

AUG 17 1984

Docket No. 50-368

Licensee: Arkansas Power & Light Company (AP&L)

Facility: Arkansas Nuclear One, Unit No. 2 (ANO-2)

SUBJECT: SUMMARY OF JULY 12, 1984 MEETING WITH AP&L REGARDING
INADEQUATE CORE COOLING (ICC) MONITORING SYSTEM

Introduction

At the request of AP&L, a meeting was held on July 12, 1984 at the NRC offices in Bethesda, Maryland. The purpose of the meeting was to discuss the installation schedule, project status, and preliminary test results related to the ICC monitoring system at ANO-2. A list of attendees is provided as Attachment 1. A copy of the Vugraphs used in the licensee's presentation is provided as Attachment 2.

Discussion

The licensee indicated that they still intend to install the ICC monitoring system during the fourth refueling outage even though the outage could begin as early as February 1985 due to early shutdown of ANO-2 at the end of Cycle 2 and excellent performance of ANO-2 so far in Cycle 3. The fourth refueling outage was expected to begin in September 1985 when the licensee provided the NRC staff with the ICC monitoring system installation schedule for ANO-2 in April 1983. In view of the change in the projected schedule of the fourth refueling outage, the licensee emphasized that an expeditious NRC review and approval of the final design report associated with the ICC monitoring system at ANO-2 was necessary. The licensee indicated that they expected to submit the final design report by early August and requested that the NRC staff review and approve it by early October. The staff indicated that an expeditious review would be afforded this project.

The licensee and their contractors, Technology for Energy Corporation (TEC) and Scandpower, presented results of the preliminary test which appeared to indicate that the proposed ICC monitoring system would provide the plant operator with a clear indication of the approach to ICC and a valuable indication of the effect of the recovery measures. However, it appeared that the licensee had not addressed the behavior of the ICC monitoring system with primary coolant pumps running with both voided and unvoided coolant. The licensee agreed to address this in their next submittal on this subject matter.

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P PDR

Future Work

The licensee has not completed the final design report. Once this is submitted in early August, the staff will review it in an expeditious manner to support installation of the ICC monitoring system at ANO-2 during the fourth refueling outage. It was agreed that more meetings might be necessary to expedite the review process.

Original signed by:

R. S. Lee, Project Manager
Operating Reactors Branch #3
Division of Licensing

Attachments:
As stated

cc w/attachments
See next page

ORB#3:DL
PMreutzer
8/5/84

ORB#3:DL
RSLee:dd
8/17/84

ORB#3:DL
JRMiller
8/17/84

LIST OF ATTENDEES

<u>Name</u>	<u>Organization</u>
T. Enos	AP&L
R. Oakley	AP&L
R. Rothwell	AP&L
J. Melito	AP&L
R. Smith	Scandpower
J. Waring	Scandpower
D. Bell	TEC
R. Hedrick	TEC
G. Pannell	TEC
G. Schwenk	CPB/DSI/NRR
L. Lois	CPB/DSI/NRR
L. Phillips	CPB/OSI/NRR
R. Lee	ORB-3/DL/NRR

ARKANSAS NUCLEAR ONE

UNIT 2

INADEQUATE CORE COOLING SYSTEM

STATUS REPORT

TO

U.S. NUCLEAR REGULATORY COMMISSION

BY

ARKANSAS POWER AND LIGHT COMPANY
TECHNOLOGY FOR ENERGY CORPORATION

JULY 12, 1984

AGENDA

ANO-2 ICC STATUS MEETING

JULY 12, 1984

P-114

BETHESDA, MARYLAND

- | | | |
|------|--|------------------|
| 1:30 | - Introduction | T. Enos - AP&L |
| | - Progress Summary | R. Oakley - AP&L |
| | - CPM Scheduling NRC Review | T. Enos - AP&L |
| | - Overview of Preliminary Test Results | R. Hedrick - TEC |
| 3:30 | - Adjourn | |

PURPOSE OF MEETING

- o UPDATE NRC ON PROGRESS AND IMPLEMENTATION SCHEDULE
- o DISCUSS PRELIMINARY TEST RESULTS
- o DISCUSS NRC REVIEW OF OPERATING SYSTEM

KEY MILESTONES COMPLETED
TO DATE FOR ANO-2

- o 12/82 - NRC ORDER
- o 3/83 - MEETING WITH NRC
- o 4/83 - RESPONSE TO ORDER
- o 5/83 - SUPPLEMENTAL RESPONSE
- o 8/83 - ICC PROGRAM PLAN COMPLETED
- o 9/83 - NRC SER RECEIVED
- o 9/83 - RESPONSES TO SER
- o 10/83 - CONFIRMATORY TESTING PROJECT PLAN DEVELOPED
(CPM SCHEDULE FOR TESTING)
- o 10/83 - CONFIRMATORY TEST PLAN DEVELOPED TO DEFINE
BASIC OBJECTIVES AND PROGRAM ELEMENTS OF THE
TESTING WHICH ARE:
 - o AIR-WATER TESTING IN AIR ENTRAINMENT
LOOP FACILITY AT ORNL
 - o UPPER HEAD TESTING IN FORCED CONVECTION
TEST FACILITY (FCTF) AT ORNL
 - o IN-CORE TESTING IN FCTF AT ORNL
CONTAINING 3X3 ARRAY OF SIMULATED
FUEL RODS
- o 12/83 - SUPPLEMENTAL RESPONSE TO SER
- o 12/83 - AIR ENTRAINMENT TEST FIXTURE DESIGNED AND
CONSTRUCTED
- o 1/84 - 5 PROTOTYPE RGT RODS FABRICATED FOR CONFIRMATORY
TESTING

- o 2/84 - FORCED CONVECTION TEST FACILITY (FCTF)
REFURBISHED
- o 2/84 - AIR-WATER TESTING COMPLETED
- o 4/84 - UPPER-HEAD TESTING COMPLETED
- o 6/84 - IN-CORE TESTING COMPLETED
- o - QUICK-LOOK REPORTS WITH TEST PROGRAM RESULTS
AND PRELIMINARY ANALYSIS DEVELOPED FOR:
 - o AIR-WATER TESTS
 - o UPPER-HEAD TESTS
 - o IN-CORE TESTS
- o 6/84 - ANO-2 DETAILED DESIGN PHASE INITIATED
- o 6/84 - ANO-2 DETAILED DESIGN PHASE PROJECT PLAN
DEVELOPED
- o 6/84 - PROCUREMENT OF LONG LEAD ITEMS FOR ANO-2
INITIATED
- o 6/84 - ANO-2 RGT INSTRUMENT LOCATIONS SELECTED
- o 6/84 - ANO-2 SENSOR LOCATIONS ON ROD SELECTED
- o 7/84 - PRELIMINARY INTERFACE DRAWINGS FOR ANO-2
RECEIVED
- o 7/84 - UPDATE TO NRC ON SCHEDULE

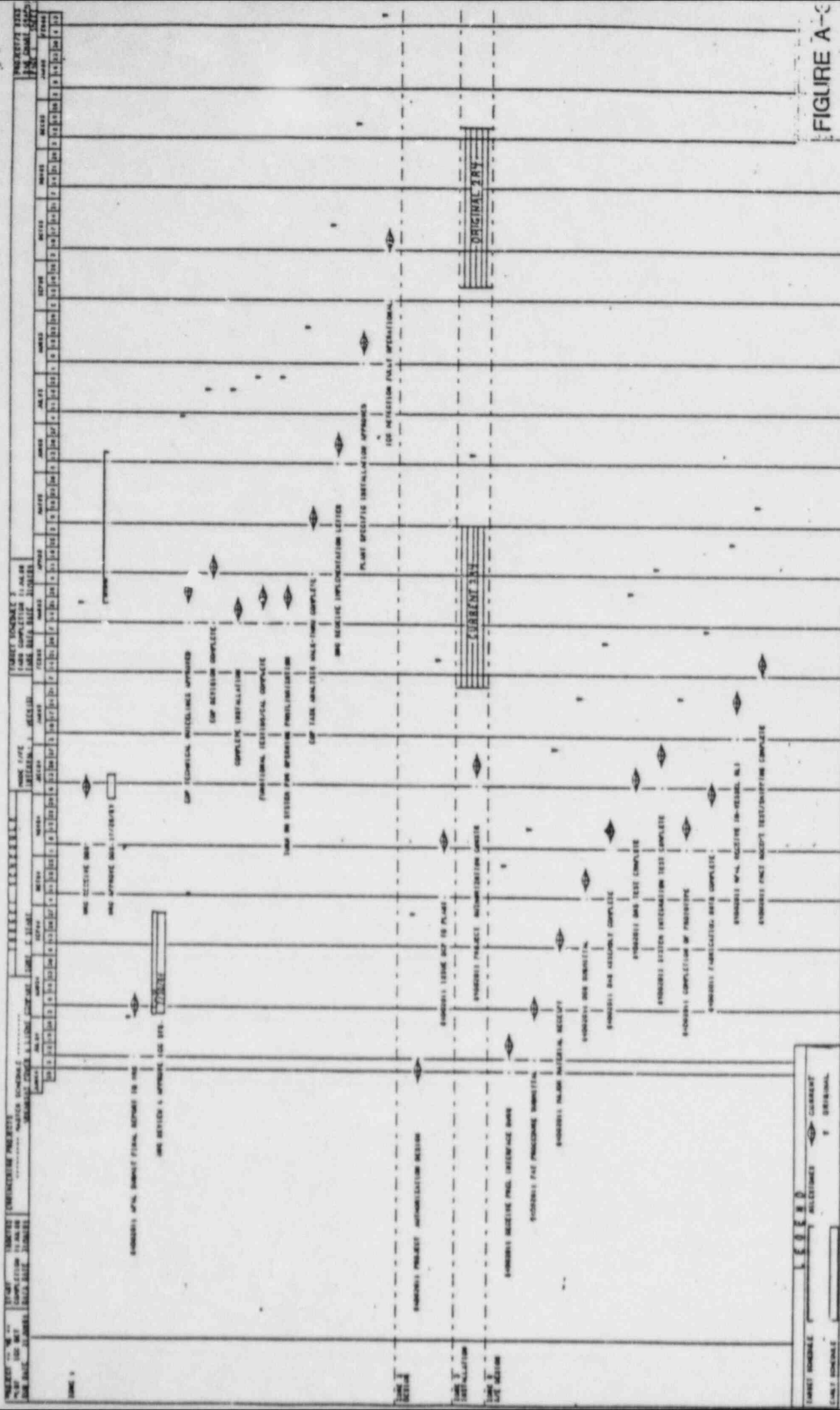


FIGURE A-3

OVERVIEW
OF THE
PRELIMINARY RESULTS OF THE
RADCAL INVENTORY METER
CONFIRMATORY TEST PROGRAM

ARKANSAS POWER AND LIGHT COMPANY
TECHNOLOGY for ENERGY CORPORATION

JULY 12, 1984

30357A30

THE CONFIRMATORY TEST PROGRAM HAD THREE PRIMARY OBJECTIVES

- DEMONSTRATE THAT THE RADCAL INSTRUMENT CAN EFFECTIVELY MONITOR ICC OVER THE ENTIRE REACTOR VESSEL.
- PROVIDE DATA TO DETERMINE THE BOUNDARY CONDITIONS ON UNAMBIGUOUS ICC MONITORING PERFORMANCE - RATE OF INVENTORY LOSS (BLOWDOWN) - RATE OF INVENTORY GAIN (REFLOOD).
- PROVIDE DATA TO SELECT THE OPTIMUM SENSOR TYPES AND ARRANGEMENT FOR ANO-1 AND ANO-2.

THE PRIMARY OBJECTIVES WERE
ACCOMPLISHED IN A THREE PHASE
TEST PROGRAM

● AIR WATER TEST SERIES

ATMOSPHERIC CONDITIONS
BASIC RESPONSE DATA
MANOMETER TESTING

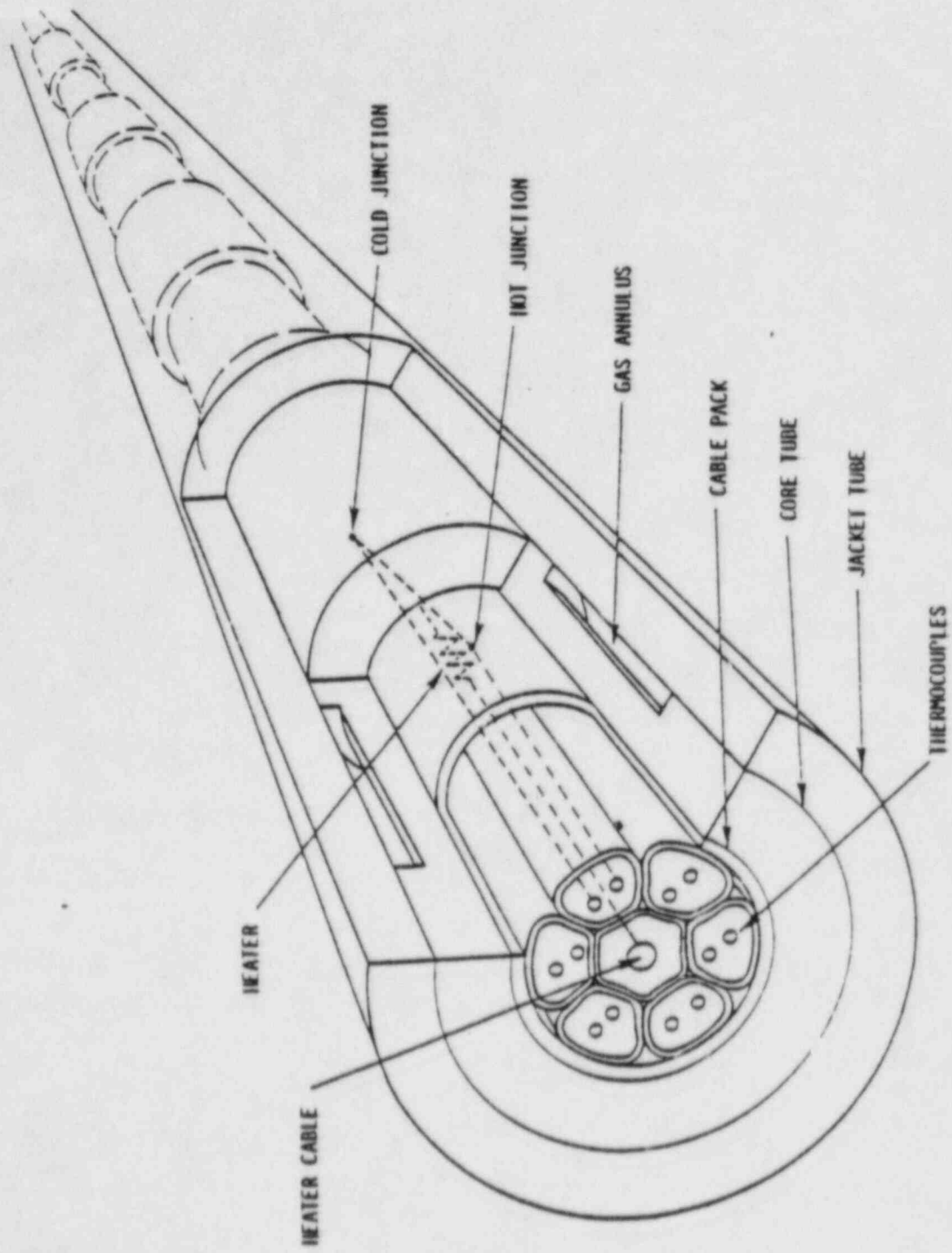
● UPPER HEAD TEST SERIES

PWR INITIAL CONDITIONS
UPPER HEAD CONFIGURATION
STEADY STATE TEMPERATURE
AND FLOW DATA
BLOWDOWN AND REFLOOD
TRANSIENT DATA

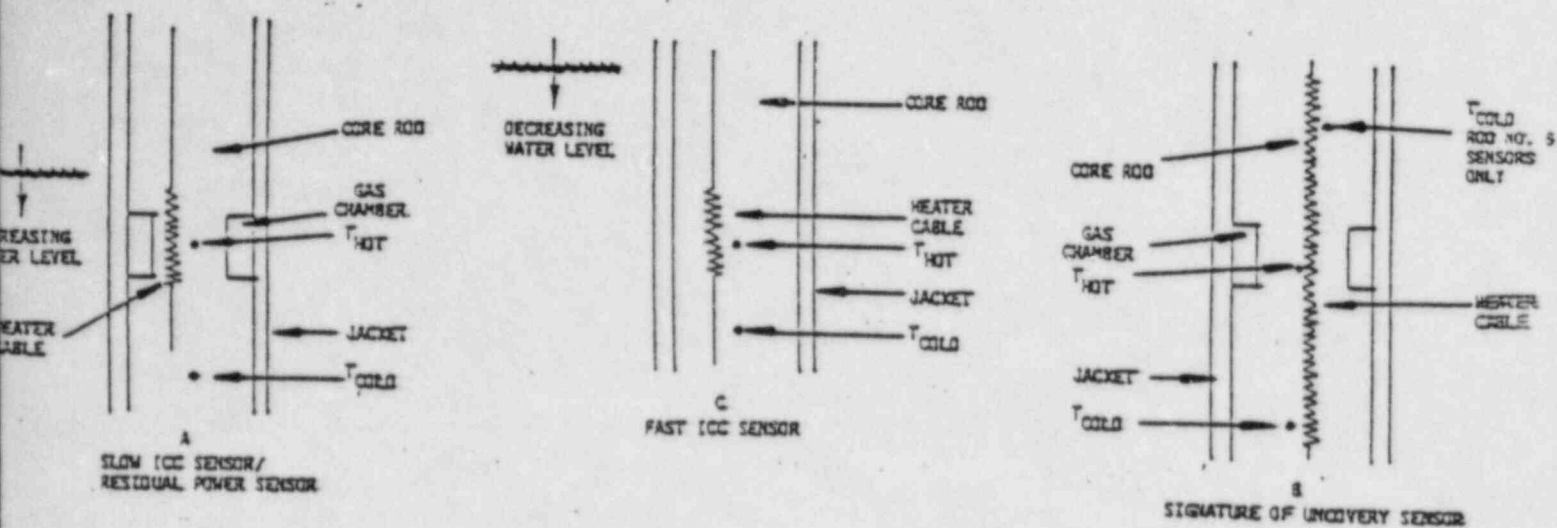
● IN-CORE TEST SERIES

PWR INITIAL CONDITIONS
FUEL LATTICE CONFIGURATION
STEADY STATE TEMPERATURE AND
FLOW DATA
BLOWDOWN AND REFLOOD
TRANSIENT DATA

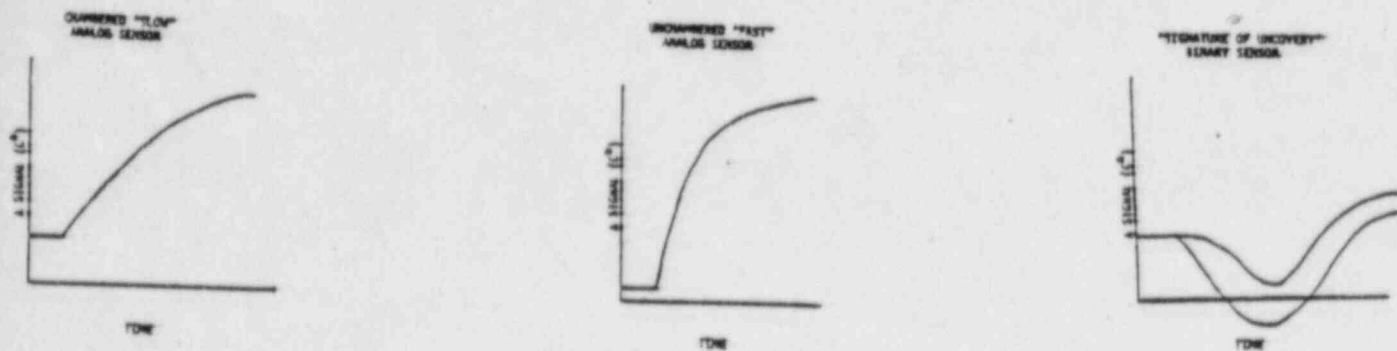
ROD STRUCTURE



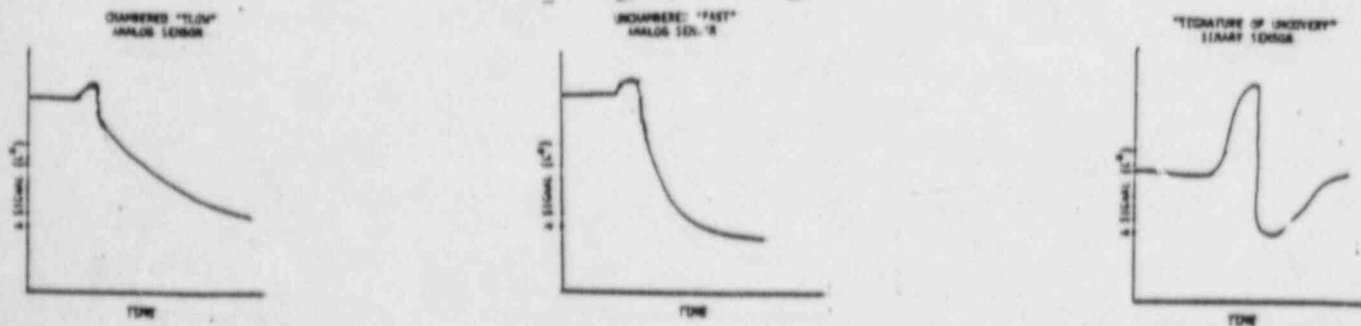
Prototype Sensor Designs Used in Upper Head Tests



RADICAL UNCOVERY RESPONSE CHARACTERISTICS



RADICAL REFLOOD RESPONSE CHARACTERISTICS



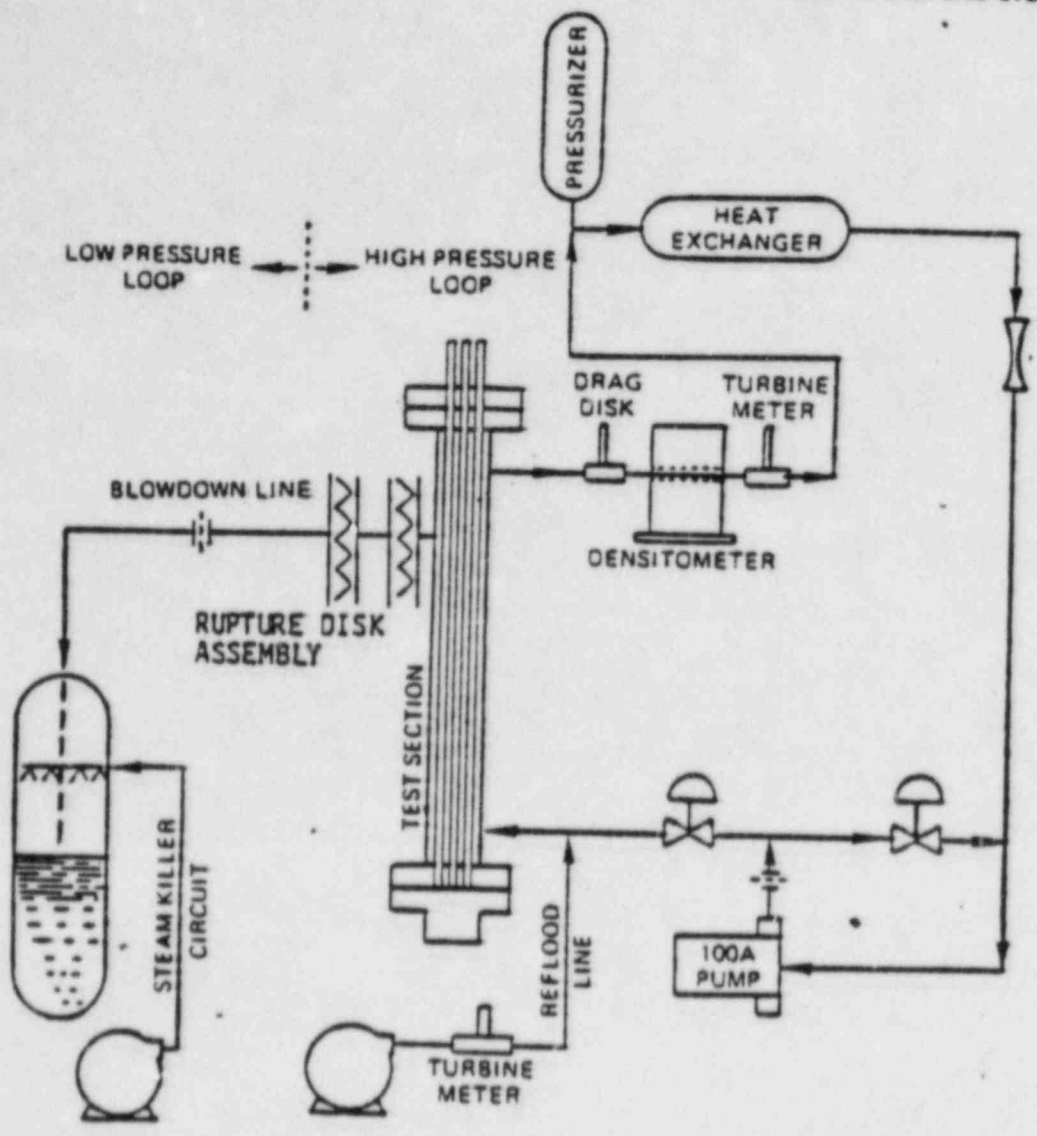


Figure 2-1. ORNL forced convection test facility schematic.

UPPER HEAD TEST SERIES

9 TESTS TOTAL

1 STEADY STATE TEST

6 BLOWDOWN TESTS

2 REFLOOD TESTS

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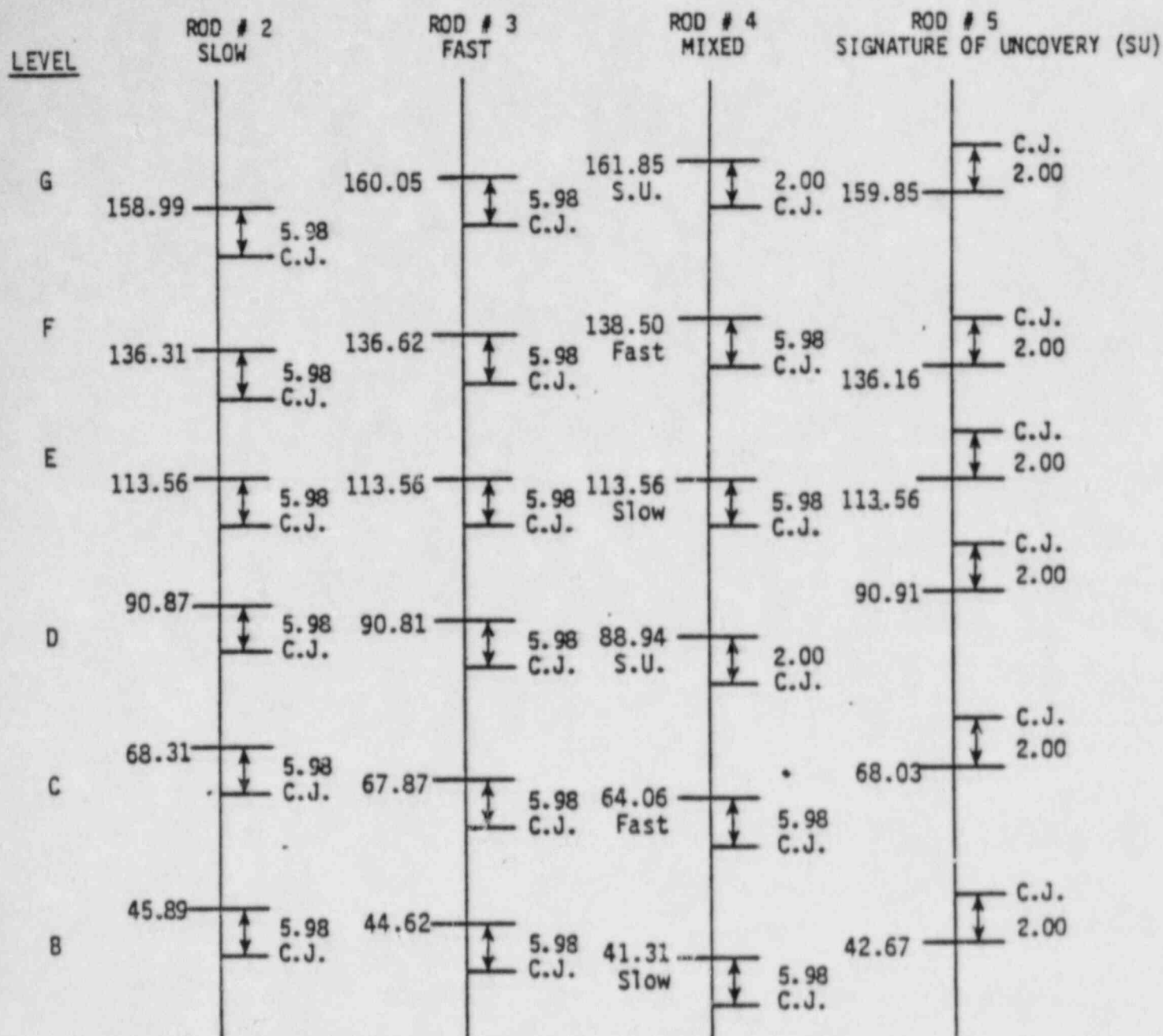
Table 2-1

SUMMARY OF UPPER HEAD PROBE SENSOR ARRANGEMENT

(S - Slow, F - Fast, SU - Signature of Uncovery)

Upper Head Bundle Level	Approximate Hot Junction Elevation* (ft)	Rod 2			Rod 3			Rod 4			Rod 5		
		Sensor Type	Approximate Cold Junction Elevation* (ft)	Gas Gap Length (in)	Sensor Type	Approximate Cold Junction Elevation* (ft)	Gas Gap Length (in)	Sensor Type	Approximate Cold Junction Elevation* (ft)	Gas Gap Length (in)	Sensor Type	Approximate Cold Junction Elevation* (ft)	Gas Gap Length (in)
G	13.600	S	13.102	1.25	F	13.102	SU	13.433	1.00	SU	13.767	1.25	
F	11.544	S	11.046	1.25	F	11.046	F	11.046	NA	SU	11.711	1.25	
E	9.463	S	8.965	1.00	F	8.965	S	8.965	1.00	SU	9.630	1.00	
D	7.409	S	6.911	1.00	F	6.911	SU	7.242	1.00	SU	7.576	1.00	
C	5.330	S	4.832	0.75	F	4.832	F	4.832	NA	SU	5.497	0.75	
B	3.253	S	2.755	0.75	F	2.755	S	2.755	1.00	SU	3.420	0.75	

*Zero is the centerline of the stainless steel bundle ground plate.



NOTE: Figure not to scale. All levels are centerline of hot junction. Absolute thermocouple located at cold junction (C.J.) in Rods 2, 3, and 4; and hot junctions in Rod 5.

Zero elevation is centerline of stainless steel ground plate. All dimensions are in inches.

Figure 2-5. Relative positions of the upper head bundle sensors.

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AP&L/TEC TEST UH2201

6-APR-84

BLOWDOWN

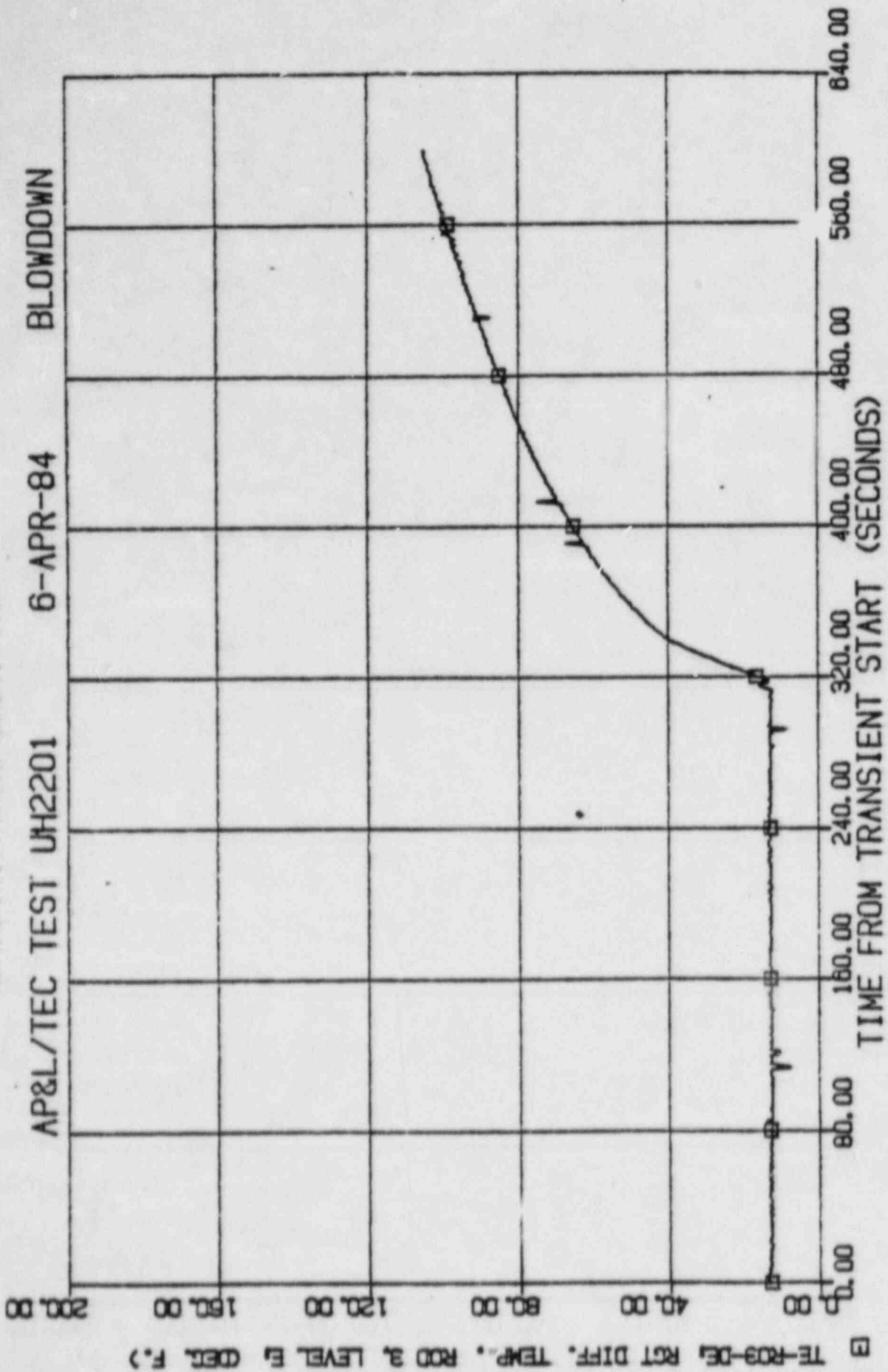


Figure 3-14. Response of a fast-type sensor to a medium rate of level fall (1.33 ft/min).

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AP&L/TEC TEST UH2201

6-APR-84

BLOWDOWN

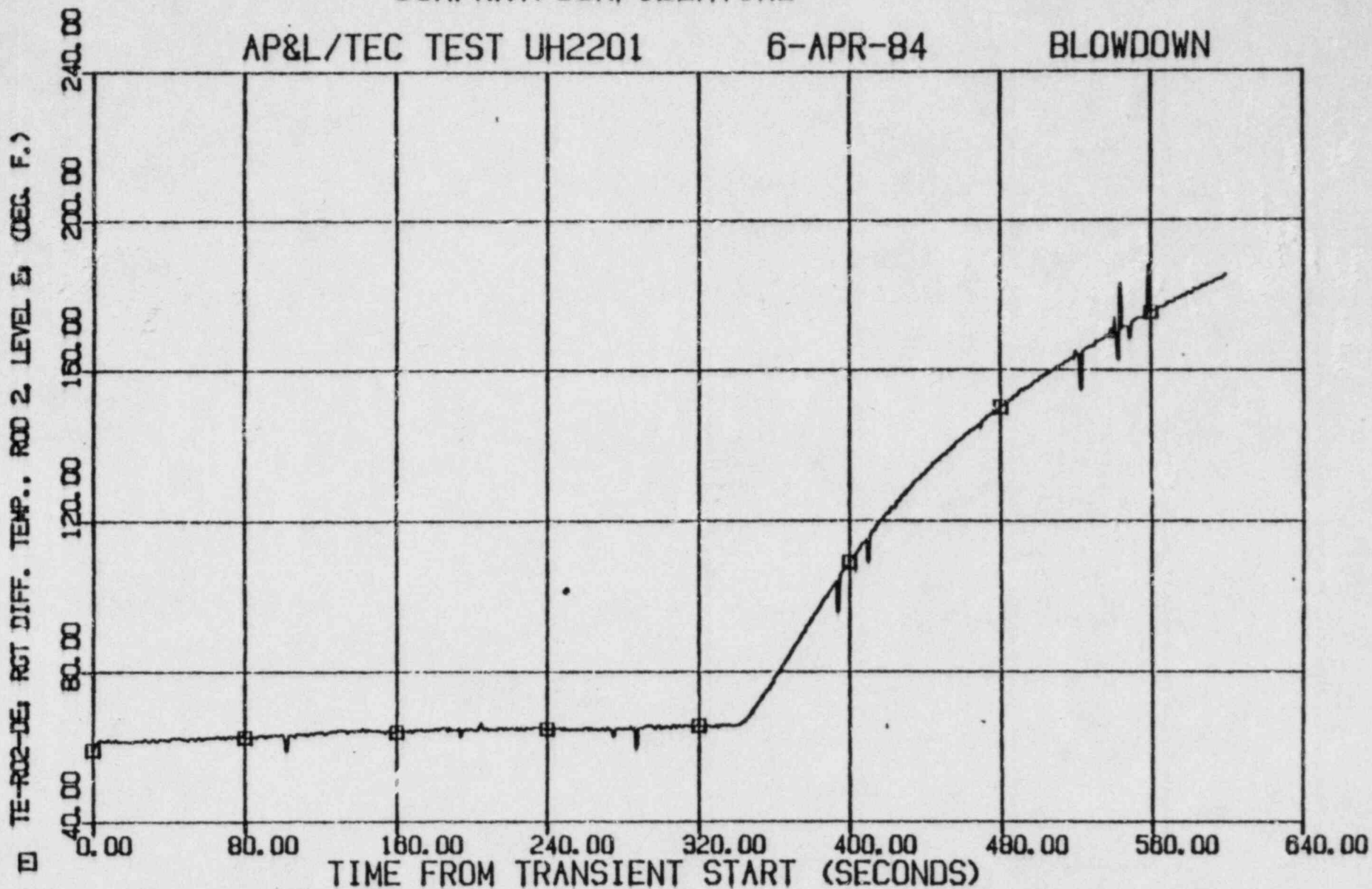


Figure 3-13. Response of a slow-type sensor to a medium rate of level fall (1.33 ft/min).

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AP&L/TEC TEST UH2201 6-APR-84 BLOWDOWN

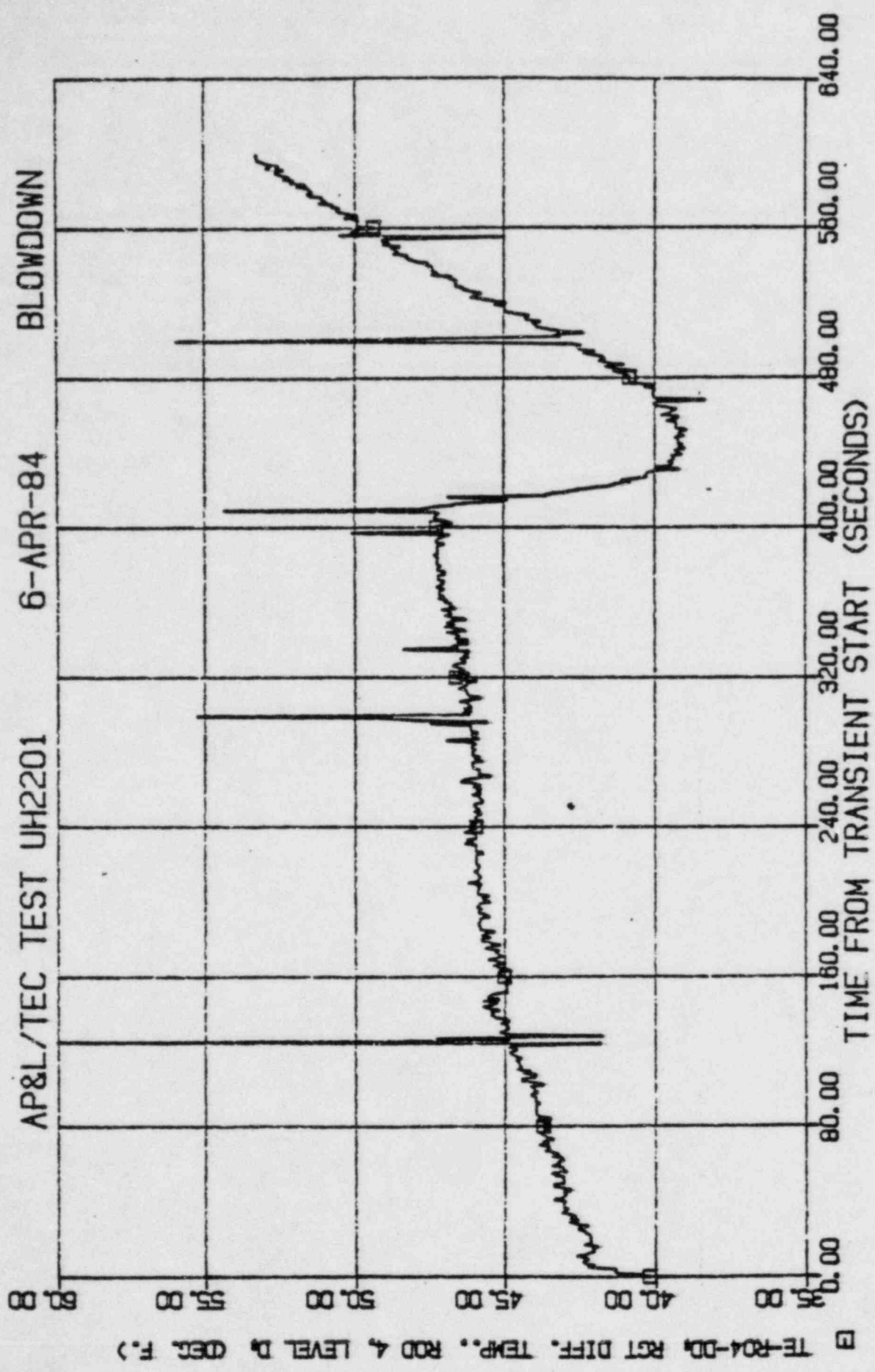


Figure 3-15. Response of a signature of uncover sensor to a medium rate of level fall (1.33 ft/min)

Normalized RIM response as a function of normalized level

Rod 2, test UH1331, blowdown

3 ----- 7

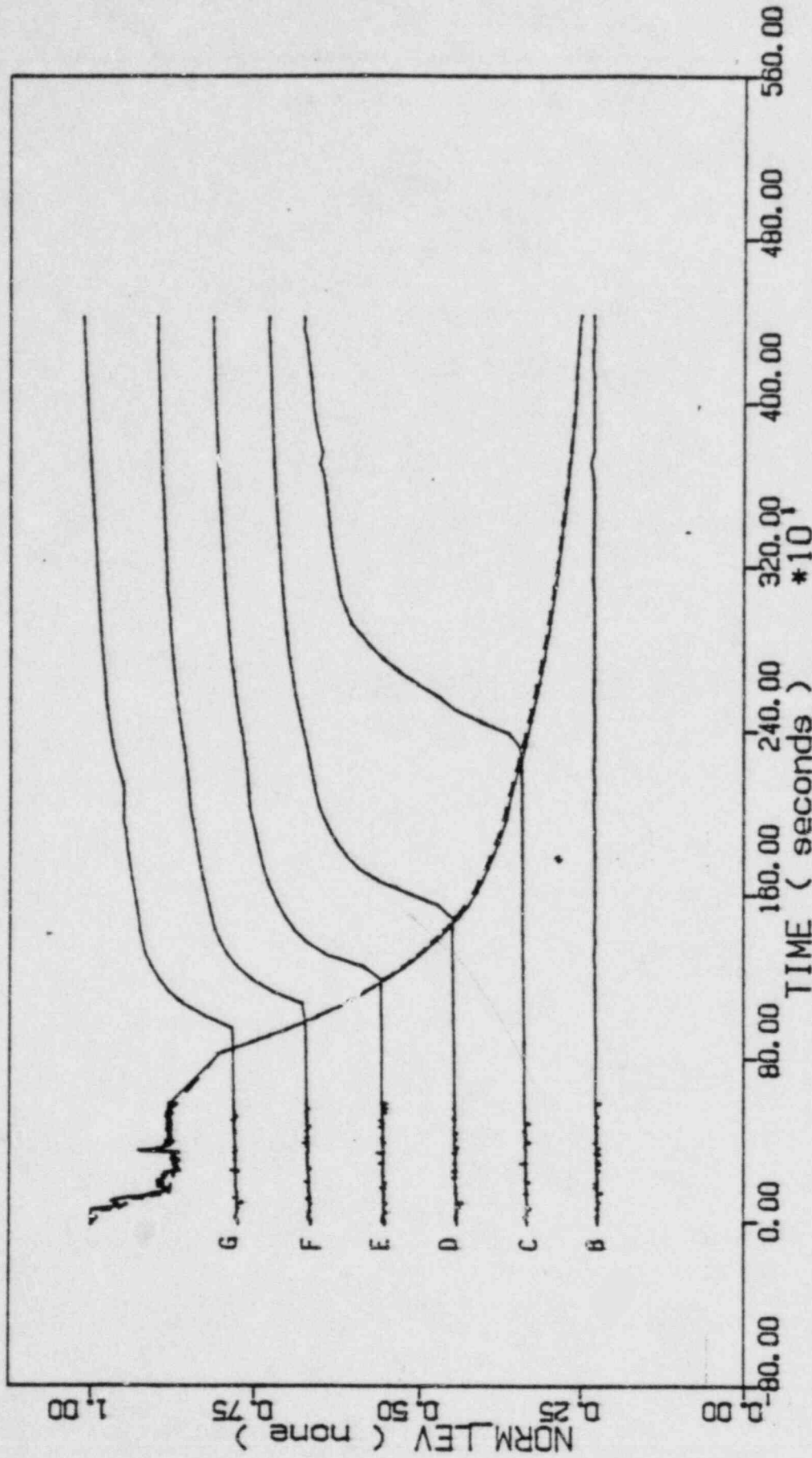


Figure 3-60. Comparison of collapsed liquid level calculated from differential pressure transducers PDE-T3 (3) and PDE-T7 (7) with the response of slow sensors in rod #2 during test UH1331.

Normalized RIM response as a function of normalized level

Rod 2, test UH2201, reflood

—— 3 - - - - - 7 ——

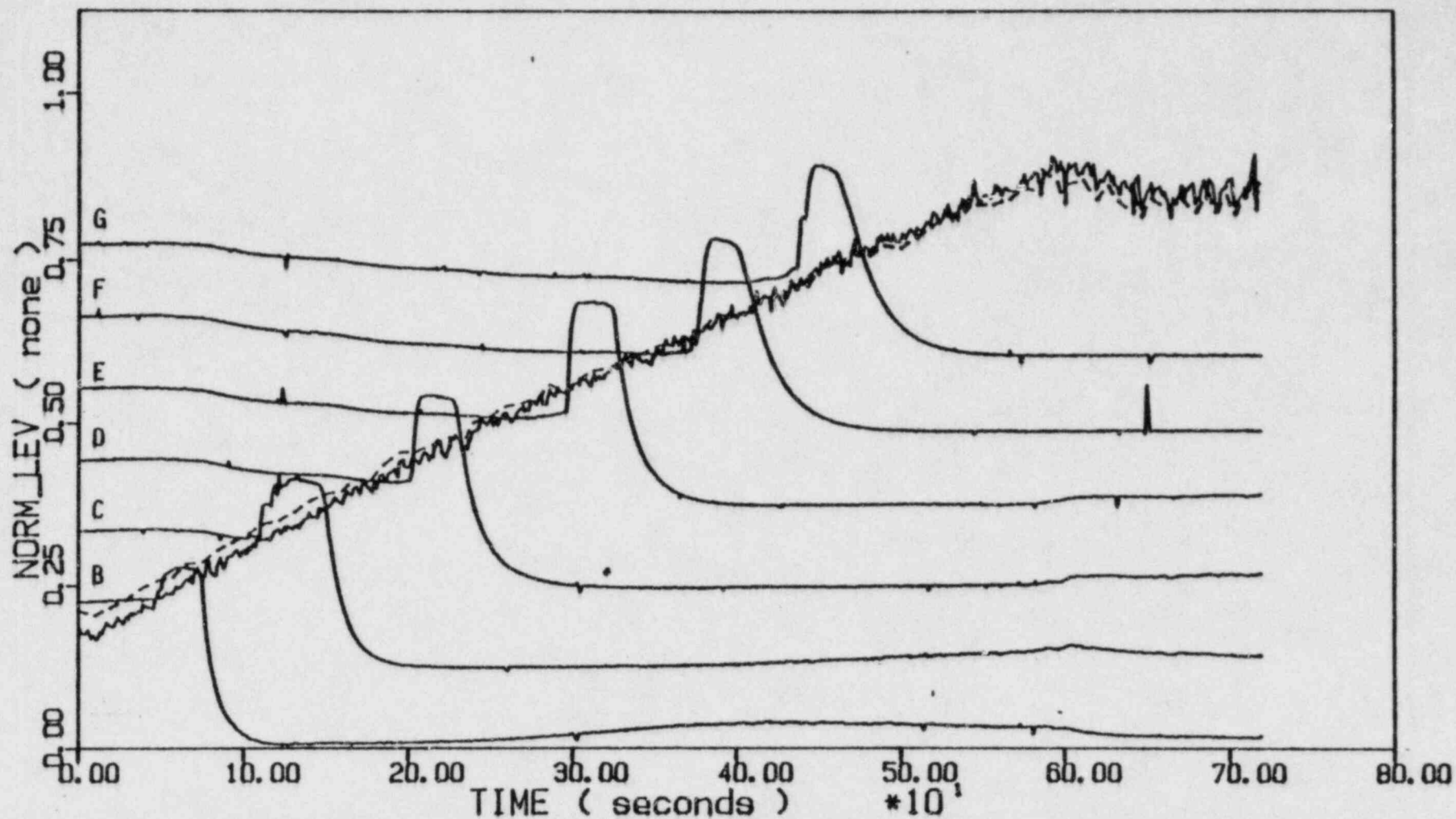


Figure 3-105. Comparison of collapsed liquid level calculated from differential pressure transducers PDE-T3 (3) and PDE-T7 (7) with the responses of slow sensors in rod #2 during test UH2201 reflood.

IN-CORE TEST SERIES

12 TESTS TOTAL

3 STEADY STATE TESTS

5 BLOWDOWN TESTS

4 REFLOOD TESTS

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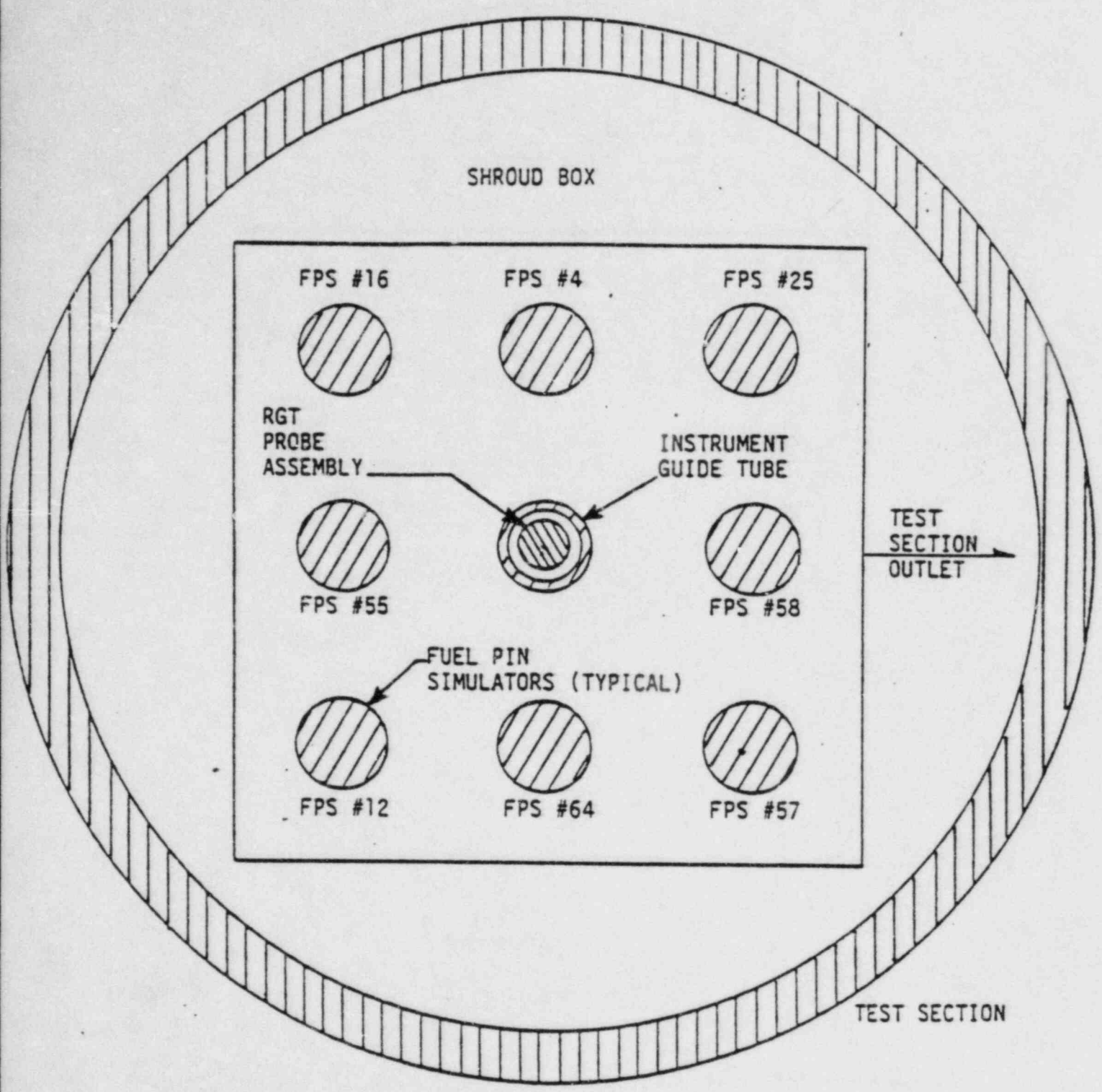
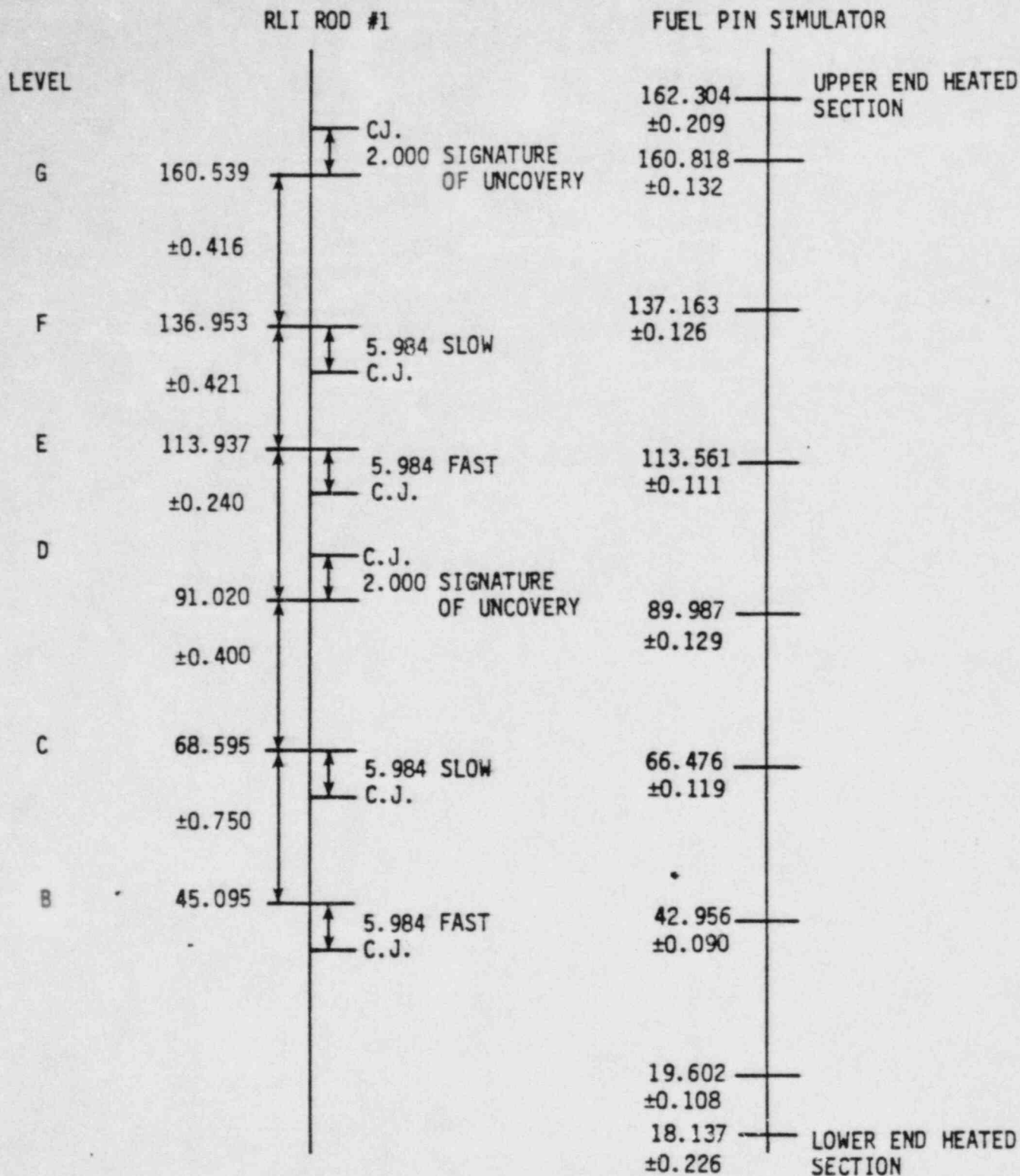


Figure 4-1. In-Core Test Bundle Cross Section.



NOTE: Figure not to scale. All levels are centerline of hot junction. Absolute thermocouple located at cold junction (C.J.)

Zero elevation is centerline of stainless steel ground plate. All dimensions are in inches.

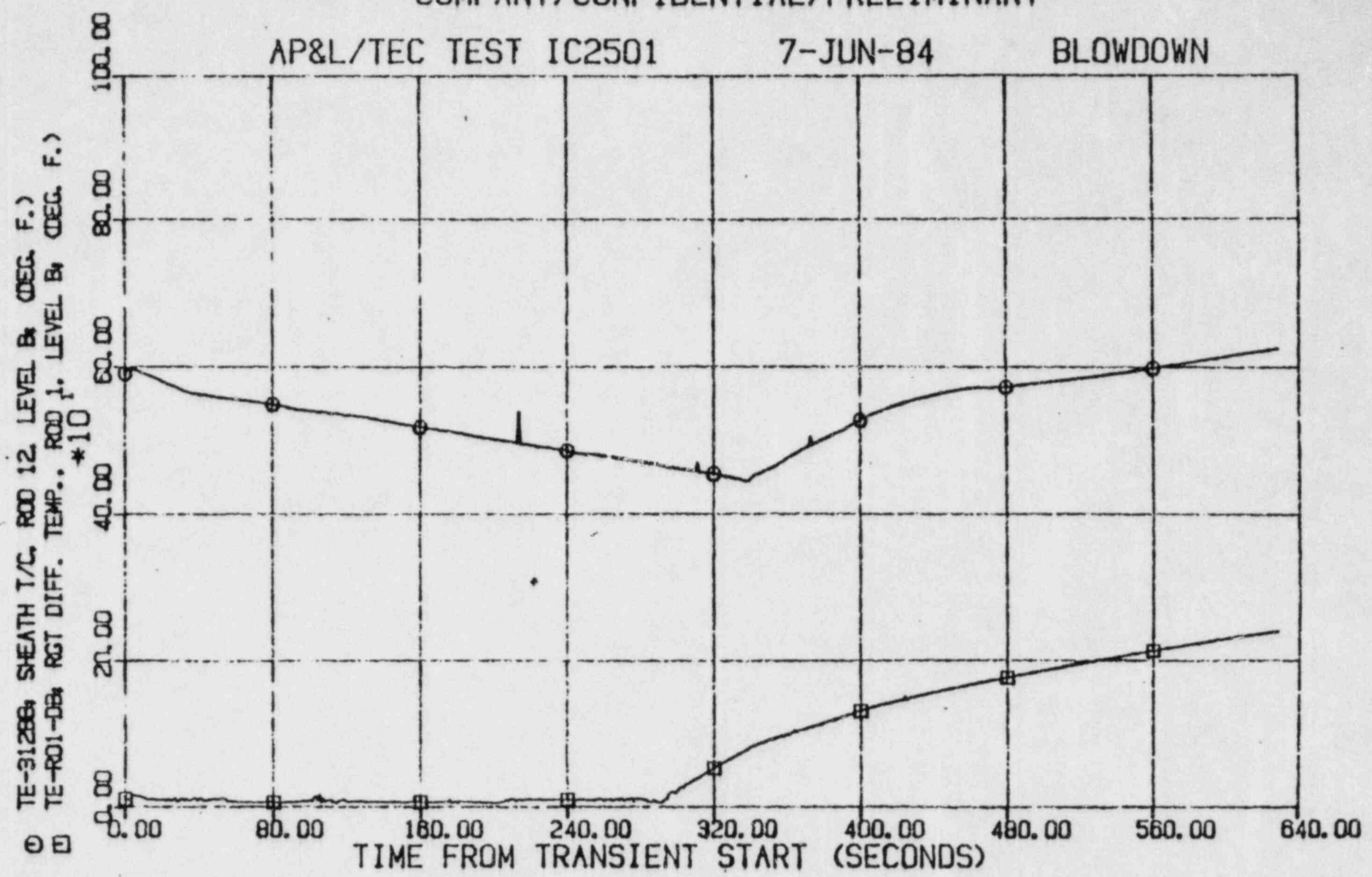
Figure 3. Relative positions of incore bundle sensors.

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AP&L/TEC TEST IC2501

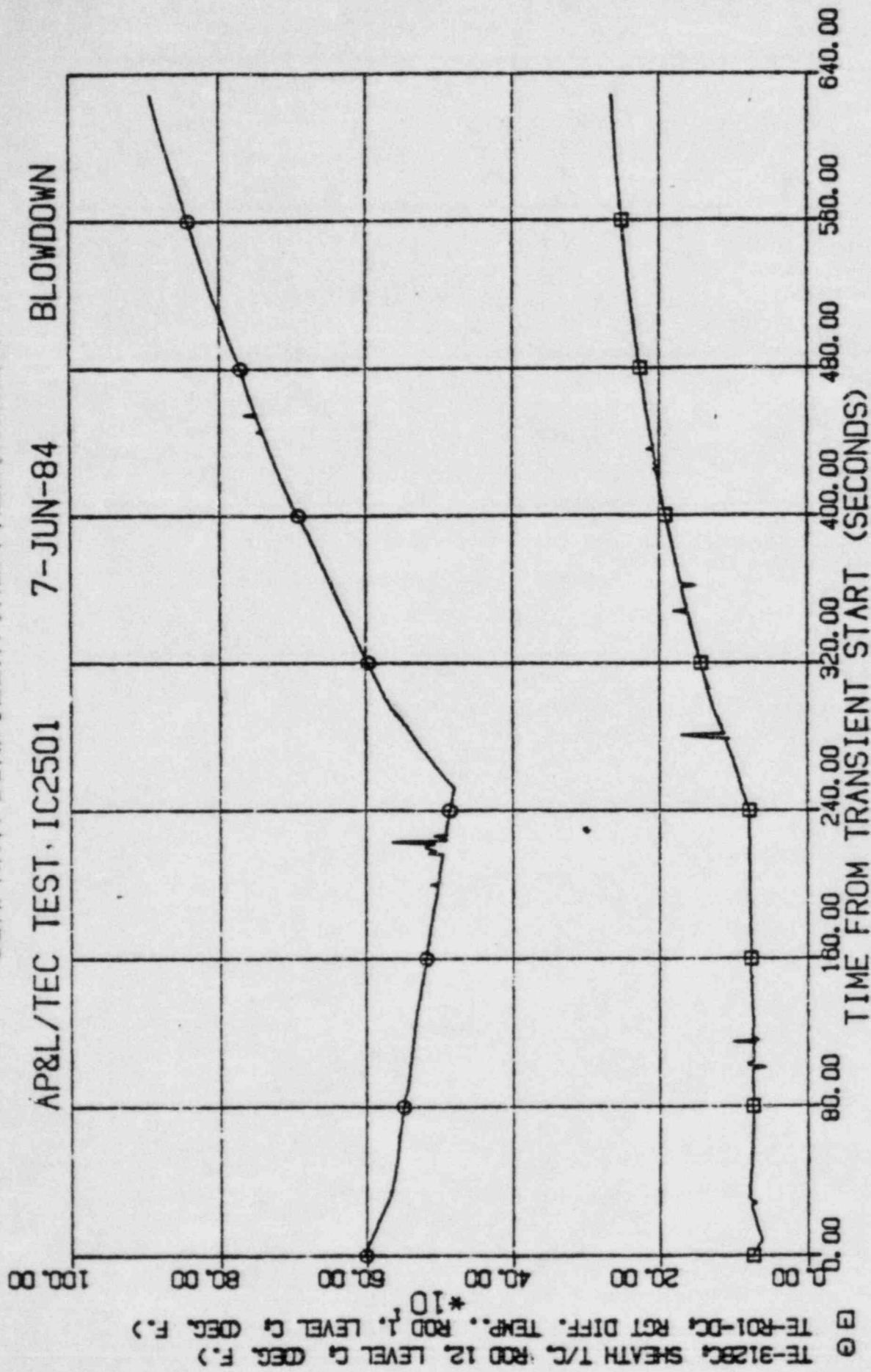
7-JUN-84

BLOWDOWN



COMPANY/CONFIDENTIAL/PRELIMINARY

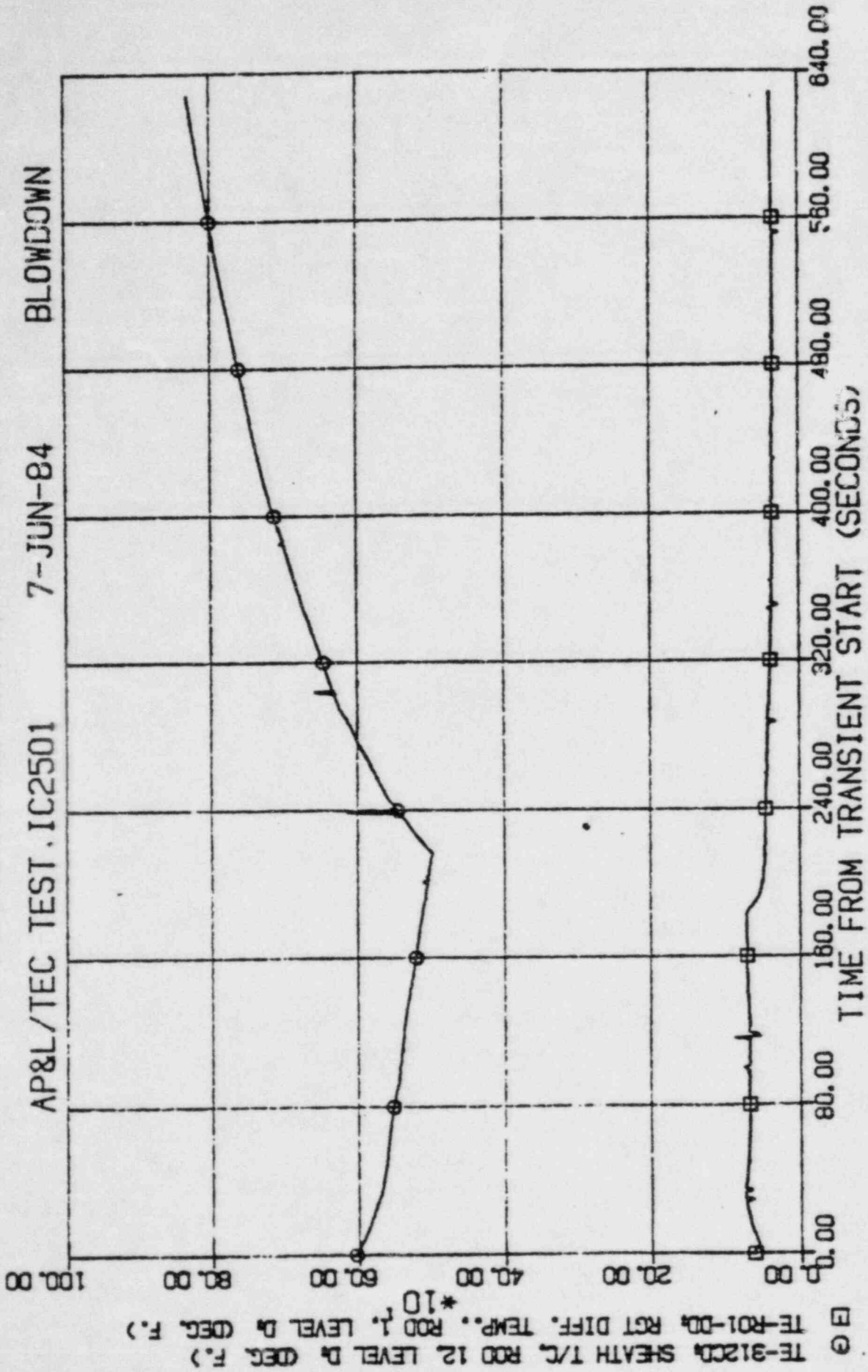
AP&L/TEC TEST IC2501 7-JUN-84 BLOWDOWN



TE-312BC SHEATH T/C, ROD 12, LEVEL 6 (DEG. F.)
TE-R01-DC RGT DIFF. TEMP., ROD 1, LEVEL 6 (DEG. F.)
*10

COMPANY/CONFIDENTIAL/PRELIMINARY

AP&L/TEC TEST . IC2501 7--JUN-84 BLOWDOWN



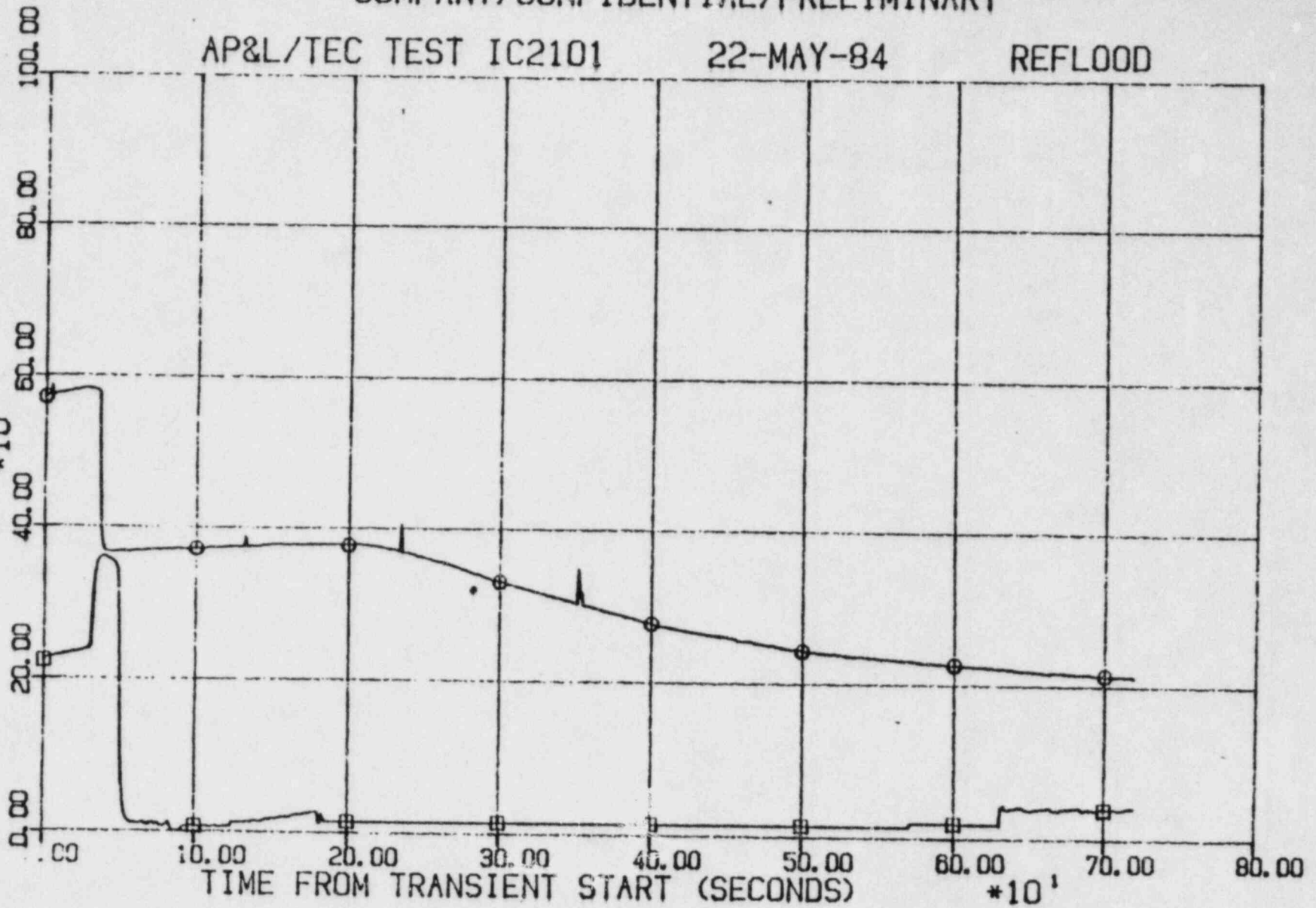
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AP&L/TEC TEST IC2101

22-MAY-84

REFLOOD

TE-31288; SHEATH T/C, ROD 12, LEVEL B; (DEG. F.)
TE-RO1-DB; RGT DIFF. TEMP., ROD 1, LEVEL B; (DEG. F.)

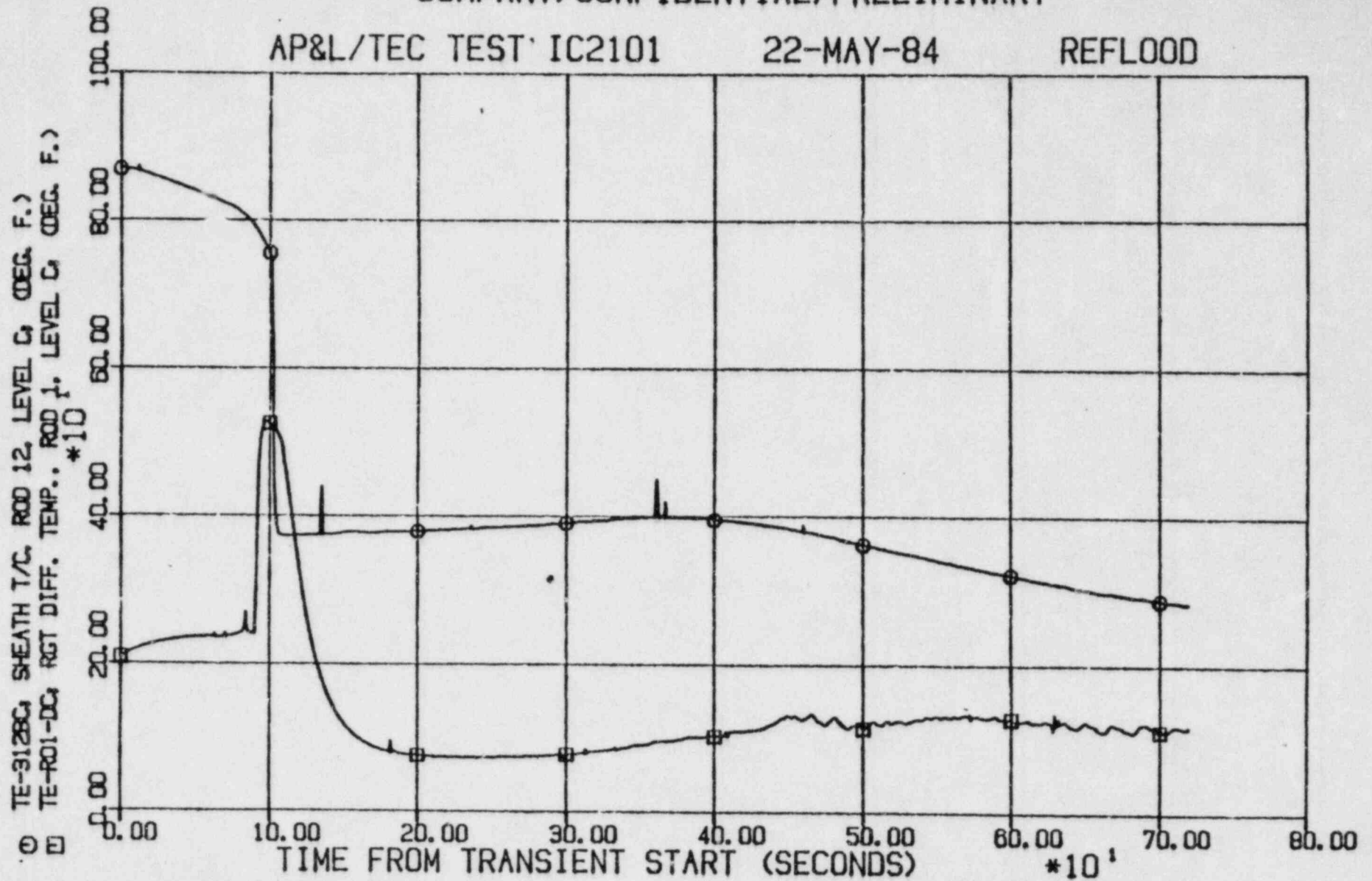


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AP&L/TEC TEST IC2101

22-MAY-84

REFLOOD

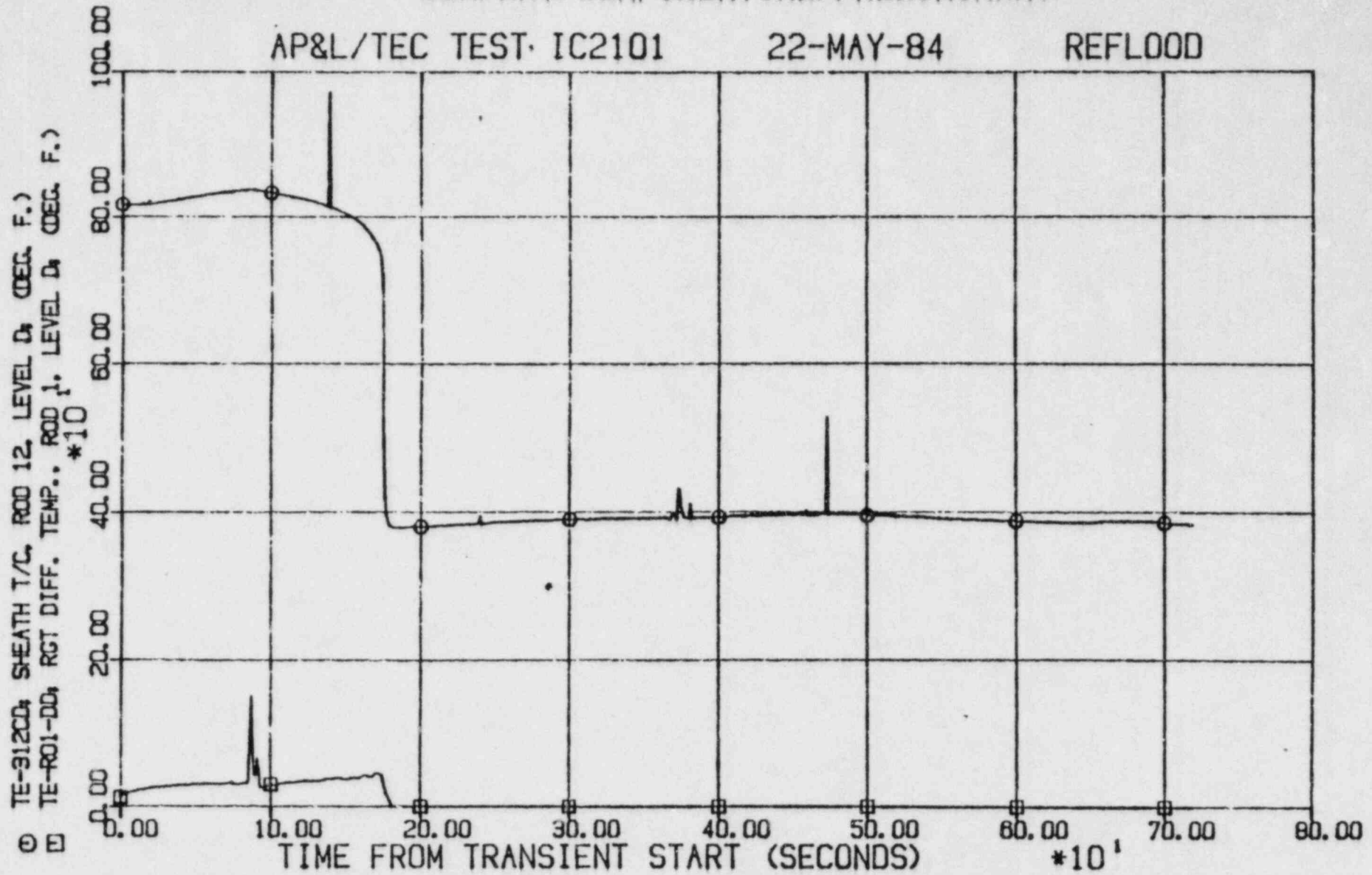


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AP&L/TEC TEST IC2101

22-MAY-84

REFLOOD



SUMMARY

- o TESTING COMPLETED - ANO 1 AND 2
- o TESTING SUCCESSFUL - ANO 1 AND 2
- o FINAL ENGINEERING PROCEEDING - ANO-2
- o MATERIAL ORDERED - ANO-2
- o INSTALLATION FOR 2R4 PROCEEDING - ANO-2

MEETING SUMMARY DISTRIBUTION

Licensee: Arkansas Power & Light Company (AP&L)

*Copies also sent to those people on service (cc) list for subject plant(s).

Docket File

NRC PDR

L PDR

ORB#3 Rdg

ORB#3 Summary File

JRMiller

PMKreutzer

Project Manager

OELD

ELJordan

JMTaylor

ACRS-10

NRC Participants