PAUL SCHERRER INSTITUT

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Document Title

PANDA Transient Tests

M3B Integral System Test Apparent Test Results

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Rev.	Prepared / Revised by	P-PM	G-PM	G-SQR	Issue Date	Remarks
0	C. Aubert	J. Rau 10-IV-96	J. Torbeck 10 April 96	G. Wingate 10 April 96	11 April 96	G-PM & G-SQR approvals on file (P-ERM-37, p.2)

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Titel: **PANDA Transient Tests M3B Integral System Test Apparent Test Results**	Ersetzt ---
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Summary:

This Apparent Test Results (ATR) report is compiled in accordance with the requirements specified in the Test Plan (TP) 25A5764R2 (GE document) section 10. The report covers the results for the PANDA Transient Test M3B. The ATR summarizes the apparent results and includes: test number, test objective, test date and time, data recording period, data analysis period, name of data file and ORACLE data tables, list of failed or unavailable instruments considered to be required for the test, list of required instruments with zero or reference check points not in tolerance or in over-range or under-range during test, deviations from test procedure and problems which occured during test. Statements are made whether or not the test objective has been reached and the data were recorded correctly. A table of actual initial conditions based on average and standard deviation over one minute time period just before the test start for all parameters with a specified acceptance criteria in section 9.2 of TP is provided as well as time history plots over test duration for all top priority measurements.

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PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

TEST M3B

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TEST M3B

1. TEST OBJECTIVES:

The objectives of the PANDA integral system tests are to provide additional data to: a) confirm the capability of TRACG to predict SBWR containement system performance, including potential systems interaction effects *(Integral System Tes*ts) and b) demonstrate startup and long-term operation of a passive containement cooling system *(Concept Demonstrati*on).

The specific objective of test M3B which was conducted with nominal post-LOCA conditions after a Main Steam Line Break is to establish the base case and demonstrate transient system response and repeatability.

2. REFERENCE DOCUMENTS:

Test Plan:	GE document 25A5764R2
Test Procedure:	ALPHA-520-2

3. TEST DATE/TIME:

Test Start:	31-OCT-95 / 18:25:38
Test Stop:	01-NOV-95 / 14:38:26
Test Duration:	20:12:48
Test Period:	0 to 72768 sec

4. DATA RECORDING PERIOD:

Start:	31-OCT-95 / 18:02:22
Stop:	01-NOV-95 / 14:38:26
Data Recording Period:	-1396 to 72768 sec

5. FILE NAMES:

Raw Data:	panda_M3B.dat
DAS-Configuration / Channel List:	kbt99999999.o12

6. ORACLE DATA TABLES:

PANDA_M3B_MT_LINE
PANDA_M3B_MT_POOL
PANDA_M3B_MT_REF
PANDA_M3B_MT_VESSEL
PANDA_M3B_M_OTHER
PANDA_M3B_M_TIME
PANDA_M3B_KBT
INFO_TESTS

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7. RPV POWER CURVE:

Power analys[1] period: 20 to 20600 sec and 21800 to 72768 sec

Maximum negative deviation:
Maximum positive deviation:
Standard deviation:

Power curve tolerance: ±25.0 [kW]

Definition of RPV power deviation (ΔPower) and standard deviation (σ):

$$\Delta Power = Power_{th} - \sum_{j=1}^{6} MW.RP.j$$

$$\sigma = \sqrt{\frac{1}{n}\sum_{k=1}^{n}\left(Power_{th}^{k} - \sum_{j=1}^{6} MW.RP.j^{k}\right)^{2}}$$

$Power_{th}$: theoretical power

$\sum_{j=1}^{6} MW.RP.j$: measured power

n: # of measurements throughout the test

8. TEST INSTRUMENTATION

LIST OF FAILED OR UNAVAILABLE REQUIRED INSTRUMENTS:

Air partial pressure in DW1	MPG.D1.3	Back-up instrument: MPG.D1.2
Air partial pressure in DW2	MPG.D2.2	(see NCR P-016)
	MPG.D2.3	(see NCR P-016)

LIST OF REQUIRED INSTRUMENTS WITH ZERO NOT IN TOLERANCE OR OVER-RANGE OR UNDER-RANGE DURING TEST:

None

9. DEVIATIONS FROM TEST PROCEDURE:

None

1. The power curve analysis has been performed without including power spikes due to switching between rod groups (see NCR P-013). This analysis does also not include a test period of 1200 seconds (between 20600 and 21800 sec); it is covered by NCR P-015.

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10. LIST OF DEVIATIONS FROM REQUESTED INITIAL CONDITIONS:

11. TEST PROCESSING

PROBLEMS:

None

HAS THE TEST OBJECTIVE BEEN REACHED:

Yes

HAVE THE DATA BEEN CORRECTLY RECORDED:

Yes

12. WATER TEMPERATURE FOR PCC POOL REFILLING

13. REQUESTED INITIAL CONDITIONS

DATA ANALYSIS PERIOD FOR INITIAL CONDITIONS:

Data analysis period: -556 to -496 sec

Initial conditions are calculated over one minute just before connection of Drywells to RPV (phase n°123.9 of Test Procedure)

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TABLE OF INITIAL CONDITIONS

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
ENVIRONMENT PARAMETERS						
Atmospheric pressure	MP.EN	bar				
Temperature of saturation for atmospheric pressure (T_{sat_EN})		C				
RPV PARAMETERS						
Total pressure	MP.RP.1	bar				
Fluid temperatures:						
Spatial average	T_{F_mean}(RP)	C				
Local	MTF.RP.1	C				
	MTF.RP.2	C				
	MTF.RF.3	C				
	MTF.RP.4	C				
	MTF.RP.5	C				
Water level	ML.RP.1	m				
DRYWELL PARAMETERS						
*Total pressure	MP.D1	bar				
Air partial pressure	MPG.D1.1	bar				
	MPG.D1.2	bar				
	MPG.D2.1	bar				
	MPG.D2.2	bar				
Gas temperatures:						
Spatial average	T_{G_mean}(D1)	C				
Local	MTG.D1.1	C				
	MTG.D1.2	C				
	MTG.D1.3	C				
	MTG.D1.4	C				
	MTG.D1.5	C				
	MTG.D1.6	C				

* The Drywell total pressures are not independant variables, they are given by temperatures and air partial pressures. The corresponding tolerance is calculated from temperature and gas partial pressure tolerances.

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TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
DRYWELL PARAMETERS (Cont'd)						
Spatial average	$T_{G\_mean}(D2)$	C				
Local	MTG.D2.1	C				
	MTG.D2.2	C				
	MTG.D2.3	C				
	MTG.D2.4	C				
	MTG.D2.5	C				
	MTG.D2.6	C				
Water level	ML.D1	m				
	ML.D2	m				
SUPPRESSION CHAMBER PARAMETE						
Total pressure	MP.S1	bar				
**Air partial pressure	MPG.S1	bar				
	MPG.S2	bar				
Water temperatures:						
Spatial average	$T_{W\_mean}(S1)$	C				
Local	MTL.S1.1	C				
	MTL.S1.2	C				
	MTL.S1.3	C				
	MTL.S1.4	C				
	MTL.S1.5	C				
	MTL.S1.6	C				
Spatial average	$T_{W\_mean}(S2)$	C				
Local	MTL.S2.1	C				
	MTL.S2.2	C				
	MTL.S2.3	C				
	MTL.S2.4	C				

**The Suppression Chamber air partial pressures are not independant variables, they are given by temperatures and total pressures. The corresponding tolerance is calculated from temperature and total pressure tolerances.

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TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
SUPPRESSION CHAMBER PARAMETERS (Cont'd)						
Water Temperatures:						
Local	MTL.S2.5	C				
	MTL.S2.6	C				
Gas temperatures:						
Spatial average	T_{G_mean}(S1)	C				
Local	MTG.S1.1	C				
	MTG.S1.2	C				
	MTG.S1.3	C				
	MTG.S1.4	C				
	MTG.S1.5	C				
	MTG.S1.6	C				
Spatial-average	T_{G_mean}(S2)	C				
Local	MTG.S2.1	C				
	MTG.S2.2	C				
	MTG.S2.3	C				
	MTG.S2.4	C				
	MTG.S2.5	C				
	MTG.S2.6	C				
Water level	ML.S1	m				
	ML.S2	m				
GDCS PARAMETERS						
Total pressure	MP.GD	bar				
Fluid temperatures:						
Spatial average	T_{F_mean}(GD)	C				
Local	MTF.GD.1	C				
	MTF.GD.2	C				
	MTF.GD.3	C				
	MTF.GD.4	C				

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TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
GDCS PARAMETERS (Cont'd)						
	MTF.GD.5	C				
	MTF.GD.6	C				
	MTF.GD.7	C				
Water level	ML.GD	m				
PCC1 POOL PARAMETERS						
Water temperatures:						
Spatial average	$T_{w\_mean}(U1)$	C				
Local	MTL.U1.1	C				
	MTL.U1.2	C				
	MTL.U1.3	C				
	MTL.U1.4	C				
	MTL.U1.5	C				
	MTL.U1.6	C				
	MTL.U1.7	C				
Water level	ML.U1	m				
PCC2 POOL PARAMETERS						
Water temperatures:						
Spatial average	$T_{w\_mean}(U2)$	C				
Local	MTL.U2.1	C				
	MTL.U2.2	C				
	MTL.U2.3	C				
	MTL.U2.4	C				
	MTL.U2.5	C				
	MTL.U2.6	C				
	MTL.U2.7	C				
Water level	ML.U2	m				

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TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
PCC3 POOL PARAMETERS						
Water temperatures:						
Spatial average	$T_{w\_mean}(U3)$	C				
Local	MTL.U3.1	C				
	MTL.U3.2	C				
	MTL.U3.3	C				
	MTL.U3.4	C				
	MTL.U3.5	C				
	MTL.U3.6	C				
	MTL.U3.7	C				
	MTL.U3.8	C				
	MTL.U3.9	C				
	MTL.U3.10	C				
	MTL.U3.11	C				
	MTL.U3.12	C				
	MTL.U3.13	C				
	MTL.U3.14	C				
	MTL.U3.15	C				
	MTL.U3.16	C				
	MTL.U3.17	C				
	MTL.U3.18	C				
	MTL.U3.19	C				
Water level	ML.U3	m				

PANDA INTEGRAL SYSTEM TEST
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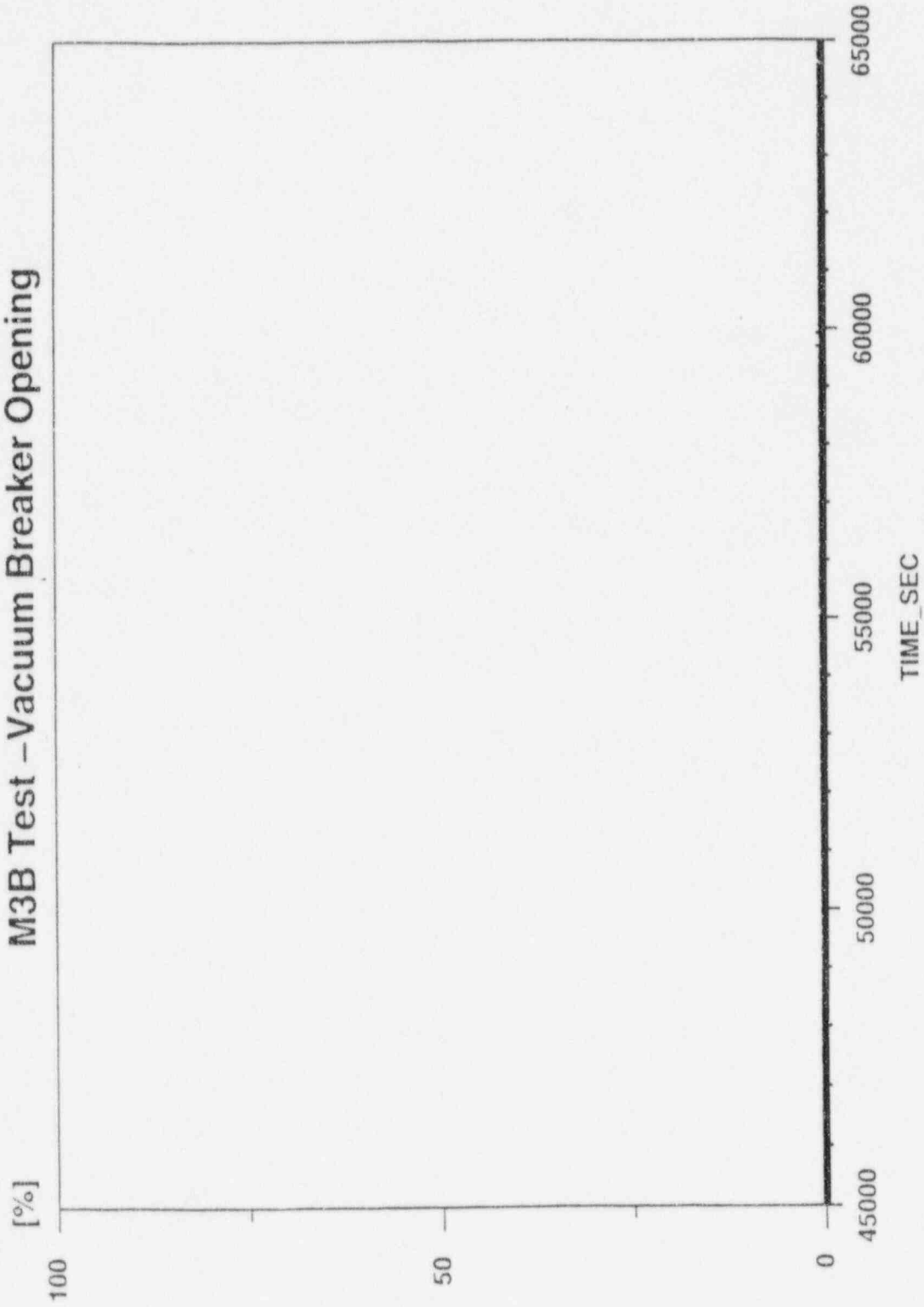

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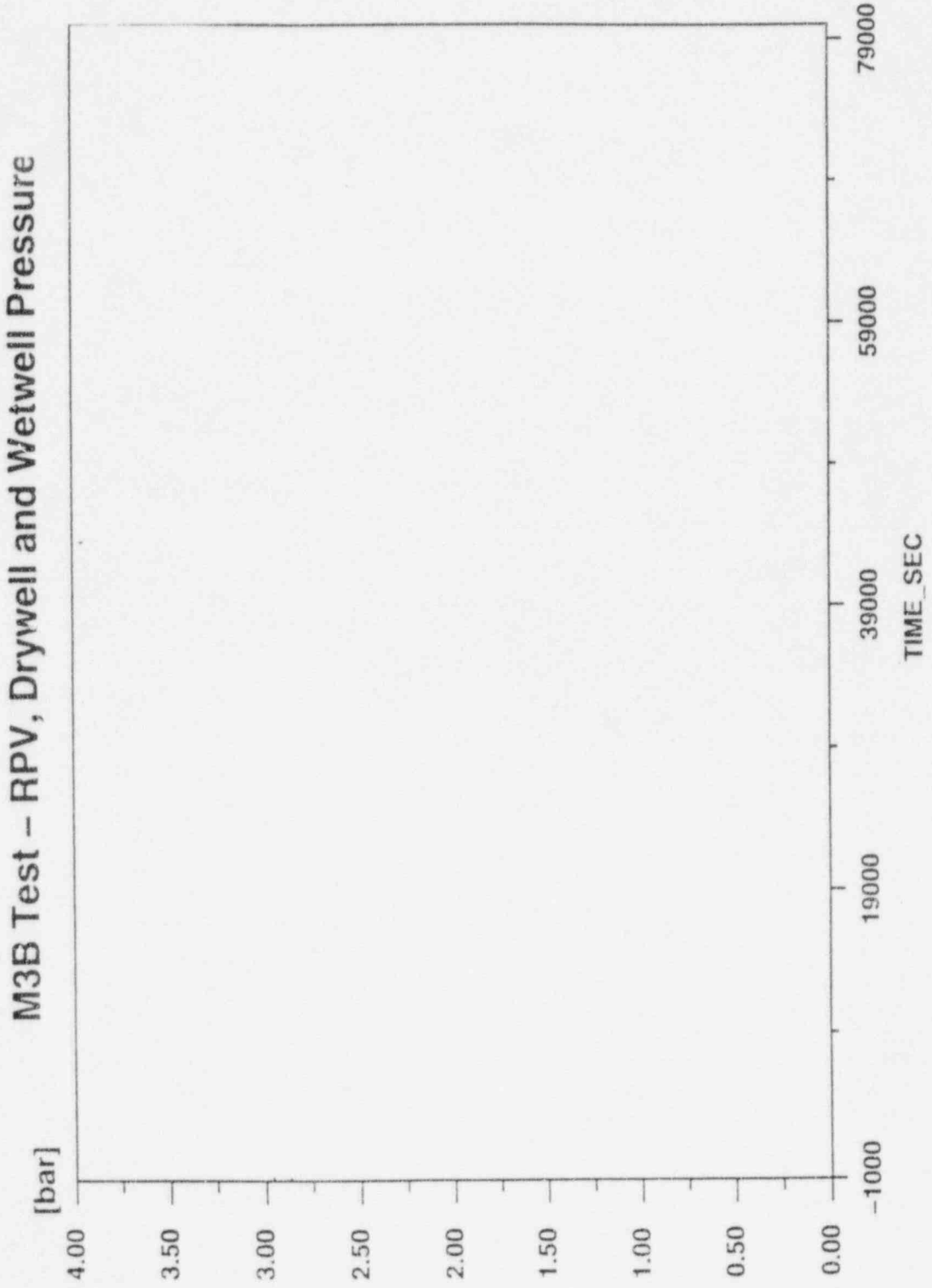

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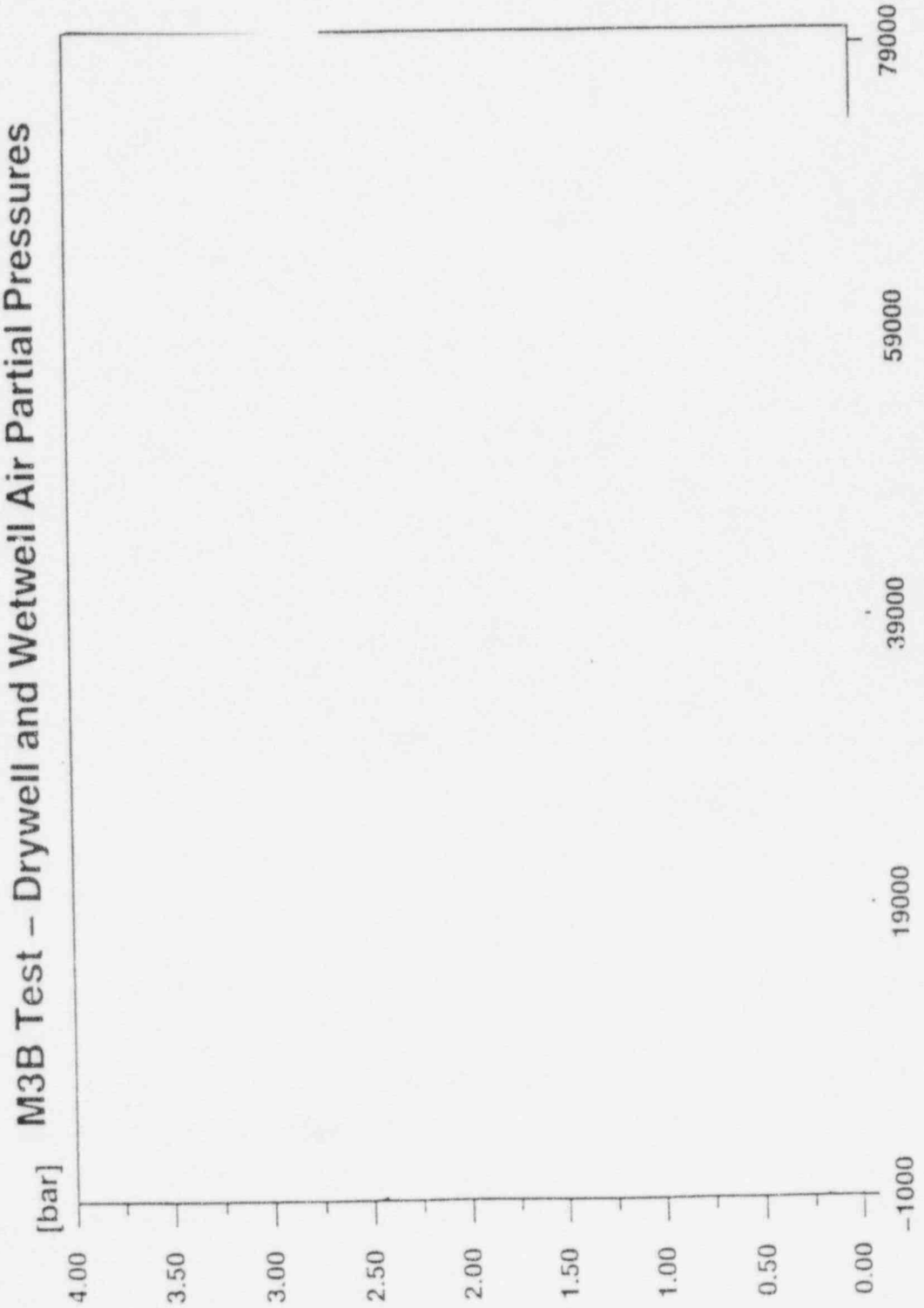

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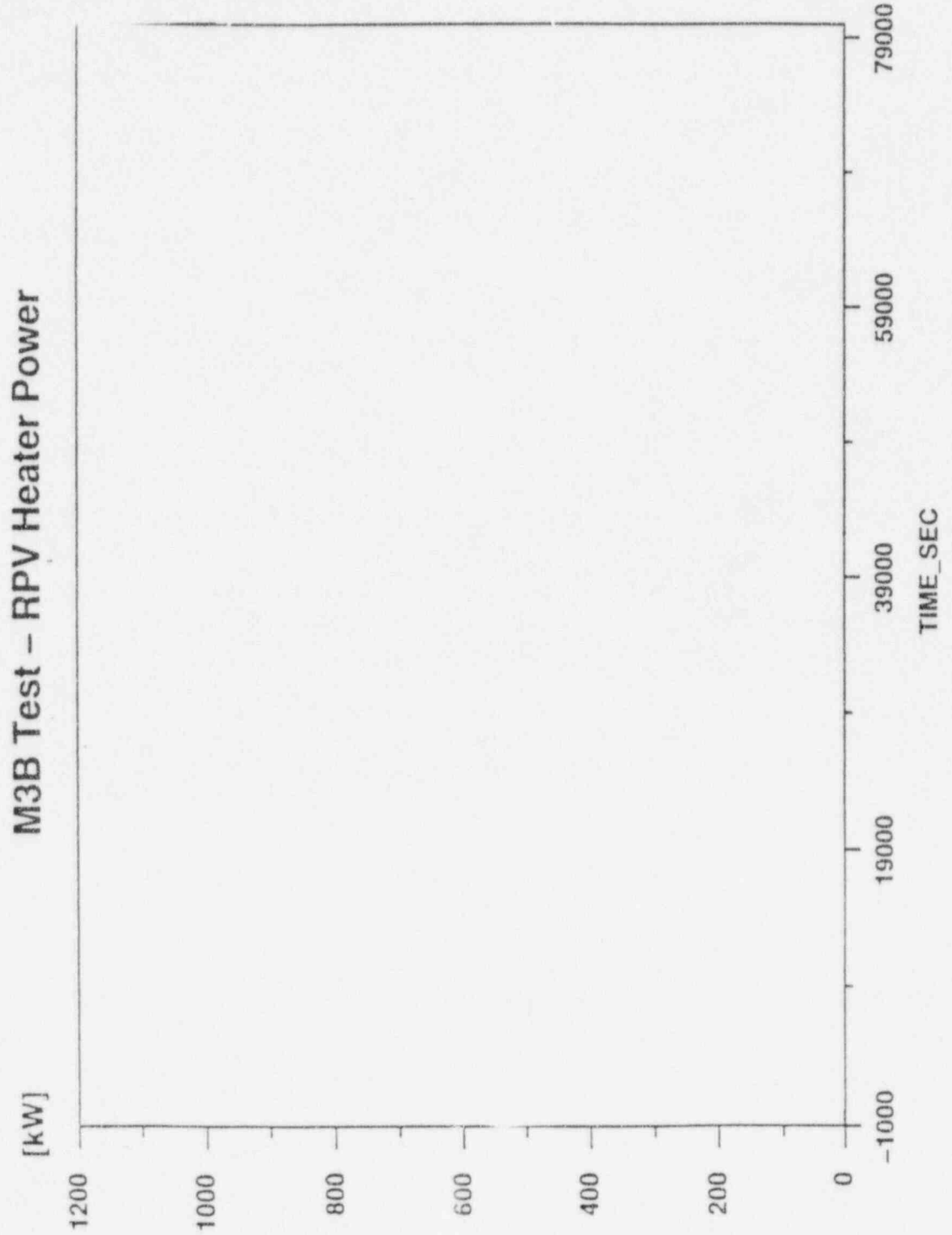

PANDA INTEGRAL SYSTEM TEST
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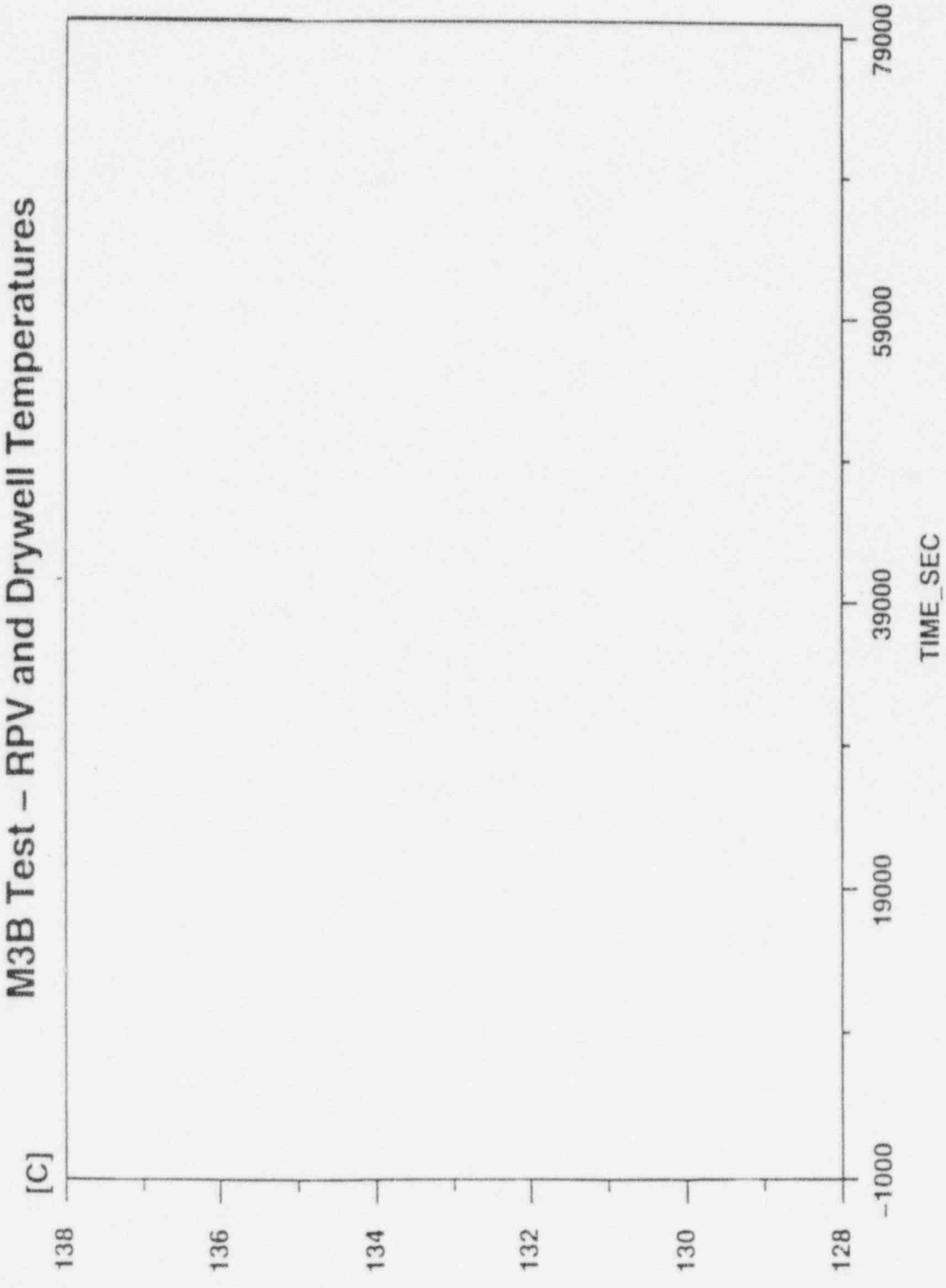

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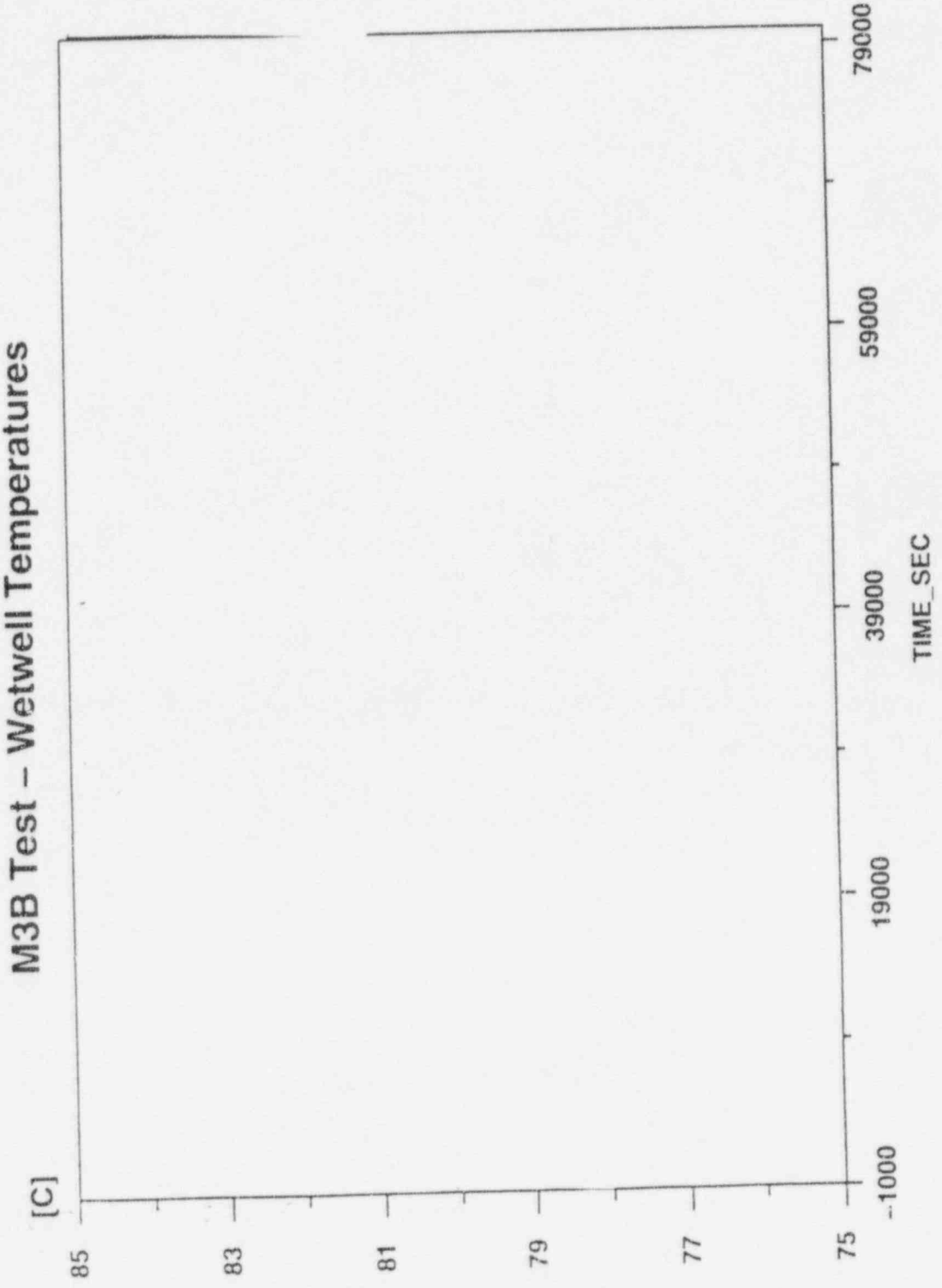

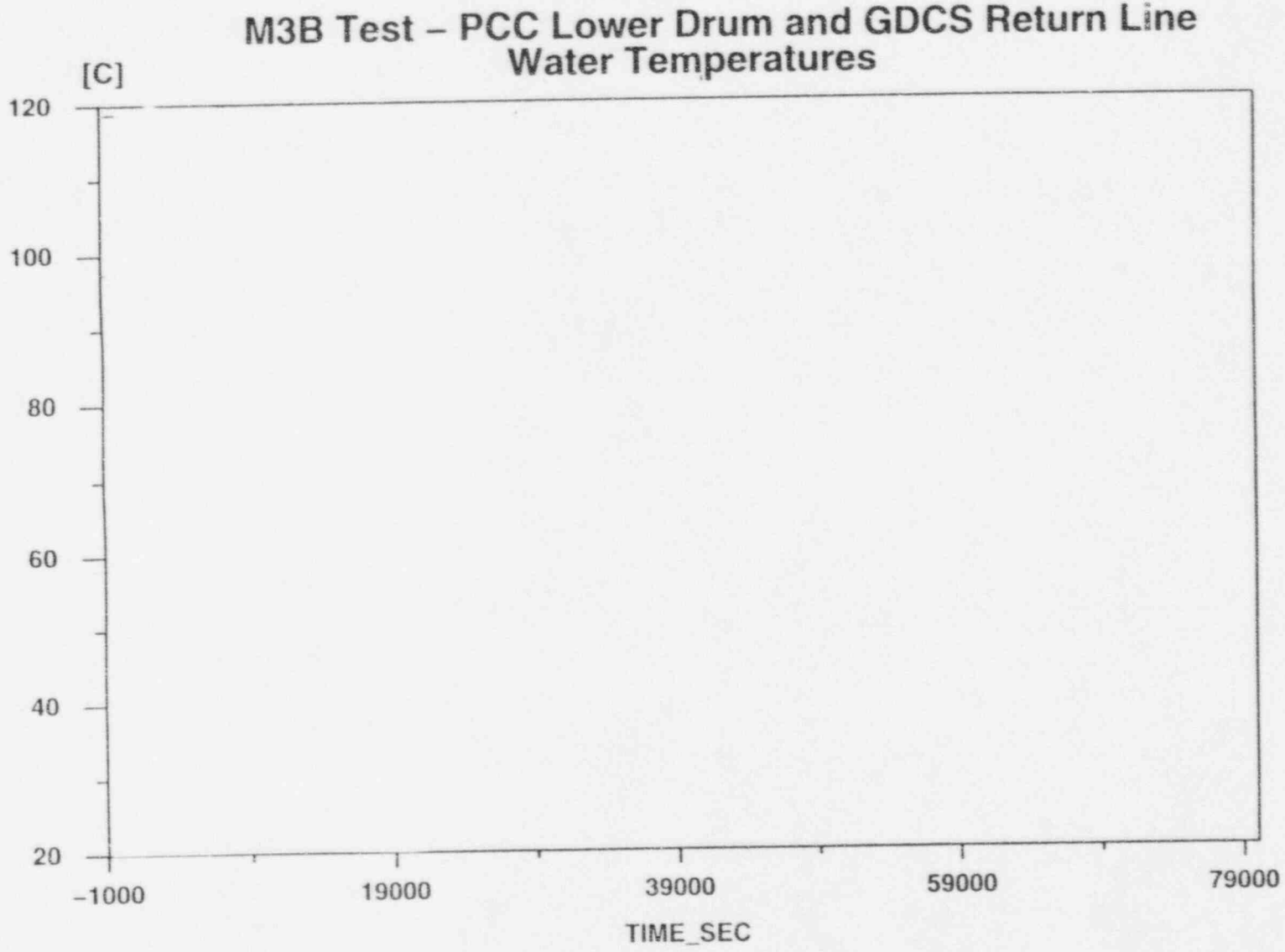
M3B Test – PCC Lower Drum and GDCS Return Line
Water Temperatures
[C]
120
100
80
60
40
20
-1000
19000
39000
59000
79000
TIME_SEC

PANDA INTEGRAL SYSTEM TEST
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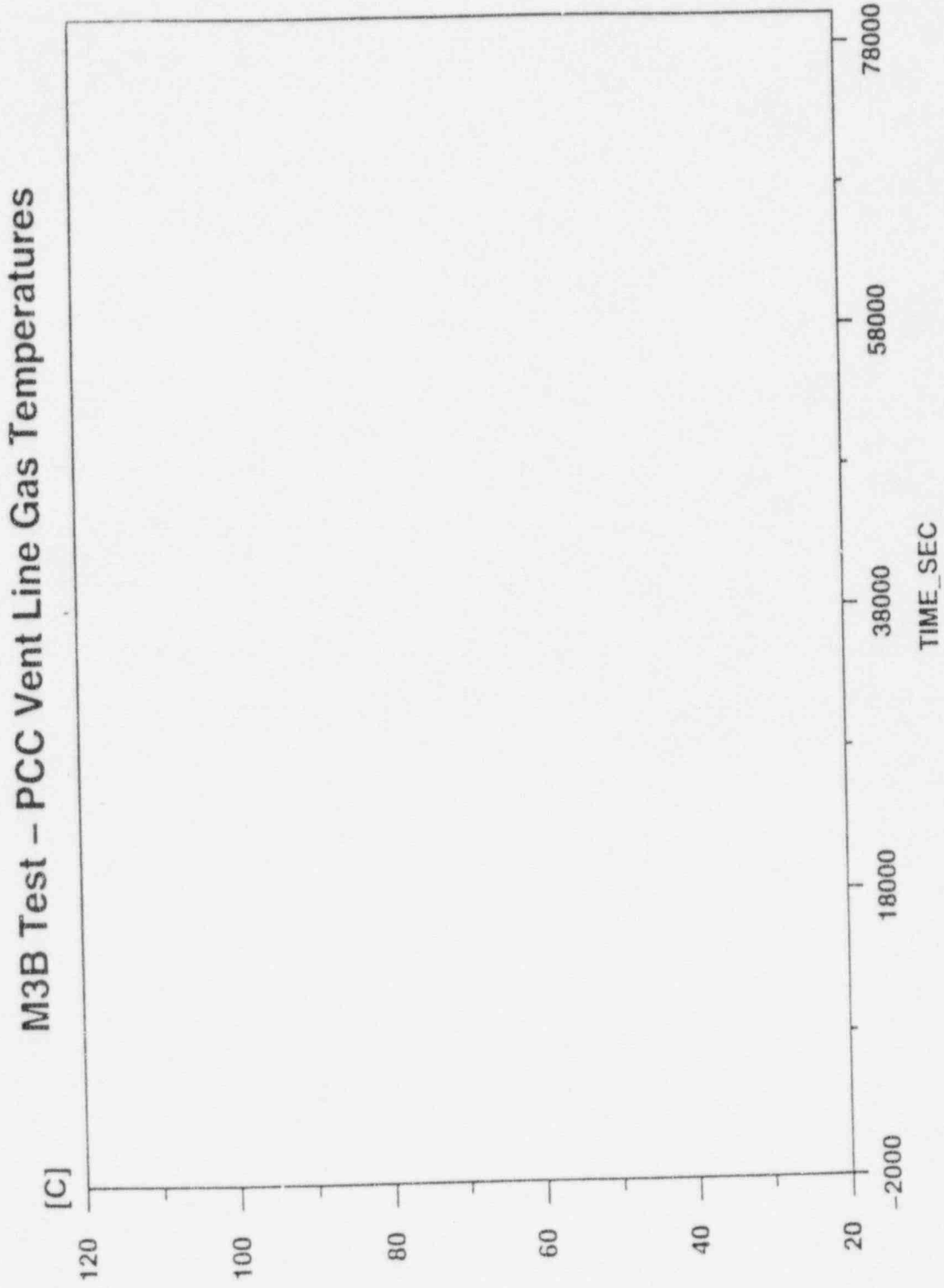

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