

TOPEX / POSEIDON BATTERY PERFORMANCE

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**1992 NASA AEROSPACE BATTERY WORKSHOP
November 17-19, 1992
U. S. Space and Rocket Center
Huntsville, AL**

OPERATIONAL RECOMMENDATIONS PRIOR TO LAUNCH

- **LIMIT PEAK CHARGE CURRENT TO 20 A MAX.**

Offset the solar array.

- **LIMIT OVERCHARGE BY CONTROLLING THE RECHARGE FRACTION (C/D) TO $1.03 \pm 3\%$ AT 0 C.**

Operate at lower V/T levels.

- **MINIMIZE CHARGE CURRENTS DURING THE FULL SUN PERIODS.**

Operate at lower V/T levels.

- **SWITCH TO THE LOWER CURRENT SENSOR FOR AMP-HOUR INTEGRATION TO IMPROVE C/D RATIO ACCURACY.**

KEY BATTERY PARAMETER TRENDING

- **ΔV - DIFFERENTIAL HALF BATTERY VOLTAGE**

This parameter historically trended to evaluate battery state of health. $[V(\text{cell 1-11}) - V(\text{cell 12-22})] = \Delta V$

- **PEAK CHARGE CURRENT**

Charge current during peak power mode / initial part of day.

- **C/D - CHARGE/DISCHARGE RATIO**

Monitors energy balance and overcharge.

- **EONV - END-OF-NIGHT-VOLTAGE**

Indicator of battery wearout/efficiency.

- **NET OVERCHARGE**

Monitors total excess energy input into batteries.

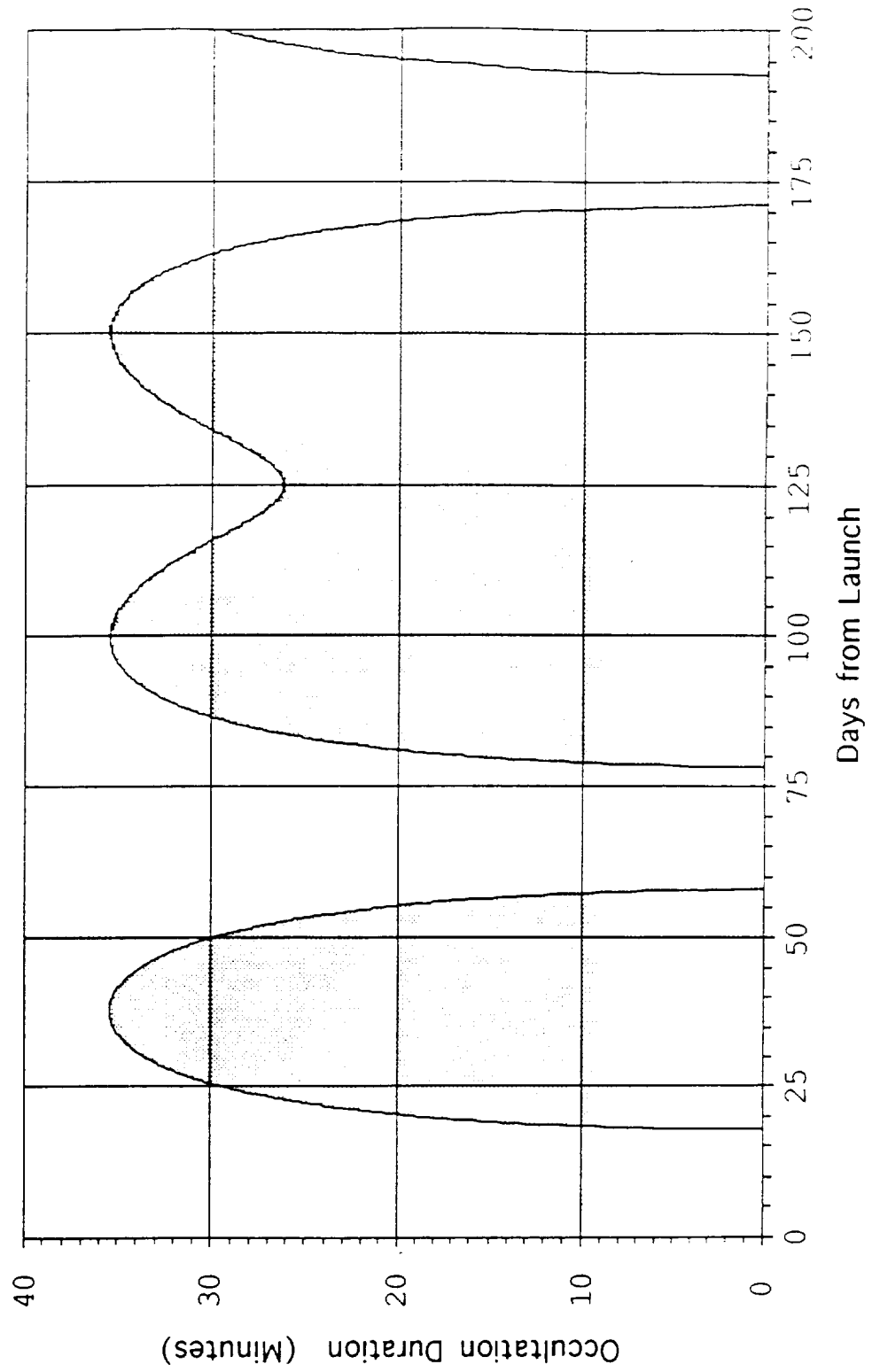
- **OTHER PARAMETERS INCLUDE:
CURRENT, VOLTAGE, TEMPERATURE AND TIME.**

TOPEX/POSEIDON BATTERY EVENT HIGHLIGHTS		
DOY	DATE	EVENT
223	8/10/92	LAUNCH - V/T 3 - DISCHARGE APPR. 15%
223	8/10/92	FULL SUN FOR NEXT 18 DAYS
225	8/12/92	COMMANDED V/T 2 AFTER REACHING 100% SOC
240	8/27/92	COMMANDED V/T 3
241	8/28/92	OFF-POINTED SOLAR ARRAY TO 55 DEGREES
242	8/29/92	FIRST OCCULTATION
247	9/3/92	ADJUSTED SOLAR ARRAY TO 57.5 DEGREES
248	9/4/92	COMMANDED V/T 4
275	10/1/92	COMMANDED V/T 3
281	10/7/92	FINAL OCCULTATION PRIOR TO 20 DAYS FULL SUN
282	10/8/92	COMMANDED V/T 2 FOR THE DURATION OF FULL SUN



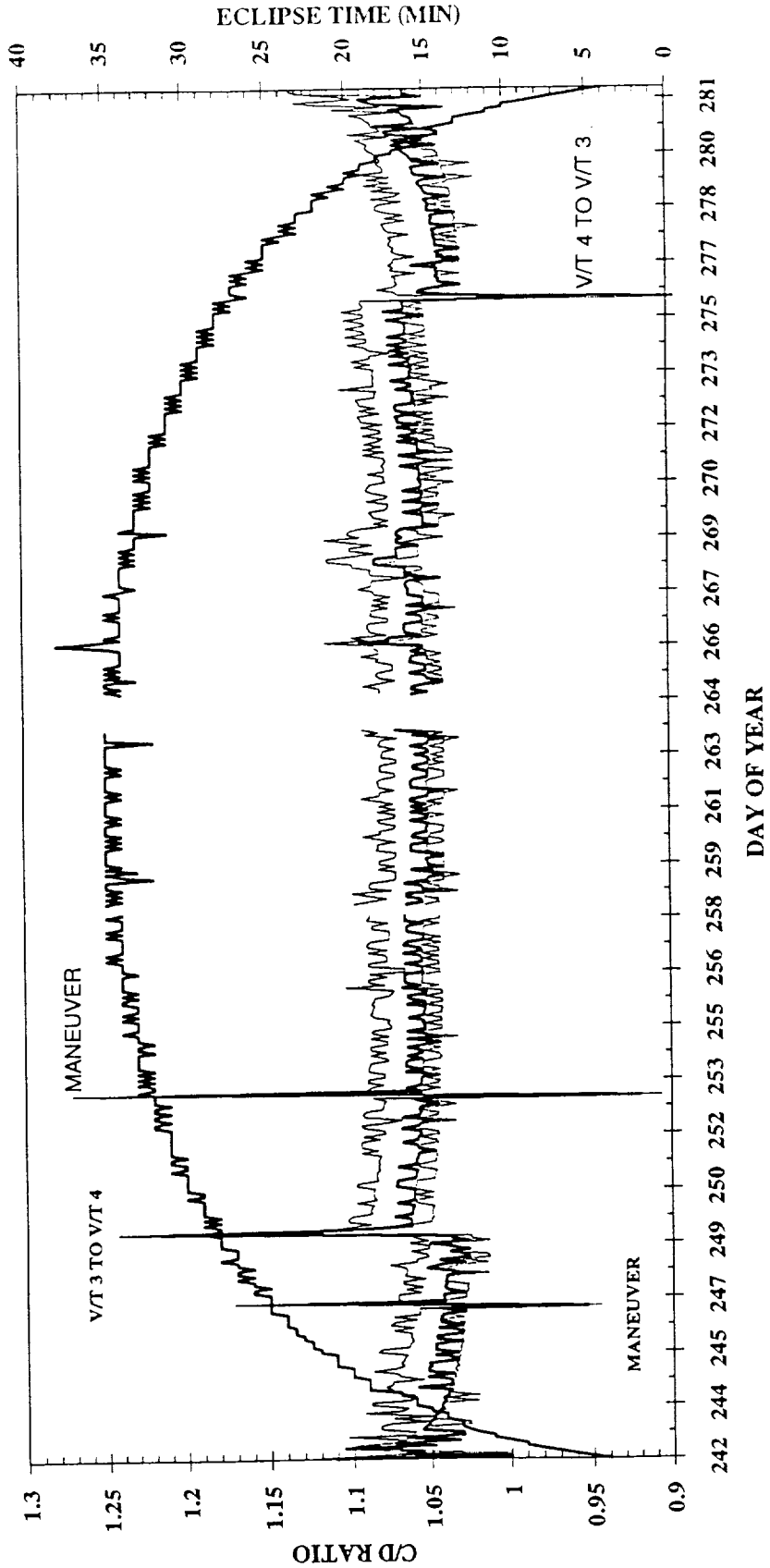
TOPEX/POSEIDON PROJECT
PRESENTATION TO DR. FISK

**BATTERY MANAGEMENT PLAN
OCCULTATIONS – FIRST 200 DAYS**



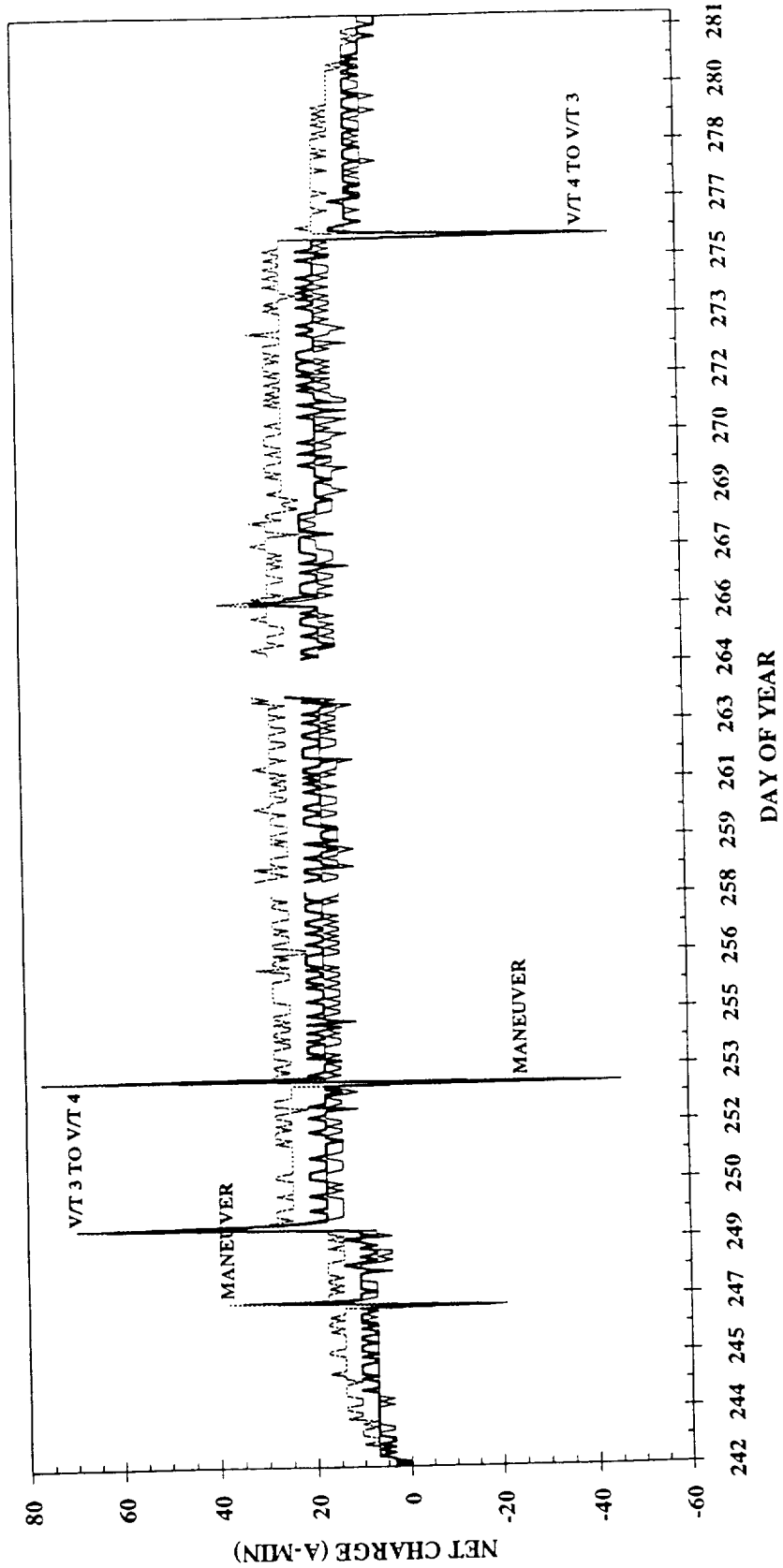
TOPEX/POSEIDON BATTERY CHARGE/DISCHARGE RATIO

B1 C/D
 B2 C/D
 B3 C/D
 ECLIPSE TIME



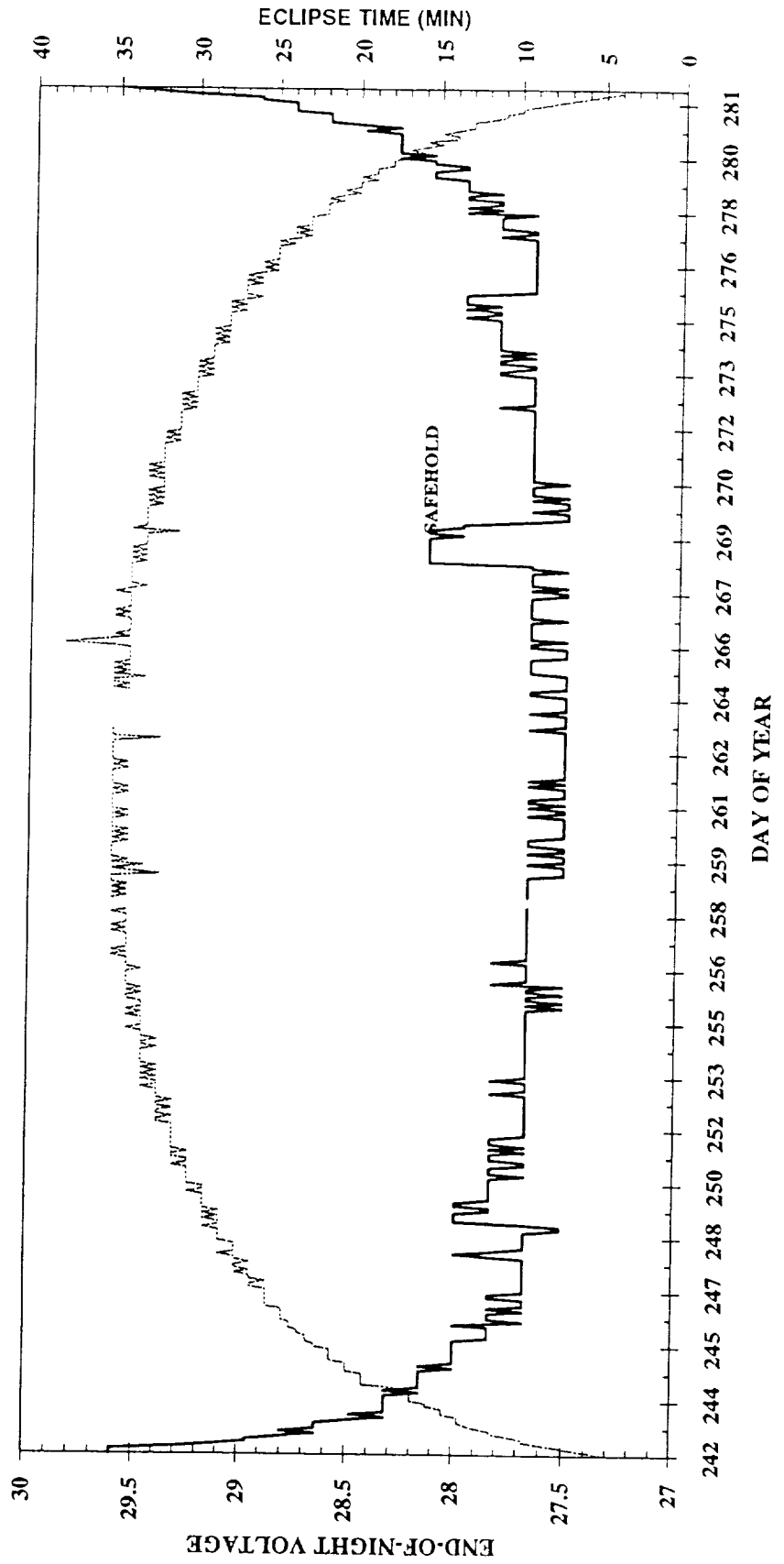
TOPEX/POSEIDON BATTERY NET CHARGE

B1 Net Charge
 B2 Net Charge
 B3 Net Charge

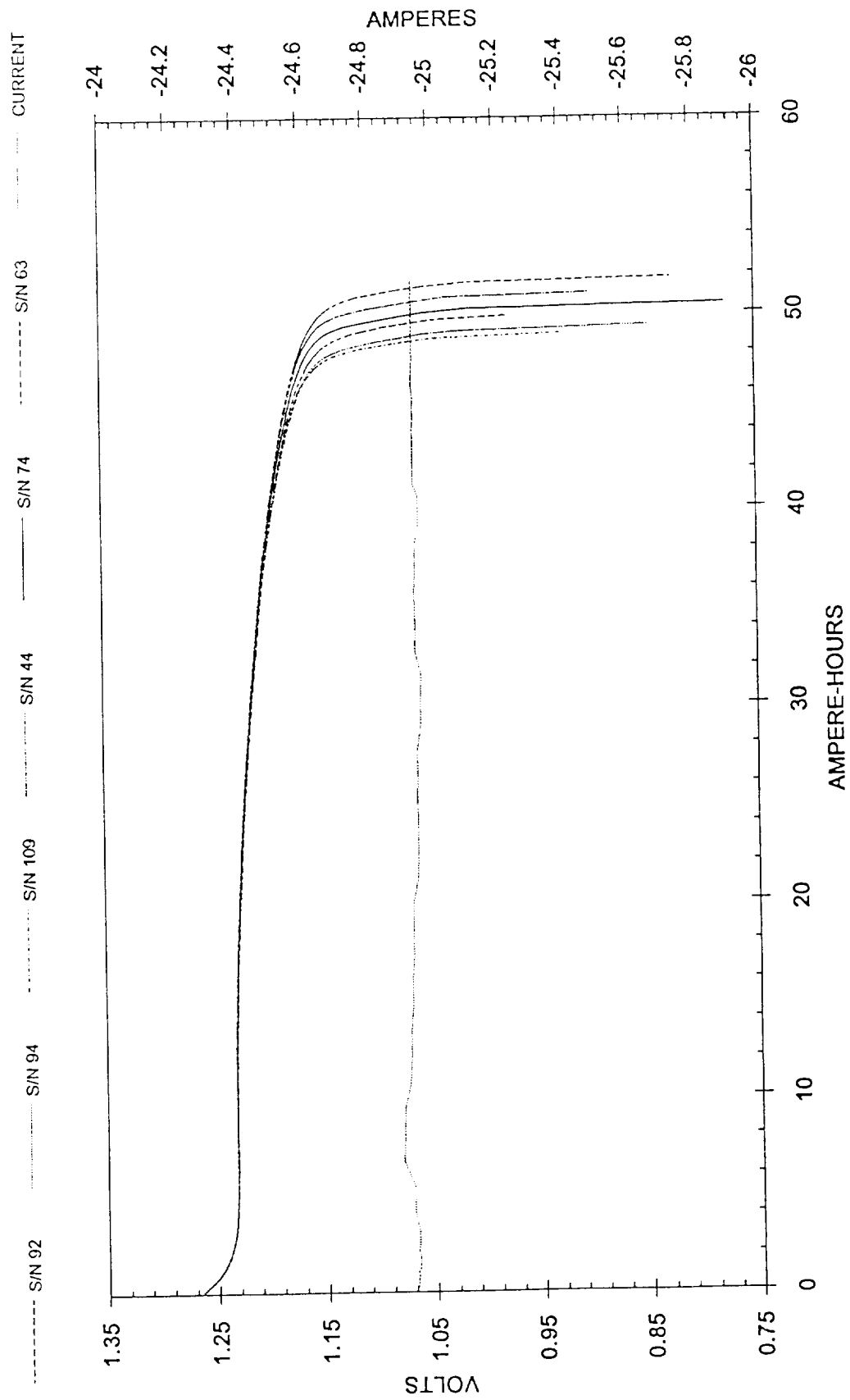


TOPEX/POSEIDON BATTERY END-OF-NIGHT VOLTAGE

— End of Night Voltage — ECLIPSE TIME

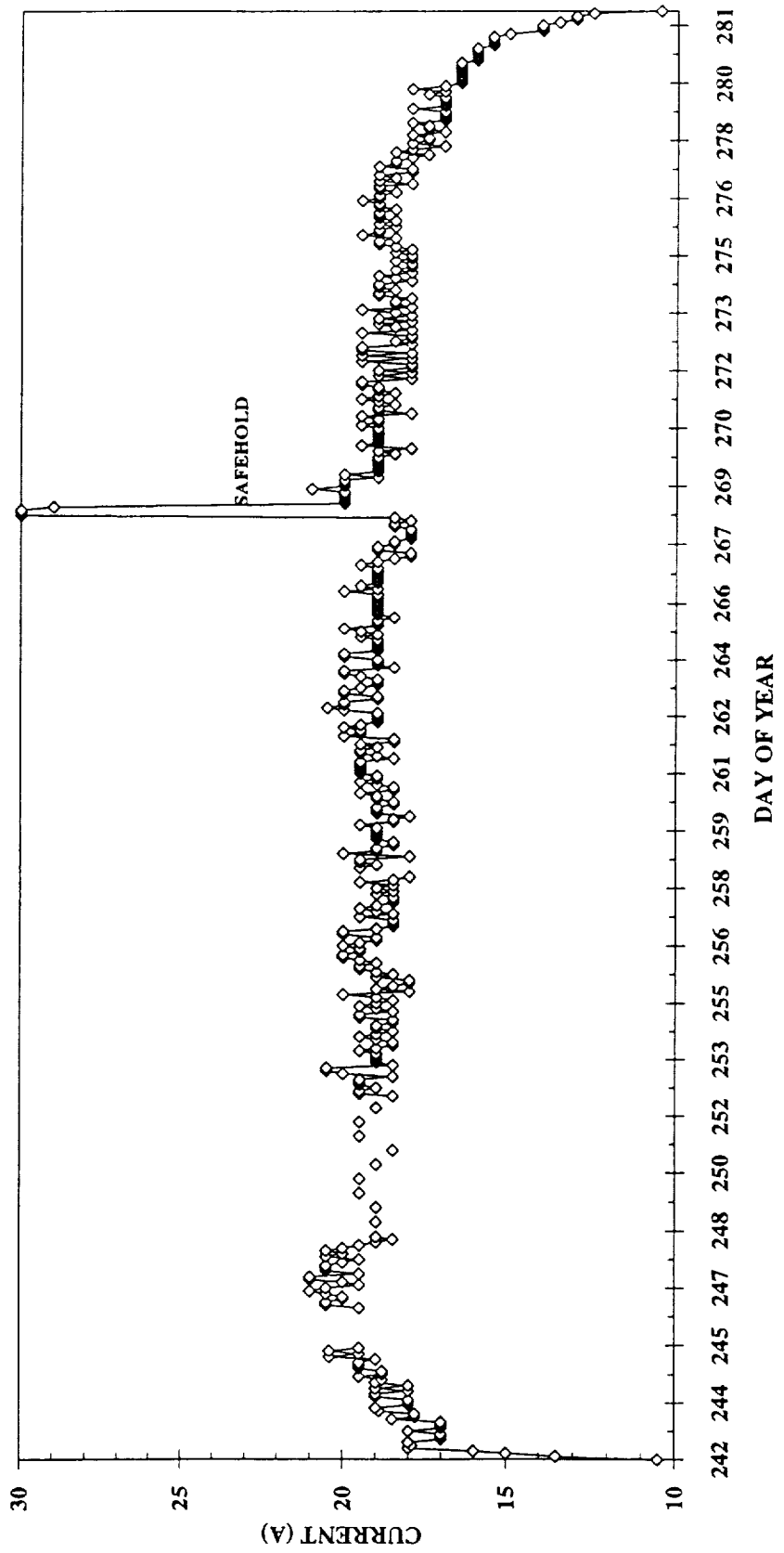


INITIAL EVALUATION "CHARGE RETENTION TEST" C/2 DISCHARGE #4



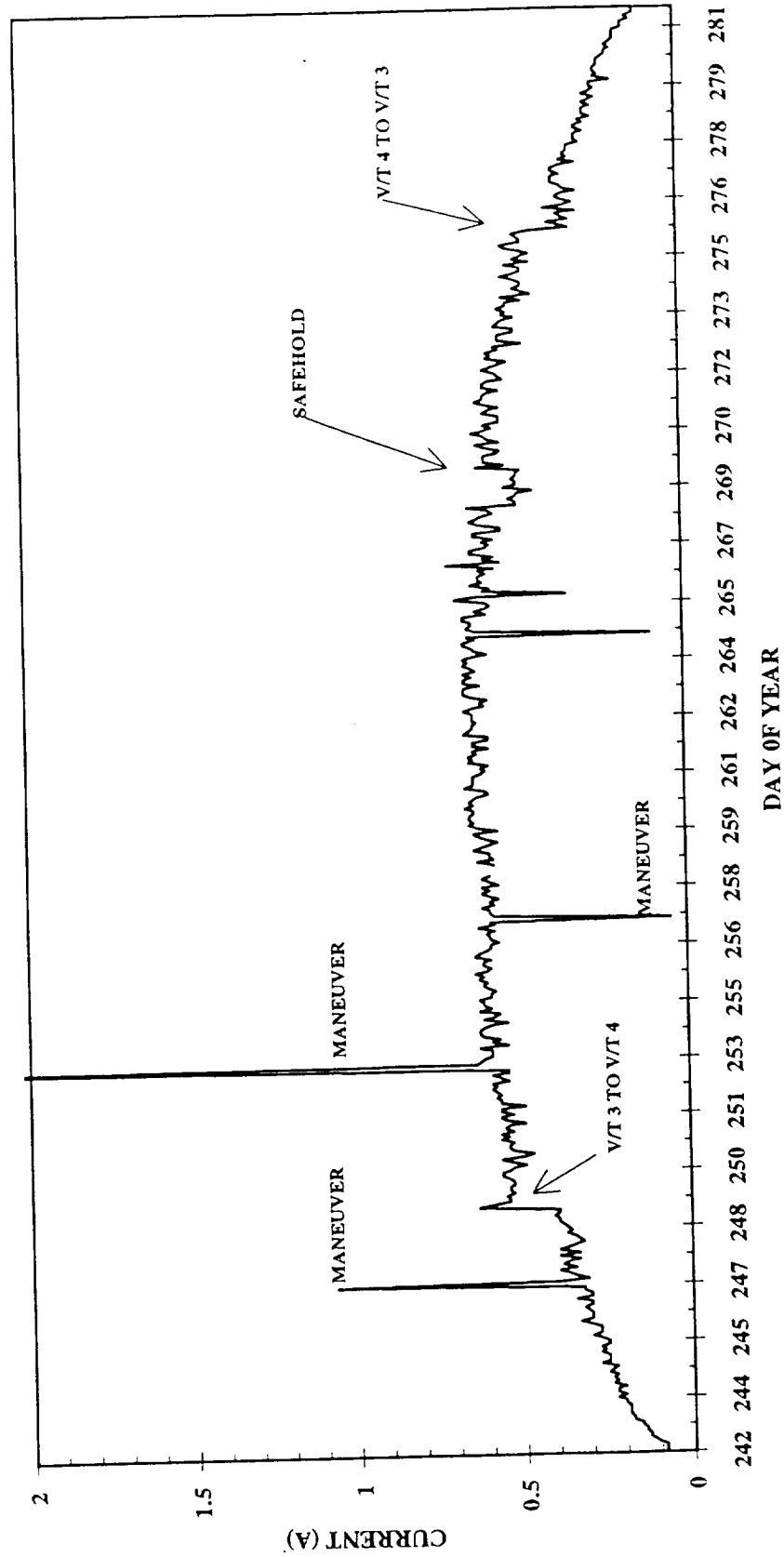
TOPEX/POSEIDON BATTERY PEAK CHARGE CURRENT

—◇— BAT 1

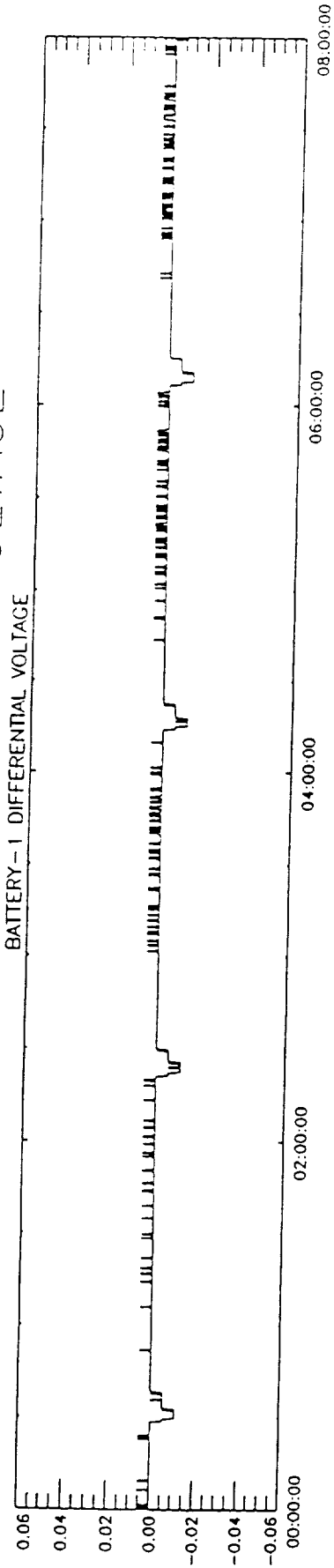


TOPEX/POSEIDON BATTERY END-OF-DAY (TAPER) CURRENT

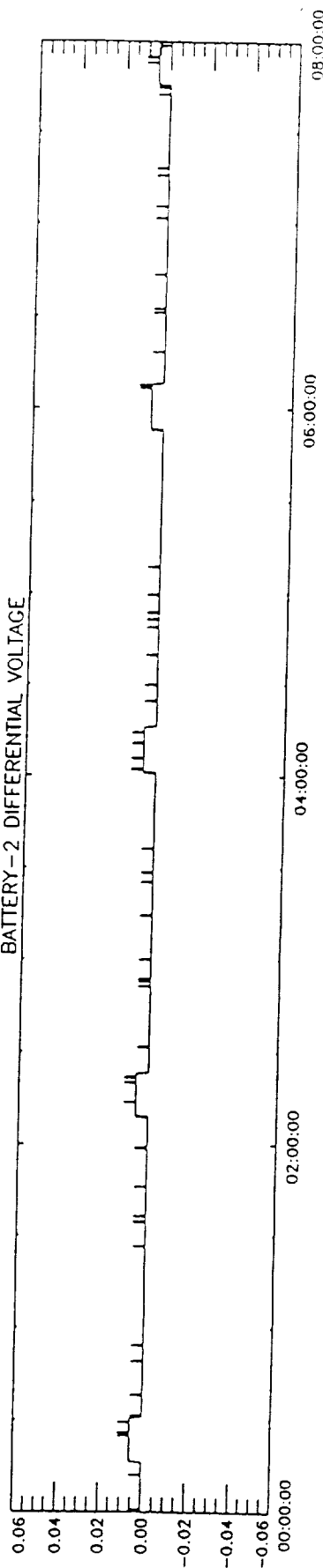
—— BAT 1



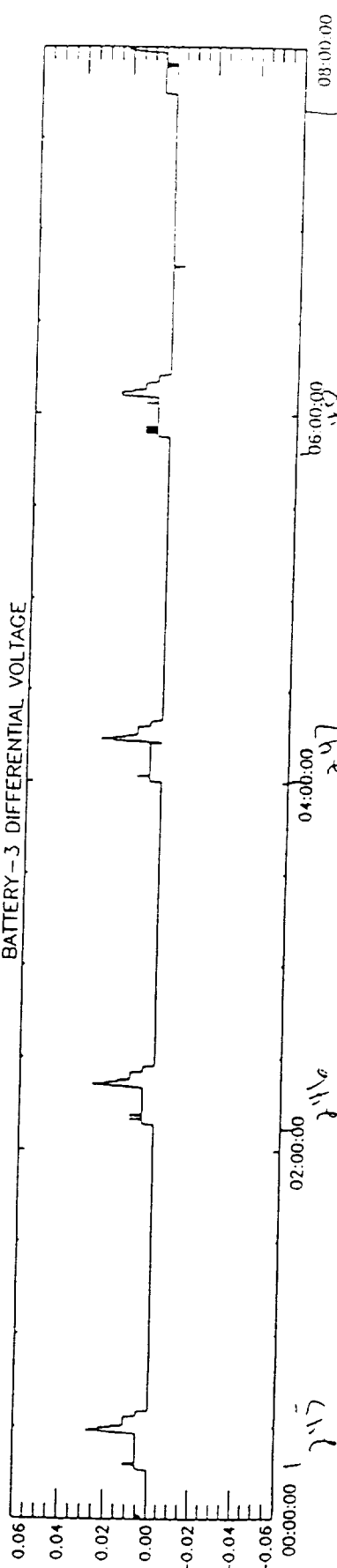
BATTERY DIFFERENTIAL VOLTAGE



BATTERY-2 DIFFERENTIAL VOLTAGE



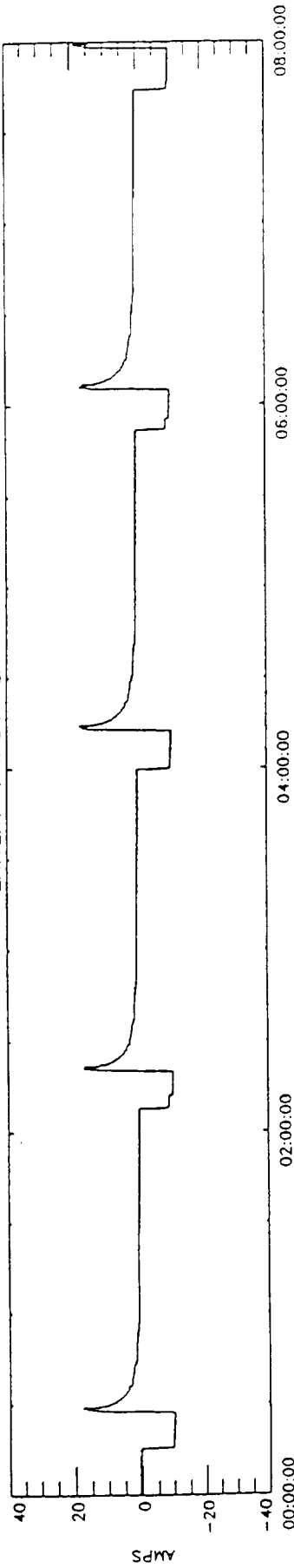
BATTERY-3 DIFFERENTIAL VOLTAGE



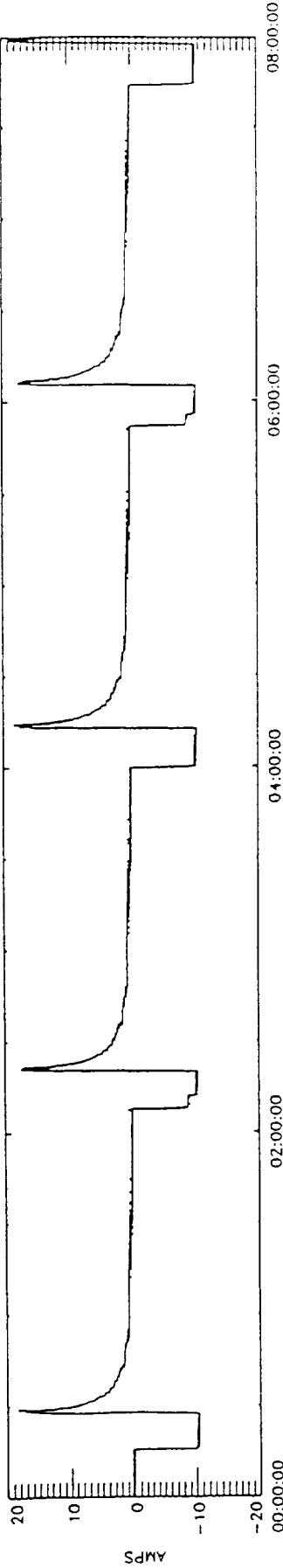
0-5

HI CURRENT STATUS

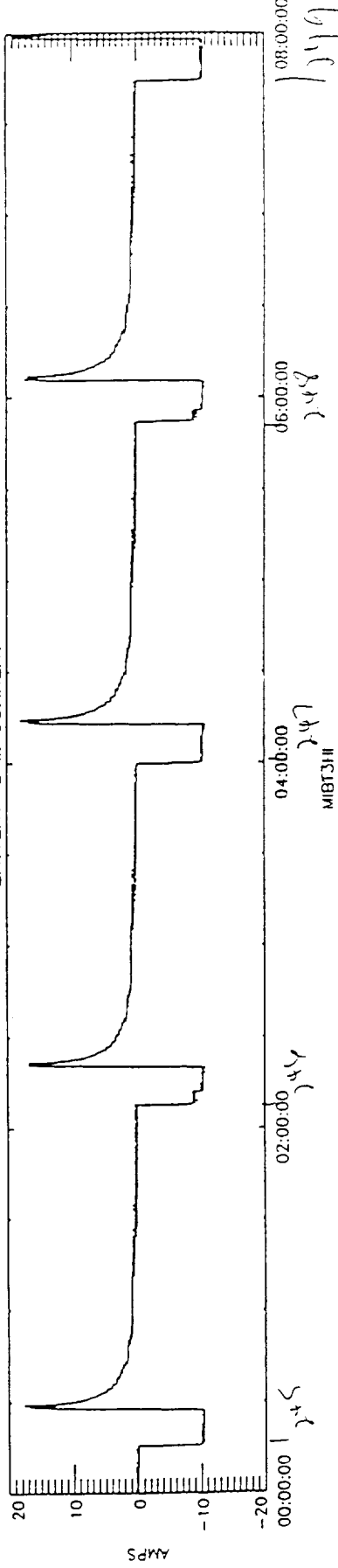
BATTERY-1 III CURRENT



MIBT1HI
BATTERY-2 III CURRENT



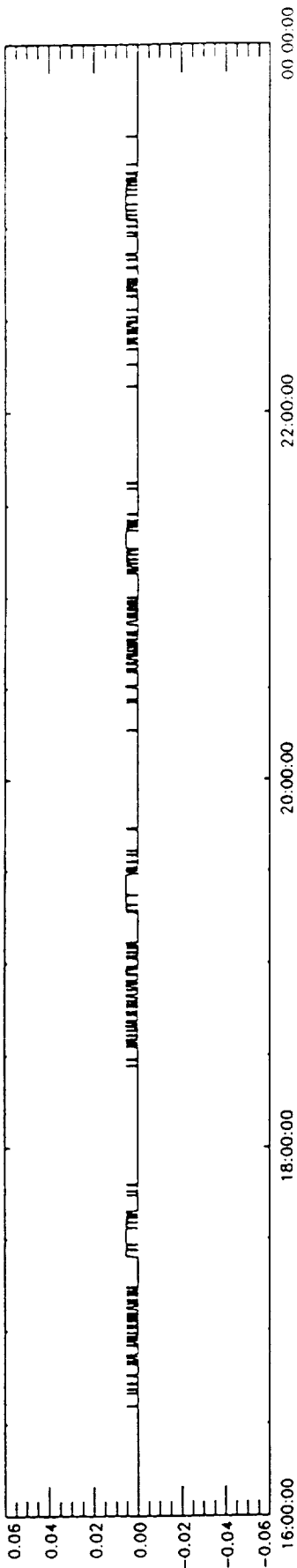
MIBT2HI
BATTERY-3 III CURRENT



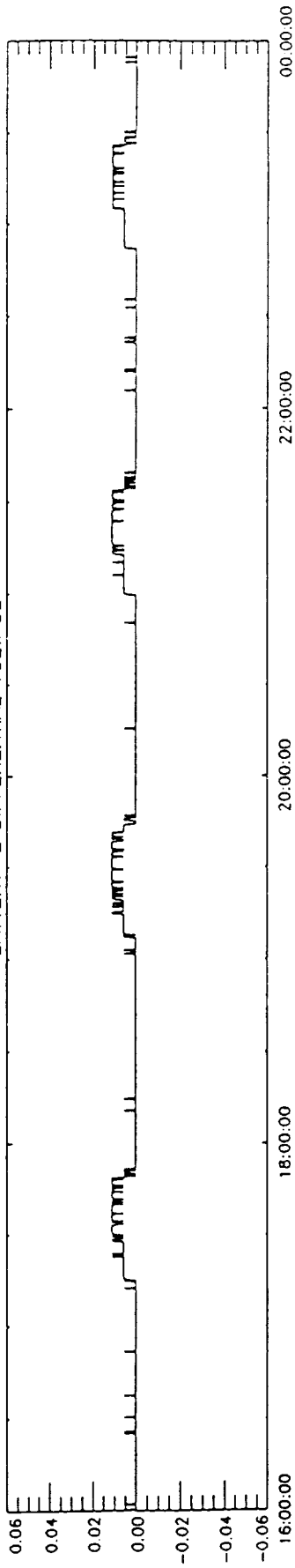
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Plot Time: Sun Aug 30 14:51:07 1992

BATTERY DIFFERENTIAL VOLTAGE

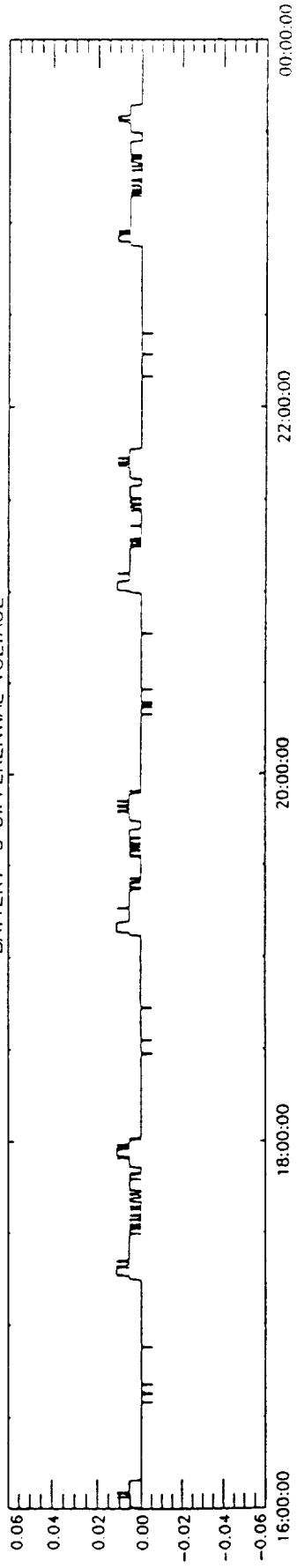
BATTERY-1 DIFFERENTIAL VOLTAGE



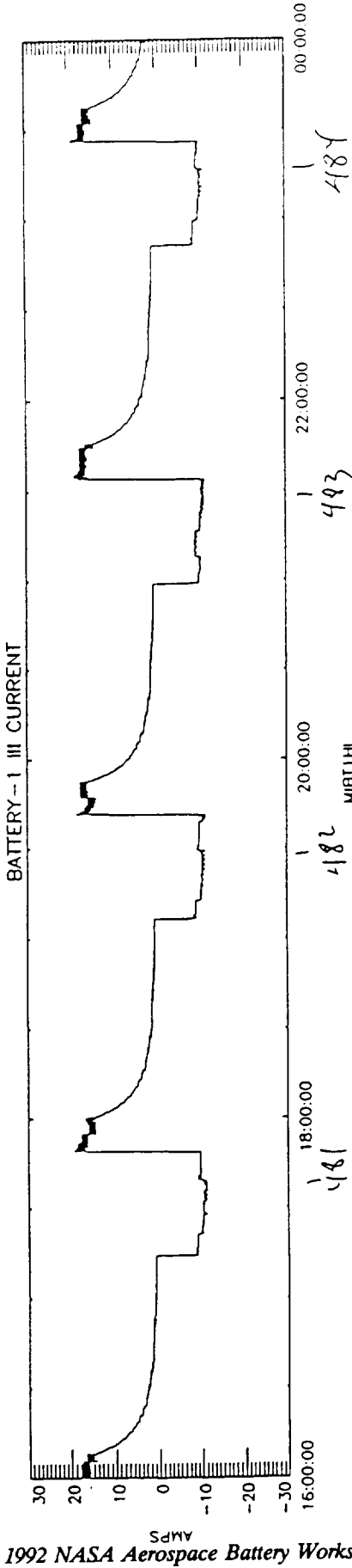
BATTERY-2 DIFFERENTIAL VOLTAGE



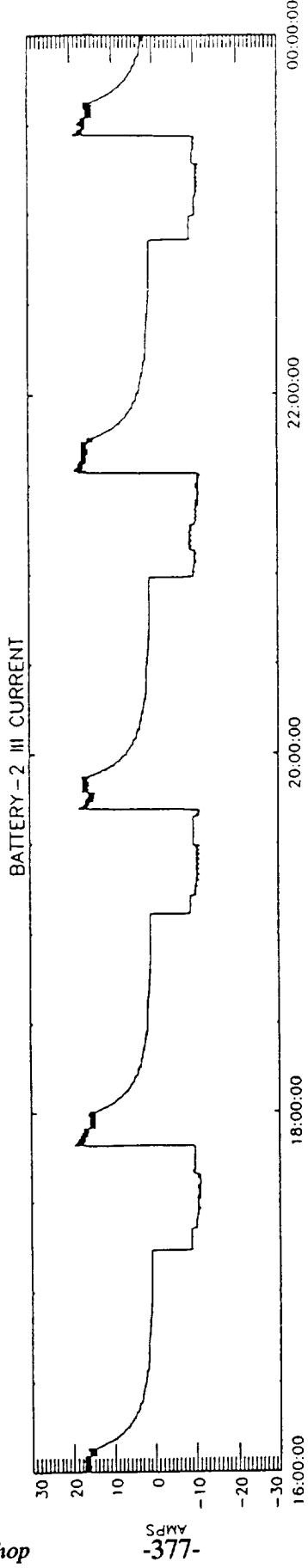
BATTERY-3 DIFFERENTIAL VOLTAGE



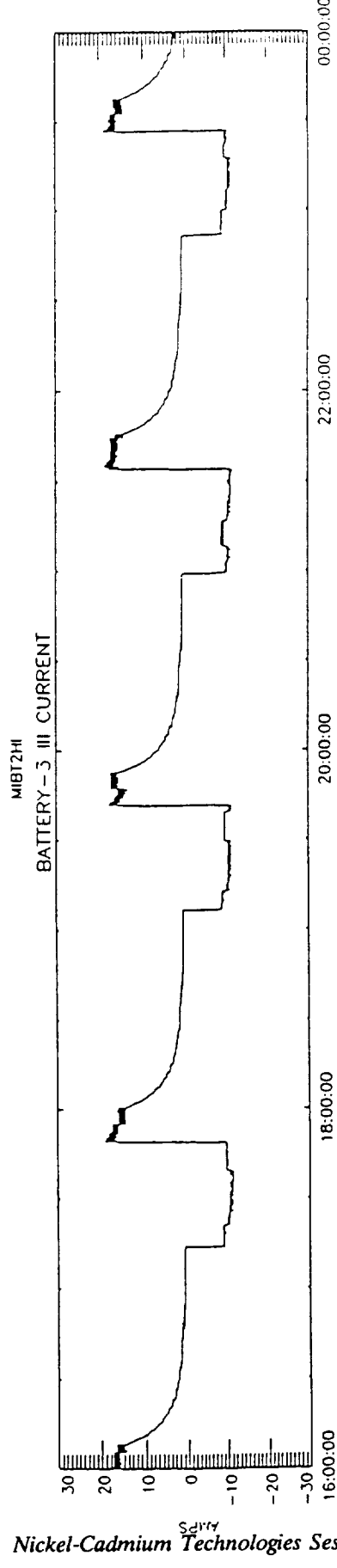
HI CURRENT STATUS



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-377-

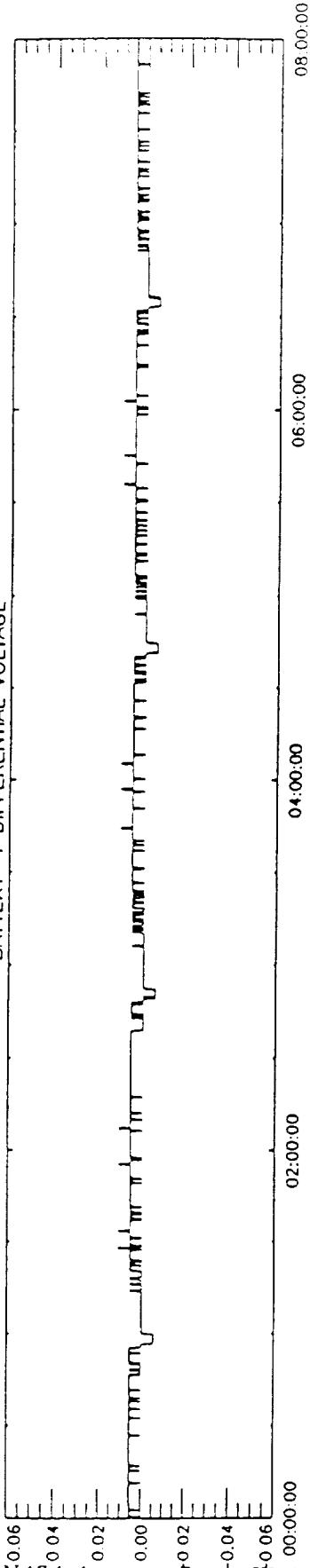


Nickel-Cadmium Technologies Session

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V-WAVE Def File: PLOT_MIBT.PV: Plot Time: Thu Sep 17 12:00:26 1992

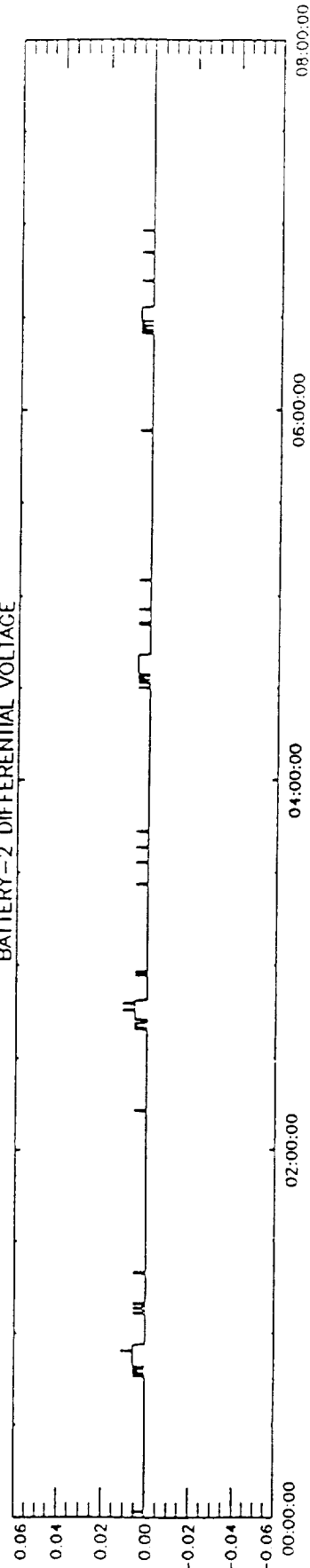
BATTERY DIFFERENTIAL VOLTAGE

BATTERY-1 DIFFERENTIAL VOLTAGE



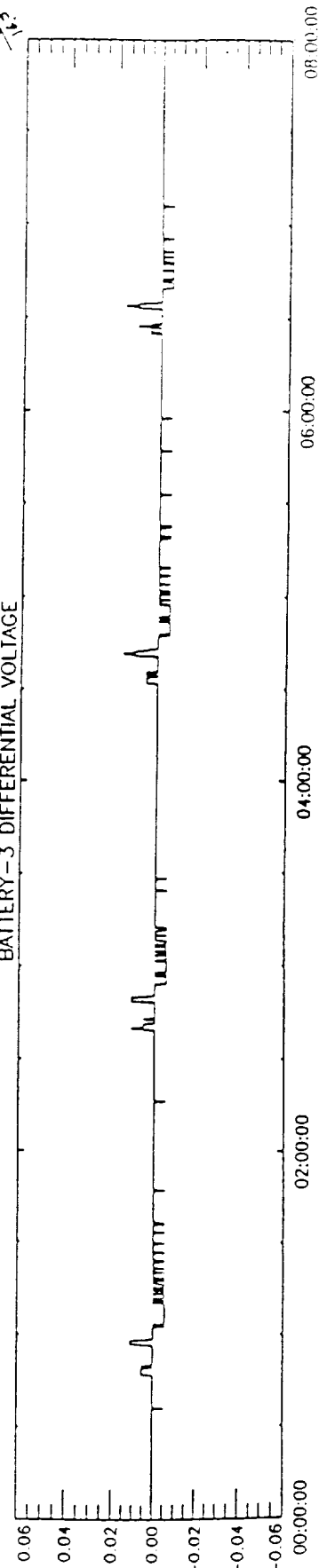
BATTERY-2 DIFFERENTIAL VOLTAGE

MVDELTA1



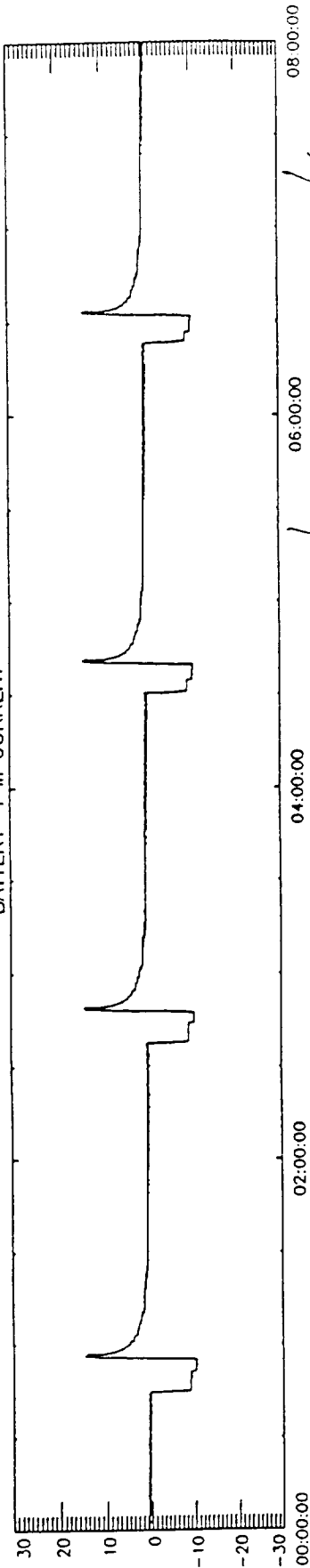
BATTERY-3 DIFFERENTIAL VOLTAGE

MVDELTA2



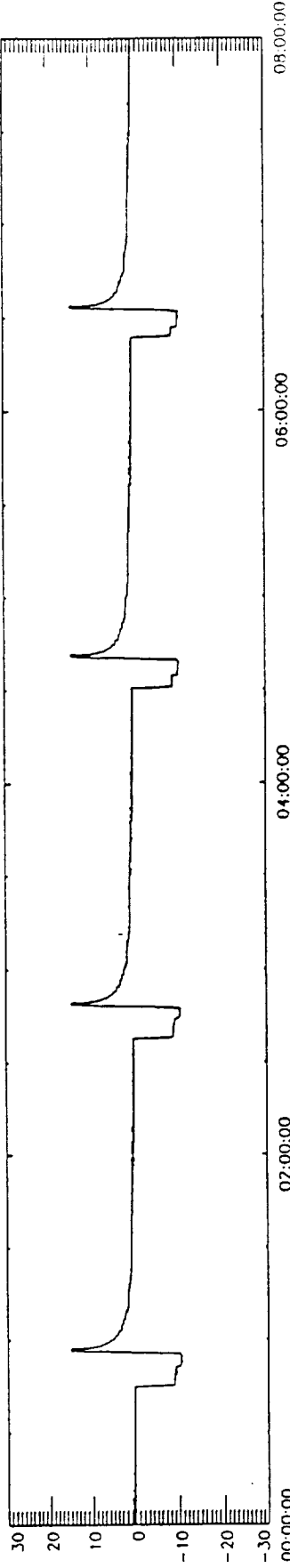
HI CURRENT STATUS

BATTERY-1 III CURRENT



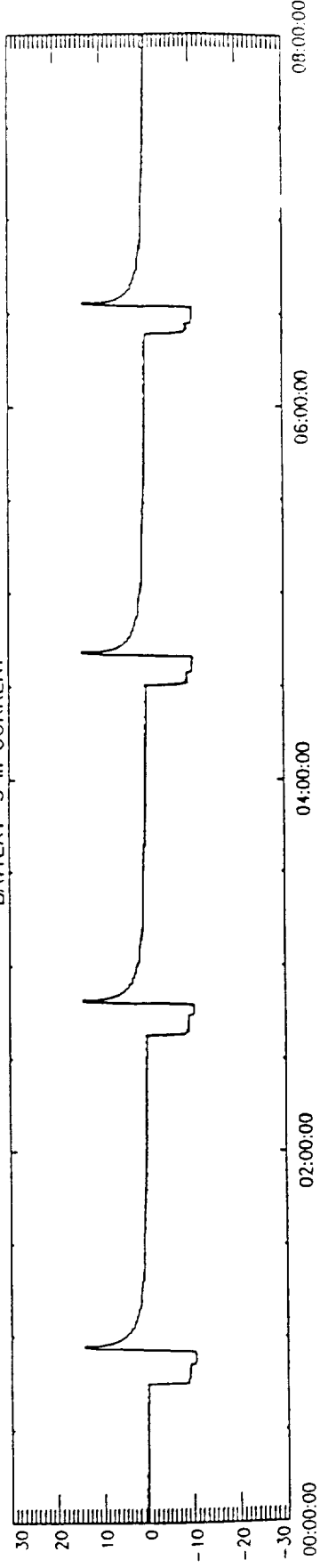
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BATTERY-2 III CURRENT



-379-

BATTERY-3 III CURRENT



Nickel-Cadmium Technologies Session

Source: SPA\$DISK:[OPS.PWR.STR]TCC_PWR1_1992280T080000.BIN;1 Data: LIVE Data Time: 1992-281
Plot Time: Wed Oct 7 13:03:58 1992

OBSERVATIONS MADE DURING THE FIRST OCCULTATION PERIOD

- **C/D RATIOS TEND TO BE HIGHER DURING THE INITIAL AND FINAL SEGMENT OF THE OCCULTATION PERIOD.**
- **NET OVERCHARGE PARAMETER USEFUL IN ASSESSING C/D'S.**
- **SMALL PEAK POWER CUSPS DURING THE INITIAL AND FINAL SEGMENT OF THE OCCULTATION PERIOD. NO CUSPS DURING THE REMAINING PERIOD.**
- **SMALL DIFFERENTIAL VOLTAGES. (< 12 mV)**
- **PEAK CHARGE CURRENT WITHIN THE RECOMMENDED LIMITS.**

SUMMARY

- **BATTERIES ARE OPERATING WITHIN RECOMMENDED LIMITS.**
- **EXCELLENT BATTERY PERFORMANCE.**

