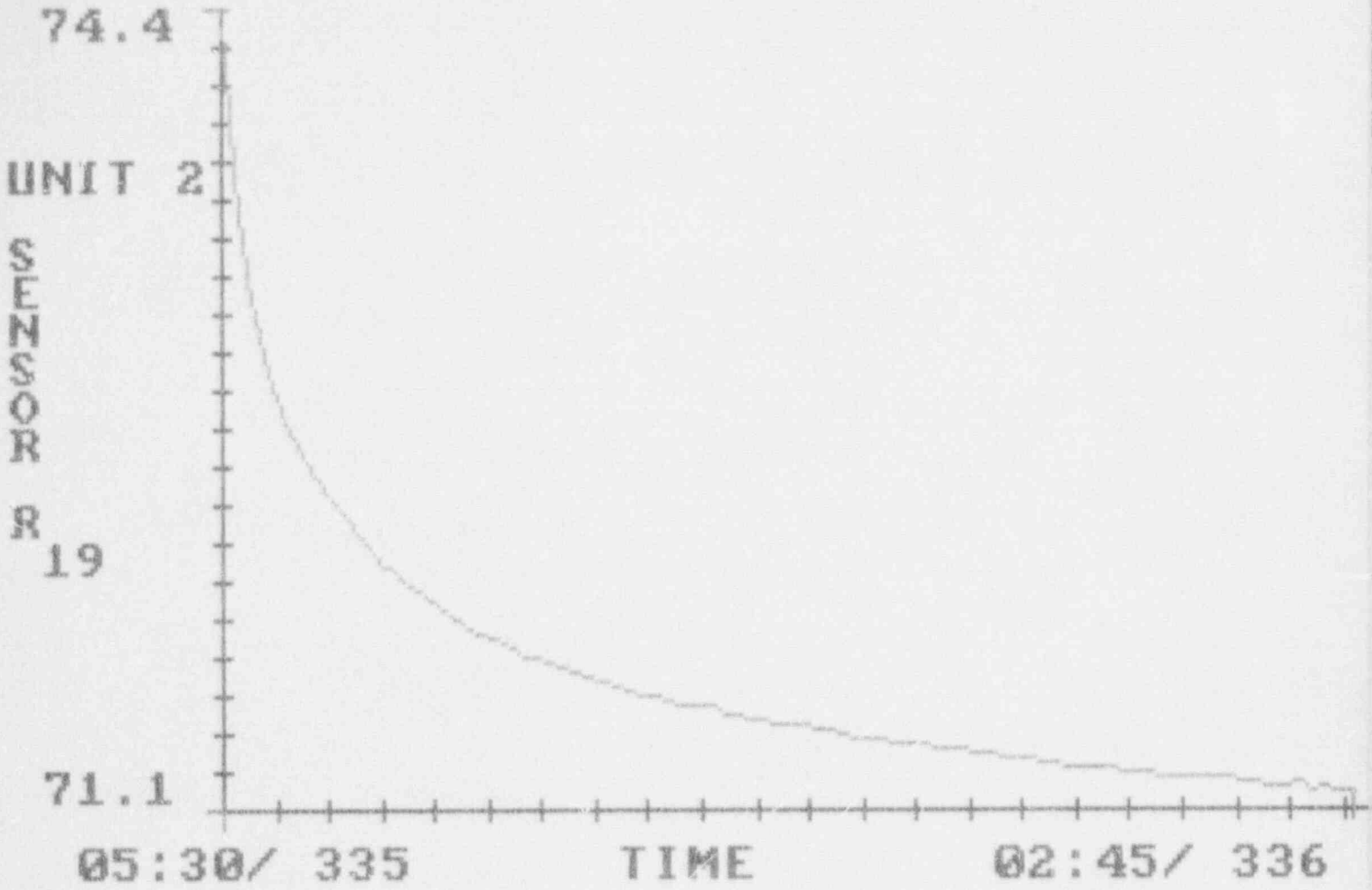

80.4
UNIT 2
SENSOR
R
14
77.8
05:30/ 335
TIME
02:45/ 336

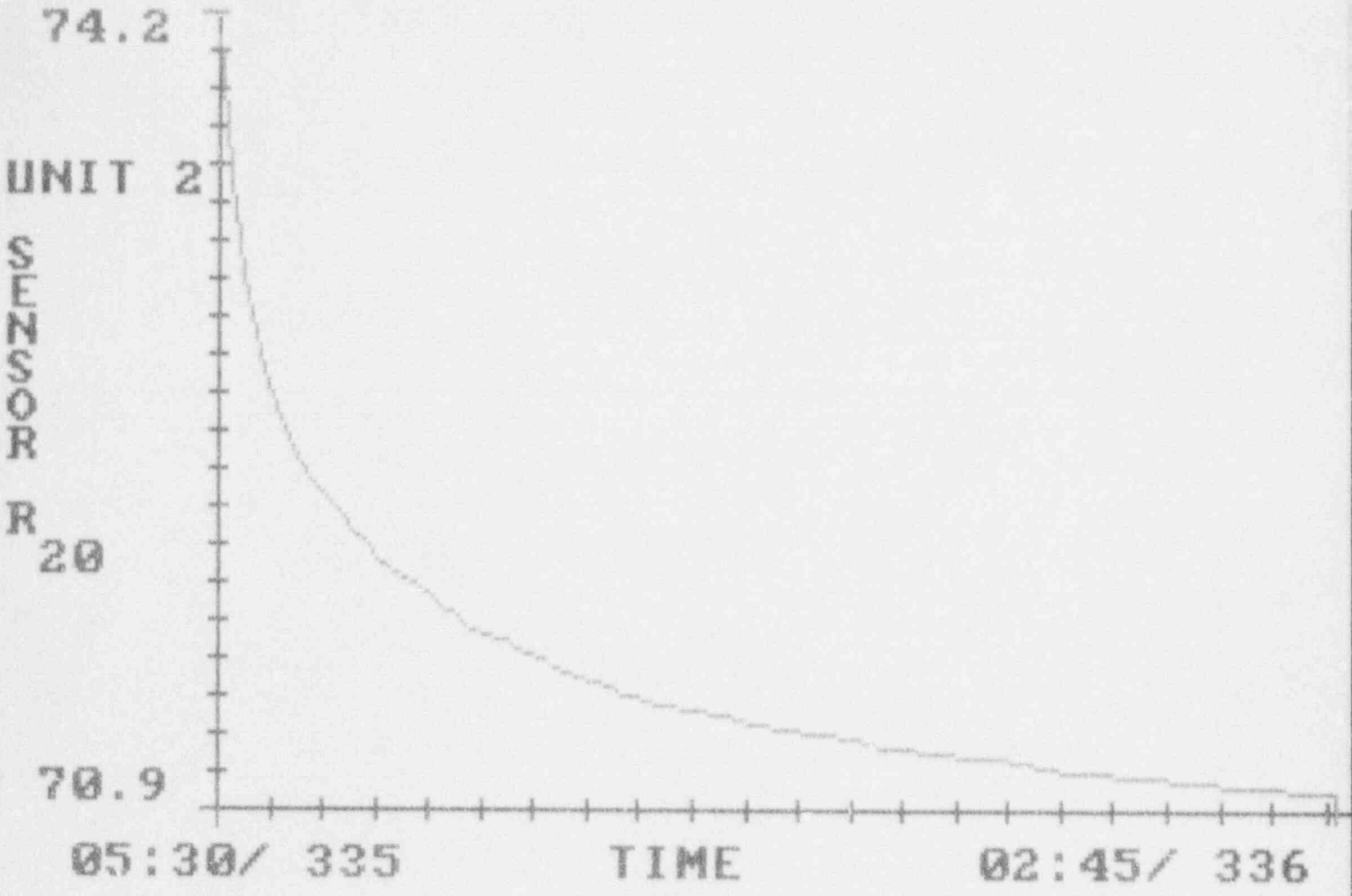

75.9
UNIT 2
SENSOR
R
15
74.1
05:30/ 335
TIME
02:45/ 336

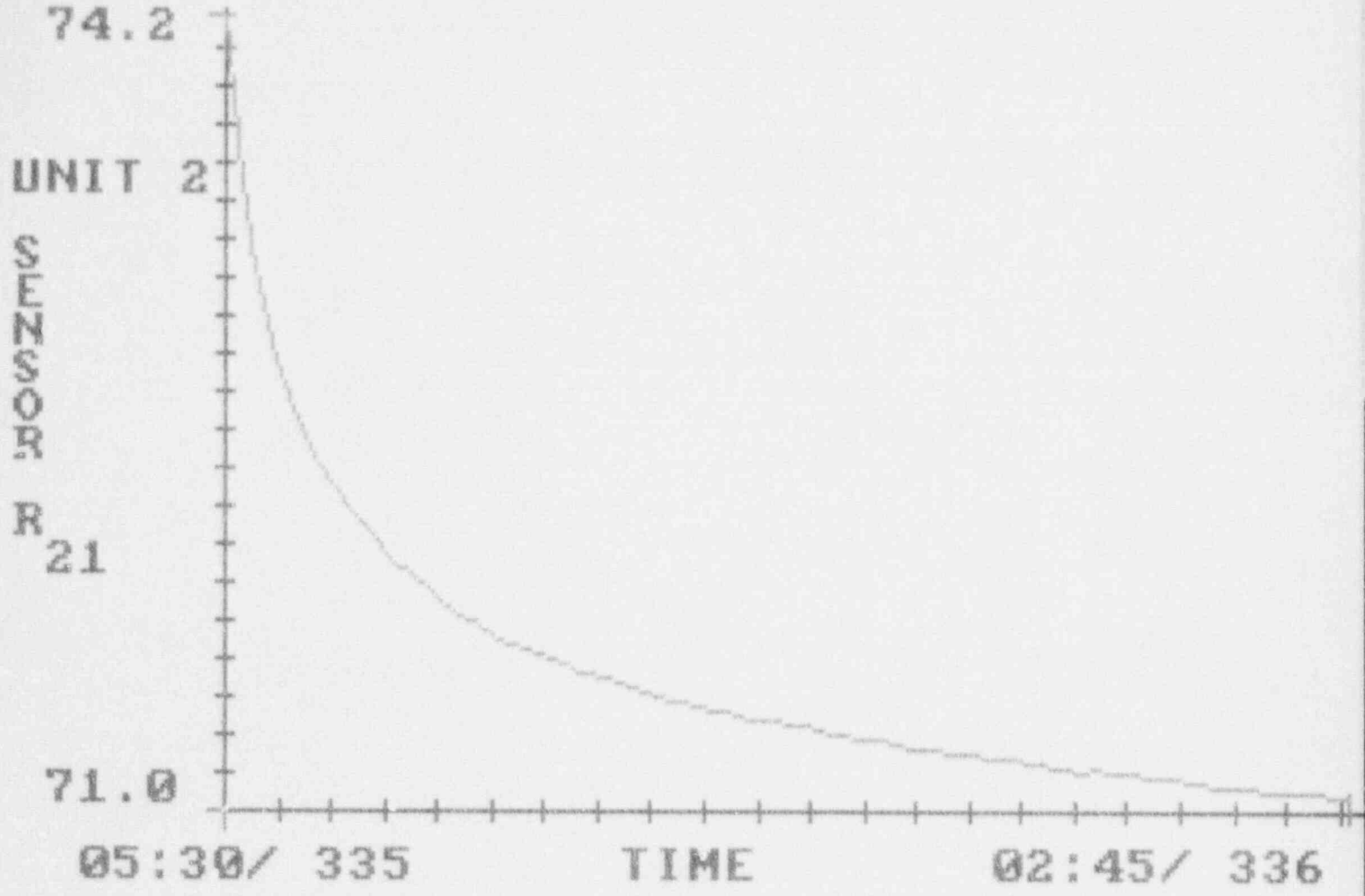

76.1
UNIT 2
SENSOR
R
16
74.2
05:30/ 335
TIME
02:45/ 336

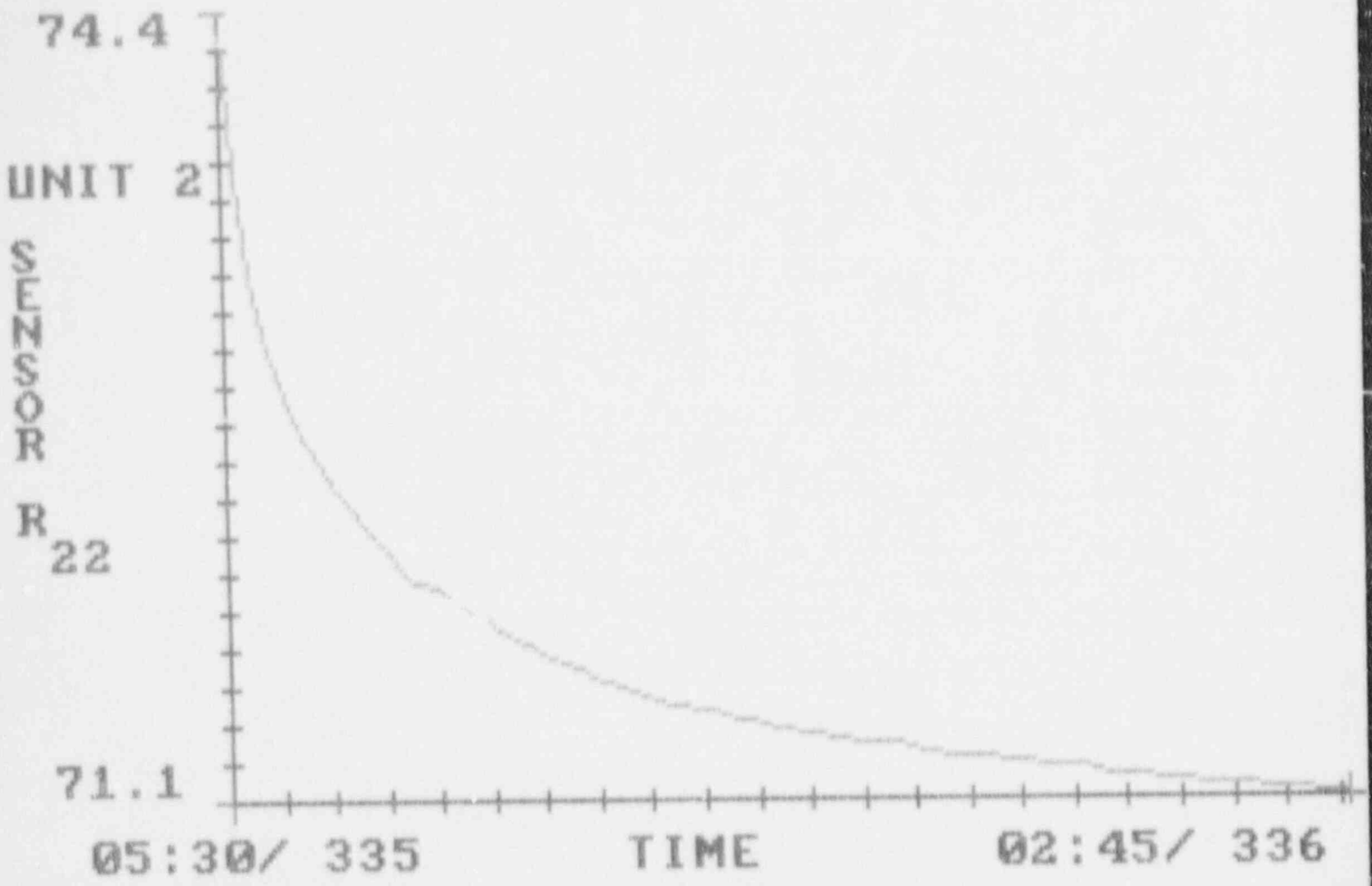

76.0
UNIT 2
SENSOR R 17
74.0
05:30/ 335
TIME
02:45/ 336


78.4
UNIT 2
SENSOR
R
18
76.2
05:30/ 335
TIME
02:45/ 336


74.4
UNIT 2
SENSOR R19
71.1
05:30/ 335
TIME
02:45/ 336


74.2
UNIT 2
SENSOR R
20
70.9
05:30/ 335
TIME
02:45/ 336


74.2
UNIT 2
SENSOR R21
71.0
05:30/ 335
TIME
02:45/ 336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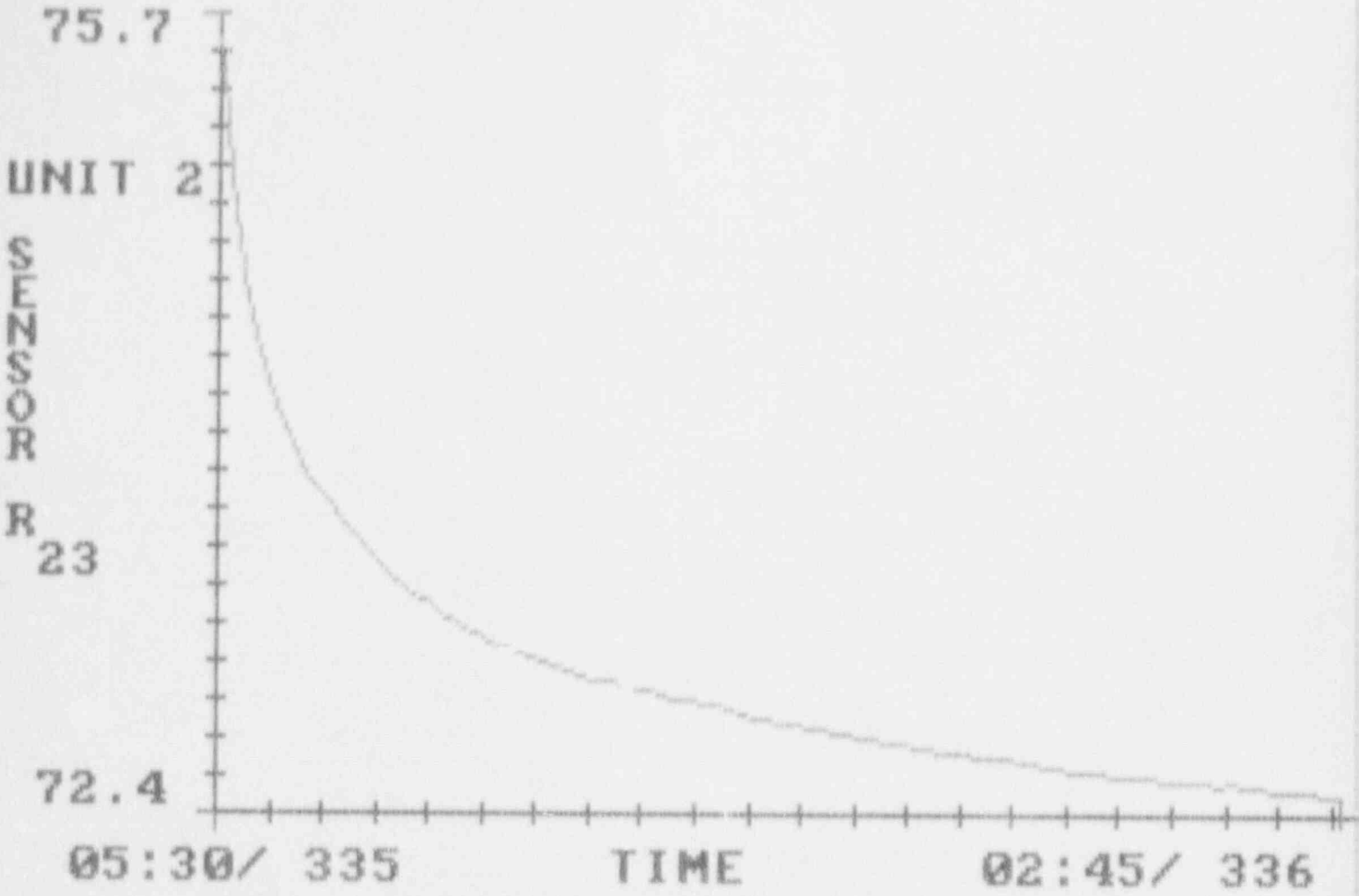
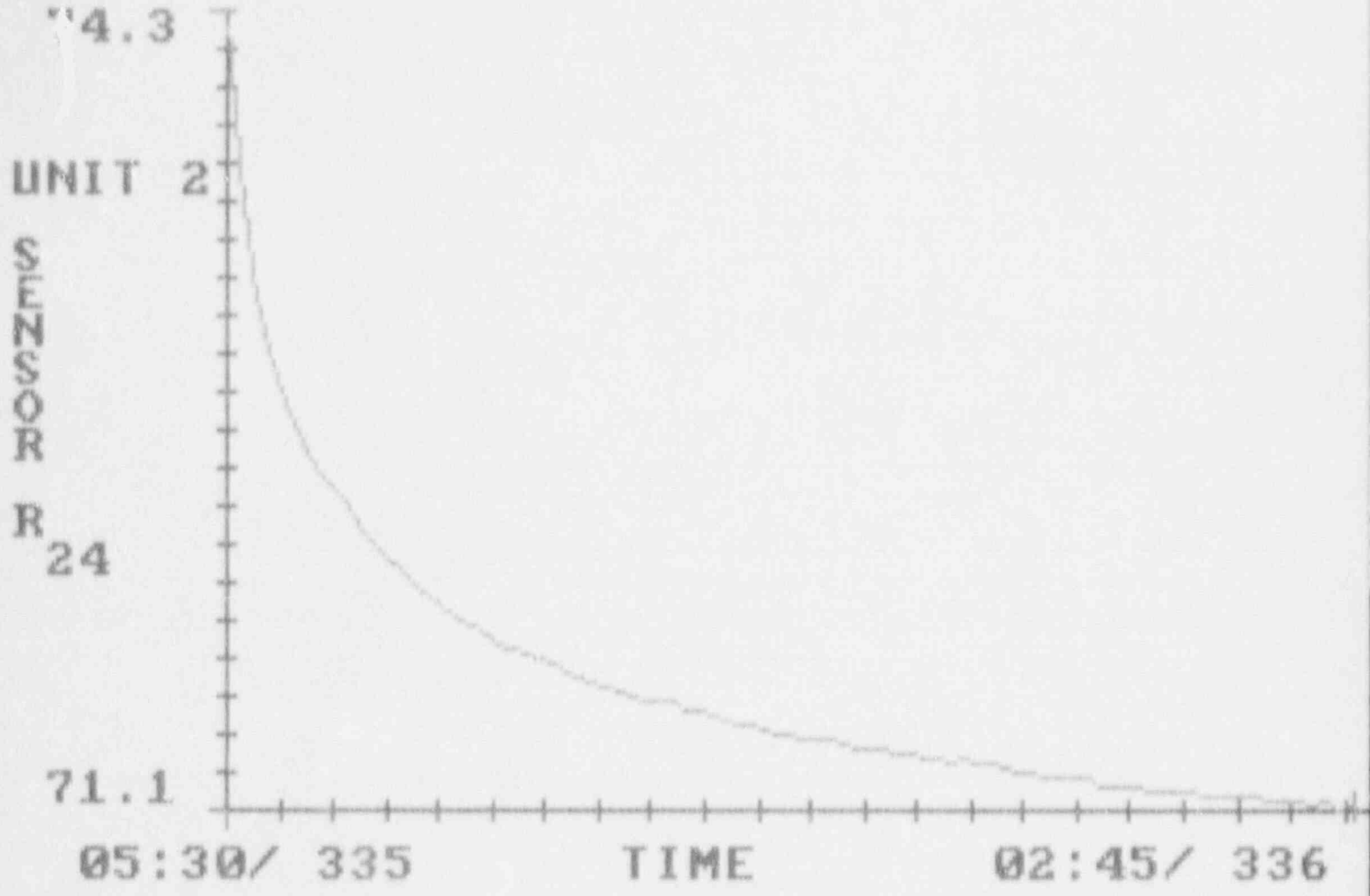
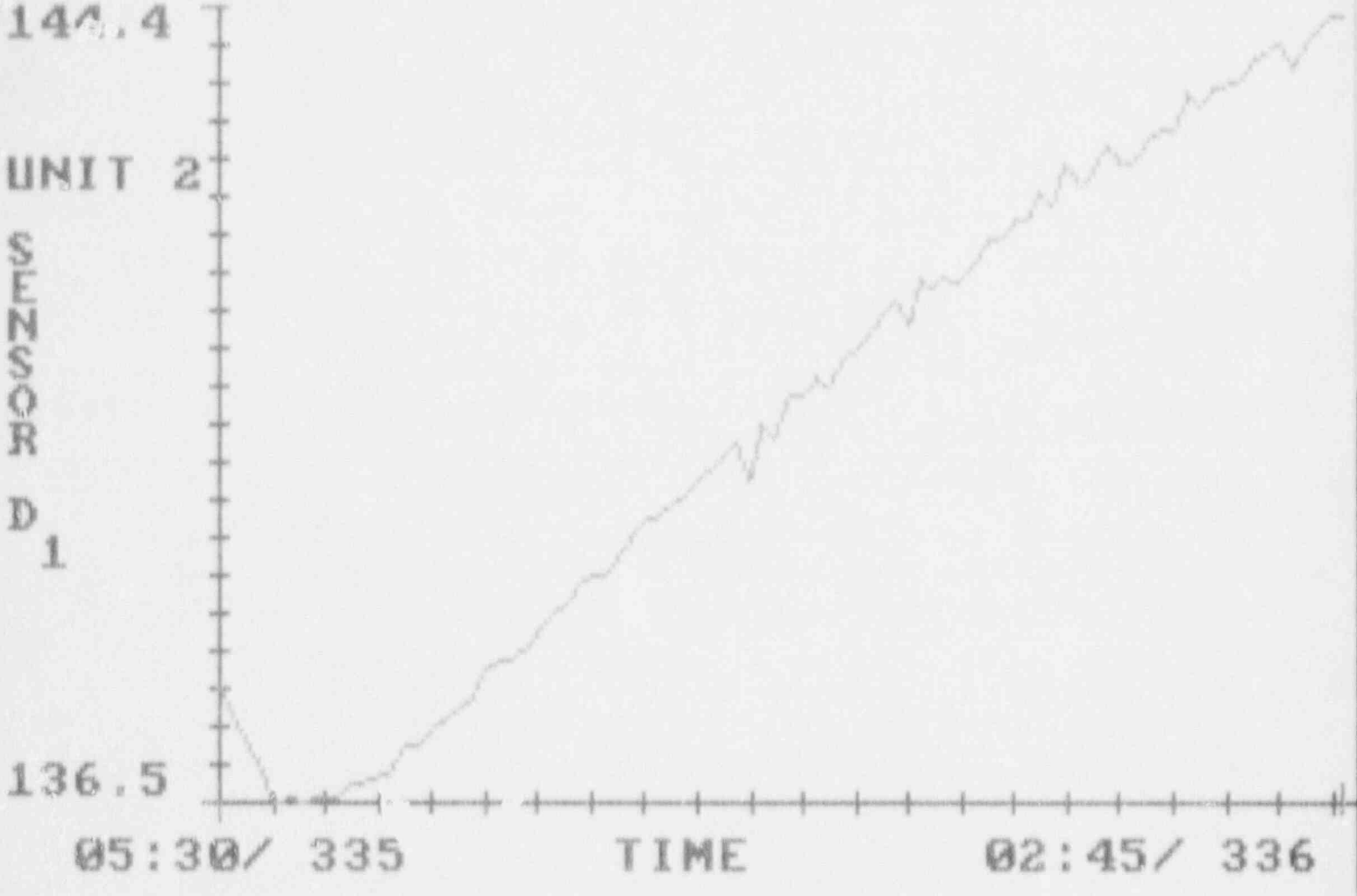
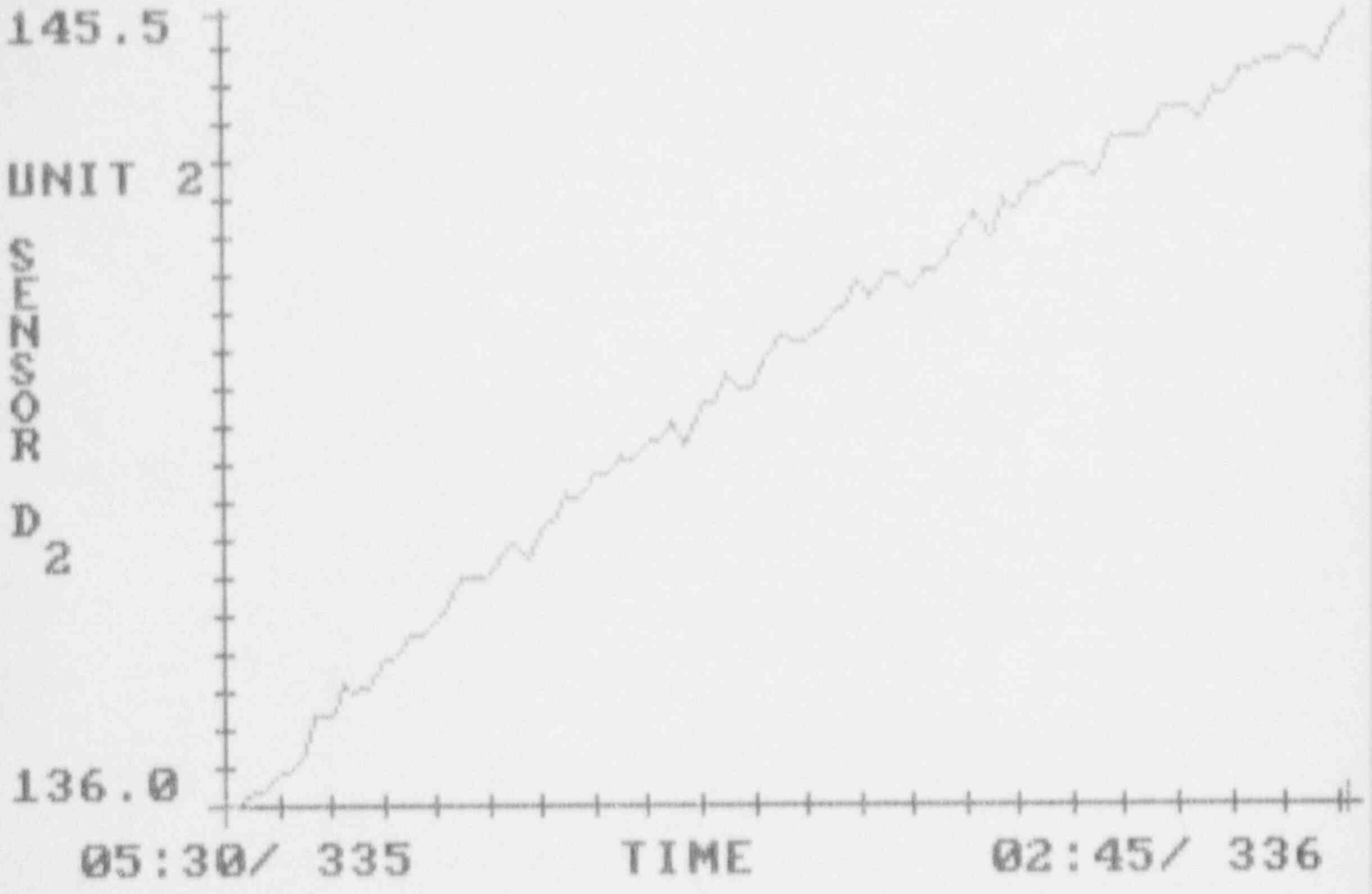
UNIT 2
SENSOR
R22
71.1
05:30/ 335
TIME
02:45/ 336


75.7
UNIT 2
SENSOR
R23
72.4
05:30/ 335
TIME
02:45/ 336


"4.3
UNIT 2
SENSOR
R
24
71.1
05:30/ 335
TIME
02:45/ 336


UNIT 2
SENSOR
D 1
136.5
05:30/ 335
TIME
02:45/ 336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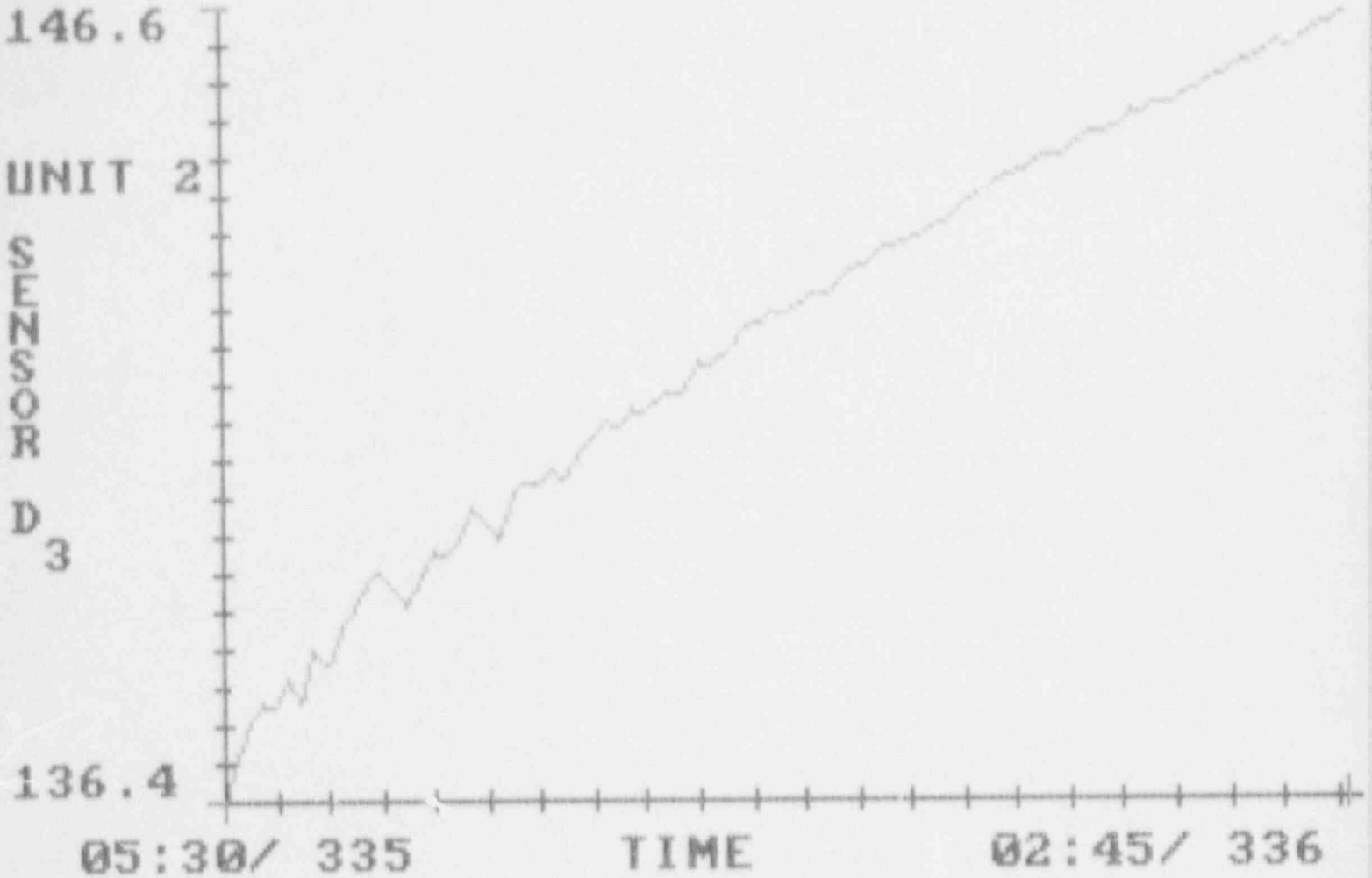
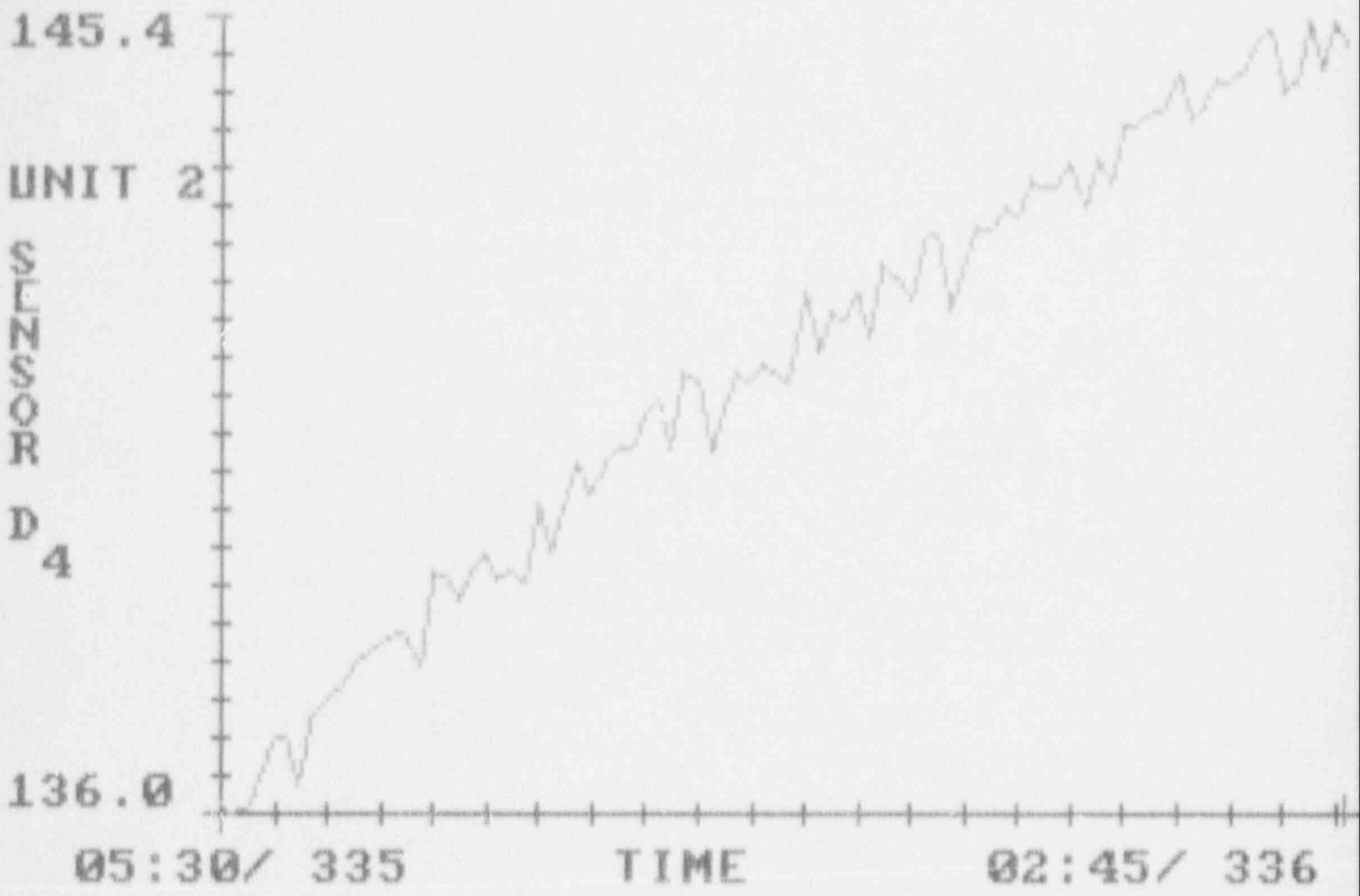
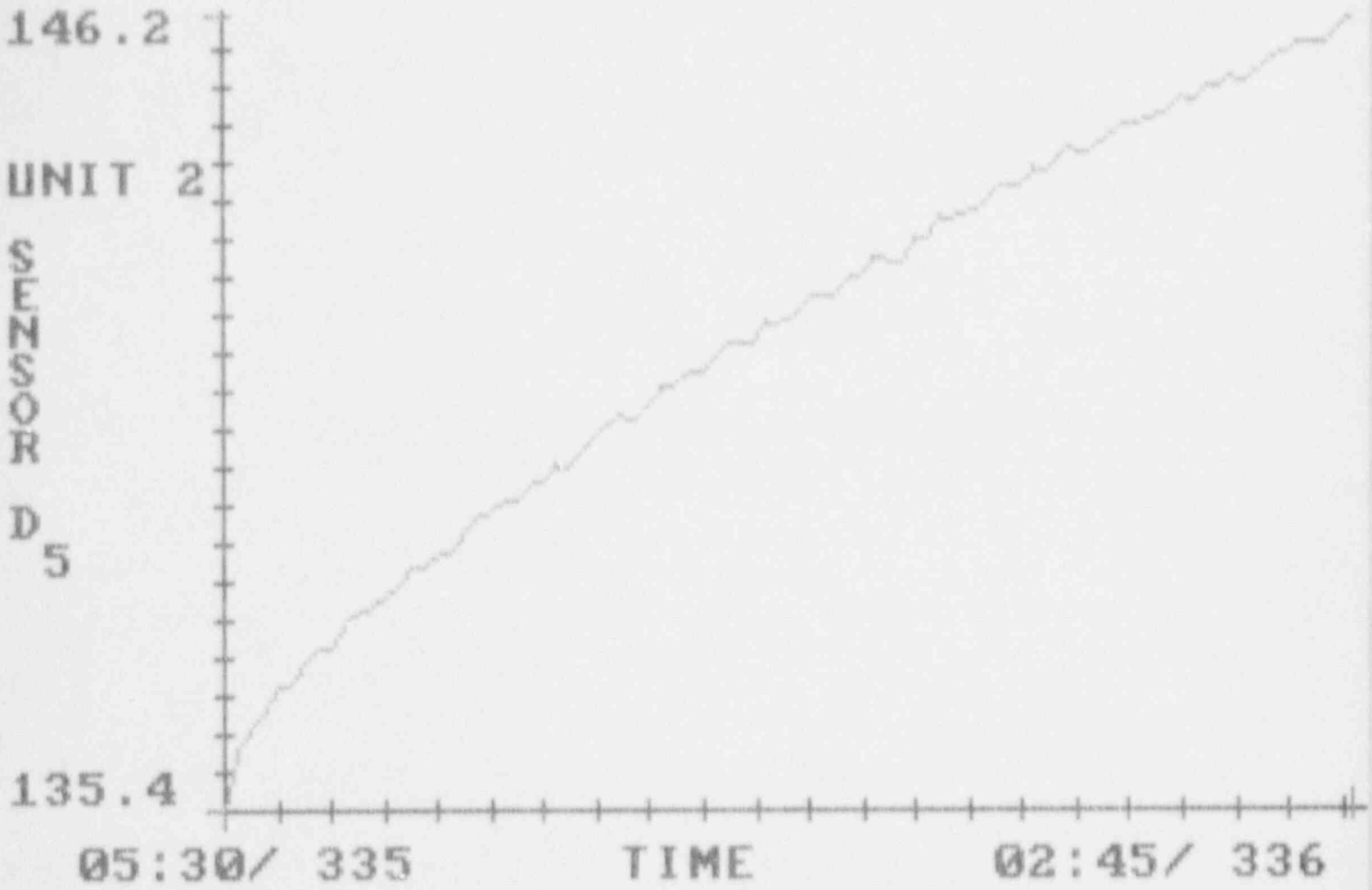
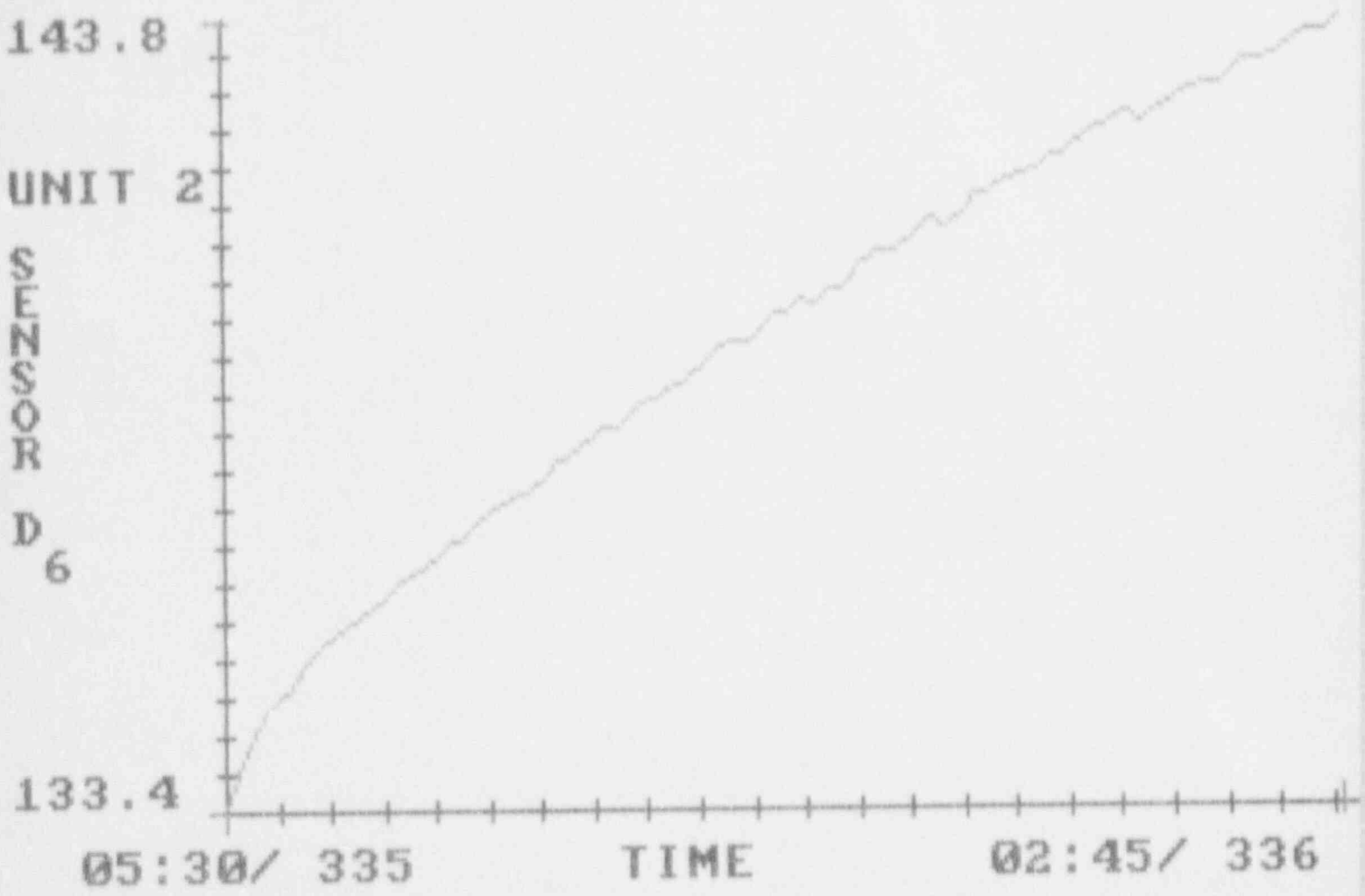
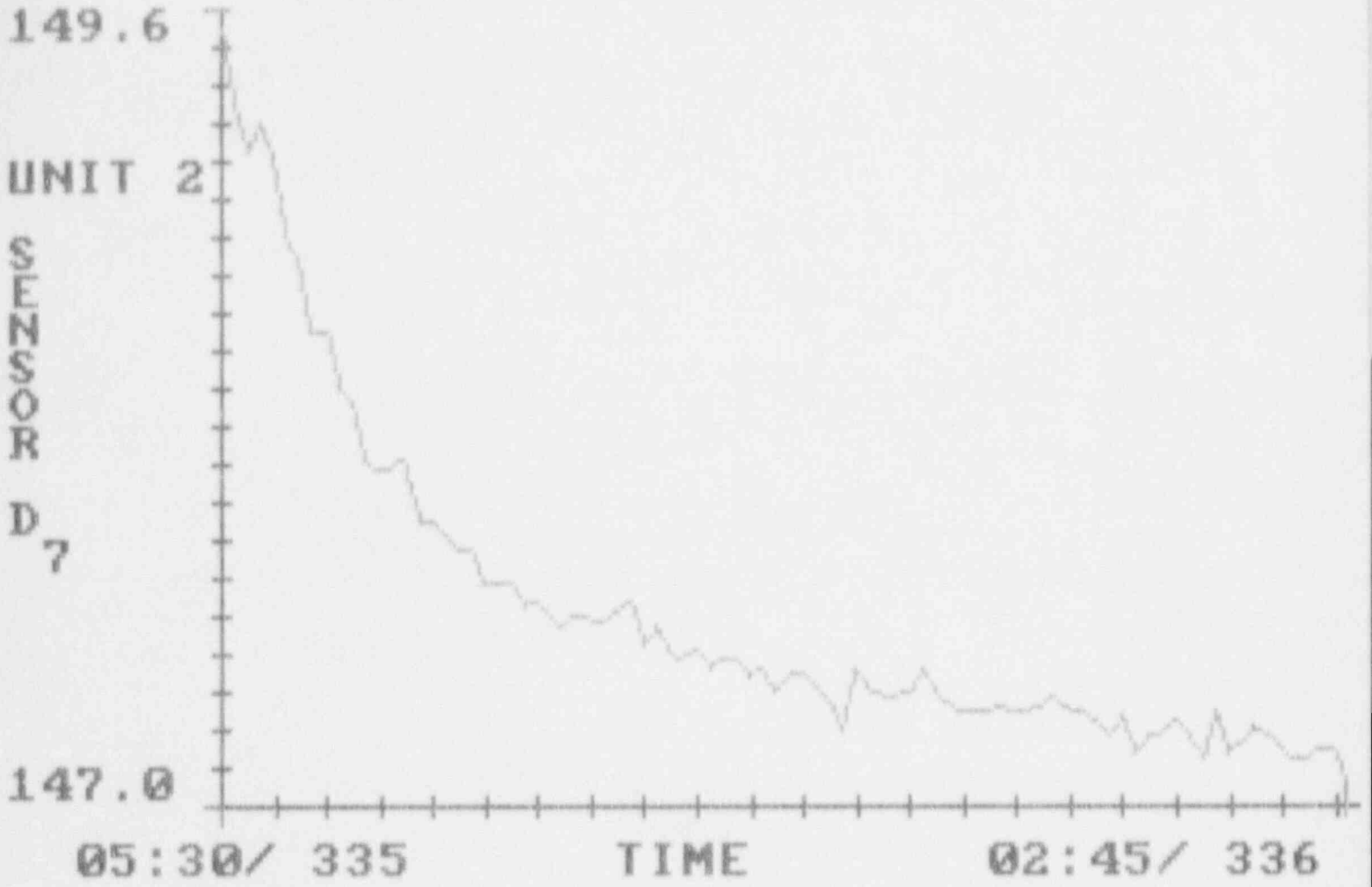
UNIT 2
SENSOR
D2
136.0
05:30/ 335
TIME
02:45/ 336

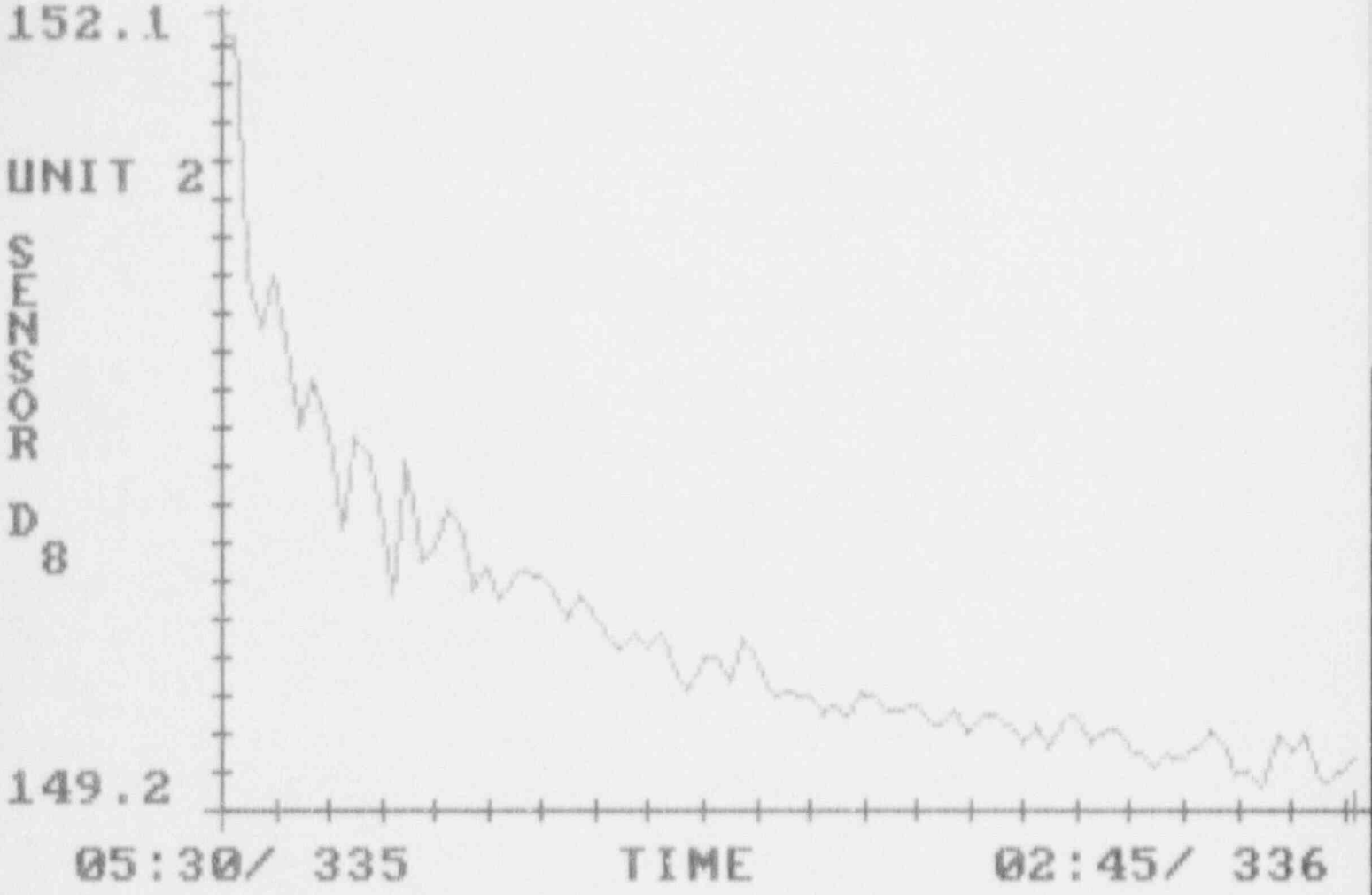

146.6
UNIT 2
SENSOR
D
3
136.4
05:30/ 335
TIME
02:45/ 336

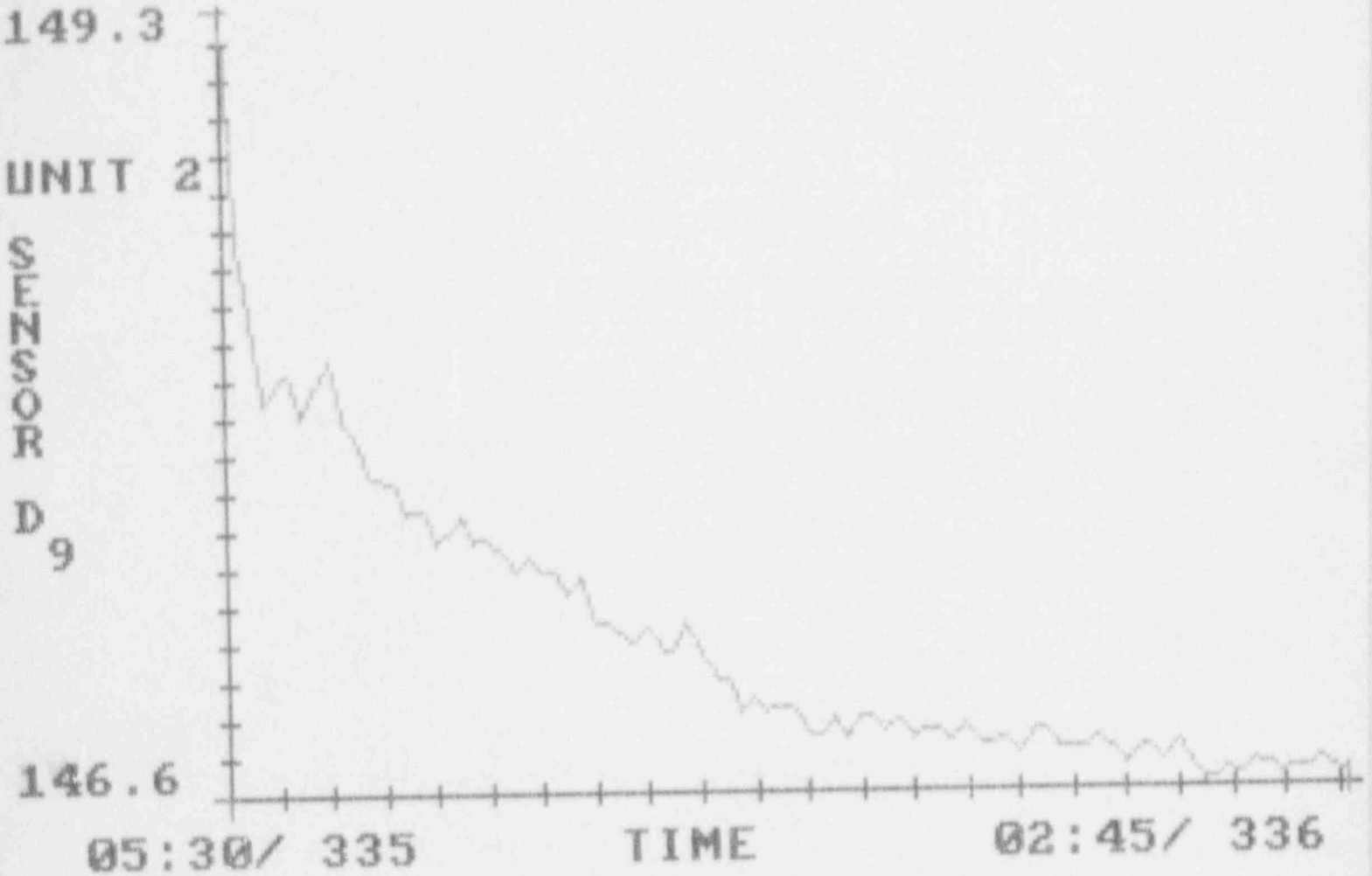

145.4
UNIT 2
SENSOR
D 4
136.0
05:30/ 335
TIME
02:45/ 336

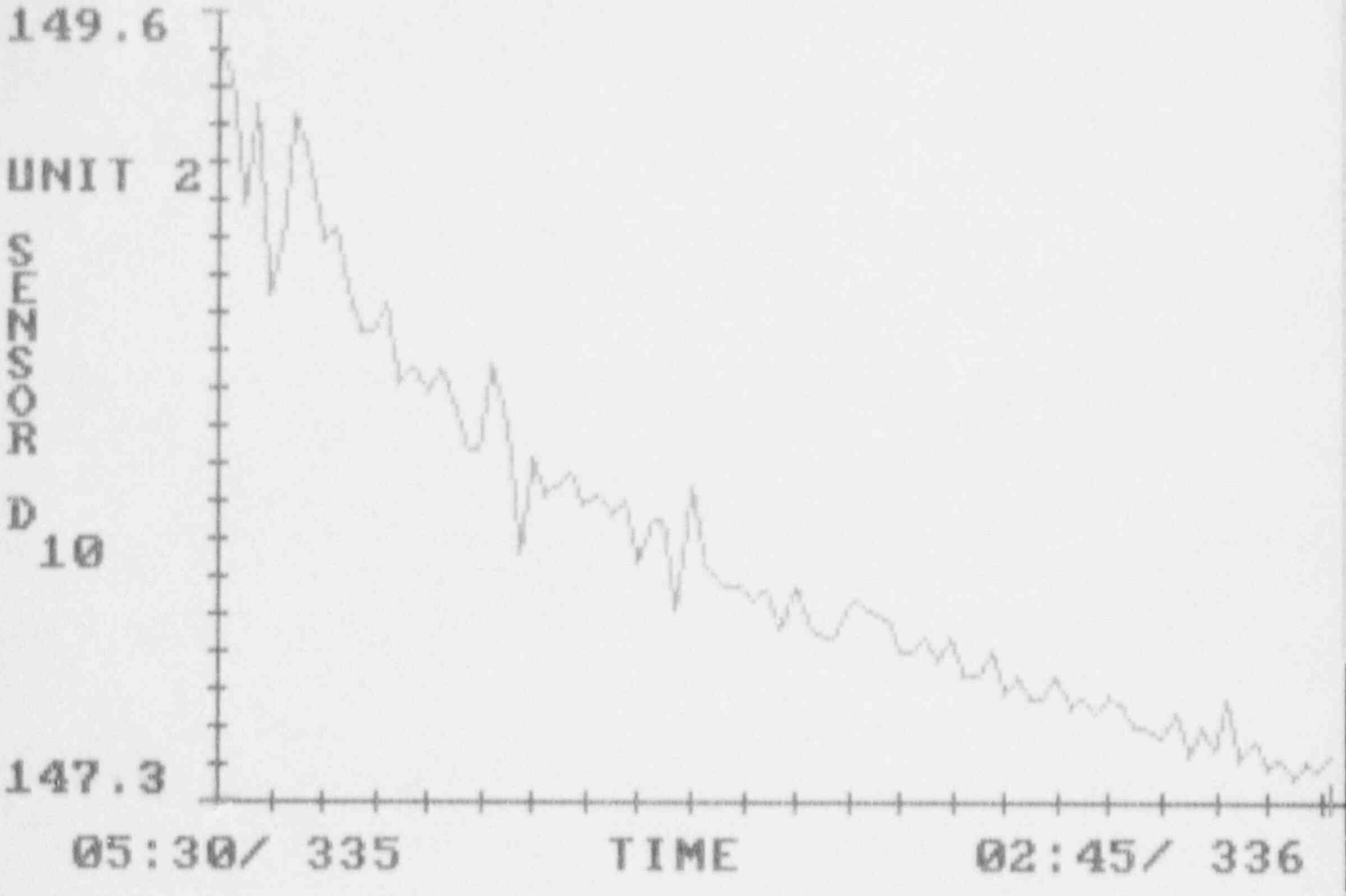

146.2
UNIT 2
SENSOR
D5
135.4
05:30/ 335
TIME
02:45/ 336


143.8
UNIT 2
SENSOR
D6
133.4
05:30/ 335
TIME
02:45/ 336


149.6
UNIT 2
SENSOR
D
7
147.0
05:30/ 335
TIME
02:45/ 336


152.1
UNIT 2
SENSOR
D
8
149.2
05:30/ 335
TIME
02:45/ 336


149.3
UNIT 2
SENSOR D9
146.6
05:30/ 335
TIME
02:45/ 336


149.6
UNIT 2
SENSOR D
10
147.3
05:30/ 335
TIME
02:45/ 336

APPENDIX F

GENERAL PHYSICS ILRT COMPUTER PROGRAM DESCRIPTION

DESCRIPTION OF GENERAL PHYSICS ILRT COMPUTER PROGRAM

The following paragraphs describe the various features and attributes of the General Physics ILRT Computer Program and the process used to certify it for each application.

REDUNDANCY

The General Physics ILRT team was equipped with two fully operational IBM compatible microcomputers during the ILRT and for on site data reduction and analysis. The computer software and hardware interfaced directly with the ILRT Measurement System Data Acquisition System (Fluke 2285B).

Two computers were brought on site for 100% redundancy, and each computer and its software is capable of independently performing the ILRT. The General Physics ILRT Computer Software is also capable of accepting manual input of raw sensor data and performing all required sensor data conversions if the data logger should cease to function. Each computer was equipped with back-up discs in the unlikely event of a disk "crash."

SECURITY

The General Physics ILRT Computer Program is written in IBM's BASICA. BASICA is a high level programming language which combines programming ease with user oriented command functions to create an easy to use and understand program. In order to increase speed of operation, the program was then compiled into an executable command file. Compiling was accomplished using the Quick Basic Compiler. In addition to execution speed, this had the added benefit of making the program more secure as compiled programs cannot be easily edited or changed. The program requires a password to change modes of operation, start times, or enter the data editing routine to safeguard the integrity of the raw data files.

FEATURES

The program itself is designed to be a menu driven program consisting of five separate, menu driven operating modes. These are the:

1. Pressurization Mode
2. Stabilization Mode
3. Test Mode
4. Verification Mode
5. Depressurization Mode

These modes also correspond to the phases of the ILRT. Menu driven means that the user is presented with a list of options that the program can perform and from which the user can choose. It allows for interactive information exchange between the user and the computer and prevents invalid information or user mistakes from crashing the program. Program organization consists of a master menu which controls access to the five operating modes changed to the individual menus which control these modes. The data processing, information display capabilities and function of each mode is as follows:

1. Pressurization Mode: All data reduction, graphic displays of average temperature, dewpoint, and corrected pressure.

2. Stabilization Mode: All data reduction, automatic comparison of data against ANSI 56.8 and BN-TOP-1 temperature stabilization criteria, notification when criteria is met, graphic displays of average temperature, dewpoint, and corrected pressure.

3. Test Mode: All data reduction, calculation of leakage rates using mass point, total time and point-to-point analysis techniques, display of trend report information required by BN-TOP-1, graphic display of average temperature, dewpoint, pressure and mass, as well as graphic display of mass point measured leakage, 95% UCL;

total time measured and calculated leakage and the total time leakage rate at the 95% UCL (as calculated by BN-TOP-1), including a superimposed acceptance criteria line.

4. Verification Test Mode: With input of imposed leakage in SCFM automatically calculates and displays on graph and trend report the acceptance criteria band, plus all graphics displays available in test mode.

5. Depressurization Mode: All data and graphics capabilities of Pressurization Mode. In programs for BWR units, this mode also includes a Drywell to Suppression Chamber Bypass Test routing (this routine is not used at Brunswick).

Other reduction and analysis capabilities of the General Physics ILRT computer program include:

1. Containment total pressure conversion from counts to psia (if required), and averaging.

2. Containment drybulb temperature weighted averaging and conversion to absolute units.

3. Containment dewpoint temperature weighted averaging (conversion from Foxboro dewcell element temperature to dewpoint temperature if required) and conversion to partial pressure of water vapor (psia).

4. Data storage of ILRT measurement system inputs for each data point.

5. Weight (mass) point calculations using the ideal gas law.

6. Automated Data Acquisition and/or Manual Data Entry.

7. Sensor performance and deviation information for sensor failure criteria, graphic display of individual sensor performance for selected operating mode.

8. Calculation of ISG formula at beginning of test; acceptance criteria based on number of sensors remaining and actual test duration.

9. Computer System Error Functions automatically checks for error in incoming data, printer or disk drive faults.

The computer program used by General Physics has been previously certified for six tests at the San Onofre Nuclear Generating Station and over a dozen other ILRTs. The initial certification required verification of the program through hand calculations and an independent review by Bechtel Power Corporation. After certification was completed, a calibration set of raw data was used to verify software of the program prior to usage. Additionally, once the computer was linked to the data acquisition system and a complete data stream was available, the input function of each mode of the program was verified by comparing the data acquisition system output to the computer printout data point summary.

General Physics supplied CP&L with certification documents for the ILRT microcomputer software for the ILRT in accordance with paragraph 4.2 of CLRT Project Procedures Manual and CP&L's Work Authorization Document.

APPENDIX G

LOCAL LEAKAGE RATE TEST SUMMARIES

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X100A	PT-20.3-1	ELEC. PENET. X100A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100B	PT-20.3-2	ELEC. PENET. X100B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100C	PT-20.3-3	ELEC. PENET. X100C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X103A	PT-20.3-4	ELEC. PENET. X103A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100D	PT-20.3-5	ELEC. PENET. X100D	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104A	PT-20.3-6	ELEC. PENET. X104A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102A	PT-20.3-7	ELEC. PENET. X102A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104B	PT-20.3-8	ELEC. PENET. X104B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102B	PT-20.3-9	ELEC. PENET. X102B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X101A	PT-20.3-10	ELEC. PENET. X101A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X101C	PT-20.3-11	ELEC. PENET. X101C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105D	PT-20.3-12	ELEC. PENET. X105D	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105E	PT-20.3-13	ELEC. PENET. X105E	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102C	PT-20.3-14	ELEC. PENET. X102C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104C	PT-20.3-15	ELEC. PENET. X104C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105H	PT-20.3-16	ELEC. PENET. X105H	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105G	PT-20.3-17	ELEC. PENET. X105G	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102E	PT-20.3-18	ELEC. PENET. X102E	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104E	PT-20.3-19	ELEC. PENET. X104E	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100F	PT-20.3-20	ELEC. PENET. X100F	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100E	PT-20.3-21	ELEC. PENET. X100E	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100G	PT-20.3-22	ELEC. PENET. X100G	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X100H	PT-20.3-23	ELEC. PENET. X100H	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102F	PT-20.3-24	ELEC. PENET. X102F	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104F	PT-20.3-25	ELEC. PENET. X104F	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUel# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X103B	PT-20.3-26	ELEC. PENET. X103B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X104G	PT-20.3-27	ELEC. PENET. X104G	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X102H	PT-20.3-28	ELEC. PENET. X102H	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105J	PT-20.3-29	ELEC. PENET. X105J	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105K	PT-20.3-30	ELEC. PENET. X105K	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X101F	PT-20.3-31	ELEC. PENET. X101F	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X101D	PT-20.3-32	ELEC. PENET. X101D	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105C	PT-20.3-33	ELEC. PENET. X105C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X105B	PT-20.3-34	ELEC. PENET. X105B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X232B	PT-20.3-35	ELEC. PENET. X232B	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X232C	PT-20.3-36	ELEC. PENET. X232C	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X232A	PT-20.3-37	ELEC. PENET. X232A	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X232D	PT-20.3-38	ELEC. PENET. X232D	0.091	0.289	0.091	0.091	0.091	0.289	0.000	A
X1	PT-20.3-39	EQUIP. HATCH	0.089	0.284	0.045	0.020	0.010	0.218	0.035	E
X2	PT-20.3-40	PER. LOCK TO DW SEAL	0.548	0.284	0.274	0.548	0.274	0.284	0.000	E
X3A	PT-20.3-41	DRYWELL HEAD BLANK	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X4	PT-20.3-42	DW HEAD ACCESS HATC	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X6	PT-20.3-43	CRD HATCH	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X200A	PT-20.3-44	S. TORUS HATCH	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X200B	PT-20.3-45	N. TORUS HATCH	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
N/A	PT-20.3-46	DW TO DW HEAD SEAL	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X3B	PT-20.3-72A	CAC-V49	1.919			1.919				
	PT-20.3-72B	CAC-V50	0.686	0.284	0.686	0.686	0.686	0.284	0.000	C

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.79 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X25/X205	PT-20.3-48	CAC-V5 INB. O-RINGS	0.089	0.284	0.045					
	PT-20.3-49	CAC-V6 INB. O-RINGS	0.089	0.284	0.045					
	PT-20.3-52	CAC-V16 INB. O-RINGS	0.089	0.284	0.045					
	PT-20.3-53	CAC-V17 INB. O-RINGS	0.165	0.284	0.083					
	PT-20.3-65	CAC-V170,V160,V162 See Note 1	WNP							
	PT-20.3-66	CAC-V171,V161,V163 See Note 1	2.599							
	PT-20.3-67A	CAC-V4,V5,V6,V15	1.690	0.284	0.845					
	PT-20.3-70	CAC-X20A,V16	1.965	0.284	0.983					
	PT-20.3-71	CAC-VX20B,V17	3.102	0.284	1.551					
	PT-20.3-67B1	CAC-V55	0.089	0.284	0.089	0.089				
	PT-20.3-67B2	CAC-V56	0.089	0.284	0.089	0.089				H
	PM#90-038	CAC-V6,V161,V163,V171				2.599	2.599	0.284	0.000	
	PM#90-038	CAC-V5,V160,V162,V170, X20A, X20B				3.947	3.947	0.284	0.000	
	PM#90-038	CAC-V4,V15,V16,V17				6.880				K

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X220	PT-20.3-68A	CAC V7,V8	12.170	1.774	6.085					
	PT-20.3-68B	CAC-V22 See Note 1	10.400	1.580						
	PT-20.3-69C	CAC-V172 See Note 1	2.450	0.218						
	PT-20.3-50	CAC-V7 INB. O-RINGS	0.089	0.284	0.045					G
	PM#90-038	CAC-V7,V172				2.450	2.450	0.218	6.130	
	PM#90-038	CAC-V8,V22				10.400				C
X26	PT-20.3-51	CAC-V9 INB. O-RINGS	1.380	0.218	0.690					
	PT-20.3-69A	CAC-V9,V10,V23	5.700	1.580	2.850					F
	PM#90-038	CAC-V10, V23				3.658				
	PM#90-038	CAC-V9				1.719	1.719	0.218	1.821	C
X9A	PT-20.3-54	B21-F010A	WNP							
	PT-20.3-56	B21-F032A,E41-F006	3.580	0.284	3.580	3.580				
	PM#90-016	E41-F006				4.309	7.889	0.284	0.000	
	PM#90-071	B21-F010A				9.600				C
X9B	PT-20.3-55	B21-F010B	WNP							
	PT-20.3-57	B21-F032B,E51-V88	1.380	0.218	1.380	4.309				
	PT-20.3-165	G31-F042,E51-F013	0.089			0.089				
	PM#90-071	B21-F010B				1.920	1.920	0.218	0.000	I

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

REFUEL# B210R1

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X8	PT-20.3-58A	B21-F016	14.170	1.774	14.170	0.115	0.115	0.284	14.055	
	PT-20.3-58B	B21-F019	66.190			0.216				C
X62A	PT-20.3-59A	B32-V22	0.020	0.218	0.020	0.020	0.020	0.218	0.000	
	PT-20.3-61	B32-V24	1.599			1.599				C
X78A	PT-20.3-62	B32-V32	0.089	0.284	0.089	0.089	0.089	0.284	0.000	
	PT20.3-59B	B32-V30	WNP			0.089				C
X56E	PT-20.3-60	B32-F019,F020	1.470	0.376	0.735	1.470	0.735	0.376	0.000	E
X42	PT-20.3-63	C41-F006	1.824	0.297	1.824	1.824	1.824	0.297	0.000	
	PT-20.3-64	C41-F007	2.300			2.300				C
X49B	PT-20.3-73	CAC-SV-1200B	0.020			0.020				
	PT-20.3-74	CAC-SV-1261	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C
X73C	PT-20.3-79	CAC-SV-1260	0.020			0.020				
	PT-20.3-77B	CAC-SV-1227C	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C
X76B	PT-20.3-81	CAC-SV-3440	0.020			0.020				
	PT-20.3-82	CAC-SV-1225B	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X54F	PT-20.3-83	CAC-SV-1211F	0.020			0.020				
	PT-20.3-84	CAC-SV-1262	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C
X54E	PT-20.3-89	CAC-SV-1211E	0.950			0.950				
	PT-20.3-90	CAC-SV-3439	0.740	0.218	0.740	0.740	0.740	0.218	0.000	C
X12	PT-20.3-108	E11-F008,F009	0.350	0.281	0.175	0.350	0.175	0.281	0.000	E
X13A	PT-20.3-111A	E11-F015A	6.500	1.580	6.500	6.500	6.500	1.580	0.000	
	PT-20.3-112A	E11-F017A	6.500			6.500				C
X13B	PT-20.3-111B	E11-F015B	6.440			6.440				
	PT-20.3-112B	E11-F017B	0.089	0.284	0.089	0.089	0.089	0.284	0.000	C
X39A	PT-20.3-113	E11-F021A	0.070	0.218	0.070	0.070	0.070	0.218	0.000	
	PT-20.3-113A	E11-F016A	3.800			3.800				C
X39B	PT-20.3-114	E11-F021B	3.064			3.064				
	PT-20.3-114A	E11-F016B	0.089	0.284	0.089	0.089	0.089	0.284	0.000	C
X17	PT-20.3-117	E11-F022,F023	0.089	0.284	0.045	0.089	0.045	0.284	0.000	E
X210A	PT-20.3-118A	E11-F024A,F028A	0.002	0.218	0.001	2.431	1.983	0.218	0.000	E
X211A/X211B	PT-20.3-118B	E11-F027A,F027B	1.036	0.284	1.036	1.036	1.036	0.284	0.000	A

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X210B	PT-20.3-119A	E11-F024B,F028B	0.089	0.284	0.[illegible]	3.213	1.607	0.284	0.000	E
X16A	PT-20.3-142A	E21-F005A	0.216			0.216				
	PT-20.3-143A	E21-F004A	0.089	0.284	0.089	0.089	0.089	0.284	0.000	C
X16B	PT-20.3-142B	E21-F005B	0.387			0.387				
	PT-20.3-143B	E21-F004B	0.089	0.284	0.089	0.089	0.089	0.284	0.000	C
X11	PT-20.3-148	E41-F002,F003	2.558	0.284	1.279					E
	PM#89-016	E41-F003				3.947				
	PM#89-016	E41-F002				0.593	0.593	0.284	0.686	C
X218	PT-20.3-153A	E41-F079	0.639	0.284	0.639	0.639	0.639	0.284	0.000	
	PT-20.3-153B	E41-F075	0.834			0.834				C
X10	PT-20.3-156A	E51-F007	0.089	0.284	0.089	0.020	0.020	0.218	5.069	
	PT-20.3-156B	E51-F008	0.140			0.310				C
X216	PT-20.3-161A	E51-F066	0.089	0.284	0.089	0.089	0.089	0.284		
	PT-20.3-161B	E51-F062	0.353			0.353			0.000	C

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X18	PT-20.3-162A	G16-F003	0.089	0.284	0.089	0.089	0.089	0.284	0.000	
	PT-20.3-162B	G16-F004	8.030			0.121				C
X19	PT-20.3-163A	G16-F019	0.548	0.284	0.548	0.548	0.548	0.284	0.000	
	PT-20.3-163B	G16-F020	1.370			1.370				C
X14	PT-20.3-164A	G31-F001	16.700			0.089	0.089	0.284	0.459	
	PT-20.3-164B	G31-F004	0.935	0.284	0.935	0.935				C
X23/X24	PT-20.3-166	RCC-V28,V52	0.846	0.382	0.846	0.846	0.846	0.382	0.000	A
X77B	PT-20.3-167B	RCC-SV-1222B	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
X77C	PT-20.3-167C	RCC-SV-1222C	0.089			0.089	0.089	0.284	0.000	A
X55	PT-20.3-168	RNA-SV-5262	0.089			0.089				
	PT-20.3-168A	RNA-V351	0.089	0.284	0.089	0.216	0.089	0.284	0.000	C

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 139.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X71	PT-20.3-169	RNA-SV-5261	0.089			0.089	0.089	0.284	0.000	
	PT-20.3-169A	RNA-V350	0.020	0.218	0.020	1.036				C
X83B	PT-20.3-170	RNA-SV-5251	0.020	0.218	0.020	0.020	0.020	0.218	0.000	A
X52A	PT-20.3-171	RNA-SV-5253	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
X209B-D	PT-20.3-172	RXS-SV-4186	0.020			0.020				
	PT-20.3-173	RXS-SV-4187	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C
X209B-B	PT-20.3-174	RXS-SV-4188	0.020			0.020				
	PT-20.3-175	RXS-SV-4189	0.020	0.218	0.020	0.020	0.020	0.218	0.000	C
X35A	PT-20.3-179	TIP V1	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
X35B	PT-20.3-180	TIP V2	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
X35C	PT-20.3-181	TIP V3	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
X35D	PT-20.3-182	TIP V4	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A

UNIT TWO "AS FOUND" MNPLR SUMMATION AND "AS FOUND" SAVING REPORT

"AS FOUND" SAVING TOTAL 26.384 SCFH

REFUEL# B210R1

"AS FOUND" MNPLR TOTAL 62.404 SCFH*

*SEE ENP-16.8 (SECTION 5.0) IF MNPLR TOTAL OR A PENETRATION'S MNPLR EXCEEDS 159.78 SCFH

Penetration#	Periodic Test#	Component#	"As Found" Leakage	Equipment Error	"As Found" MNPLR *	"As Left" Leakage	"As Left" MNPLR	Equipment Error	"As Found" Saving	Basis Code
X35E	PT-20.3-183	TIP N2 CHECK	0.089	0.284	0.089	0.089	0.089	0.284	0.000	A
N/A	PT-20.3B	PERSONNEL AIRLOCK	6.200	1.774	3.100					E
		TOTAL	213.368	4.974	57.430	119.852	44.460	3.129	23.255	

Reviewed By: [signature] Date: 11/28/91

Reviewed By: [signature] Date: 11-28-91

NOTE #1 As Found per PM#90-038

SUMMARY OF UNIT TWO LOCAL LEAK RATE TESTS
PERFORMED SINCE 1990 REFUELING OUTAGE

TEST NO.	EQUIPMENT TESTED	TEST DATE	STATUS	SCFH	ERROR	WR/JO
20.3-1	ELECTRICAL X-100A	09/19/91	PASS	0.091	0.289	
20.3-2	ELECTRICAL X-100B	09/19/91	PASS	0.091	0.289	
20.3-3	ELECTRICAL X-100C	09/19/91	PASS	0.091	0.289	
20.3-4	ELECTRICAL X-103A	09/22/91	PASS	0.091	0.289	
20.3-5	ELECTRICAL X-100D	09/19/91	PASS	0.091	0.289	
20.3-6	ELECTRICAL X-104A	09/22/91	PASS	0.091	0.289	
20.3-7	ELECTRICAL X-102A	09/22/91	PASS	0.091	0.289	
20.3-8	ELECTRICAL X-104B	09/22/91	PASS	0.091	0.289	
20.3-9	ELECTRICAL X-102B	09/22/91	PASS	0.091	0.289	
20.3-10	ELECTRICAL X-101A	10/02/91	PASS	0.091	0.289	
20.3-11	ELECTRICAL X-101C	10/02/91	PASS	0.091	0.289	
20.3-12	ELECTRICAL X-105D	10/02/91	PASS	0.091	0.289	
20.3-13	ELECTRICAL X-105E	10/02/91	PASS	0.091	0.289	
20.3-14	ELECTRICAL X-102C	09/24/91	PASS	0.091	0.289	
20.3-15	ELECTRICAL X-104C	09/24/91	PASS	0.091	0.289	
20.3-16	ELECTRICAL X-105H	10/05/91	PASS	0.091	0.289	
20.3-17	ELECTRICAL X-105G	09/24/91	PASS	0.091	0.289	
20.3-18	ELECTRICAL X-102E	10/05/91	PASS	0.091	0.289	
20.3-19	ELECTRICAL X-104E	10/05/91	PASS	0.091	0.289	
20.3-20	ELECTRICAL X-100F	10/05/91	PASS	0.091	0.289	
20.3-21	ELECTRICAL X-100E	10/05/91	PASS	0.091	0.289	
20.3-22	ELECTRICAL X-100G	10/05/91	PASS	0.091	0.289	
20.3-23	ELECTRICAL X-100H	10/05/91	PASS	0.091	0.289	
20.3-24	ELECTRICAL X-102F	10/05/91	PASS	0.091	0.289	

20.3-25	ELECTRICAL X-104F	10/05/91	PASS	0.091	0.289	_____
20.3-26	ELECTRICAL X-103B	10/05/91	PASS	0.091	0.289	_____
20.3-27	ELECTRICAL X-104G	09/30/91	PASS	0.091	0.289	_____
20.3-28	ELECTRICAL X-102H	09/30/91	PASS	0.091	0.289	_____
20.3-29	ELECTRICAL X-105J	09/23/91	PASS	0.091	0.289	_____
20.3-30	ELECTRICAL X-105K	09/23/91	PASS	0.091	0.289	_____
20.3-31	ELECTRICAL X-101F	09/23/91	PASS	0.091	0.289	_____
20.3-32	ELECTRICAL X-101D	09/23/91	PASS	0.091	0.289	_____
20.3-33	ELECTRICAL X-105C	09/19/91	PASS	0.091	0.289	_____
20.3-34	ELECTRICAL X-105B	09/19/91	PASS	0.091	0.289	_____
20.3-35	ELECTRICAL X-232B	10/06/91	PASS	0.091	0.289	_____
20.3-36	ELECTRICAL X-232C	10/07/91	PASS	0.091	0.289	_____
20.3-37	ELECTRICAL X-232A	10/06/91	FAIL	3.496	0.289	91-ARXY1
		11/13/91	PASS	0.091	0.284	
20.3-38	ELECTRICAL X-232D	10/07/91	PASS	0.091	0.289	_____
20.3-39	EQUIPMENT HATCH	09/13/91	PASS	0.089	0.284	91-ALMR1
		11/11/91	PASS	0.020	0.284	
20.3-40	PERSONNEL LOCK TO DRYWELL LINER SEAL	10/02/91	PASS	0.584	0.284	_____
20.3-41	DRYWELL HEAD BLANK	09/30/91	PASS	0.089	0.284	_____
20.3-42	DRYWELL HEAD ACCESS HATCH	09/30/91	PASS	0.089	0.284	_____
20.3-43	CRD HATCH	09/12/91	PASS	0.089	0.284	91-ANDH1
		11/23/91	PASS	0.089	0.284	
20.3-44	SOUTH TORUS ACCESS HATCH	09/11/91	PASS	0.089	0.284	91-ANQX1
		11/23/91	PASS	0.089	0.284	
20.3-45	NORTH TORUS ACCESS HATCH	09/12/91	PASS	0.089	0.284	91-AGBM1
		12/07/91	PASS	0.089	0.284	
20.3-46	DRYWELL TO DRYWELL HEAD SEAL	09/13/91	PASS	0.089	0.284	91-AKUQ1
		11/18/91	PASS	0.089	0.284	

20.3-48	CAC-V5 INBOARD O-RINGS	09/17/91	PASS	0.089	0.284	
20.3-49	CAC-V6 INBOARD O-RINGS	09/17/91	PASS	0.089	0.284	
20.3-50	CAC-V7 INBOARD O-RINGS	09/17/91	PASS	0.089	0.284	
20.3-51	CAC-V9 INBOARD O-RINGS	09/24/91	PASS	1.380	0.218	
20.3-52	CAC-V16 INBOARD O-RINGS	09/13/91	PASS	0.089	0.284	
20.3-53	CAC-V17 INBOARD O-RINGS	09/13/91	PASS	0.165	0.284	
20.3-54	B21-F010A	09/23/91	FAIL	WNP		PM90-071
		10/30/91	PASS	9.600	1.580	
20.3-55	B21-F010B	10/08/91	FAIL	WNP		PM90-071
		10/31/91	PASS	1.920	0.218	
20.3-56	E21-F032A,E41-F006	09/16/91	PASS	3.580	0.284	
PM 90-016	E41-F006	09/26/91	PASS	4.309	0.284	
20.3-57	B21-F032B,E51-V88	10/08/91	PASS	1.380	0.218	91-AGEX1
		11/15/91	PASS	4.309	0.284	
20.3-58A	B21-F016	10/05/91	FAIL	14.170	1.774	91-APHF1
		11/10/91	PASS	0.115	0.284	
20.3-58B	B21-F019	10/05/91	FAIL	66.190	3.980	91-APHG1
		11/10/91	PASS	0.216	0.284	
20.3-59A	B32-V22	10/17/91	PASS	0.020	0.218	
20.3-59B	B32-V30	11/01/91	FAIL	WNP		91-ATSB1
		11/17/91	PASS	0.089	0.284	
20.3-60	B32-F019, F020	10/24/91	PASS	1.470	0.376	
20.3-61	B32-V24	10/17/91	PASS	1.599	0.284	
20.3-62	B32-V32	11/01/91	PASS	0.089	0.284	
20.3-63	C41-F006	10/02/91	PASS	1.824	0.297	
20.3-64	C41-F007	10.02/91	PASS	2.300	1.845	
20.3-67A	CAC-V4,V5,V6,V15	09/14/91	PASS	1.690	0.284	

20.3-67B1	CAC-V55	09/25/91	PASS	0.089	0.284	_____
20.3-67B2	CAC-V56	09/25/91	PASS	0.089	0.284	_____
20.3-67C	CAC-V4,V15,V16,V17	11/18/91	PASS	6.880	1.774	PM90-038
20.3-67D	CAC-V5,X20A,X20B V160,V162,V170	10/30/91	FAIL	WNP	_____	91-ATKR1
		11/09/91	PASS	3.947	0.218	91-ATKS1
20.3-67E	CAC-V6,V171,V161, V163	10/29/91	PASS	2.599	0.284	PM90-038
20.3-68A	CAC-V7, V8	09/17/91	PASS	12.170	1.774	PM90-038
20.3-68C	CAC-V7,V172	10/26/91	PASS	2.450	0.218	PM90-038
20.3-68D	CAC-V8,V22	10/26/91	PASS	10.480	1.580	PM90-038
20.3-69A	CAC-V9,V10,V23	09/24/91	PASS	5.700	1.580	_____
20.3-69D	CAC-V9	11/11/91	PASS	1.719	0.218	PM90-038
20.3-69E	CAC-V10,V23	11/11/91	PASS	3.658	0.218	PM90-038
20.3-70	CAC-X20A, V16	09/13/91	PASS	1.965	0.284	_____
20.3-71	CAC-X20B, V17	09/13/91	PASS	3.102	0.284	_____
20.3-72A	CAC-V49	09/30/91	PASS	1.919	0.284	_____
20.3-72B	CAC-V50	09/30/91	PASS	0.686	0.284	_____
20.3-73	CAC-SV-1200B	11/19/91	PASS	0.020	0.218	_____
20.3-74	CAC-SV-1261	11/19/91	PASS	0.020	0.218	_____
20.3-77B	CAC-SV-1227C	11/19/91	PASS	0.020	0.218	_____
20.3-79	CAC-SV-1260	11/19/91	PASS	0.020	0.218	_____
20.3-81	CAC-SV-3440	11/19/91	PASS	0.020	0.218	_____
20.3-82	CAC-SV-1225B	11/19/91	PASS	0.020	0.218	_____
20.3-83	CAC-SV-1211F	11/15/91	PASS	0.020	0.218	_____
20.3-84	CAC-SV-1262	11/15/91	PASS	0.020	0.218	_____
20.3-89	CAC-SV-1211E	11/15/91	PASS	0.950	0.218	_____
20.3-90	CAC-SV-3439	11/15/91	PASS	0.740	0.218	_____
20.3-108	E11-F008,F009	10/20/91	PASS	0.350	0.281	_____

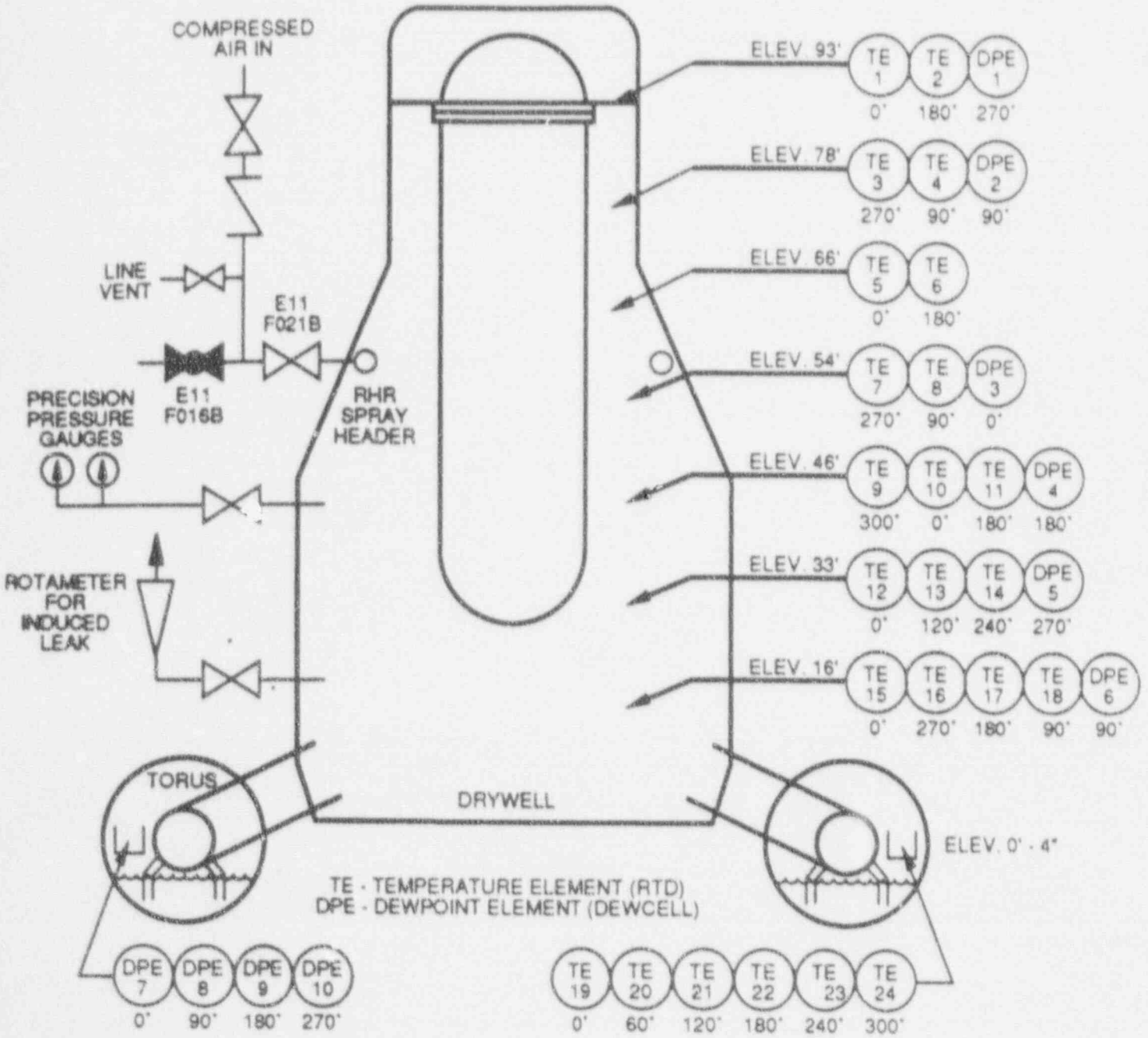
20.3-111A	E11-F015A	10/26/91	PASS	6.500	1.580	_____
20.3-111B	E11-F015B	09/19/91	PASS	6.440	1.774	_____
20.3-112A	E11-F017A	10/26/91	PASS	6.500	1.580	_____
20.3-112B	E11-F017B	09/19/91	PASS	0.089	0.284	_____
20.3-113	E11-F021A	10/27/91	PASS	0.070	0.218	_____
20.3-113A	E11-F016A	10/27/91	PASS	3.800	0.218	_____
20.3-114	E11-F021B	09/19/91	PASS	3.064	0.284	_____
20.3-114A	E11-F016B	09/19/91	PASS	0.089	0.284	_____
20.3-117	E11-F022,F023	09/21/91	PASS	0.089	0.284	_____
20.3-118A	E11-F024A, F028A	10/28/91	PASS	0.020	0.218	91-NMJ341
		11/09/91	PASS	3.967	0.284	
20.3-118B	E11-F027A, F027B	09/21/91	PASS	1.036	0.284	_____
20.3-119A	E11-F024B, F028B	09/20/91	PASS	0.089	0.284	91-NMK341
		10/12/91	PASS	3.213	0.284	
20.3-142A	E21-F005A	09/25/91	PASS	0.216	0.284	_____
20.3-142B	E21-F005B	10/23/91	PASS	0.387	0.284	_____
20.3-143A	E21-F004A	09/25/91	PASS	0.089	0.284	_____
20.3-143B	E21-F004B	10/24/91	PASS	0.089	0.284	_____
20.3-148	E41-F002,F003	09/14/91	PASS	2.558	0.284	PM89-016
20.3-148A	E41-F002	11/01/91	PASS	0.593	0.284	_____
20.3-148B	E41-F003	10/05/91	PASS	3.947	0.284	PM89-016
20.3-153A	E41-F079	10/02/91	PASS	0.639	0.284	_____
20.3-153B	E41-F075	10/02/91	PASS	0.834	0.284	_____
20.3-156A	E51-F007	09/15/91	PASS	0.089	0.284	91-APHH1
		11/16/91	PASS	0.020	0.218	
20.3-156B	E51-F008	09/15/91	PASS	0.140	0.284	91-APHI1
		11/16/91	PASS	0.310	0.218	
20.3-161A	E51-F066	09/21/91	PASS	0.089	0.284	_____
20.3-161B	E51-F062	09/21/91	PASS	0.353	0.284	_____

20.3-162A	G16-F003	11/08/91	PASS	0.089	0.284	_____
20.3-162B	G16-F004	11/08/91	FAIL	8.030	1.774	91-ATZF3
		11/14/91	PASS	0.121	0.218	
20.3-163A	G16-F019	11/17/91	PASS	0.548	0.284	_____
20.3-163B	G16-F020	11/17/91	PASS	1.370	0.284	_____
20.3-164A	G31-F001	10/14/91	FAIL	16.700	1.580	91-APWC1
		10/15/91	FAIL	18.500	1.580	
		11/08/91	PASS	0.089	0.284	
20.3-164B	G31-F004	10/15/91	PASS	0.548	0.284	_____
		10/15/91	PASS	0.935	0.284	
20.3-165	G31-F042,E51-F013	10/10/91	PASS	0.089	0.024	_____
20.3-166	RCC-V28,V52	11/08/91	PASS	0.089	0.284	_____
20.3-167B	2-RCC-SV-1222B	11/08/91	PASS	0.089	0.284	_____
20.3-167C	2-RCC-SV-1222C	11/08/91	PASS	0.089	0.284	_____
20.3-168	RNA-SV-5262	11/05/91	PASS	0.089	0.284	_____
20.3-168A	RNA-V351	11/03/91	PASS	0.089	0.284	91-ALWE1
		11/08/91	PASS	0.216	0.284	
20.3-169	RNA-SV-5261	11/17/91	PASS	0.089	0.284	_____
20.3-169A	RNA-V350	11/14/91	PASS	0.020	0.218	91-ALWD1
		11/17/91	PASS	0.020	0.218	
20.3-170	RNA-SV-5251	11/14/91	PASS	0.020	0.218	_____
20.3-171	RNA-SV-5253	11/03/91	PASS	0.089	0.284	_____
20.3-172	RXS-SV-4186	10/30/91	PASS	0.020	0.218	_____
20.3-173	RXS-SV-4187	10/30/91	PASS	0.020	0.218	_____
20.3-174	RXS-SV-4188	10/30/91	PASS	0.020	0.218	_____
20.3-175	RXS-SV-4189	10/30/91	PASS	0.020	0.218	_____
20.3-179	TIP A BALL VALVE	10/30/91	PASS	0.089	0.284	_____
20.3-180	TIP B BALL VALVE	10/30/91	PASS	0.089	0.284	_____
20.3-181	TIP C BALL VALVE	10/30/91	PASS	0.089	0.284	_____
20.3-182	TIP D BALL VALVE	10/30/91	PASS	0.089	0.284	_____

20.3-183	TIP N2 CHECK VALVE	10/30/91	PASS	0.089	0.284	_____
20.3A.1	B21-F022A, F028A	09/13/91	PASS	1.489	0.213	_____
20.3A.2	B21-F022B, F028B	09/13/91	PASS	3.159	0.213	_____
20.3A.3	B21-F022C, F028C	09/13/91	FAIL	WNP	_____	91-AUFG1
	OUTBOARD ONLY	09/17/91	FAIL	WNP		91-AQSF1
		11/21/91	PASS	0.010	0.163	
20.3A.4	B21-F022D, F028D	09/13/91	FAIL	WNP	_____	91-AUFN1
	OUTBOARD ONLY	09/17/91	FAIL	WNP		91-AQSE1
		11/21/91	PASS	0.053	0.213	

APPENDIX H

SENSOR LOCATIONS AND VOLUME FRACTIONS


COMPRESSED AIR IN
LINE VENT
E11 F021B
E11 F016B
PRECISION PRESSURE GAUGES
RHR SPRAY HEADER
ROTAMETER FOR INDUCED LEAK
TORUS
DRYWELL
ELEV. 93'
TE 1
TE 2
DPE 1
0° 180° 270°
ELEV. 78'
TE 3
TE 4
DPE 2
270° 90° 90°
ELEV. 66'
TE 5
TE 6
0° 180°
ELEV. 54'
TE 7
TE 8
DPE 3
270° 90° 0°
ELEV. 46'
TE 9
TE 10
TE 11
DPE 4
300° 0° 180° 180°
ELEV. 33'
TE 12
TE 13
TE 14
DPE 5
0° 120° 240° 270°
ELEV. 16'
TE 15
TE 16
TE 17
TE 18
DPE 6
0° 270° 180° 90° 90°
ELEV. 0' - 4"
TE - TEMPERATURE ELEMENT (RTD)
DPE - DEWPOINT ELEMENT (DEWCELL)
DPE 7
DPE 8
DPE 9
DPE 10
0° 90° 180° 270°
TE 19
TE 20
TE 21
TE 22
TE 23
TE 24
0° 60° 120° 180° 240° 300°