PAUL SCHERRER INSTITUT

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Document Title

PANDA Transient Tests

M3A Integral System Test Apparent Test Results

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0	C. Aubert	J. Bajo 28-III-96	J. Torbeck 28 March 96	G. Wingate 28 March 96	29 March 96	G-PM & G-SQR approvals on file (P-ERM-36, p.2)

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Titel: **PANDA Transient Tests M3A 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 M3A. 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 M3A

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TEST M3A

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 Tests)* and b) demonstrate startup and long-term operation of a passive containement cooling system *(Concept Demonstration)*.

The specific objective of test M3A 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:	25-OCT-95 / 22:46:42
Test Stop:	26-OCT-95 / 18:54:57
Test Duration:	20:08:15
Test Period:	0 to 72495 sec

4. DATA RECORDING PERIOD:

Start:	25-OCT-95 / 22:35:50
Stop:	26-OCT-95 / 18:54:57
Data Recording Period:	-652 to 72495 sec

5. FILE NAMES:

Raw Data:	panda_M3A.dat
DAS-Configuration / Channel List:	kbt99999999.o12

6. ORACLE DATA TABLES:

PANDA_M3A_MT_LINE
PANDA_M3A_MT_POOL
PANDA_M3A_MT_REF
PANDA_M3A_MT_VESSEL
PANDA_M3A_M_OTHER
PANDA_M3A_M_TIME
PANDA_M3A_KBT
INFO_TESTS

PANDA INTEGRAL SYSTEM TEST
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7. RPV POWER CURVE:

Power analys[1] period: 20 to 72495 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):

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

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

$Power_{th}$: 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.D2.3	Back-up instrument: MPG.D2.2

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

None

9. DEVIATIONS FROM TEST PROCEDURE:

Non

1 The power curve analysis has been performed without considering power spikes due to switching between rod groups (see NCR p-013).

PANDA INTEGRAL SYSTEM TEST
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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: -212 to -152 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.RP.3	C				
	MTF.RP.4	C				
	MTF.RP.5	C				
Water level	ML.RP.1	m				
DRYWELL PARAMETERS* Total pressure						
2.94	+/- 0.19					
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.

PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

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TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
DRYWELL PARAMETERS (Cont'd)						
Gas temperatures:						
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 PARAMETERS						
Total pressure	MP.S1	bar				
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				

TABLE OF INITIAL CONDITIONS (Cont'd)

**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.

PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

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VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
SUPPRESSION CHAMBER PARAMETERS (Cont'd)						
Water Temperatures:						
	MTL.S2.5	C				
	MTL.S2.6	C				
Gas temperatures:						
Spatial average	$T_{G\_mean}(S1)$	C				
Gas temperatures:						
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				

PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

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VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
GDCS PARAMETERS (Cont'd)						
	MTF.GD.4	C				
	MTF.GD.5	C				
	MTF.GD.6	C				
	MTF.GD.7	C				
Water level	ML.GD	m				
PCC1 PARAMETERS						
Water temperatures:						
Spatial average	TW_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 PARAMETERS						
Water temperatures:						
Spatial average	TW_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				

PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

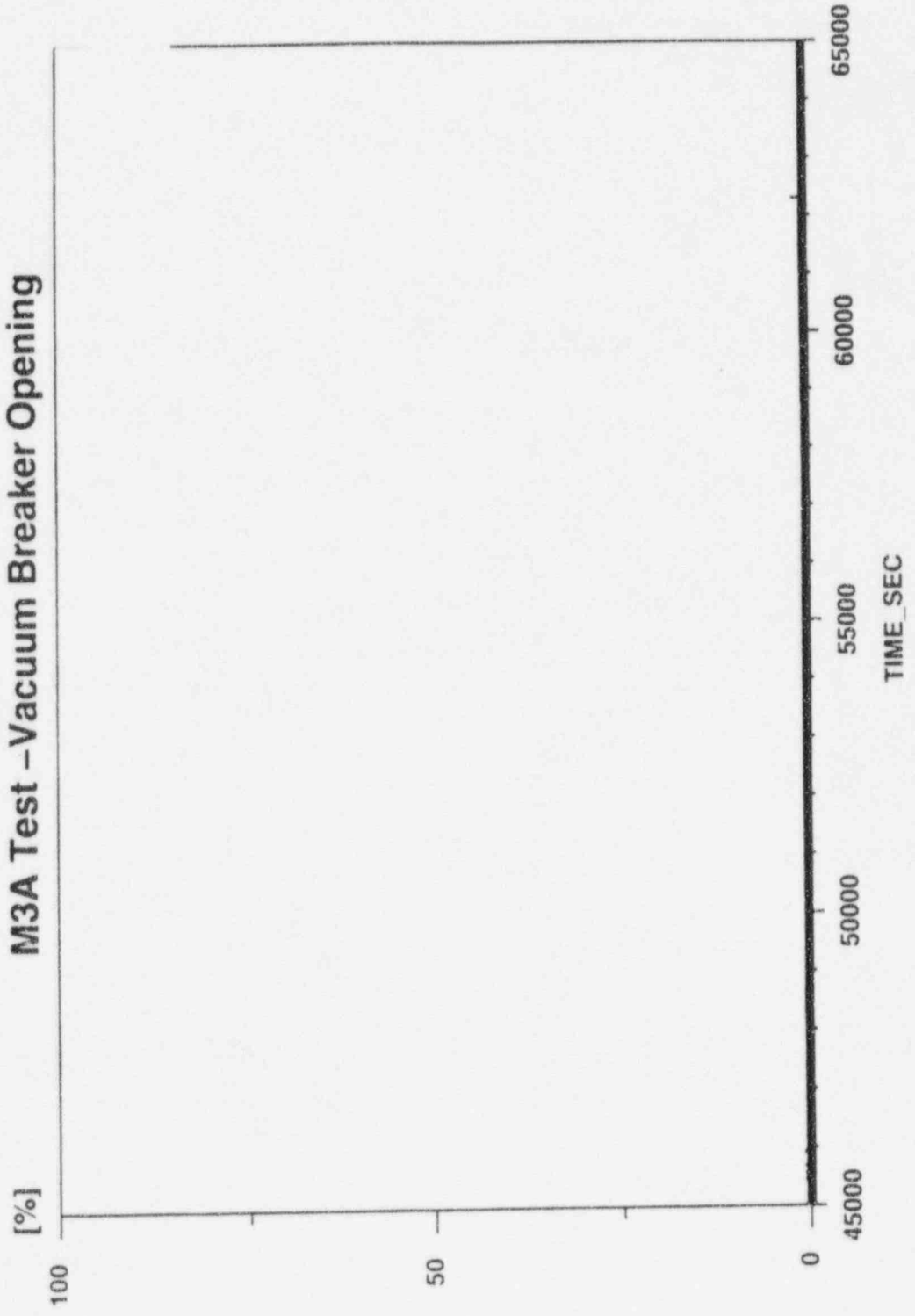
TEST M3A

TABLE OF INITIAL CONDITIONS (Cont'd)

VARIABLE	PROCESSID	UNIT	Average Value	Standard Deviation	Requested Value	Tolerance
PCC3 PARAMETERS						
Water temperatures:						
Spatial average	$TW\_mean(U3)$	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
APPARENT TEST RESULTS

TEST M3A



PANDA INTEGRAL SYSTEM TEST
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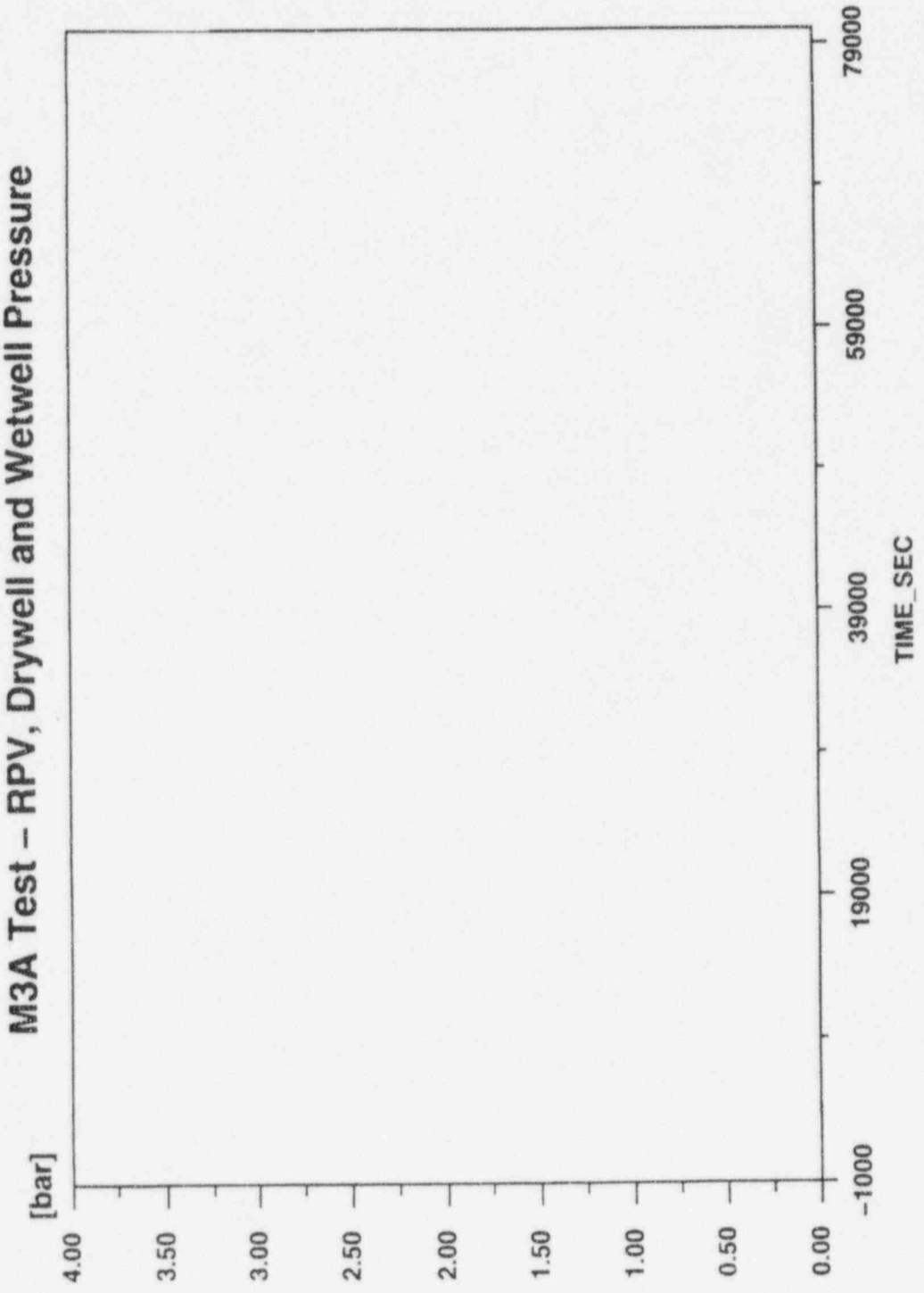
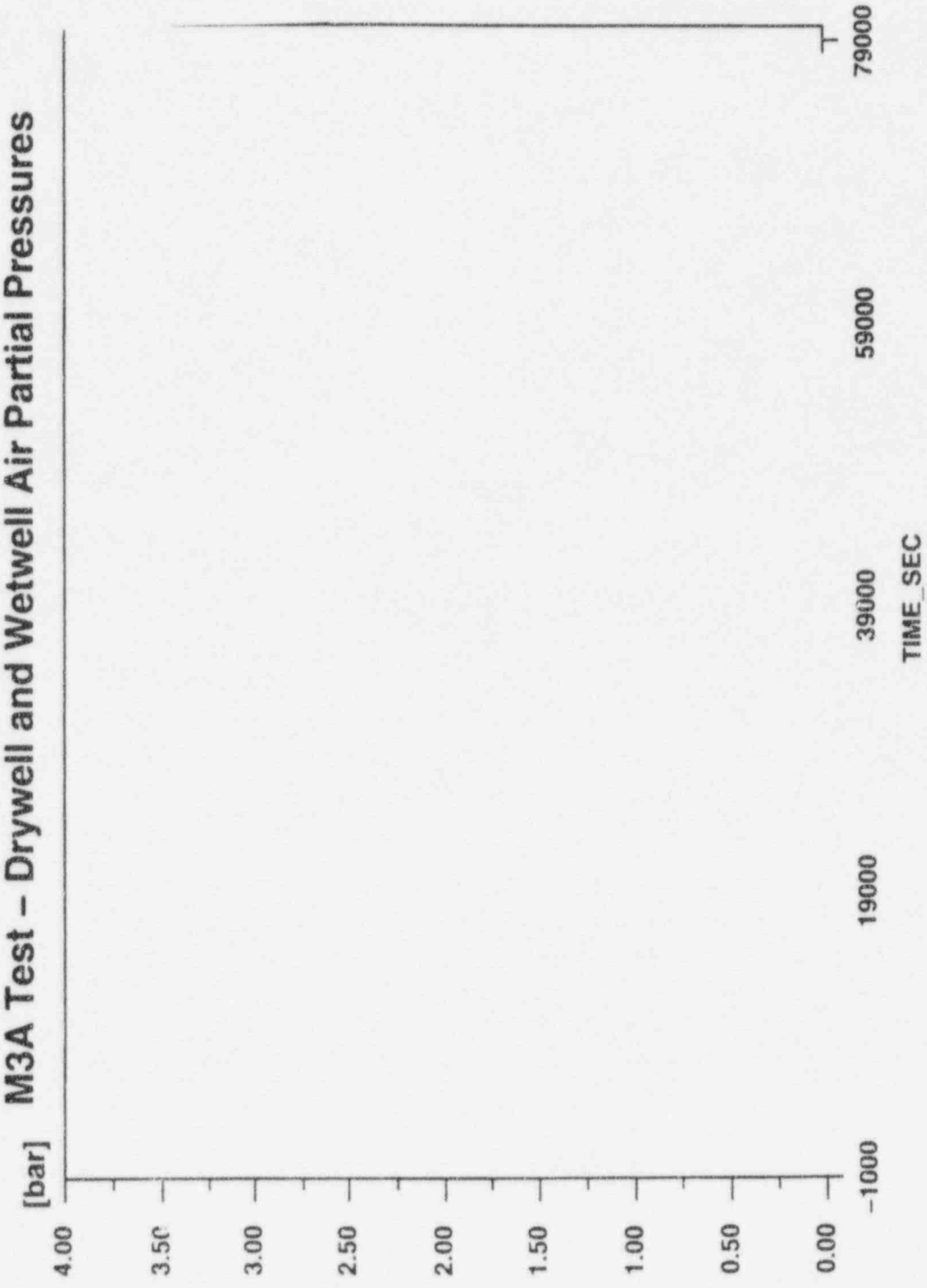
TEST M3A



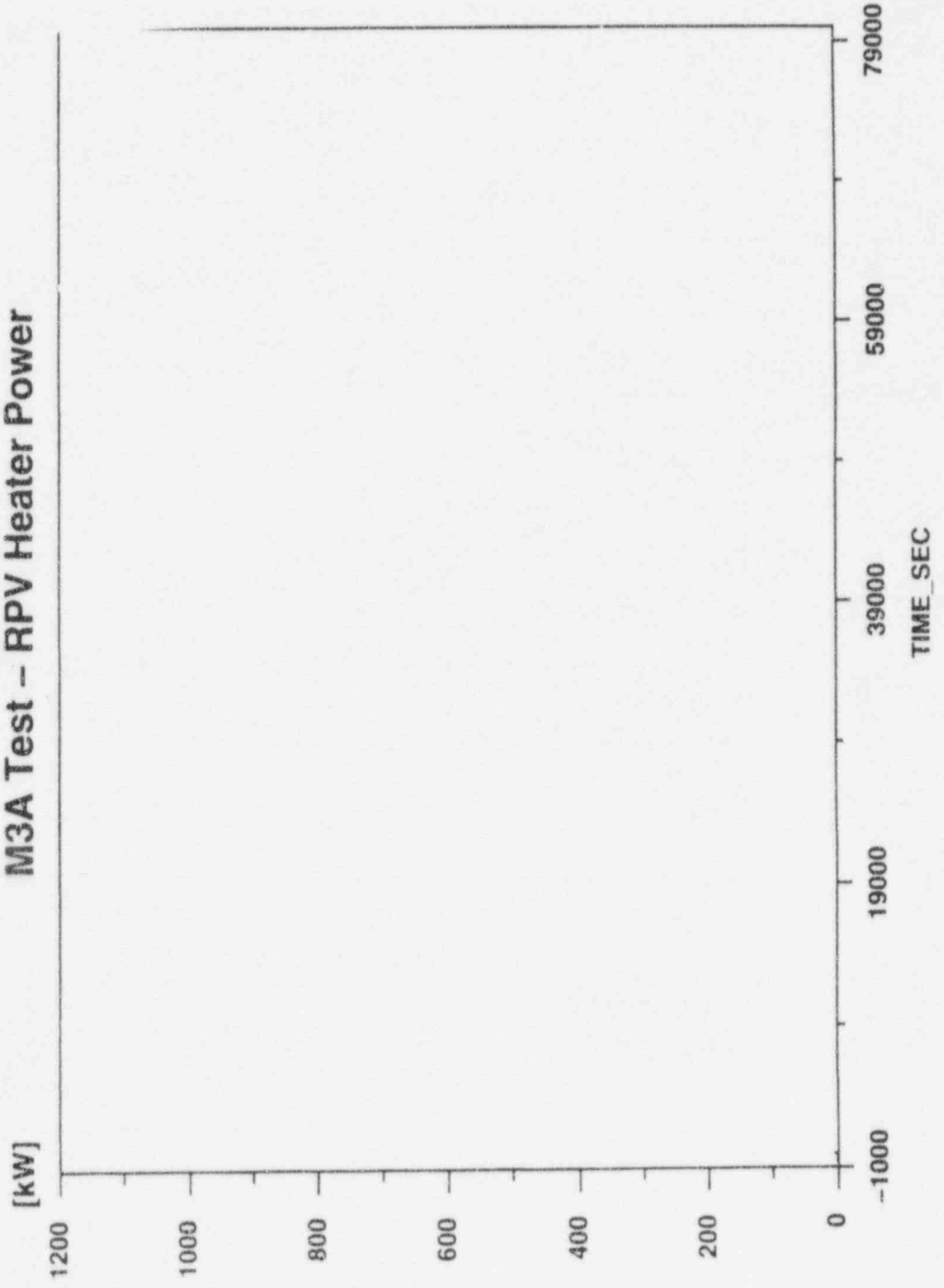
PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

TEST M3A



PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

TEST M3A



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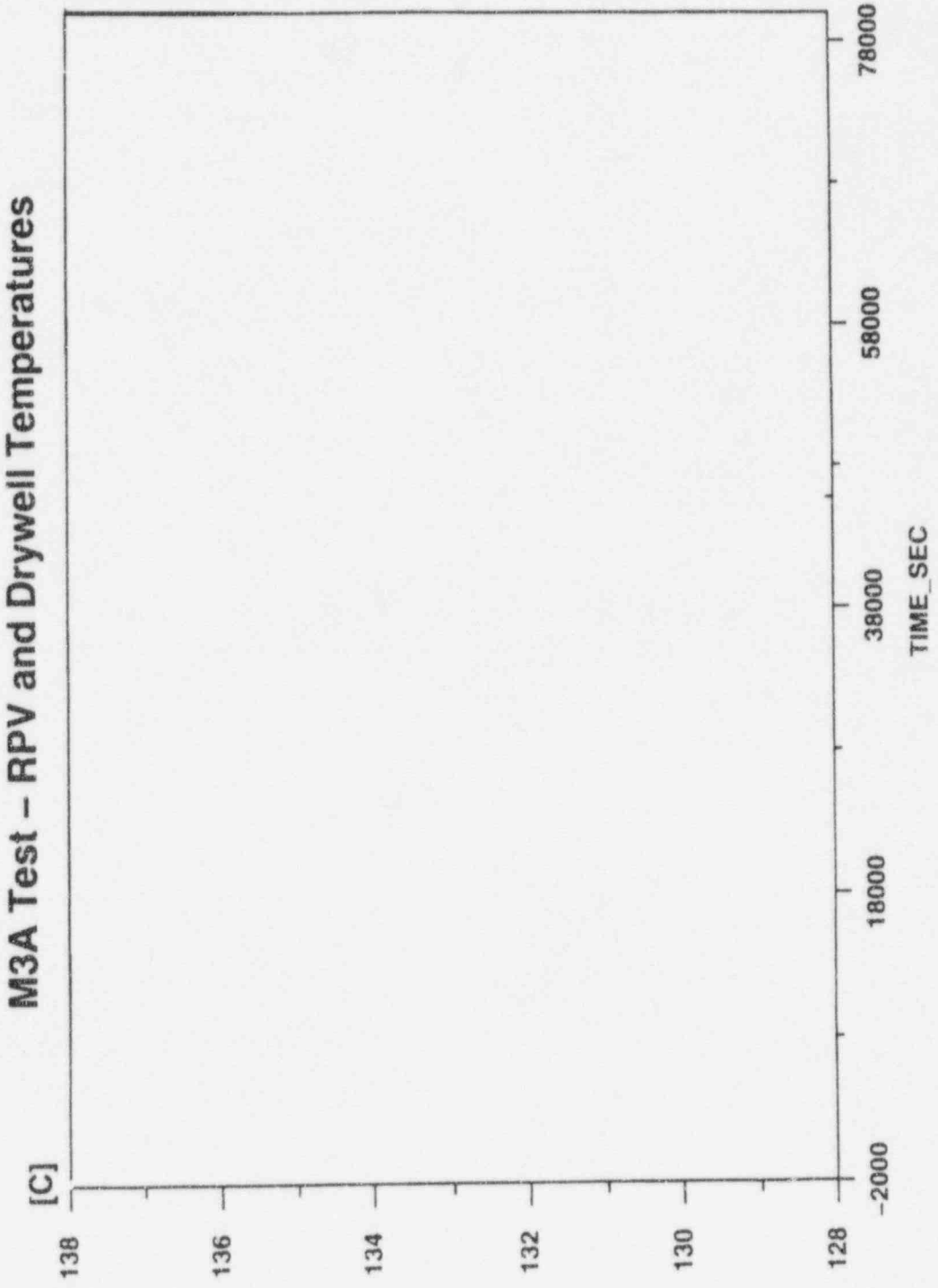
APPARENT TEST RESULTS

TEST M3A



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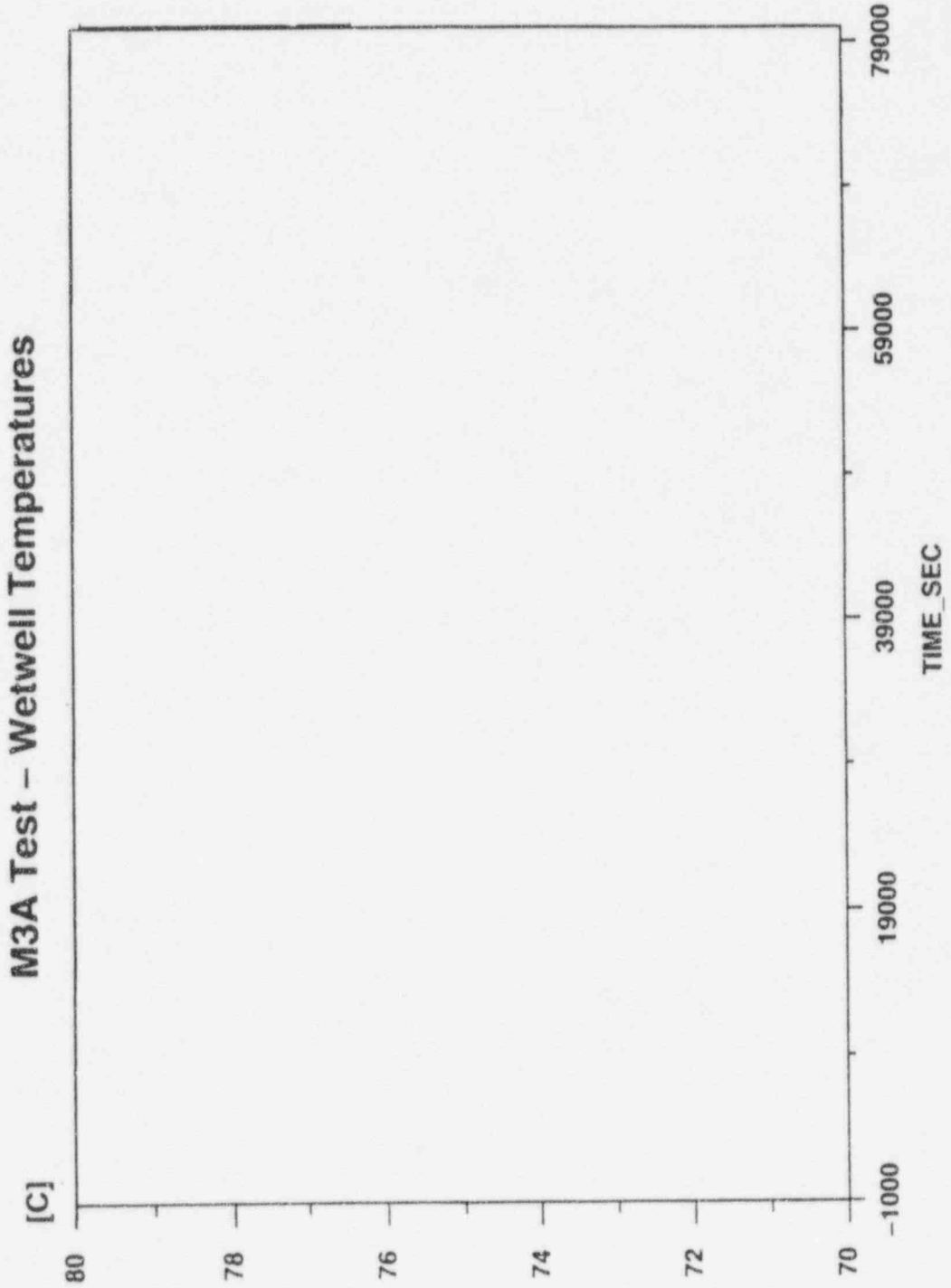
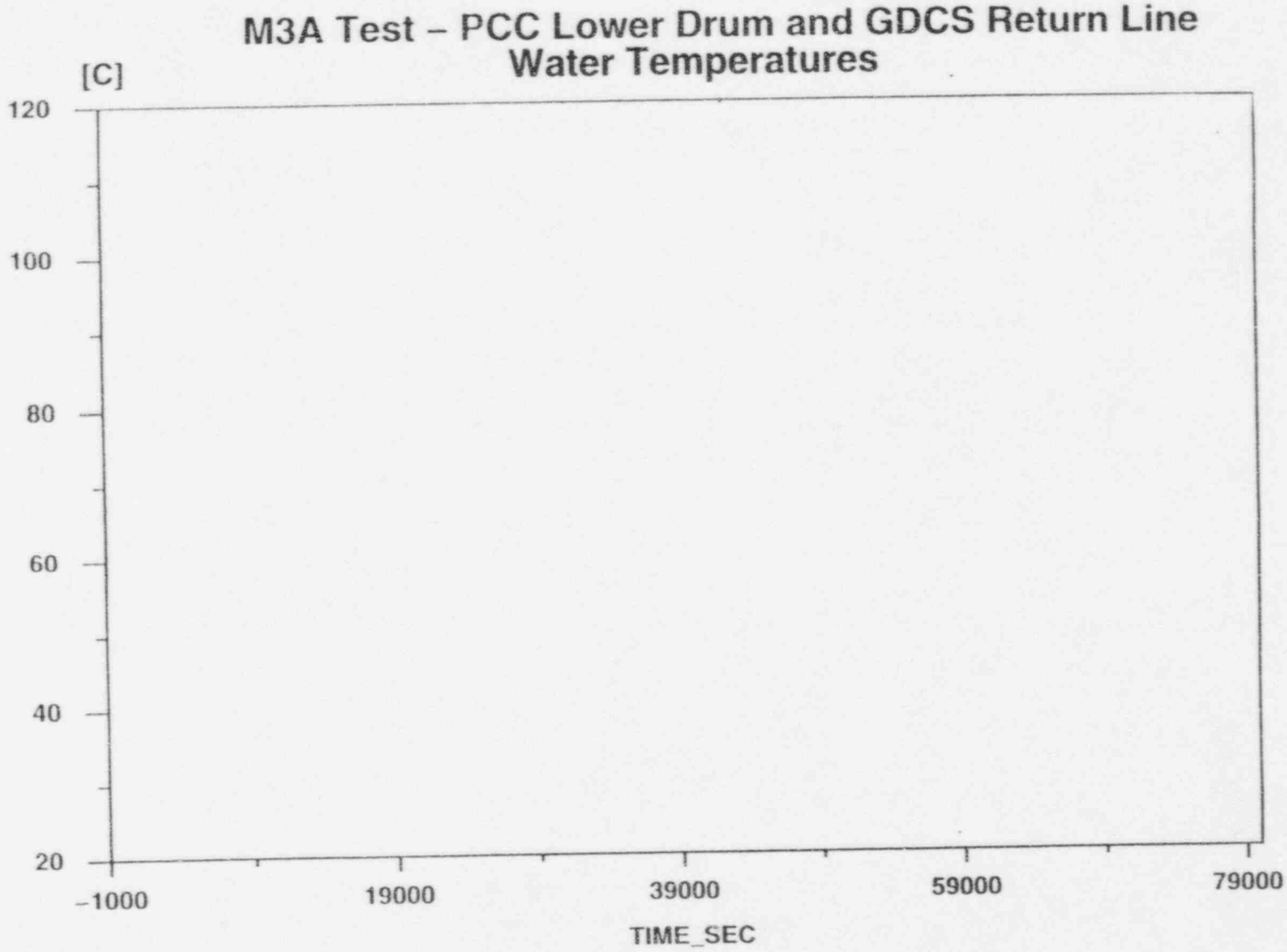
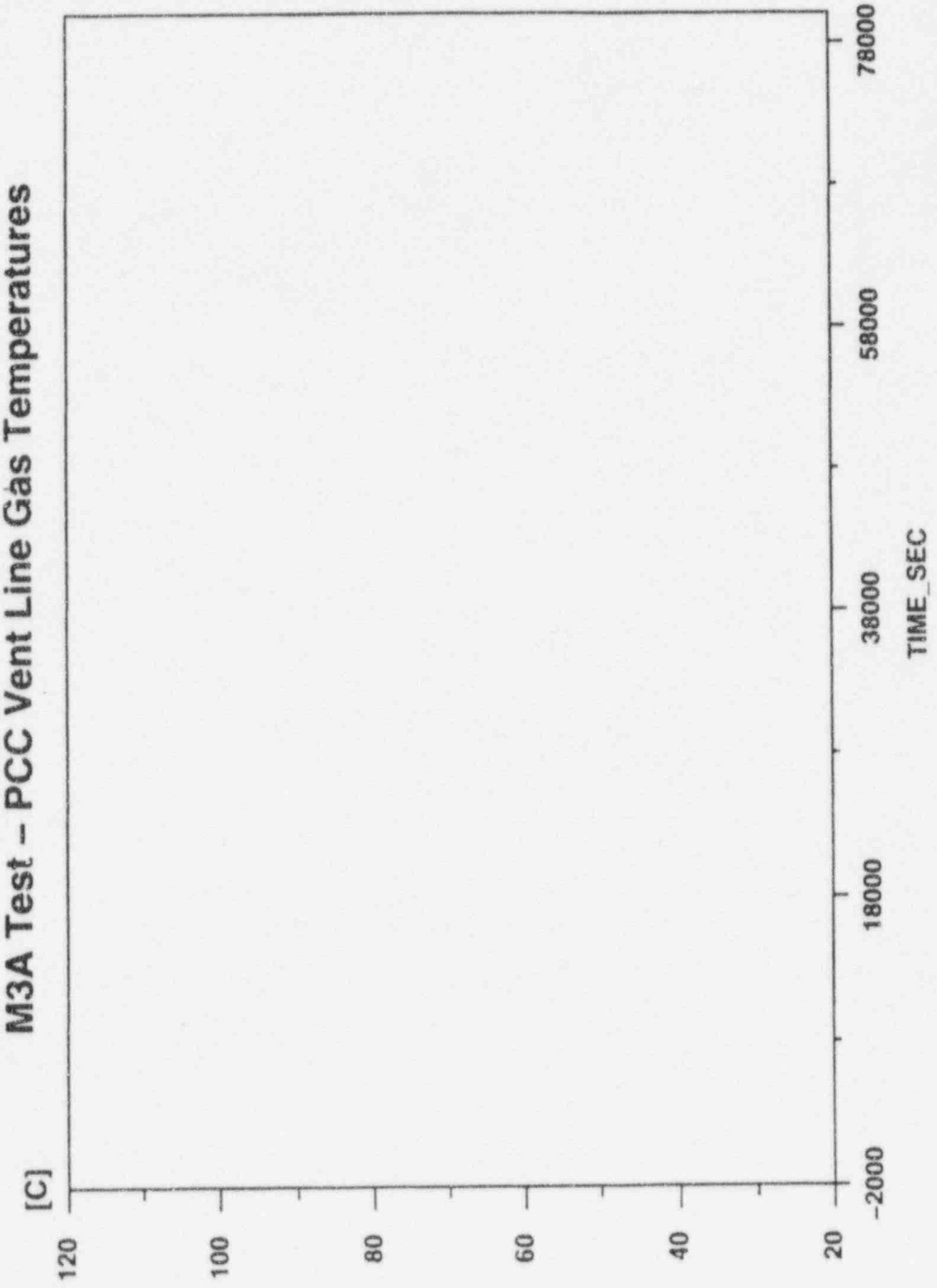



M3A Test – PCC Lower Drum and GDCS Return Line
Water Temperatures
[C]
120
100
80
60
40
20
-1000
19000
39000
59000
79000
TIME_SEC

PANDA INTEGRAL SYSTEM TEST
APPARENT TEST RESULTS

TEST M3A



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