

CRANE CELL TESTING SUPPORT OF
NASA/GODDARD SPACE FLIGHT
CENTER: AN UPDATE

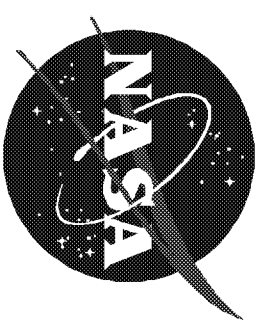
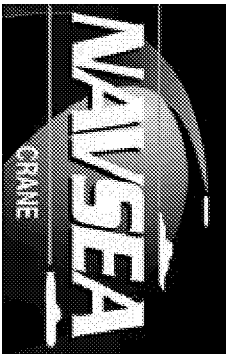
Mike Strawn and Jerry David

NAVSURFWARCENDIV Crane, Indiana

Gopalakrishna M. Rao

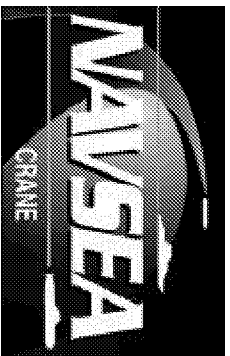
NASA Goddard Space Flight Center

Greenbelt, Maryland

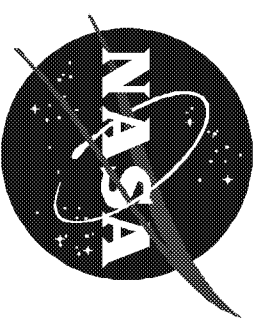


OBJECTIVE

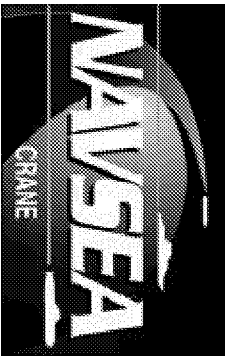
- Verify the Quality and Reliability of aerospace battery cells and batteries for NASA flight programs
- Disseminate the data
 - to develop a Plan for in-orbit battery management
 - to Design a cell/battery for future NASA spacecraft
- Establish a cell test Data Base for rechargeable cell/batteries



PACKS



Orbit	Pack	Type	Ah	Start Date	DdD	°C	K Cycles
Stress	0021H	Sypr	21	1098	50	20	10.9
Mission	0040P	Satf N-Cd	40	796	21	5	20.4
Mission	0044P	Satf N-Cd	40	199	21	5	9.0
Mission	0045P	Satf N-Cd	40	100	21	5	3.2
Mission	0052T	Sypr	50	395	14.4	10	28.9
Mission	0053T	Sypr	50	595	17	0	27.9
Mission	6151T	Sypr	50	696	25	10	22.4
Stress	6152T	Sypr	50	696	17	0	24.6
Stress	3023M	EPT-CPV	23	1198	60	10	1.3
Stress	3023T	EPT-CPV	23	1298	60	10	10.4
Mission	3050S	EPT	50	100	60	10	4.1
Mission	3050H	EPT	50	1095	20	5	25.6
Mission	3600H	EPT	93	192	11	-5	42.7
Mission	3601H	EPT	93	192	11	-5	42.2

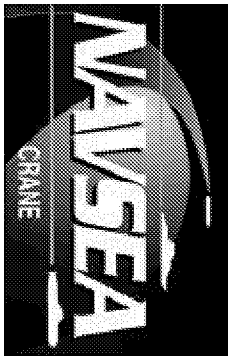


DISCONTINUED PACKS

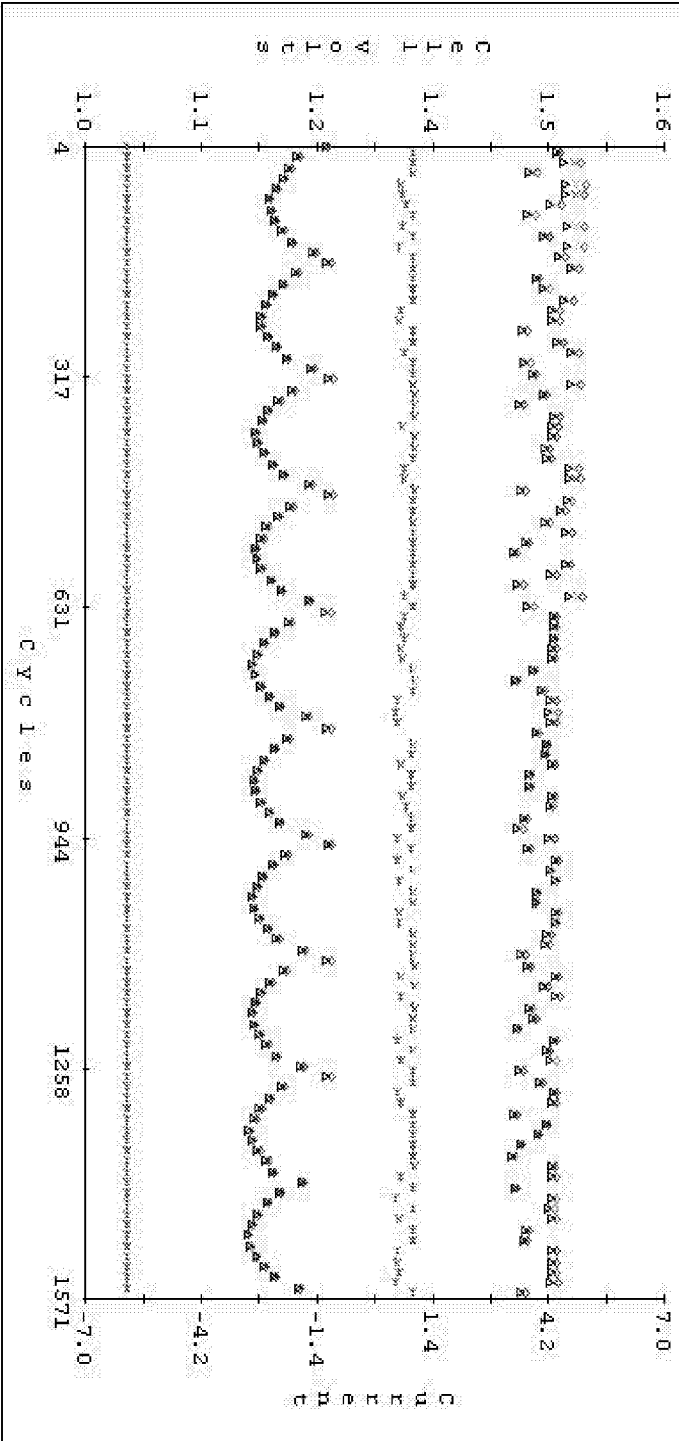


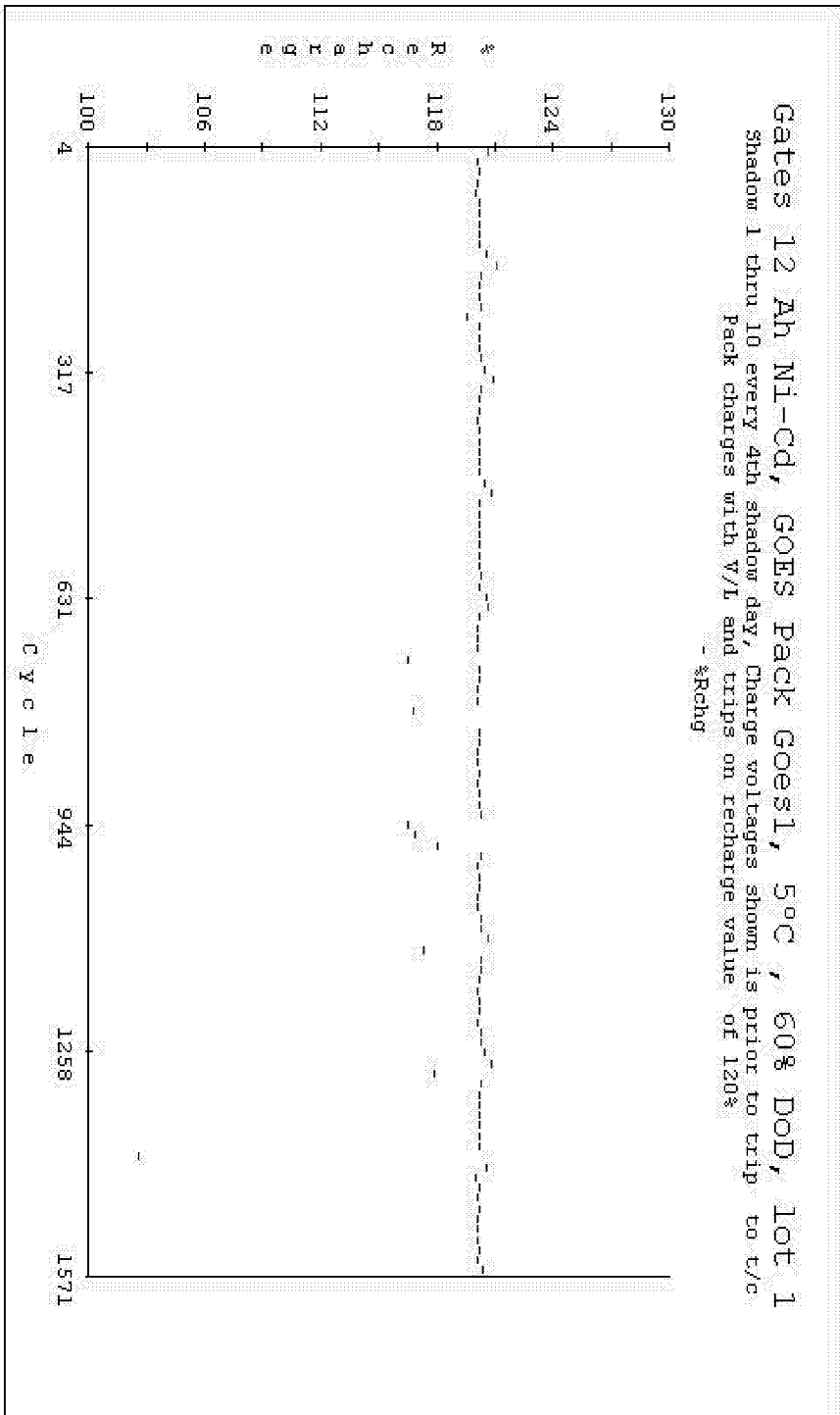
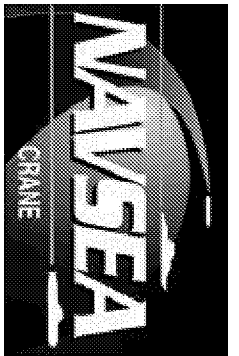
Orbit	Pack	Type	Ah	Date Start/End	DoD	°C	K Cycles
Stress	0042P	Saft Ni-Cd	40	7/97 3/00	40	20	15.1
Stress	0043P	Saft Ni-Cd	40	10/97 2/00	40	20	13.1
Mission	B300A	Super	21	3/99 2/00	pulse	5	0.5
GEO REAL	GOES 1	Saft Ni-Cd	12	10/95 7/00	60	0	Sh#10

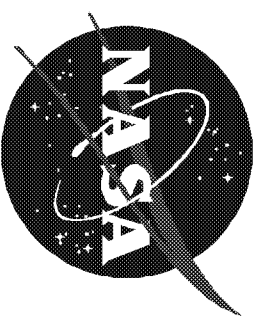
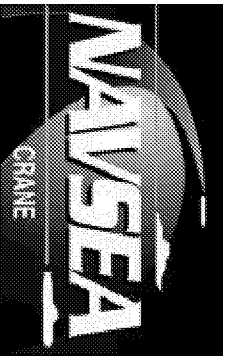
Packs discontinued during FY00



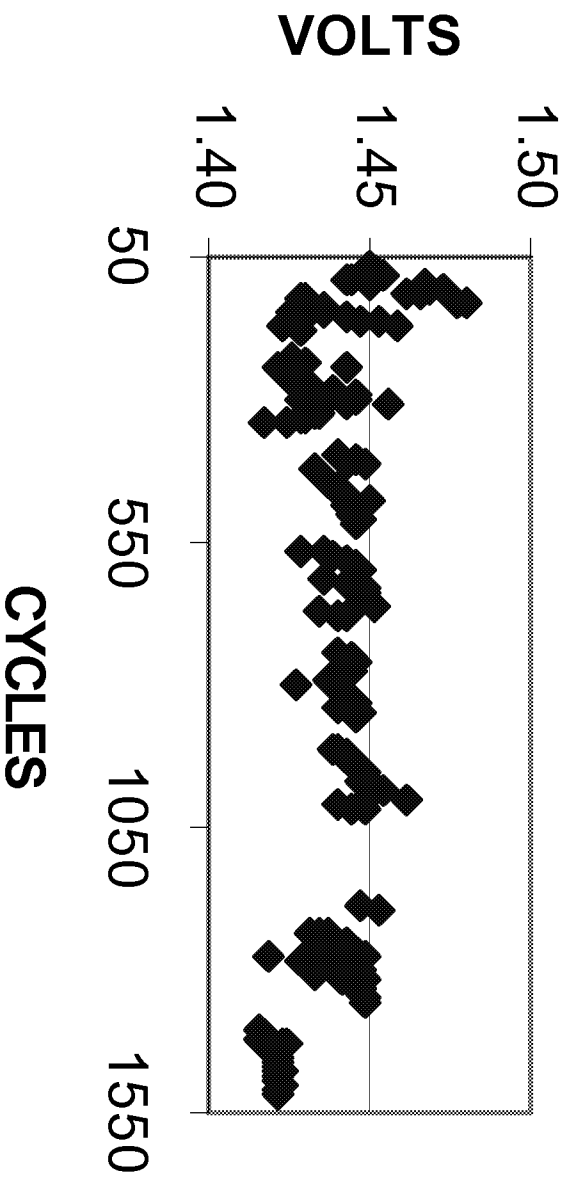
Gates 12 Ah Ni-Cd, GOES Pack Goes 1, 5°C, 60% DOD, Lot 1
Shadow 1 thru 10 every 4th shadow day, Charge voltages shown is prior to trip to t/c
Pack charges with V/L and trips on recharge value of 120%



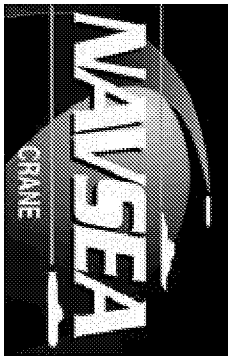




GOES 1 DURING SUN PERIODS 1 - 9

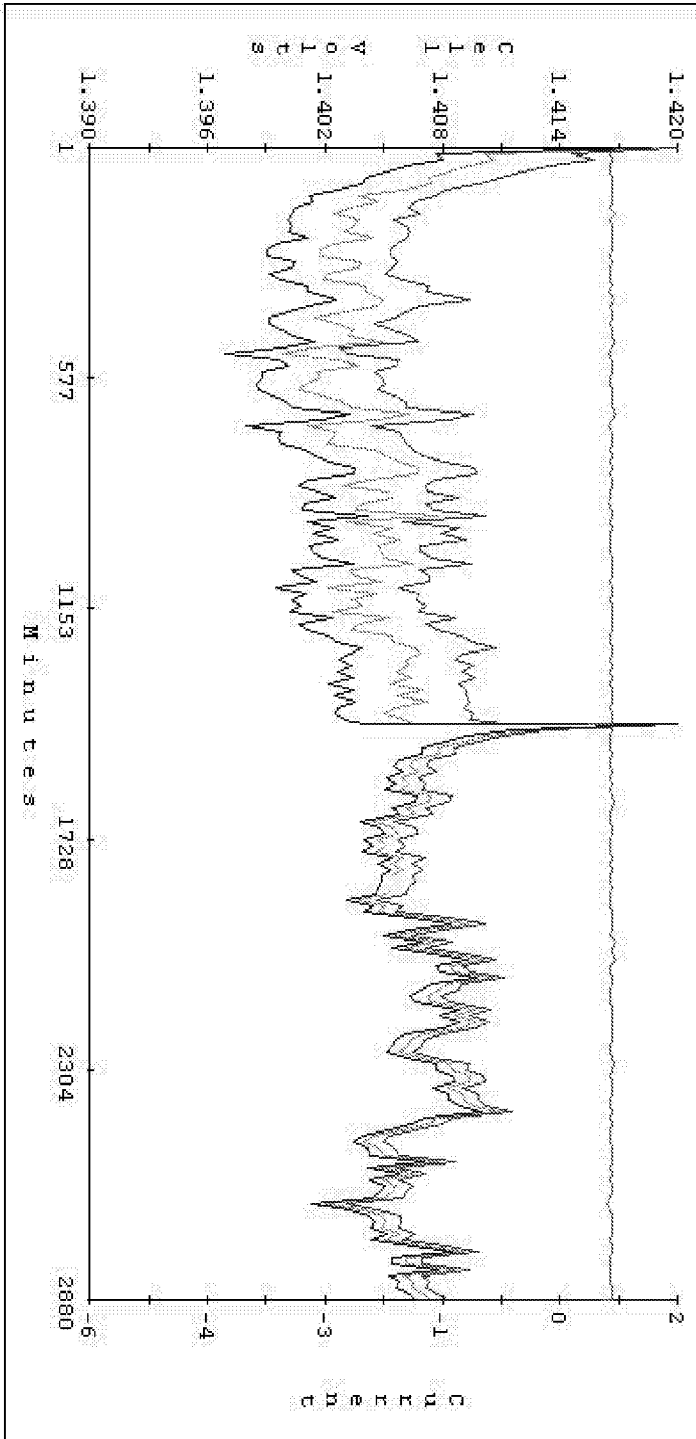


◆ AVERAGE



B300A Pulse test , Cycles 277 & 518 of sun periods 1 & 2

1.1 amp charge for 24 hours with V/T 5 voltage limit
and pulse discharge @ 5.1 amp every .8 seconds for .2 seconds

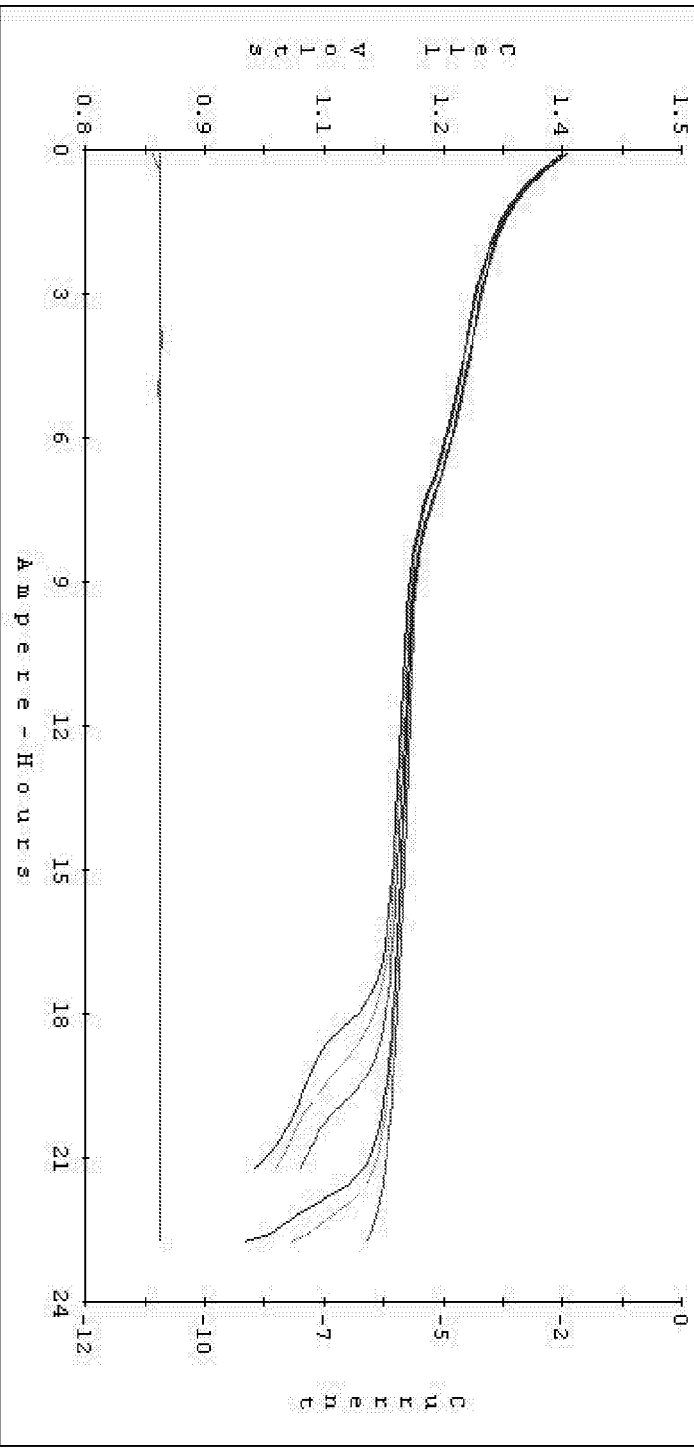


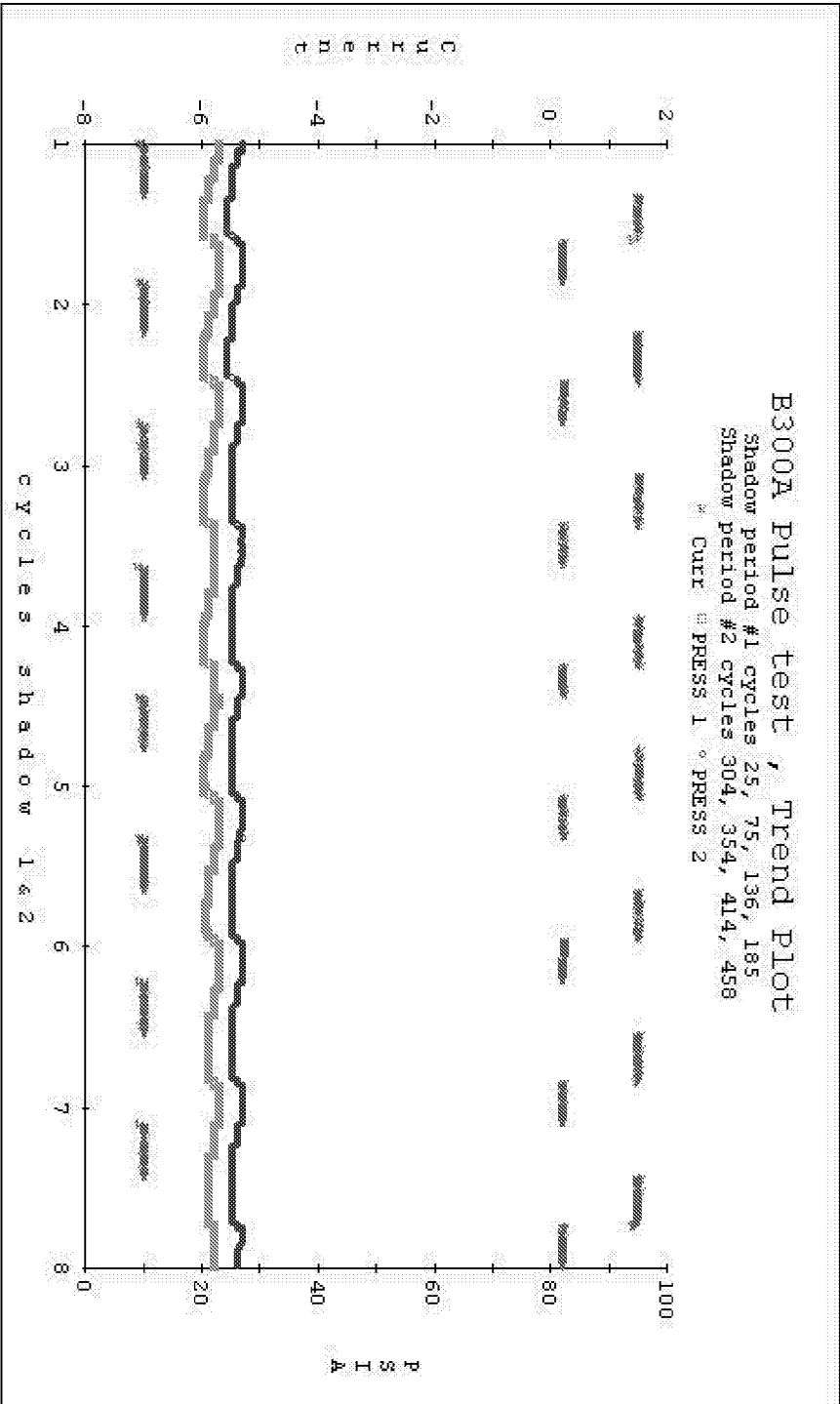
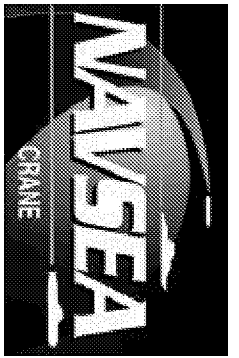


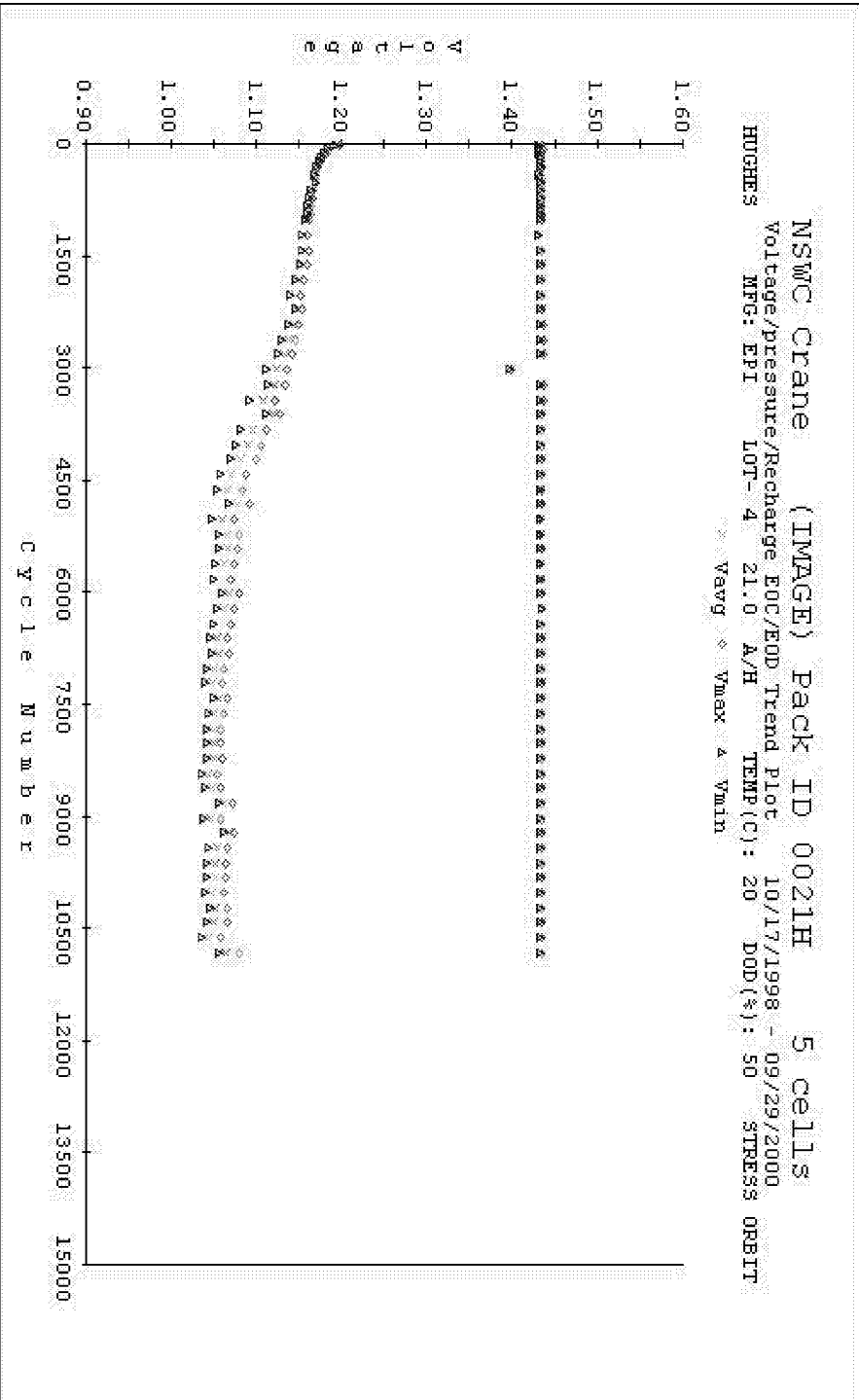
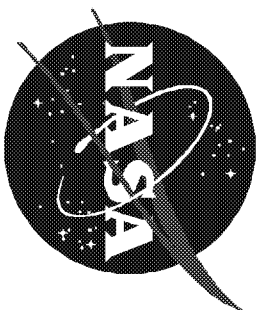
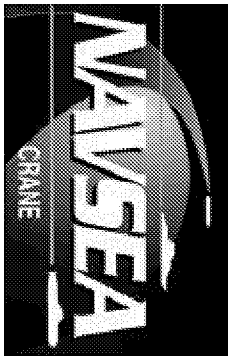
B300A Pulse test, C/2 discharge to 1.0 volt any cell

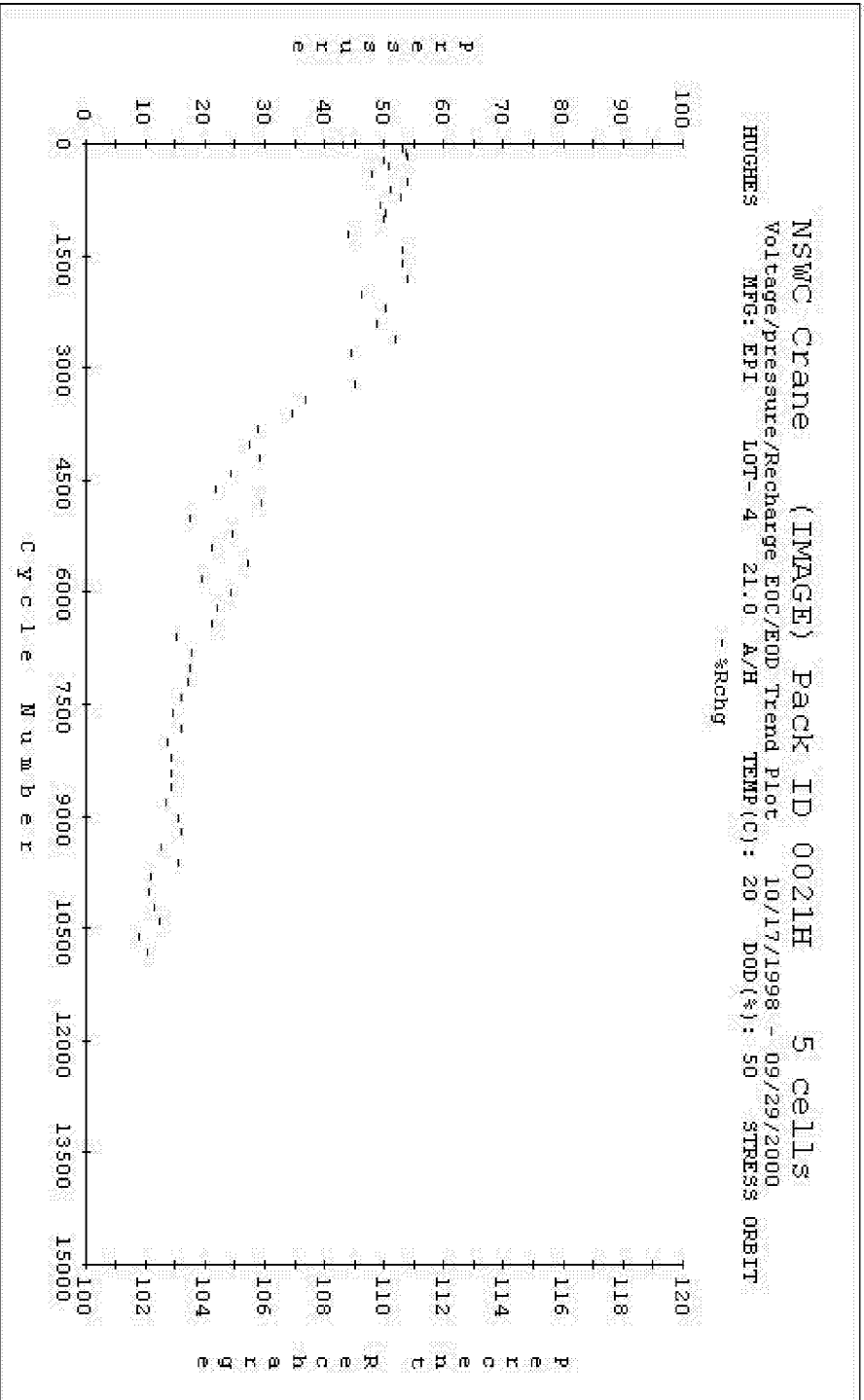
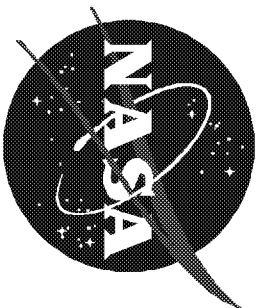
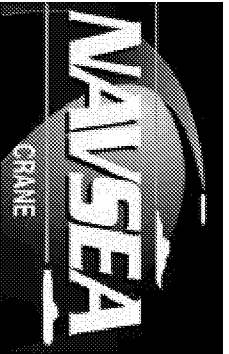
Cycle 186 discharge followed last cycle of Shadow period #1 Aho = 22.8
Cycle 459 discharge followed last cycle of Shadow period #2 Aho = 21.3

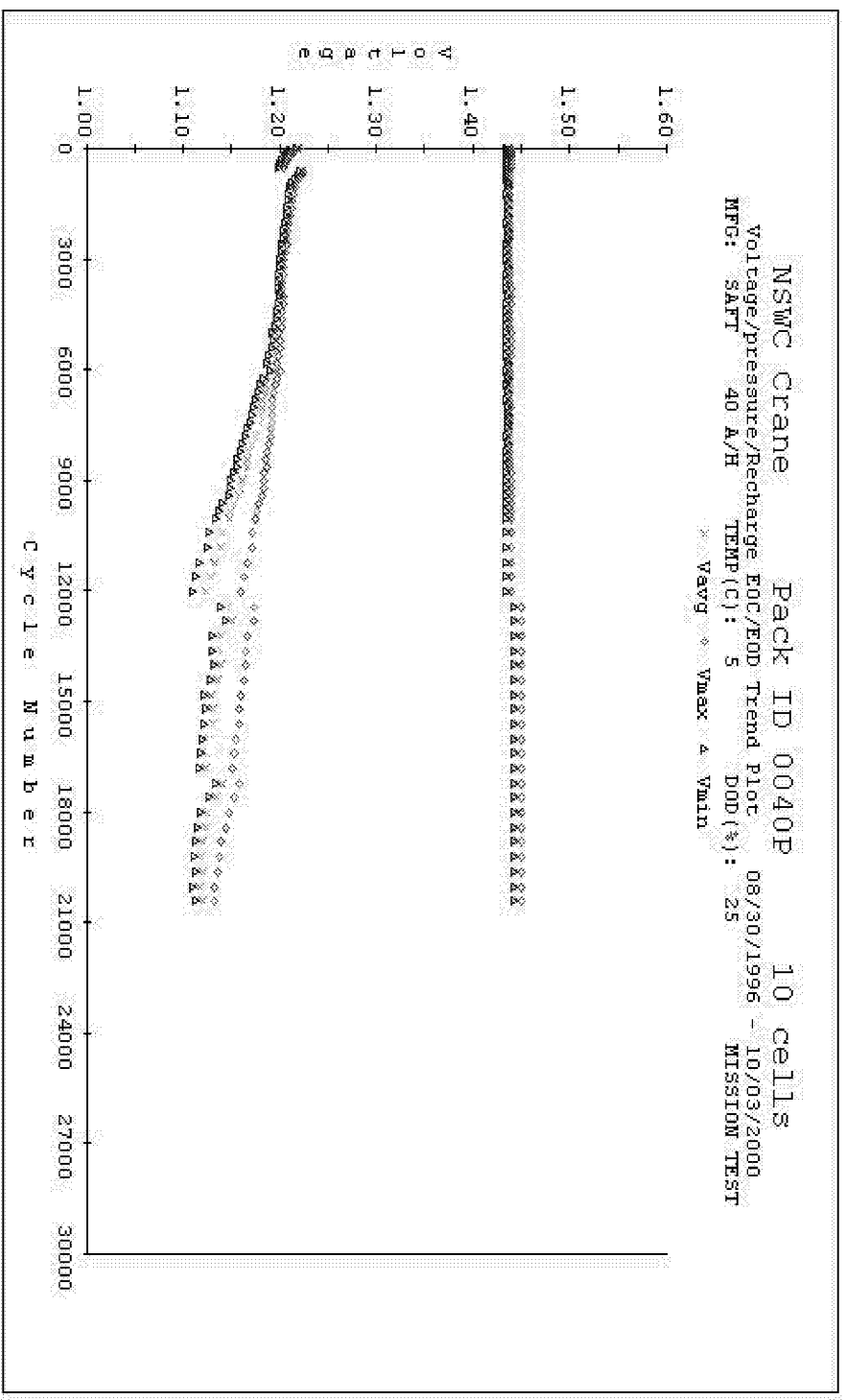
Yavg Ymax Ymin Curr

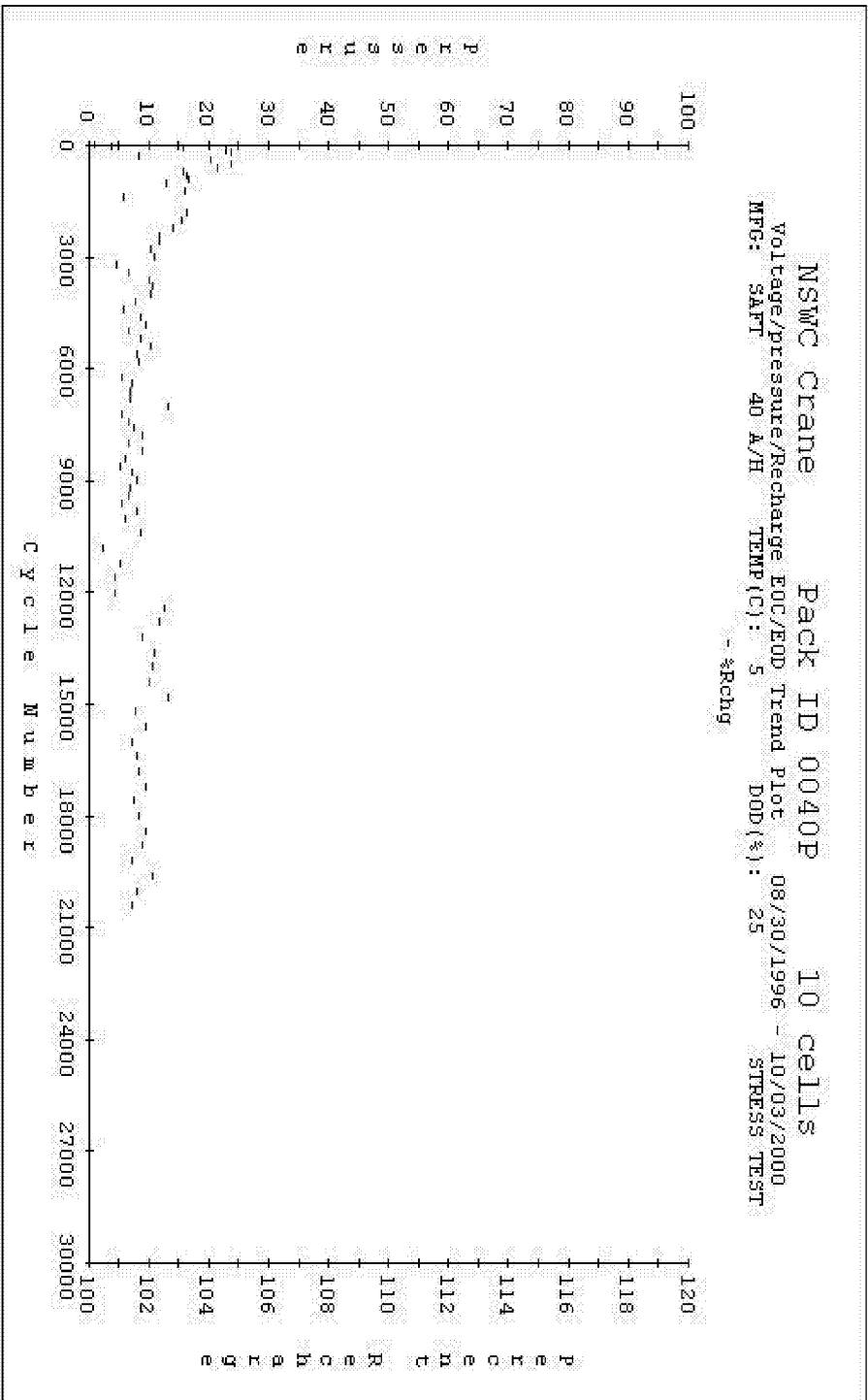
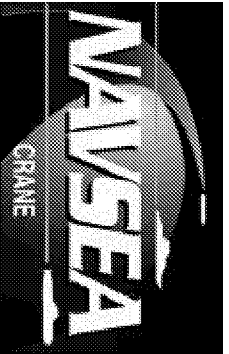


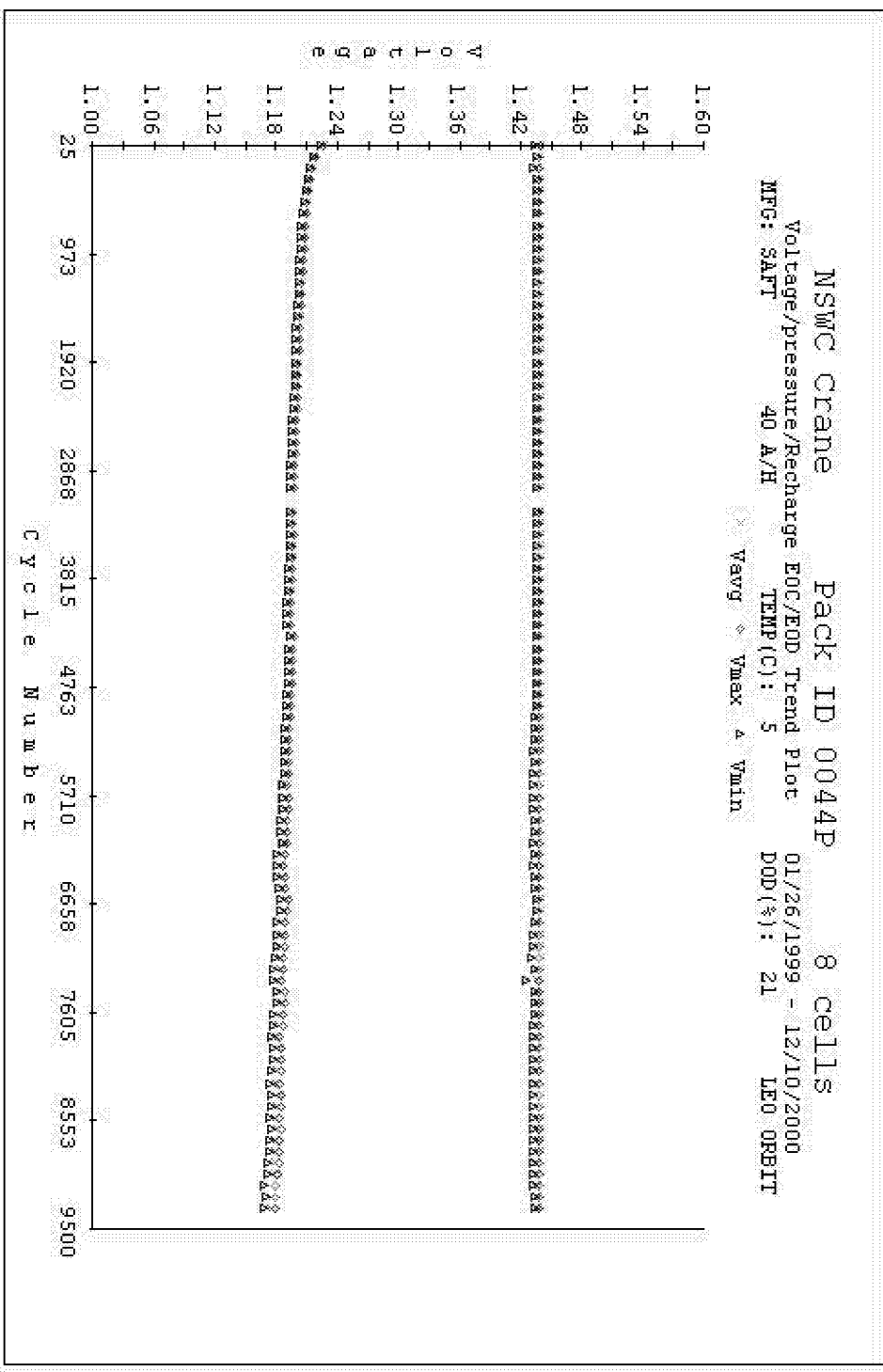


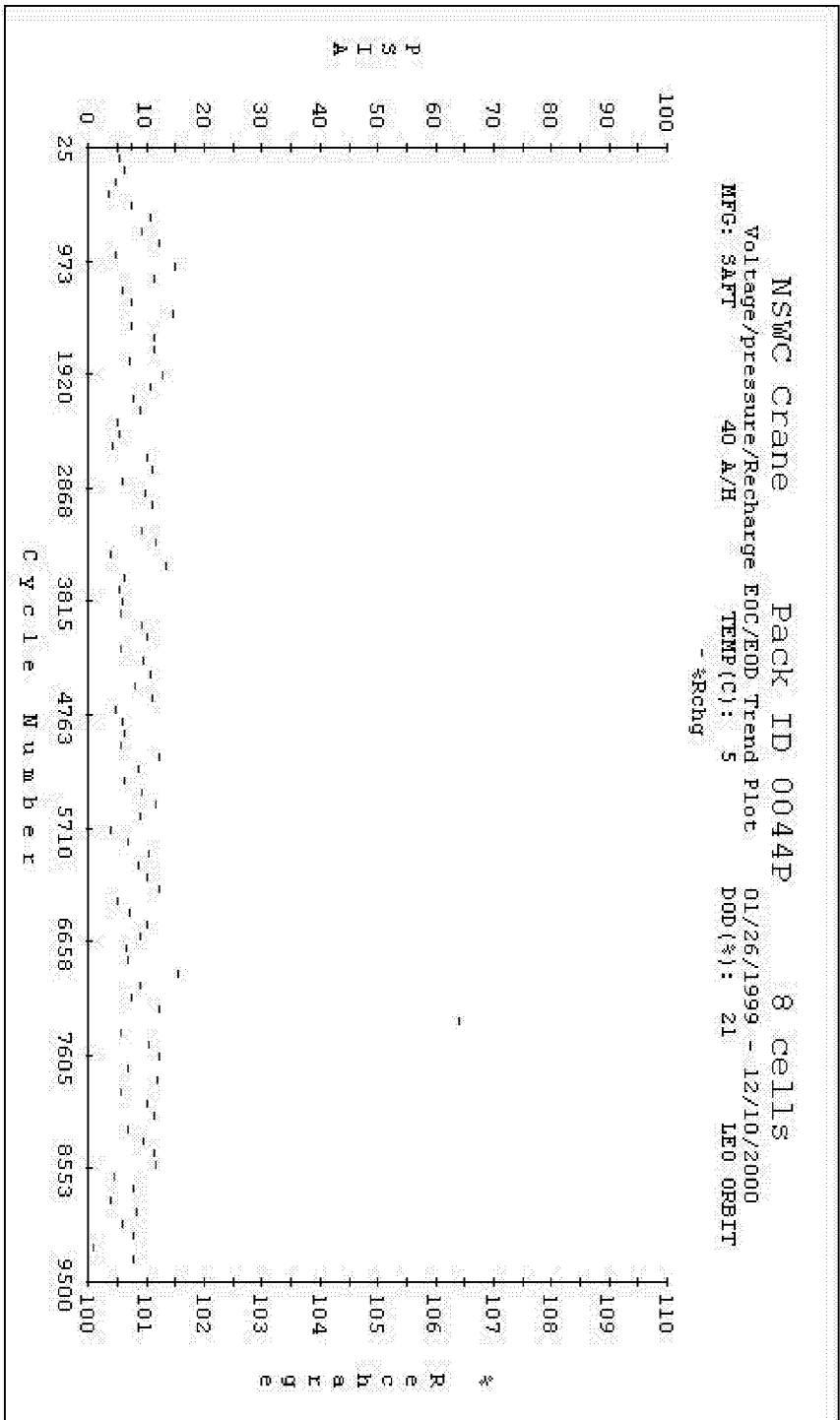
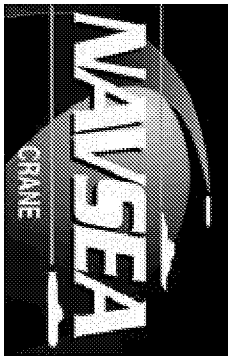


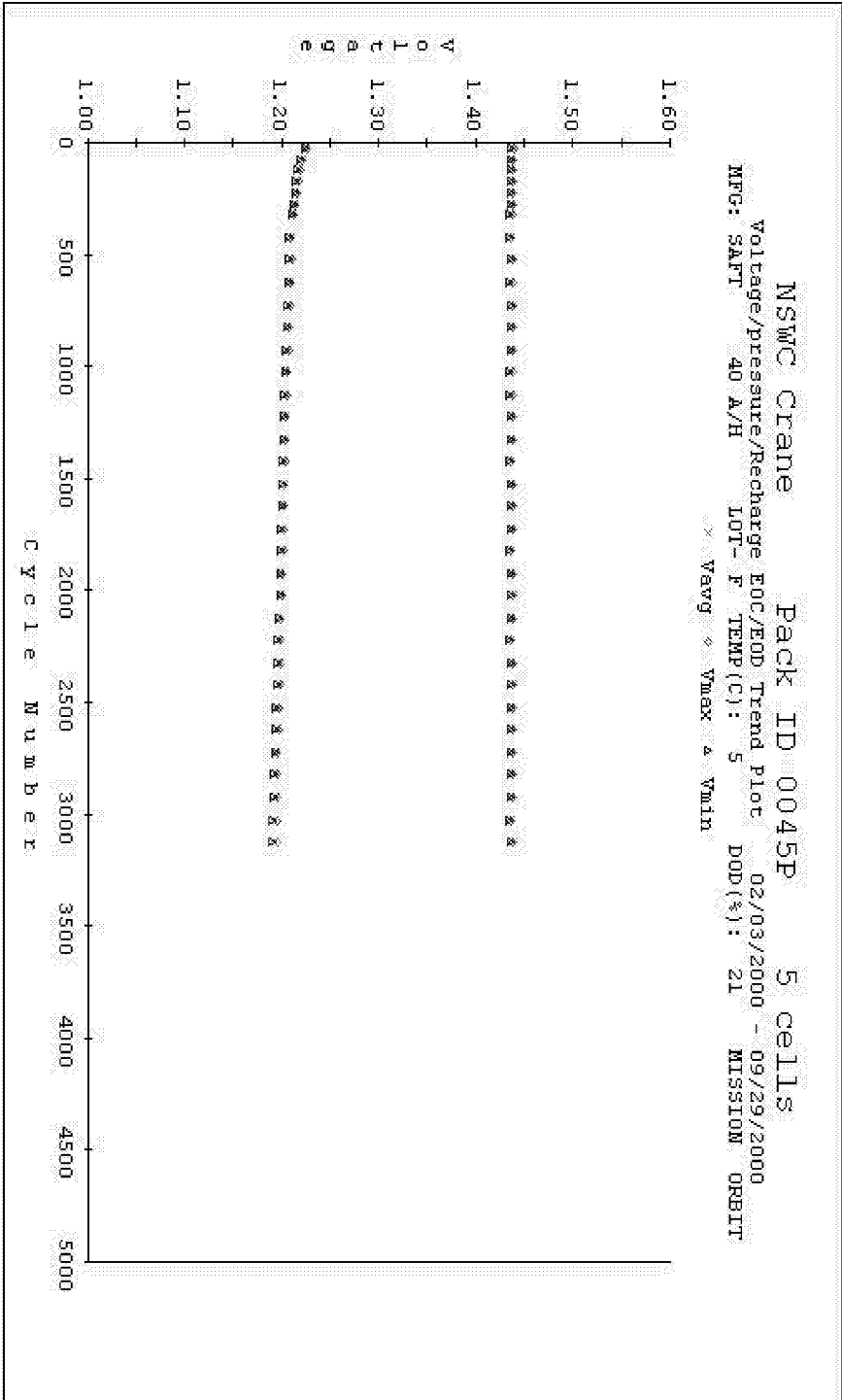
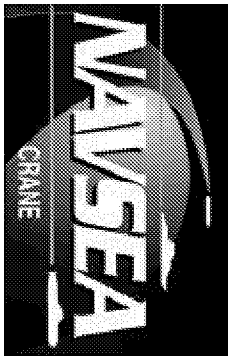


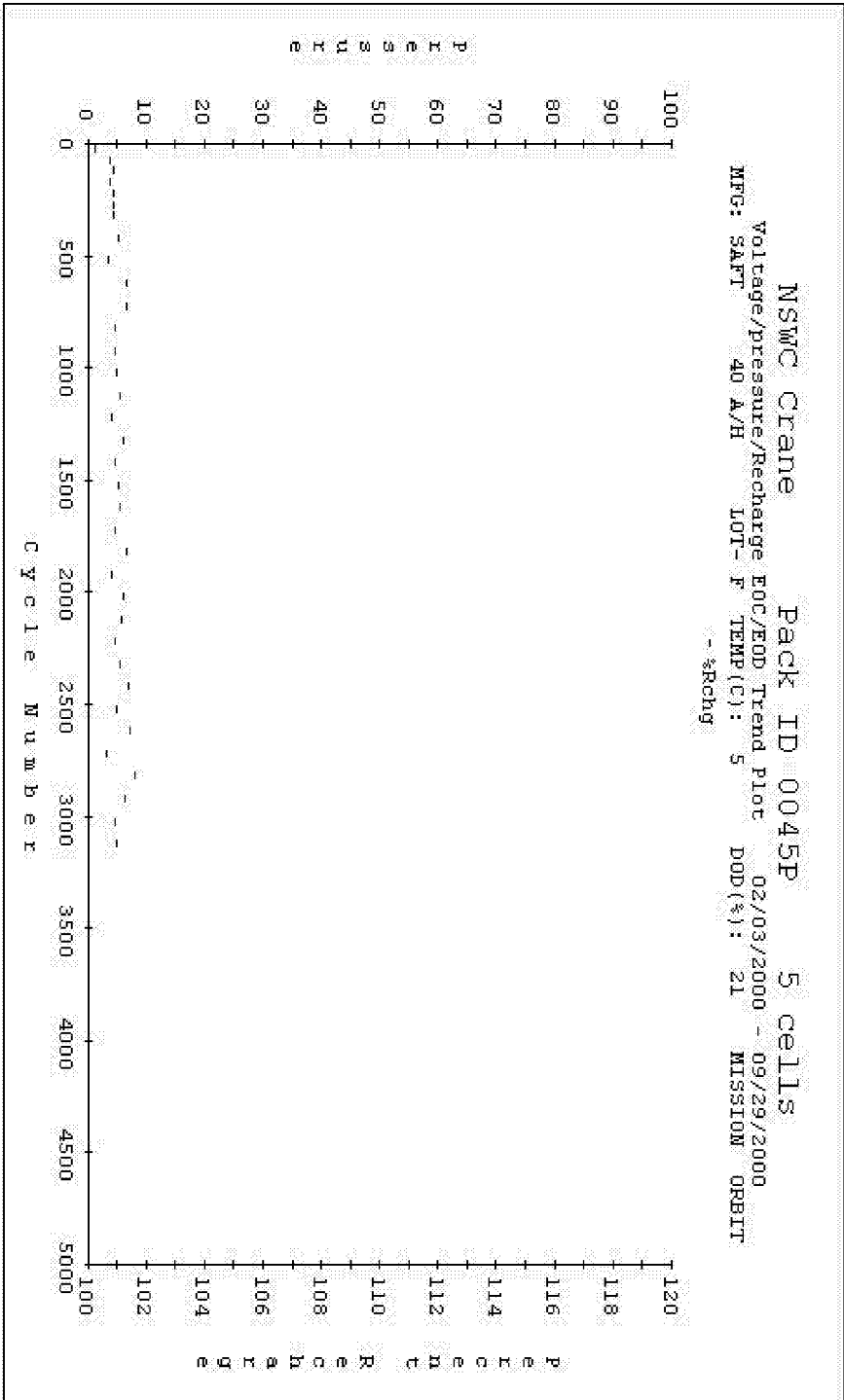
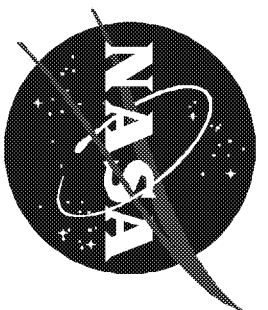
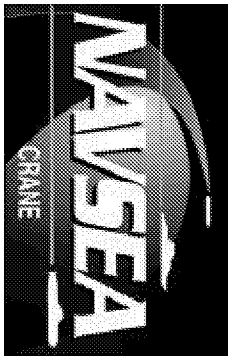


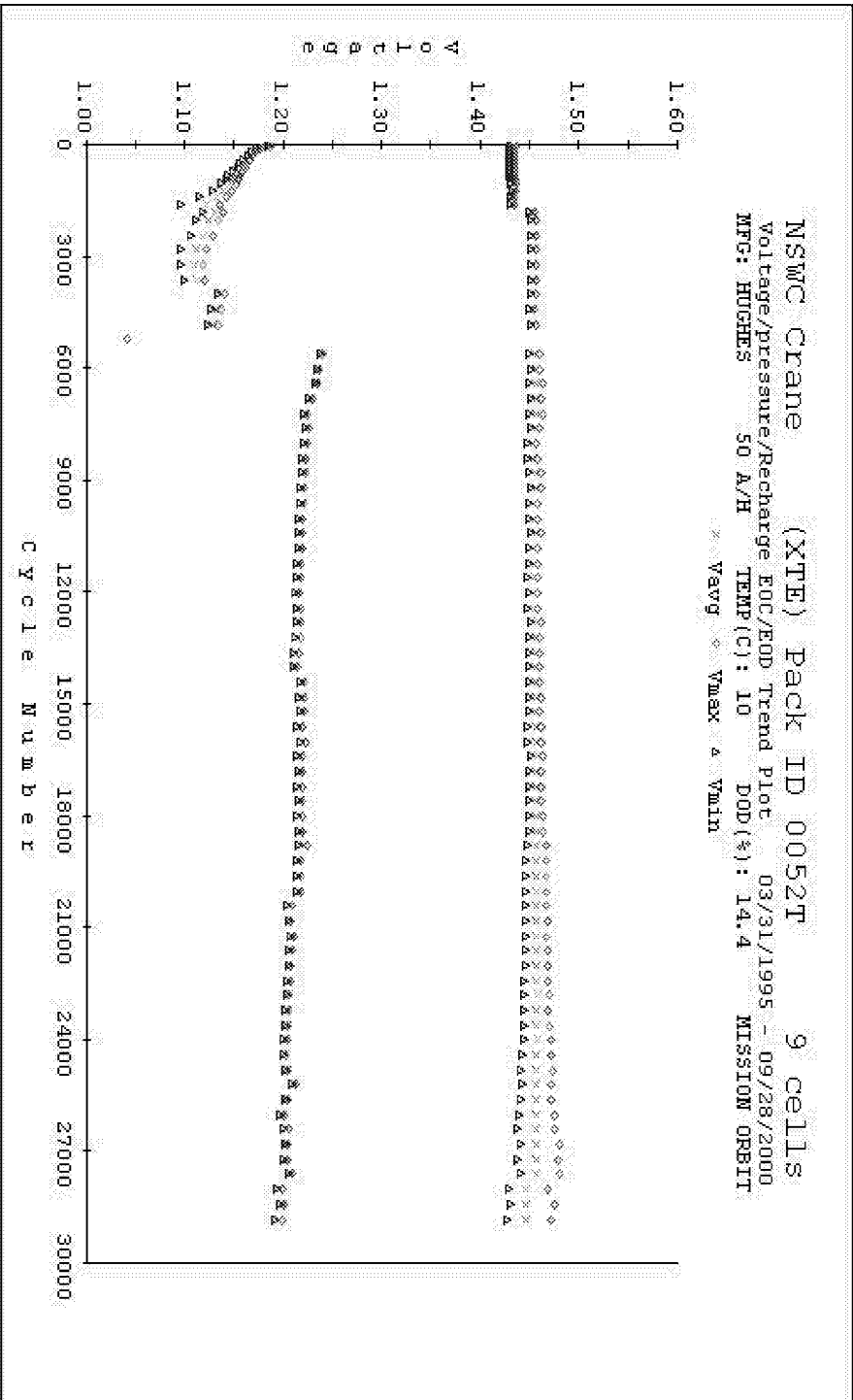
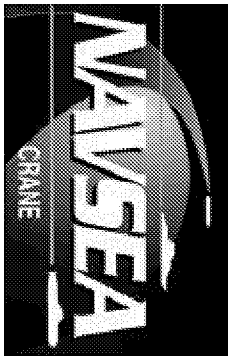


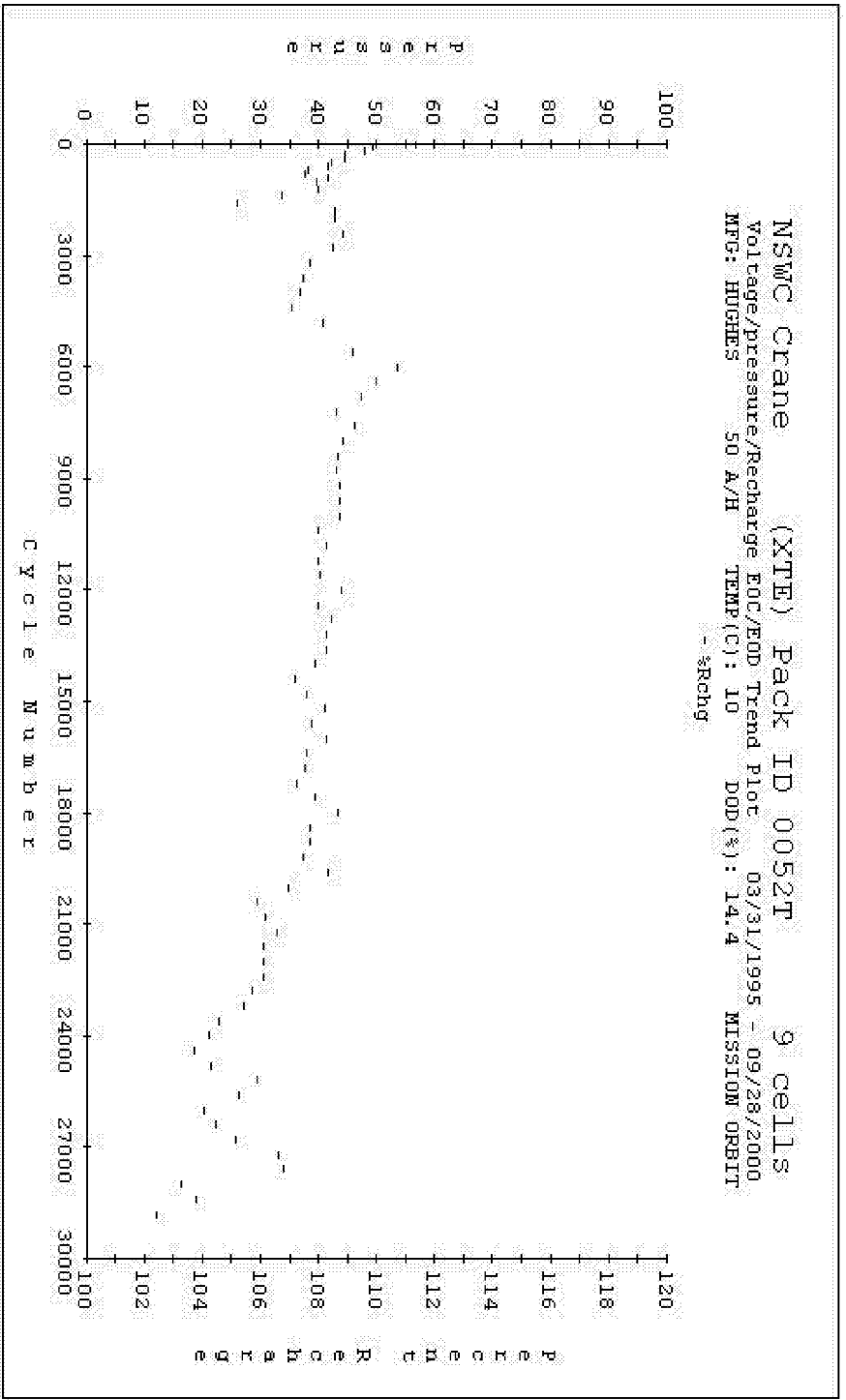


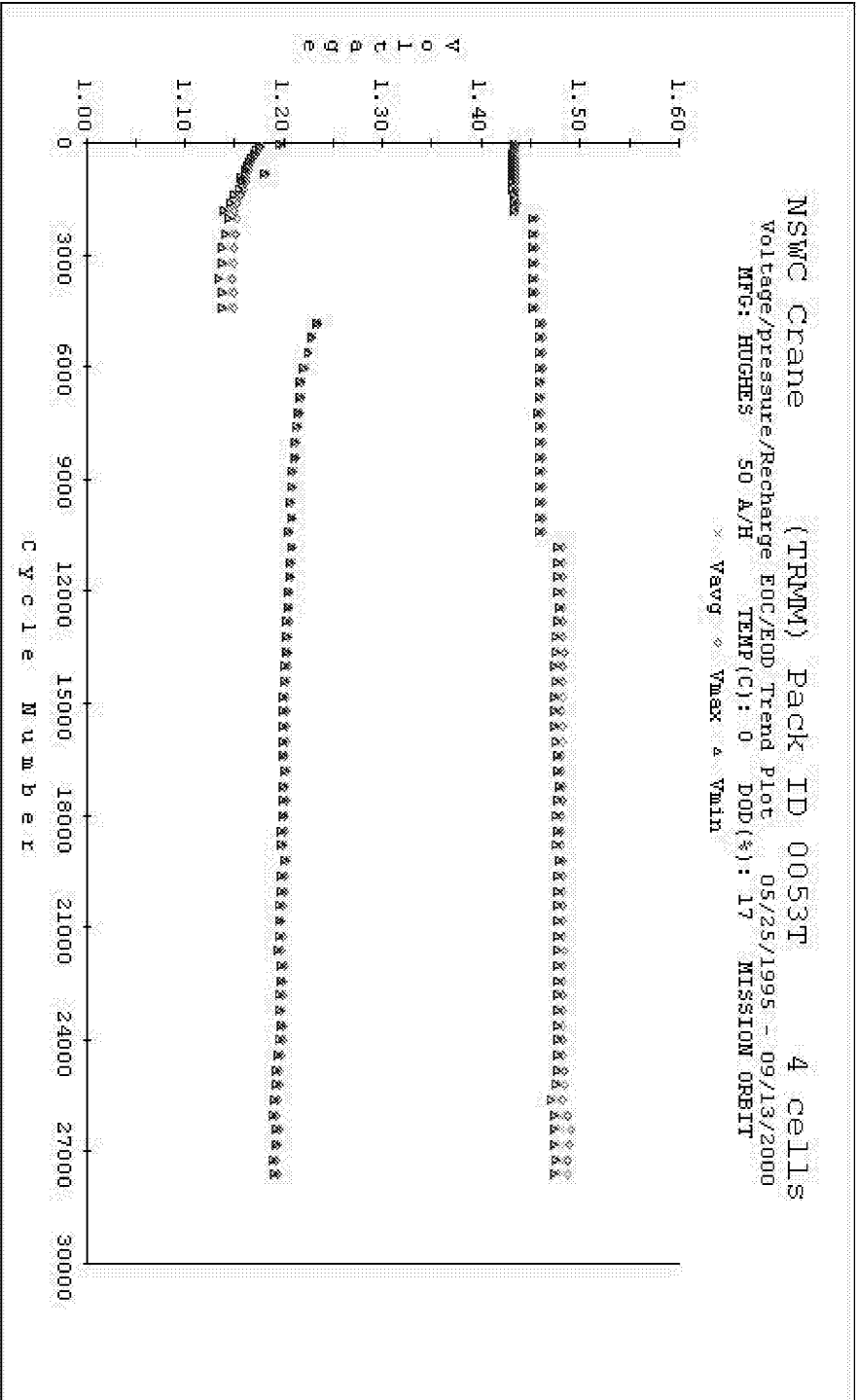
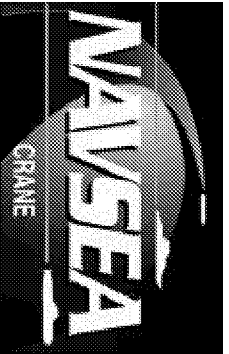


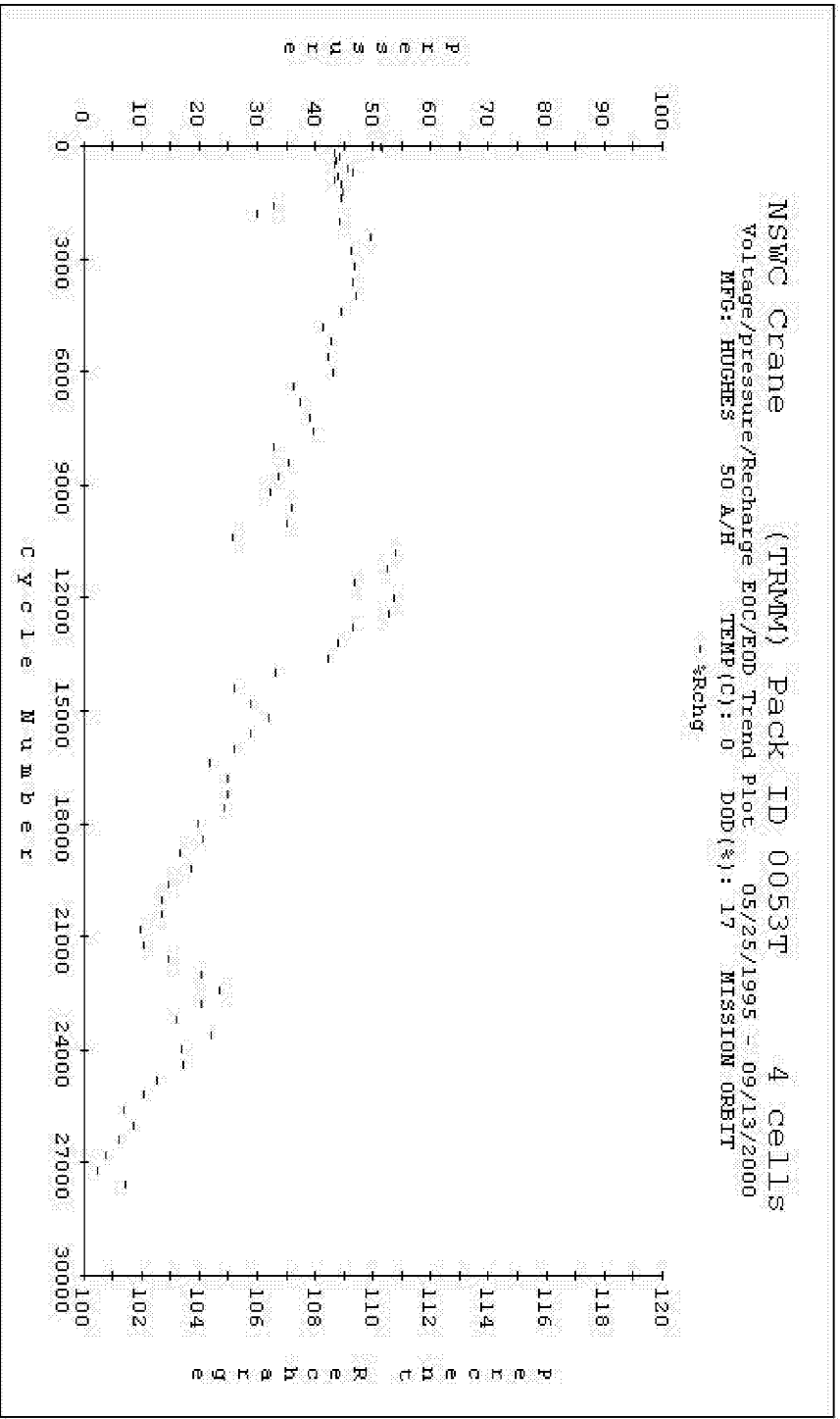


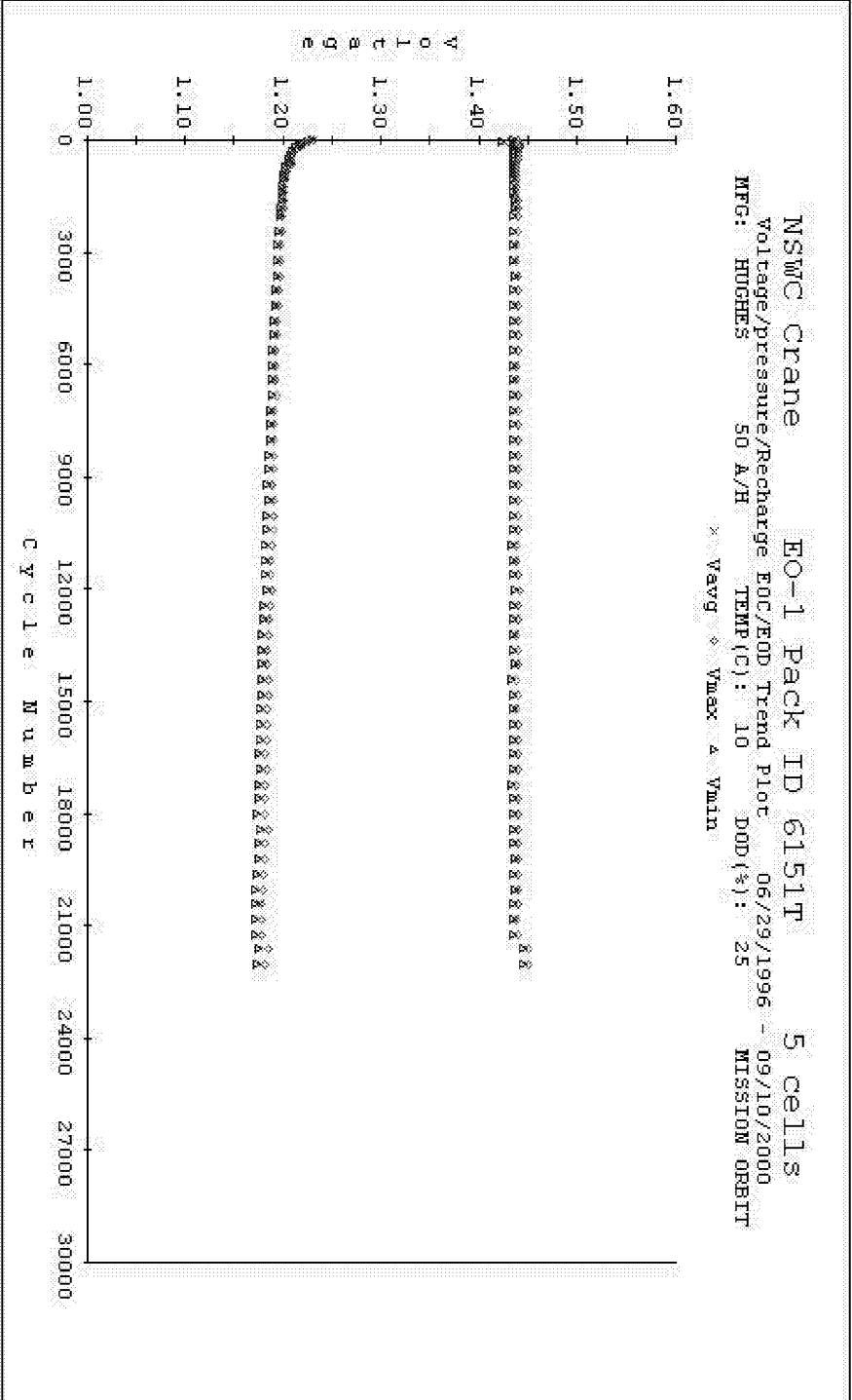
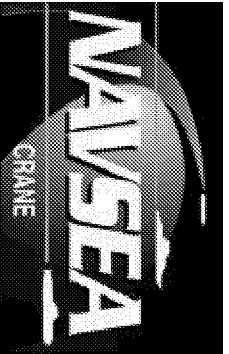


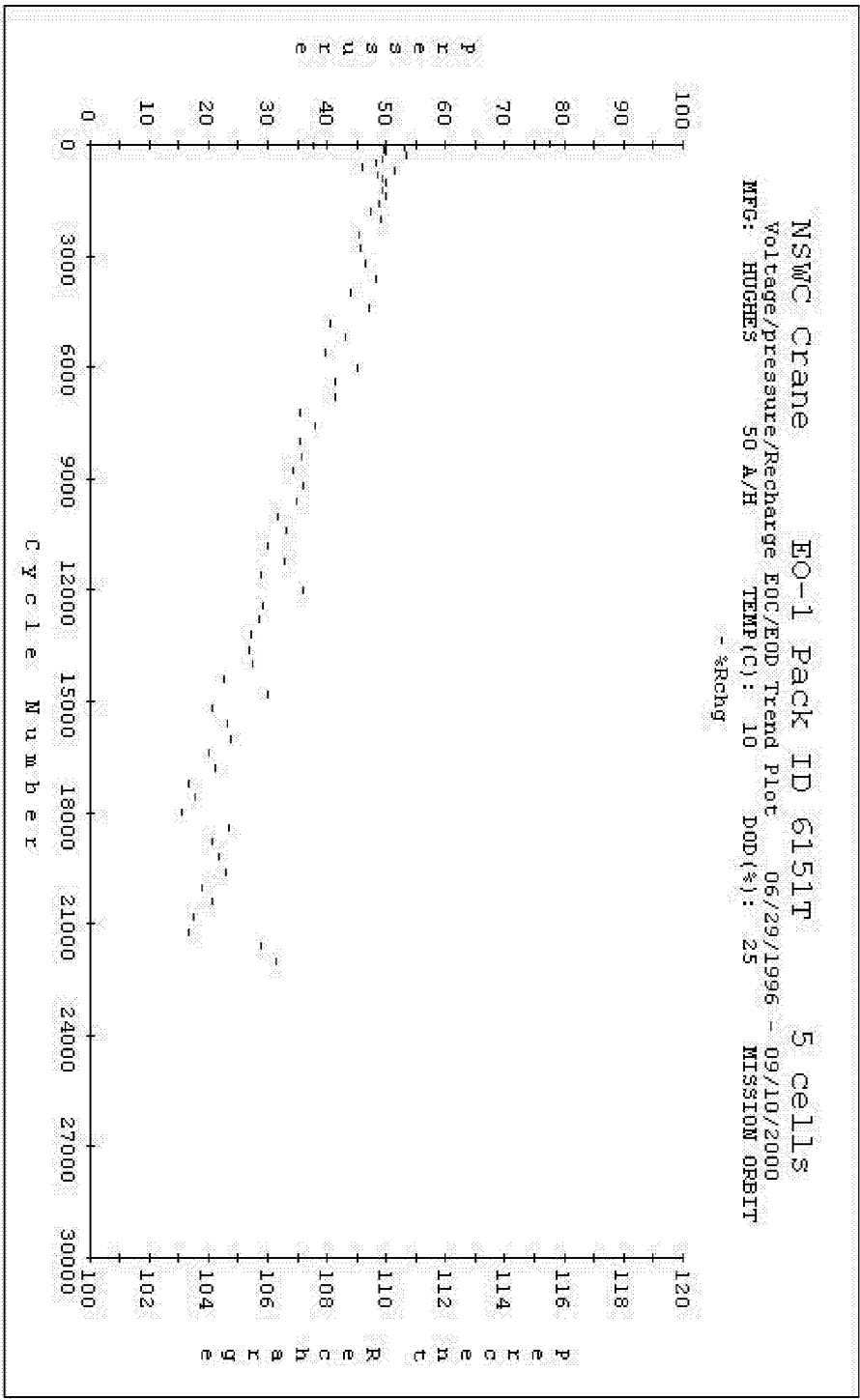


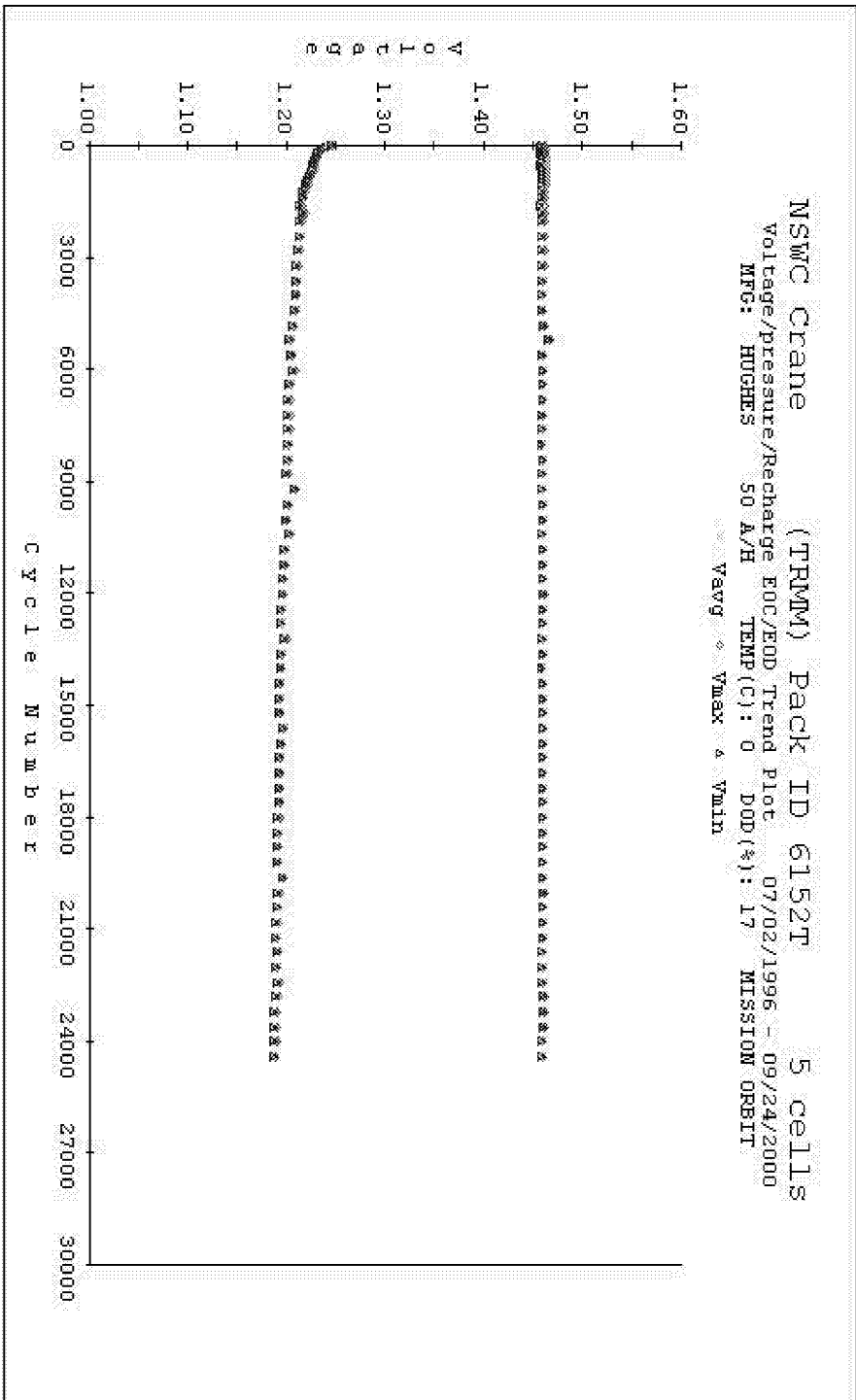
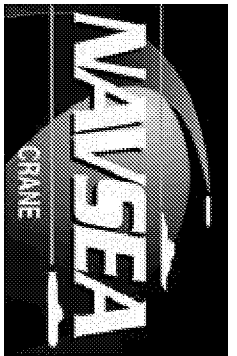


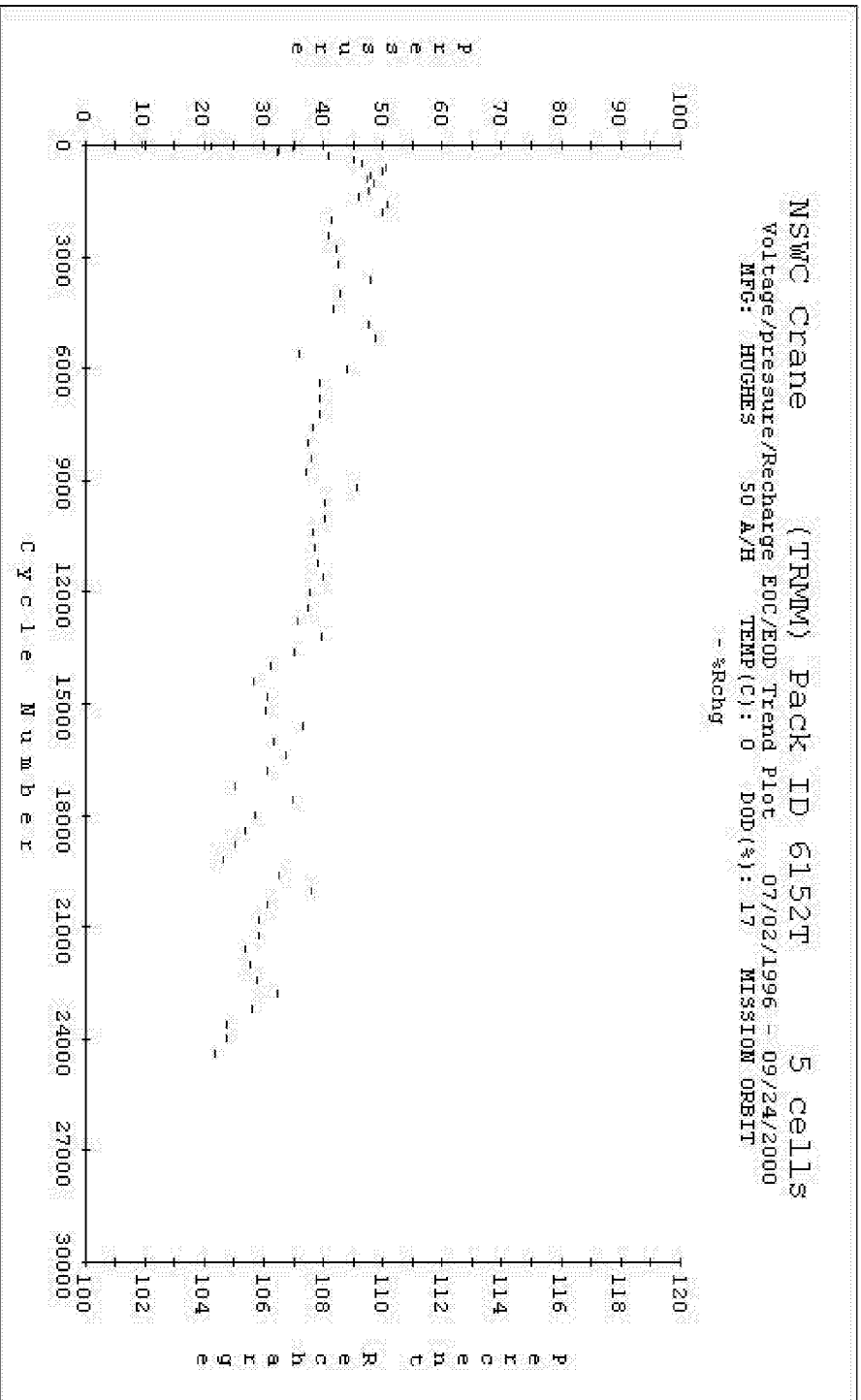
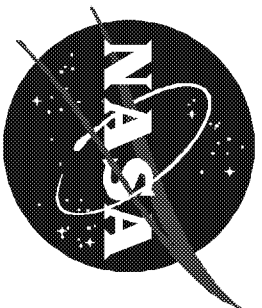
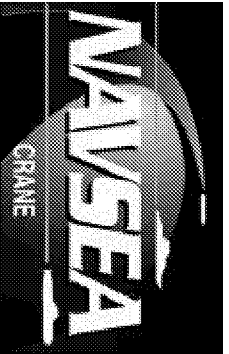


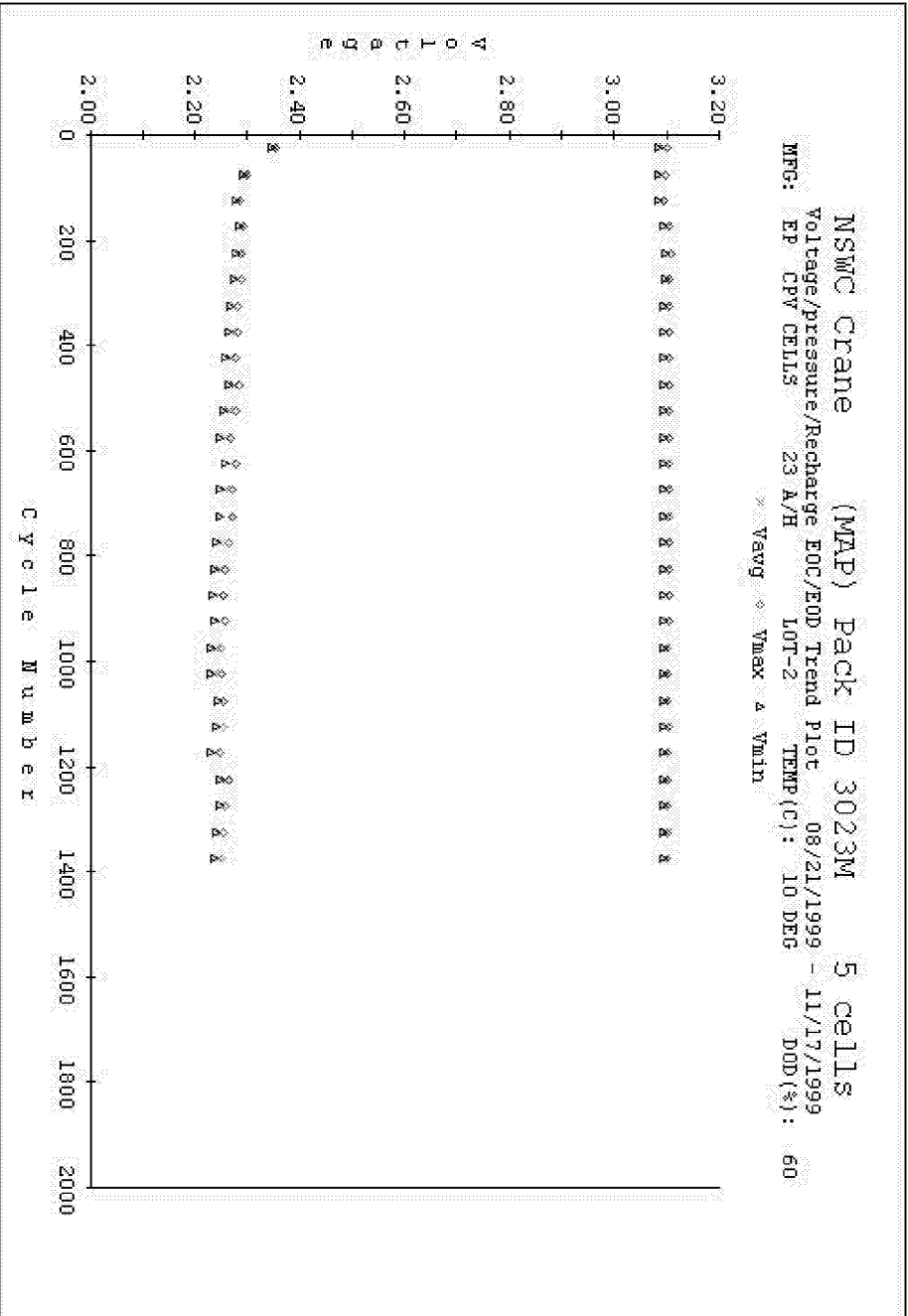
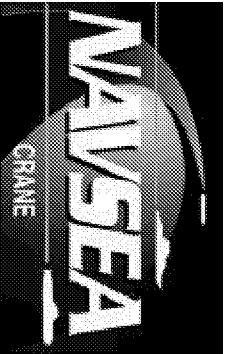


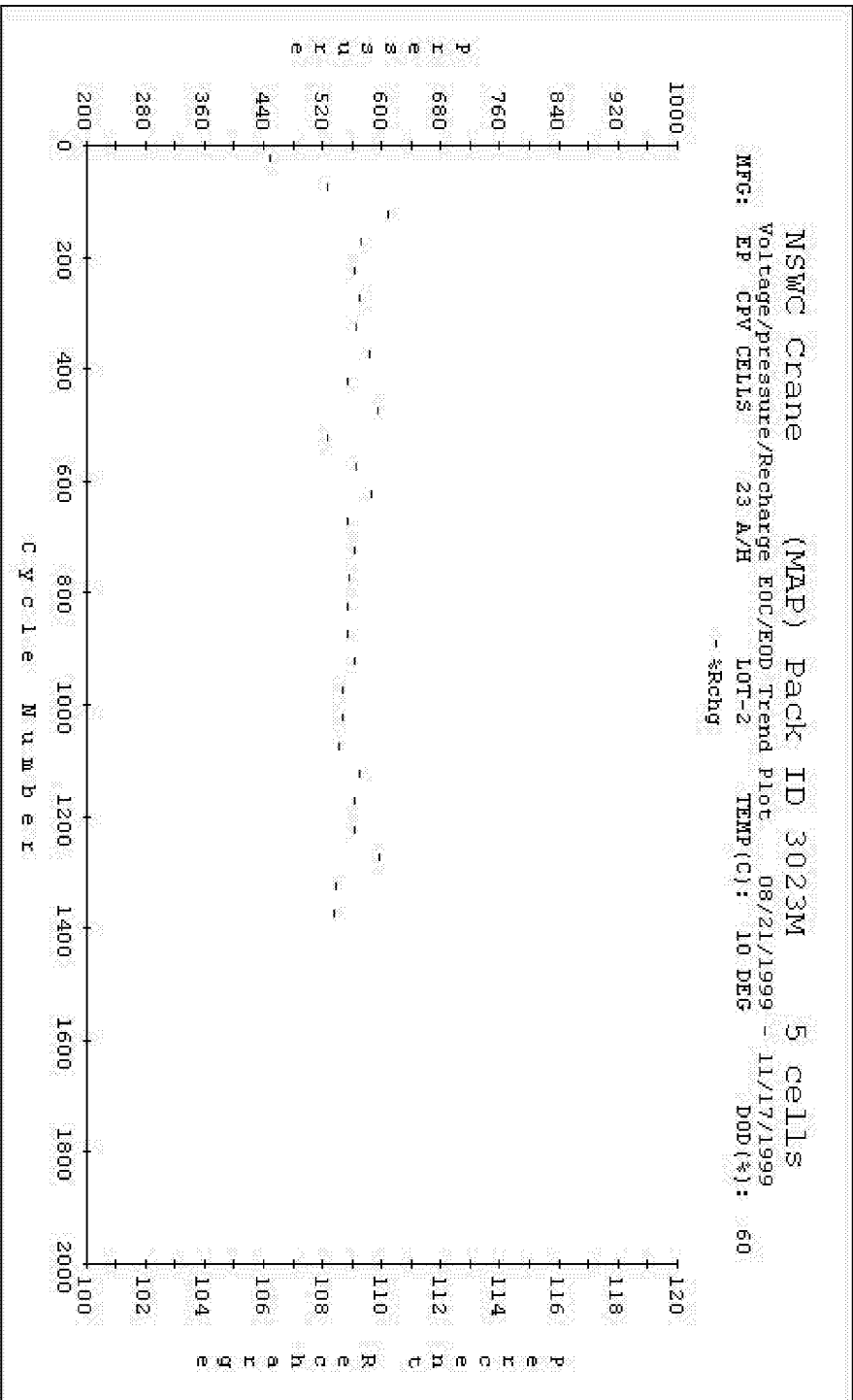
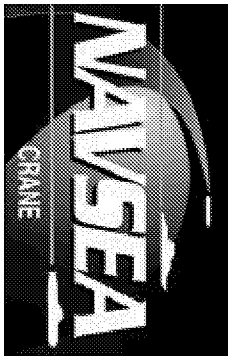


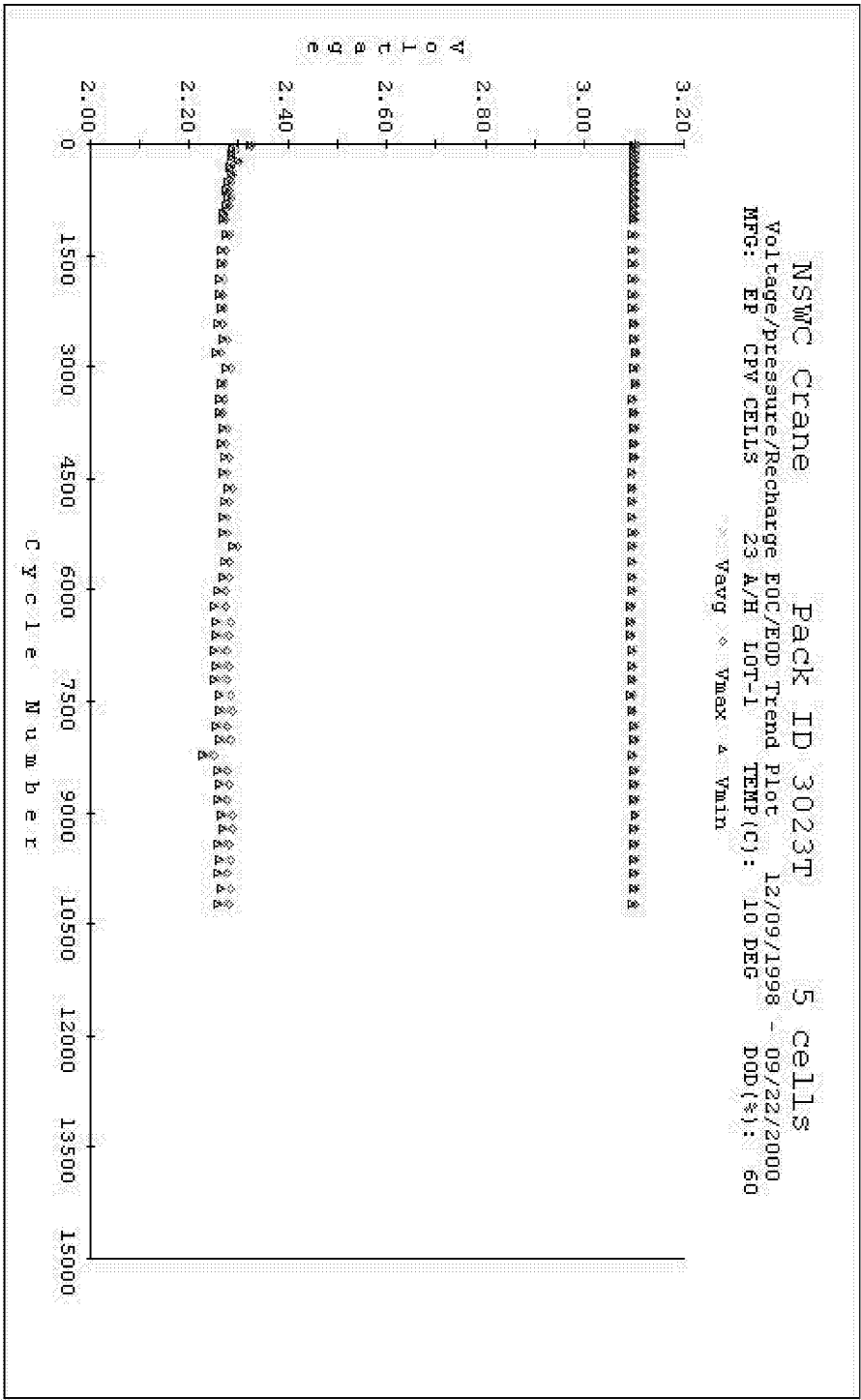


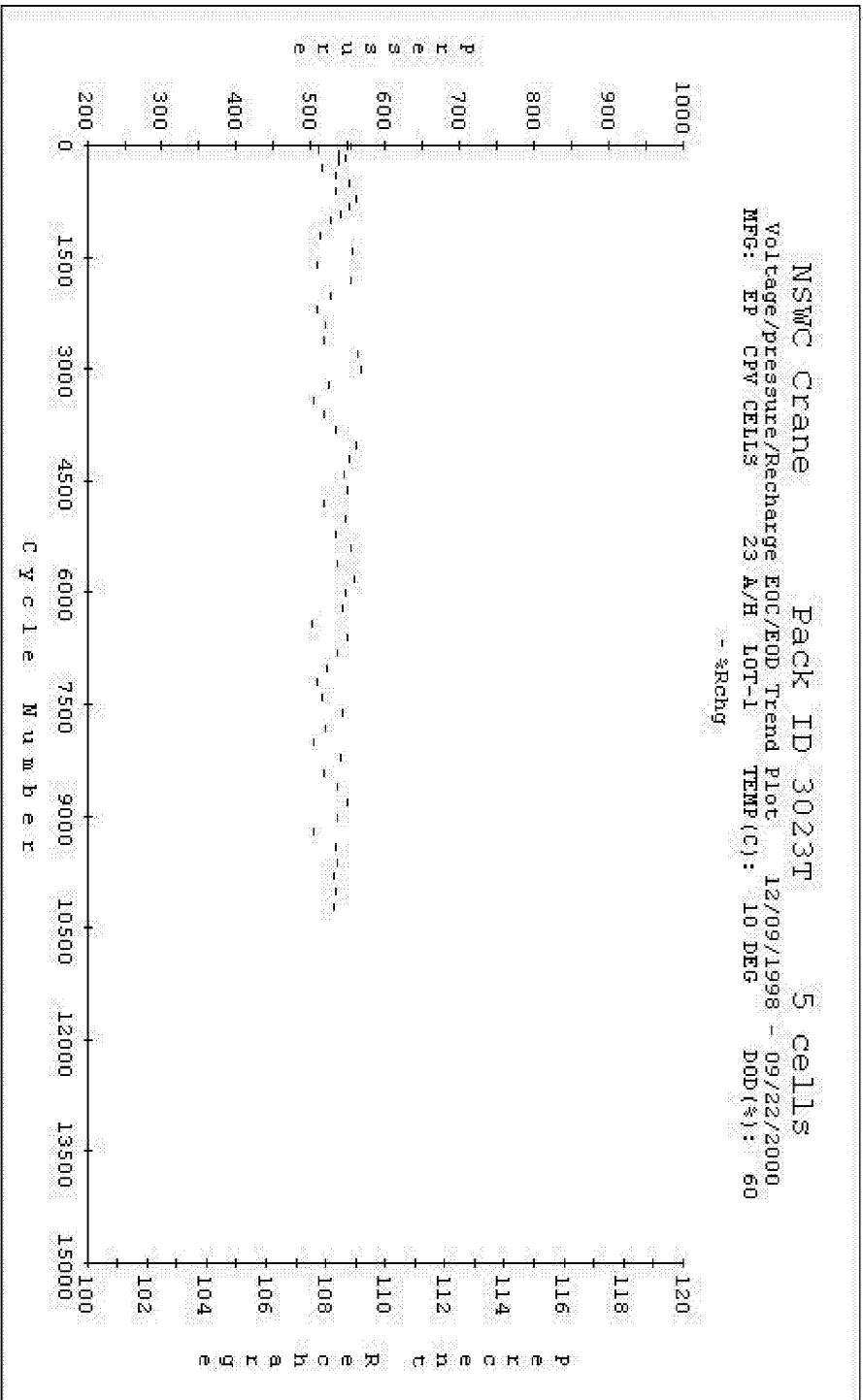


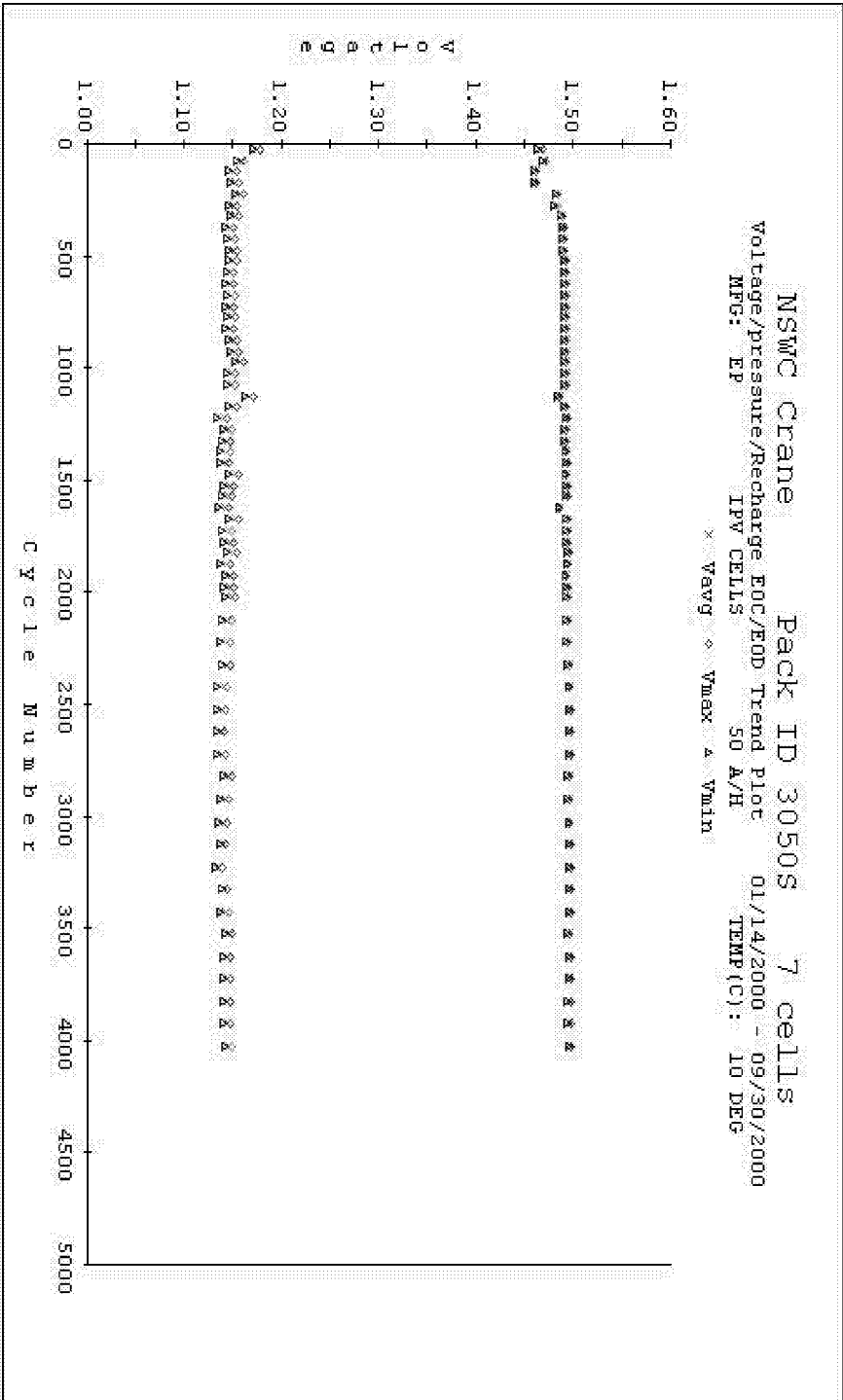
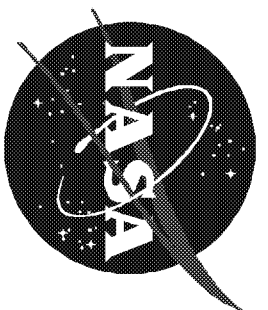
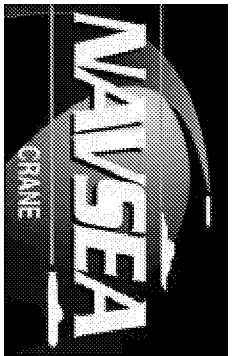


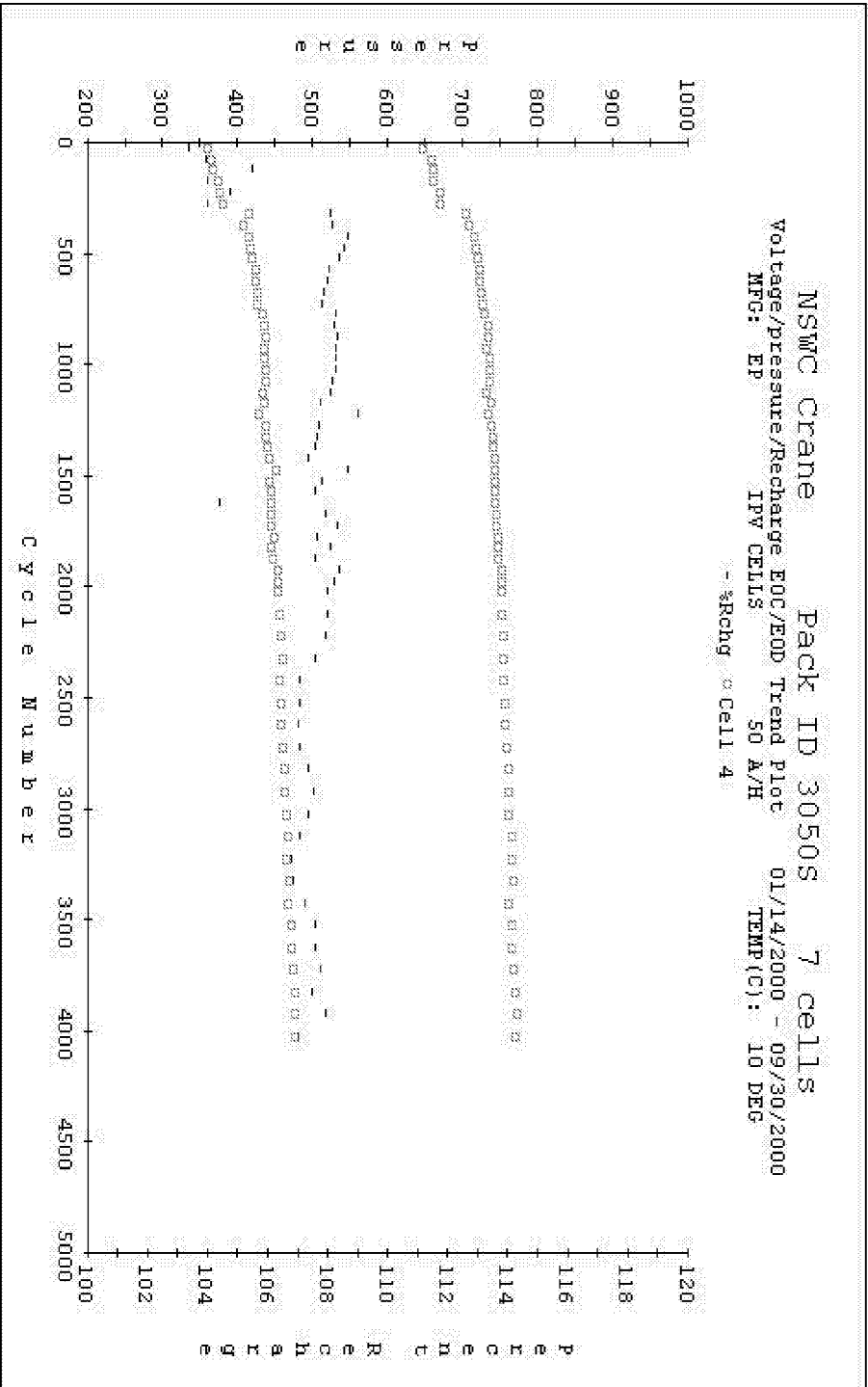
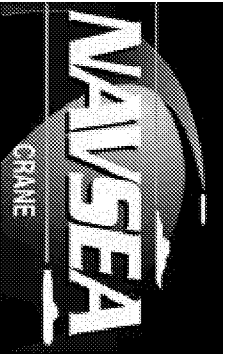


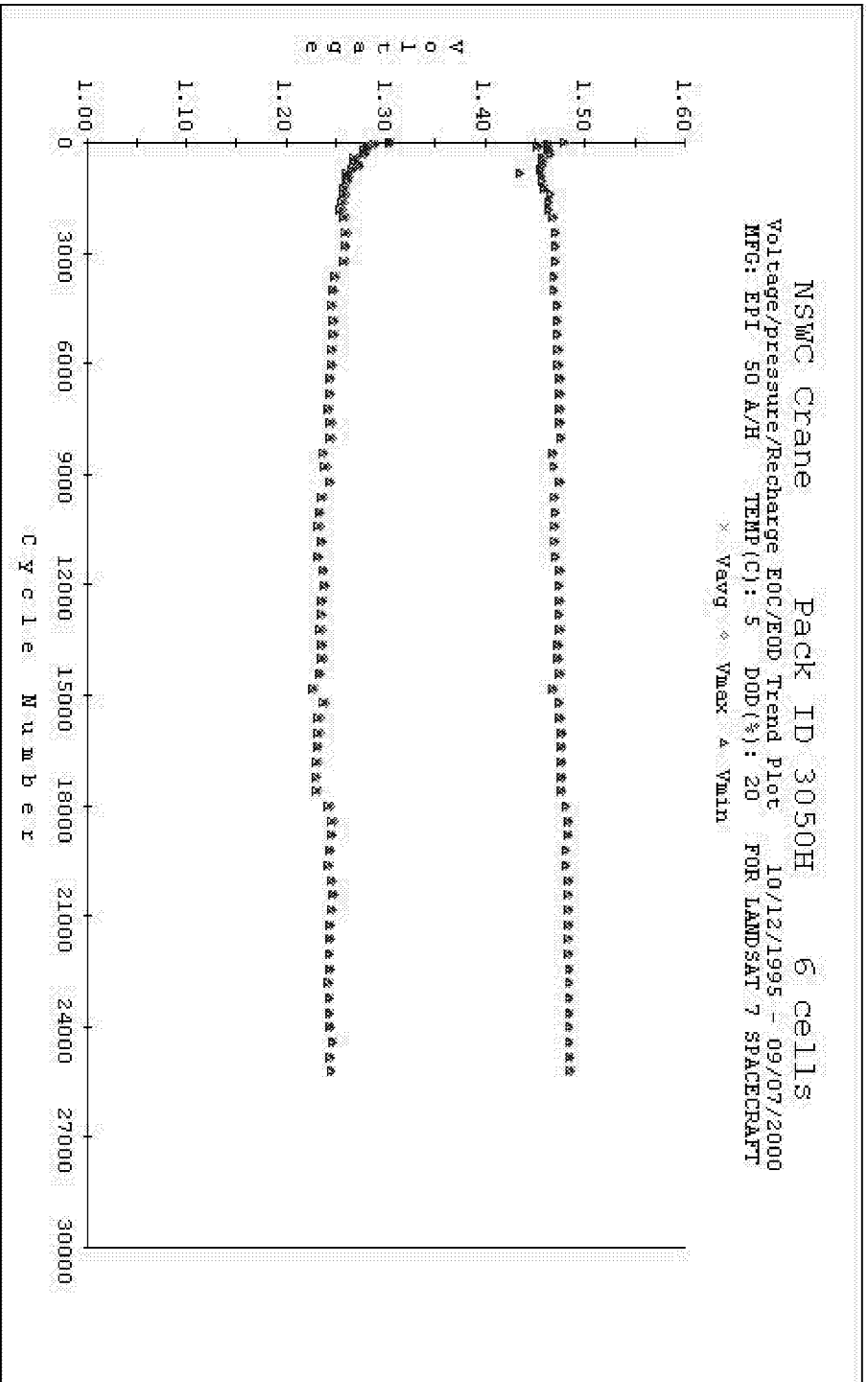


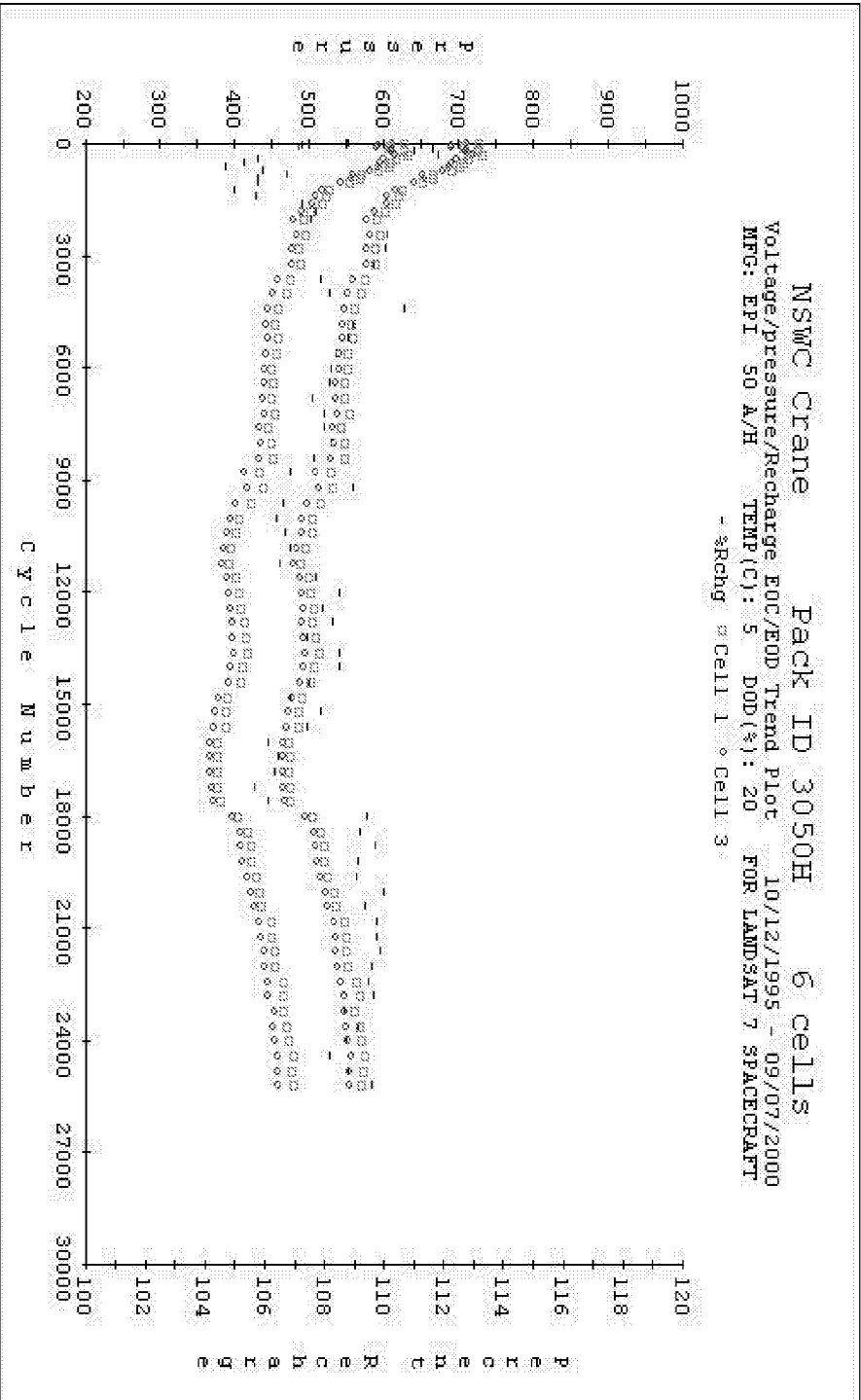
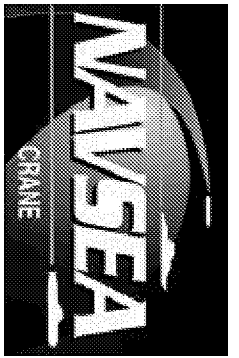


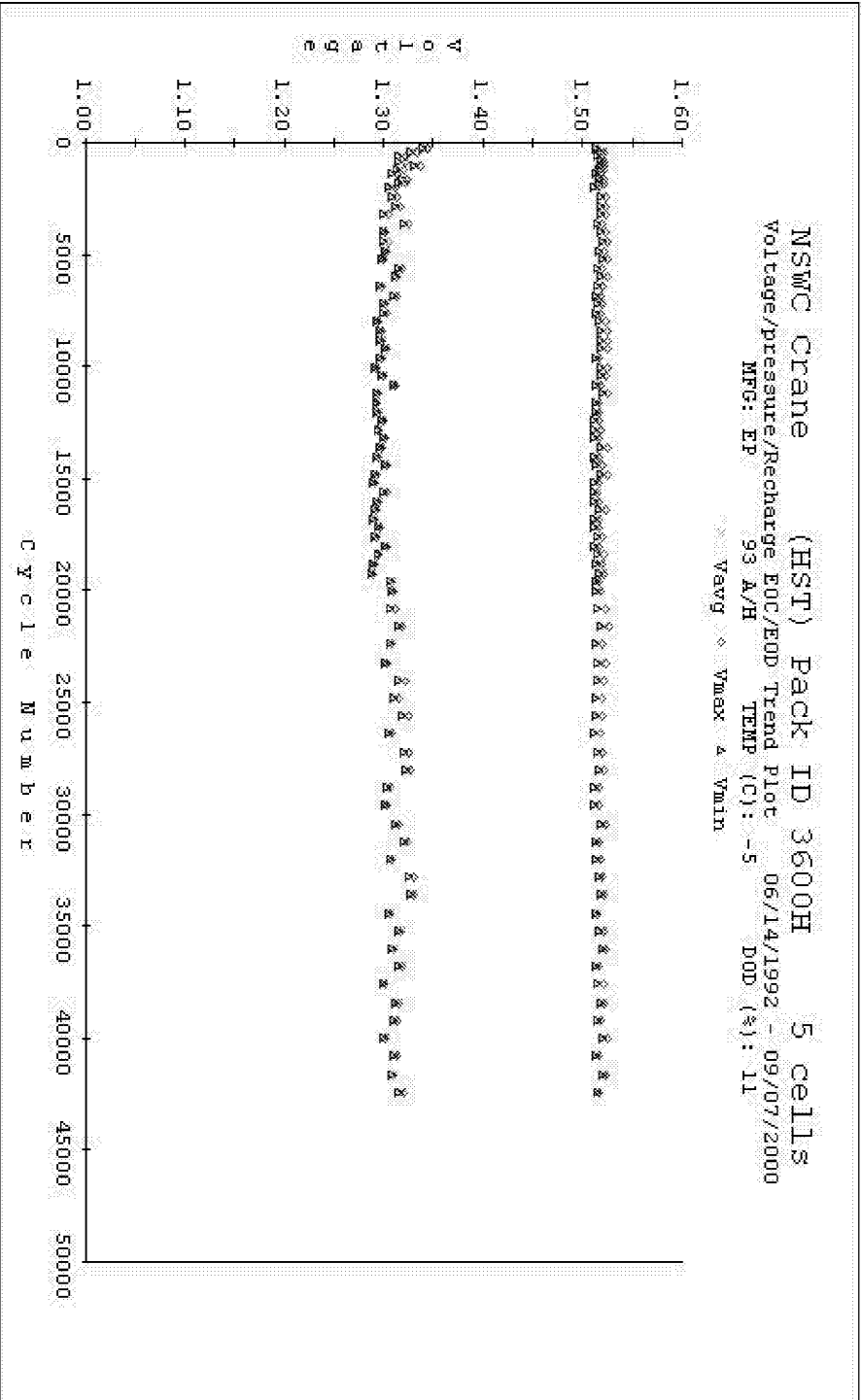
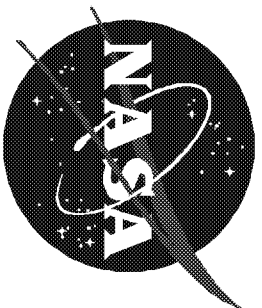
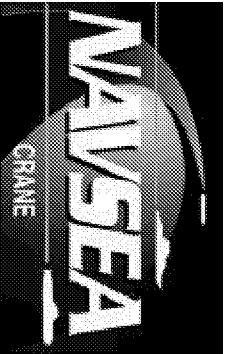


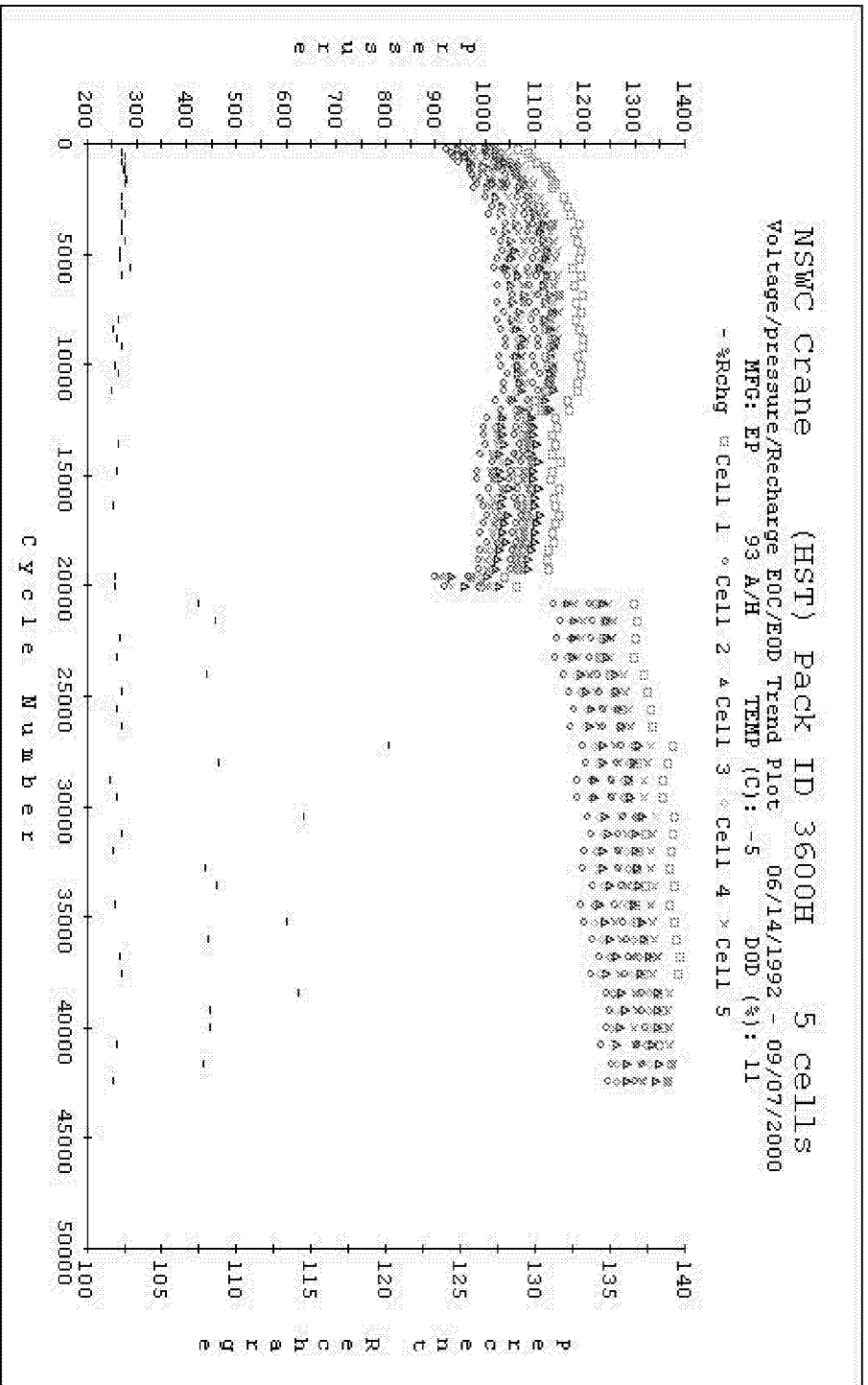


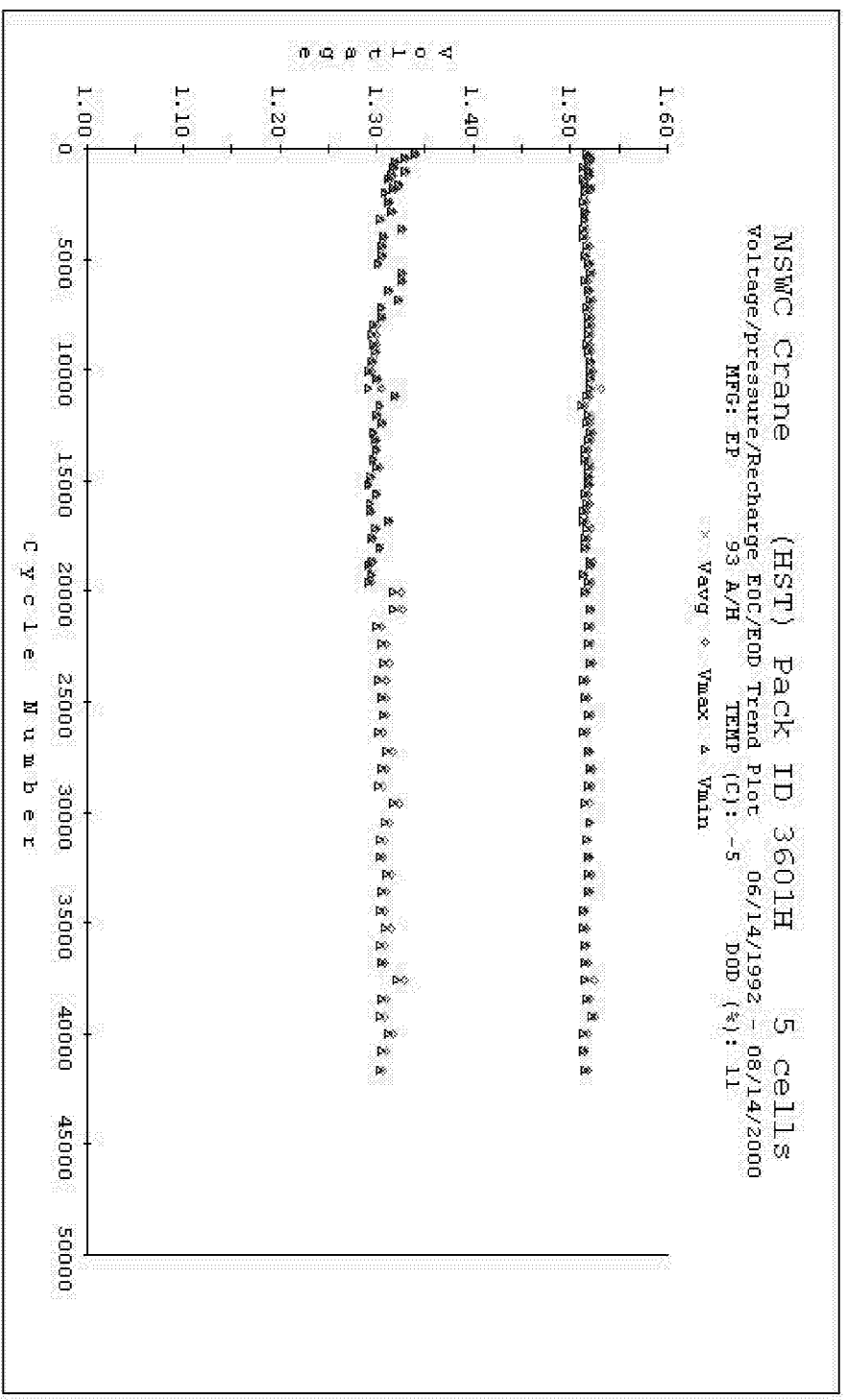


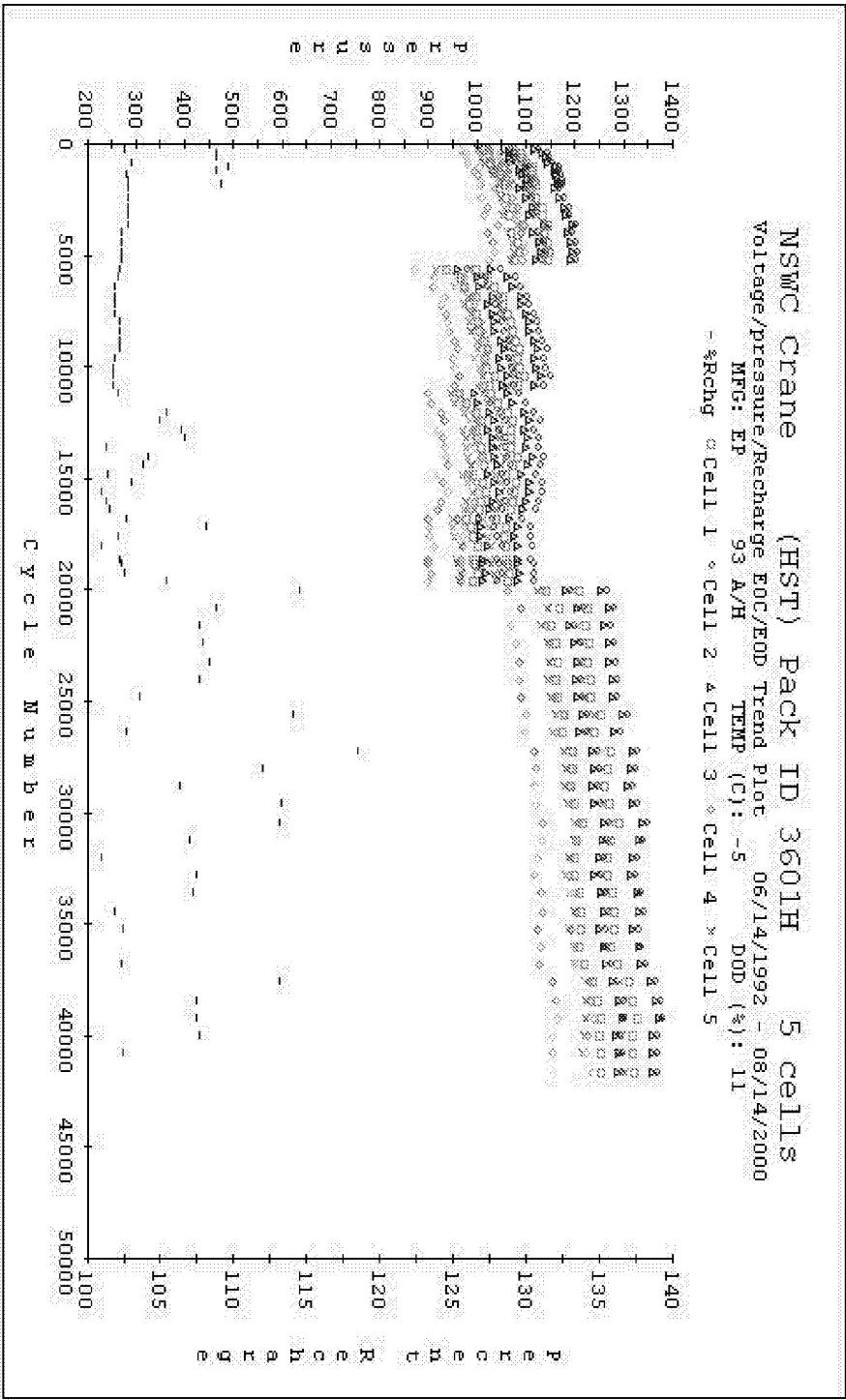


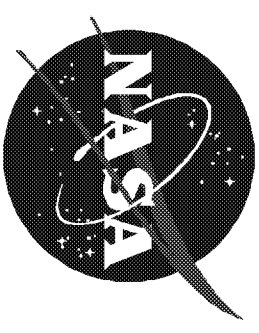
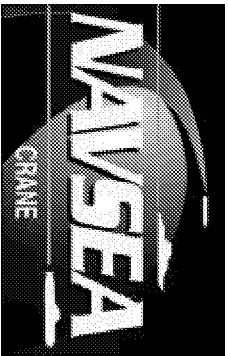












SUMMARY

- Quality EPT Ni-H₂, EPT Super NiCd and SAFT NiCd cells have been demonstrated for Aerospace applications
- The data has been provided to NASA Centers and other Agencies for their use and application
 - Developed plan and used in NASA in-orbit battery management.
- Database on rechargeable cell/batteries is now available for customer use.