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LEAD STORAGE BATTERY RADIATION DAMAGE TESTS

C. CLIFFORD and T. ARNETTE

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LEAD STORAGE BATTERY RADIATION DAMAGE TESTS

C. Clifford and T. Arnette

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LEAD STORAGE BATTERY RADIATION DAMAGE TESTS

C. Clifford and T. Arnette

ABSTRACT

A lead-acid storage battery was placed at the inner edge of the X-10 shield in a neutron flux of 10^{10}(nv) and a gamma flux of 8-10,000 r/hr. After being left there for two weeks, the battery was taken out. Comparisons were made of operating characteristics before, during, and after exposure. No trends indicating radiation damage were apparent in the data obtained.

Also, by means of an ion chamber and gold foils, gamma and neutron fluxes were measured. These data indicate the battery to be a worse neutron shield than the same thickness of water. However, it is more efficient than water for gamma radiation since the density is greater.

It is suggested that further tests of greater duration be run on several different batteries.

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Six lead-acid storage batteries were received from the Navy Department for the purpose of testing their operating characteristics during and after exposure in a high neutron and gamma flux.

The battery tested was a Navy standard portable storage battery (Class 6V-SBM-100 AH). The compositions of the various components are shown in Table II.

A battery was inserted into the core hole water tank at the inner edge of the X-10 shield where it was subjected to a neutron flux of 10^{10} (NV) and a gamma flux of 10,000 r/hr. Various measurements were taken to determine its operative characteristics. The batteries, connected in series as shown in Fig. 1 were operated for a week under water, but not exposed to radiation. After this test period, one of the batteries was put in front of the core hole water tank and subjected to radiation, and the control battery was placed in a small tank, through which water was circulated constantly from the core hole tank. During this time both batteries were run through eleven cycles (a cycle includes a 30 hr. period - 10 each of charge, stand, and discharge in that order). This, plus the six cycles after exposure, makes a total of 21 cycles of operation for the batteries.

During this test the voltage across each cell, rates of charge and discharge, and the temperature of the inside battery were continuously recorded by means of a Brown Recorder and Micromax. Because the water in the small tank was continuously circulated from the core hole tank, it is assumed that both batteries were operated at the same temperature. Because of the limitations of the number of points that could be recorded, the voltages across only two of the cells of the control battery were recorded. Some time during the test, the other cell in the control battery failed.

In Figure 2 is shown the plot of voltages across cells 1, 3, 5 (cells in the battery which was exposed in the pile, #1 being the farthest in, #3 in the center, and #5 the outermost), the temperature of the exposed battery, total amperage going through both batteries, and the voltage across the cells 2 and 4 in the control battery

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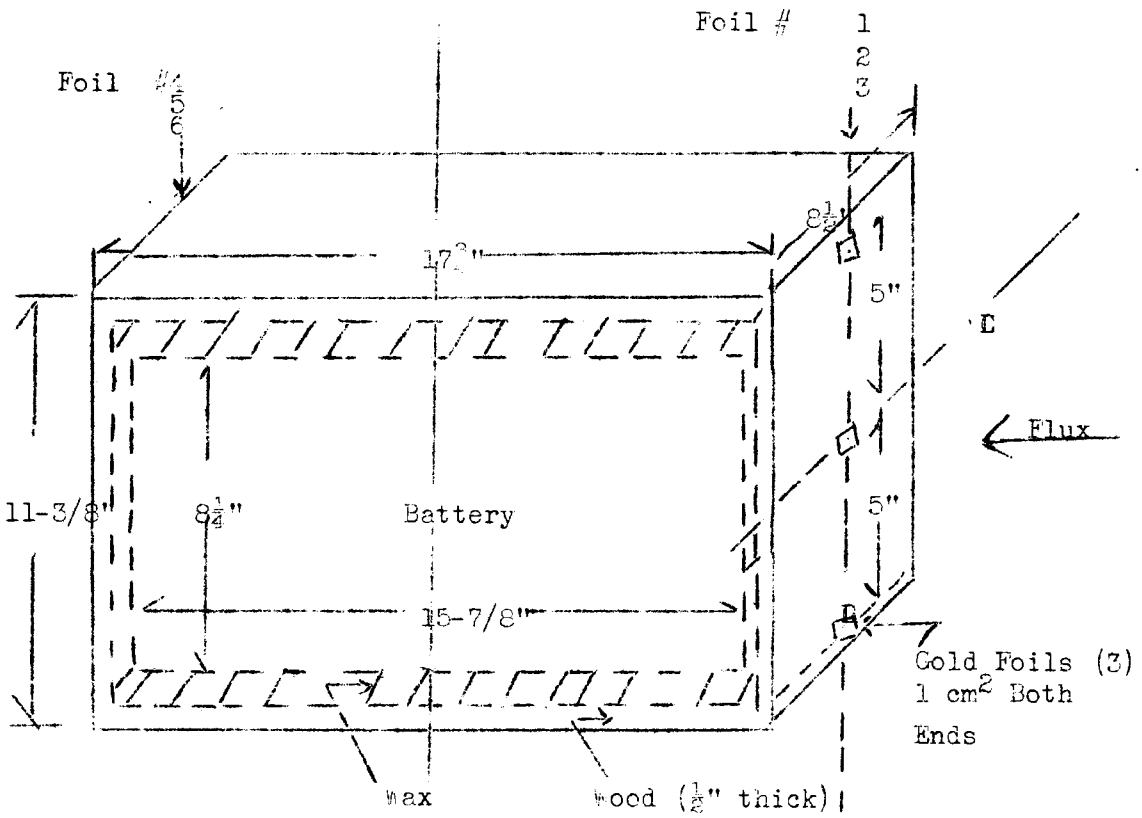
after 8 hours of charge in each cycle. Figure 3 shows the same data after 8 hours of discharge in each battery. Figure 4 shows the gamma attenuation curve in the water tank with and without batteries in the tank. These measurements were made with a boron coated ionization chamber. Figure 5 shows neutron vertical traverses with and without batteries in the tank. The hourly readings from recorder charts are reported in Table I.

One square centimeter gold foils were taped on the front and back of the battery for determination of the neutron flux. The foils were placed as shown:



The approximate nv values found were:

Foil #1	5.59×10^9	#4	4.76×10^6
#2	6.75×10^9	#5	8.16×10^5
#3	6.35×10^9	#6	6.24×10^5

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Mr. E. P. Wilkinson ran a capacity test on the battery after its exposure to radiation. This indicated the battery had retained 98% of its rated capacity. No capacity test was run prior to exposure.

In order to obtain a comparison between the control battery and the exposed battery, the voltages on each cell were plotted after eight hours charge and eight hours discharge, since it was felt that any changes in the battery would be more discernible at this point in the cycle. It is apparent from the graph that no fluctuations can be observed in the exposed battery larger than those in the control battery. Furthermore, the variations in the battery subjected to radiation correlate closely with respect to both magnitude and time with those of the control battery. The observed variations were probably caused by different rates of charge and discharge on successive cycles.

With regard to radiation attenuation, although the geometry is poor for quantitative interpretations, it is apparent that the battery is a worse shield for this neutron spectrum than water. However, it is more effective for γ rays since the average density is 1.65.

Since no positive evidence of radiation damage was found, it is recommended that tests of longer duration or in higher fluxes be made in order to obtain positive results in relation to radiation damage on batteries.

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA

CELLS 1, 3, 5 EXPOSED, 1 INNERMOST

2, 4, 6 NOT EXPOSED

			Voltage on cells					Amp.
	Date	Hour	#1	#2	#3	#4	#5	#6
Charge	5/11	2:15 P.M.	1.915	1.930	1.908	1.968	1.978	9.97
		3:00	2.005	2.032	1.964	2.023	2.034	11.34
		4:00	2.012	2.032	1.978	1.996	2.048	10.01
		5:00	2.020	2.032	1.992	1.996	2.062	9.925
		6:00	2.035	2.060	2.006	2.009	2.076	9.793
		7:00	2.050	2.077	2.027	2.023	2.097	9.616
		8:00	2.080	2.091	2.048	2.051	2.118	9.394
		9:00	2.095	2.121	2.069	2.065	2.139	9.217
		10:00	2.125	2.135	2.090	2.107	2.160	9.128
		11:00	2.185	2.208	2.153	2.149	2.223	8.685
		12:00	2.290	2.325	2.251	2.218	2.321	8.065
Stand	5/12	1:00 A.M.)	Paper on recorder jammed					
		8:00 A.M.)						
		9:00 A.M.	2.012	2.026	1.978	1.996	2.188	0
		10:00	2.005	2.026	1.971	1.982	2.174	0
Disch.		11:00	1.930	1.938	1.894	1.898	2.076	9.128
		12:00	1.915	1.938	1.880	1.877	2.069	8.951
		1:00 P.M.	1.908	1.930	1.866	1.863	2.055	8.907
		2:00	1.893	1.909	1.845	1.842	2.041	8.818
		3:00	1.878	1.894	1.838	1.821	2.020	8.685
		4:00	1.855	1.880	1.817	1.801	2.006	8.375
		5:00	1.848	1.865	1.810	1.773	1.992	7.578
		6:00	1.832	1.858	1.796	1.738	1.985	6.426
		7:00	1.810	1.851	1.789	1.717	1.978	5.894
		8:00	1.810	1.829	1.782	1.661	1.964	5.540
		9:00	1.803	1.829	1.768	1.522	1.957	5.363
Stand		10:00	1.840	1.858	1.810	1.619	2.013	0
		11:00	1.855	1.880	1.824	1.717	2.034	0
		12:00	1.855	1.872	1.824	1.738	2.041	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (continued)

	Date	Hour	Voltage on cells #1	#2	#3	#4	#5	Amp. #6
	5/13	1:00 A.M.	1.863	1.888	1.831	1.759	2.055	0
		2:00	1.863	1.888	1.838	1.759	2.062	0
		3:00	1.863	1.888	1.838	1.766	2.062	0
		4:00	1.785	1.888	1.838	1.773	2.062	0
		5:00	1.785	1.888	1.838	1.773	2.062	0
		6:00	1.785	1.888	1.838	1.773	2.062	0
		7:00	1.785	1.888	1.838	1.773	2.062	0
		8:00	1.785	1.888	1.838	1.773	2.062	0
Charge	5/13	9:00 A.M.	1.920	2.011	1.978	2.023	2.384	10.46
		10:00	1.928	2.032	1.978	2.003	2.391	9.749
		11:00	1.935	2.048	1.992	2.003	2.377	9.660
		12:00 noon	1.957	2.060	2.076	2.016	2.391	9.660
		1:00 P.M.	1.973	2.084	2.027	2.030	2.426	9.571
		2:00	1.988	2.099	2.034	2.051	2.111	9.994
		3:00	2.010	2.121	2.048	2.072	2.132	9.128
		4:00	1.965	2.150	2.090	2.121	2.160	9.483
		5:00	2.108	2.223	2.160	2.177	2.230	9.217
		6:00 P.M.	2.190	2.318	2.272	2.246	2.328	8.685
Disch.		7:00	1.868	1.967	1.894	1.919	1.950	9.040
		8:00	1.845	1.953	1.880	1.898	1.943	8.951
		9:00	1.830	1.945	1.880	1.877	1.936	8.907
		10:00	1.823	1.924	1.866	1.856	1.922	8.818
		11:00	1.808	1.916	1.859	1.842	1.908	8.730
		12:00	1.792	1.902	1.845	1.821	1.894	8.685
	5/14	1:00 A.M.	1.778	1.888	1.824	1.801	1.880	8.242
		2:00	1.770	1.872	1.817	1.780	1.866	6.869
		3:00	1.755	1.858	1.810	1.731	1.859	5.983
		4:00	1.740	1.851	1.796	1.689	1.845	5.673
		5:00	1.725	1.843	1.782	1.578	1.831	5.452
		6:00 A.M.	1.718	1.821	1.782	.324	1.831	4.521
Stand		7:00	1.755	1.872	1.810	1.327	1.866	0
		8:00	1.770	1.880	1.824	1.675	1.880	0
		9:00 A.M.	1.785	1.888	1.824	1.717	1.880	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on Cells #1	#2	#3	#4	#5	Amp. #6
Charge	5/14	10:00	1.935	2.032	1.985	2.002	2.034	9.837
		11:00	1.935	2.040	1.992	2.009	2.048	9.660
		12:00 noon	1.950	2.048	2.006	1.996	2.062	9.394
		1:00 P.M.	1.973	2.062	2.034	2.023	2.062	9.926
		2:00	1.980	2.077	2.034	2.020	2.097	9.394
		3:00	2.003	2.099	2.090	2.051	2.090	9.749
		4:00	2.018	2.128	2.097	2.079	2.104	9.571
		5:00	2.055	2.164	2.090	2.135	2.174	9.217
		6:00 P.M.	2.130	2.252	2.174	2.191	2.272	8.685
Disch.		7:00	1.890	1.989	1.922	1.940	2.013	9.217
		8:00	1.853	1.953	1.873	1.898	1.978	9.084
		9:00	1.838	1.938	1.852	1.877	1.964	8.996
		10:00	1.823	1.924	1.838	1.856	1.957	8.907
		11:00	1.800	1.909	1.817	1.842	1.950	8.863
		12:00	1.792	1.902	1.810	1.821	1.936	8.774
Disch.	5/15	1:00	1.777	1.887	1.796	1.787	1.915	8.331
		2:00	1.762	1.872	1.782	1.759	1.901	6.958
		3:00	1.747	1.858	1.782	1.738	1.894	6.072
		4:00 A.M.	1.740	1.850	1.761	1.696	1.880	5.806
Stand		5:00 A.M.	1.770	1.880	1.796	1.745	1.922	0
		6:00	1.785	1.902	1.817	1.780	1.929	0
		7:00	1.785	1.887	1.817	1.801	1.936	0
		8:00	1.785	1.887	1.810	1.801	1.936	0
		9:00	1.785	1.887	1.810	1.807	1.950	0
		10:00 A.M.	1.793	1.902	1.810	1.814	1.957	0
		11:00	1.793	1.909	1.789	1.814	1.985	0
		12:00 noon	1.793	1.909	1.824	1.821	1.943	0
		1:00 P.M.	1.793	1.916	1.831	1.821	1.936	0
		2:00	1.793	1.916	1.838	1.821	1.936	0
Charge		3:00	1.920	2.018	1.971	2.002	2.055	10.27
		4:00	1.928	2.033	1.978	2.002	2.062	10.90
		5:00	1.942	2.048	1.992	2.009	2.083	10.81
		6:00	1.957	2.070	2.006	2.023	2.090	10.63
		7:00	1.980	2.091	2.006	2.023	2.090	10.28
		8:00	2.002	2.113	2.048	2.072	2.132	10.24

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TABLE I
LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on Cells #1	#2	#3	#4	#5	#6 Amp.
		9:00	2.025	2.150	2.090	2.121	2.160	9.926
		10:00	2.085	2.252	2.174	2.205	2.244	9.394
		11:00	2.190	2.340	2.279	2.260	2.349	8.774
		12:00 P.M.	2.235	2.369	2.300	2.288	2.370	8.641
	5/16	1:00 A.M.	2.250	2.369	2.300	2.302	2.370	8.597
Disch.		2:00	1.860	1.960	1.894	1.912	1.964	8.597
		3:00	1.845	1.945	1.880	1.891	1.964	8.508
		4:00	1.837	1.938	1.866	1.877	1.950	8.420
		5:00	1.822	1.924	1.859	1.856	1.936	8.375
		6:00	1.808	1.909	1.845	1.835	1.922	8.464
		7:00	1.800	1.902	1.831	1.814	1.908	8.198
		8:00	1.777	1.887	1.817	1.794	1.887	8.021
		9:00	1.770	1.872	1.810	1.773	1.880	6.205
		10:00	1.838	1.931	1.796	1.745	1.866	6.293
		11:00	1.740	1.843	1.782	1.710	1.866	5.629
Stand		12:00 noon	1.785	1.887	1.817	1.800	1.908	0
		1:00 P.M.	1.793	1.894	1.810	1.800	1.936	0
		2:00	1.800	1.902	1.824	1.814	1.936	0
		3:00	1.800	1.902	1.824	1.814	1.936	0
		4:00	1.800	1.902	1.824	1.814	1.929	0
		5:00	1.800	1.902	1.845	1.821	1.929	0
		6:00	1.800	1.902	1.845	1.821	1.929	0
Stand		7:00	1.800	1.909	1.845	1.821	1.929	0
		8:00	1.800	1.916	1.852	1.828	1.929	0
		9:00	1.800	1.916	1.852	1.828	1.922	0
Charge		10:00	1.920	2.033	1.962	1.968	2.048	10.63
		11:00	1.935	2.048	1.985	1.989	2.062	10.55
		12:00	1.958	2.062	2.013	2.009	3.076	10.55
	5/17	1:00 A.M.	1.972	2.084	2.020	2.030	2.104	10.19
		2:00	1.995	2.106	2.034	2.051	2.118	10.10
		3:00	2.025	2.135	2.055	2.093	2.139	9.926
		4:00	2.085	2.208	2.139	2.177	2.216	9.394
		5:00	2.220	2.354	2.272	2.274	2.356	8.597
		6:00	2.250	2.376	2.293	2.302	2.377	8.420
Disch.		7:00	1.950	2.048	1.964	1.982	2.048	9.217
		8:00	1.860	1.960	1.880	1.884	1.971	8.907
		10:00	1.837	1.938	1.852	1.842	1.936	8.597
		11:00	1.822	1.924	1.810	1.835	1.978	8.597
		12:00 noon	1.800	1.902	1.782	1.814	1.985	8.774

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on Cells #1	#2	#3	#4	#5	Amp #6
	5/17	1:00 P.M.	1.785	1.894	1.810	1.800	1.908	8.552
		2:00	1.770	1.872	1.803	1.780	1.887	8.464
		3:00	1.735	1.858	1.852	1.752	1.950	8.154
		4:00	1.740	1.843	1.768	1.731	1.866	6.559
		5:00	1.725	1.836	1.761	1.710	1.838	6.116
Stand		6:00 P.M.	1.785	1.887	1.817	1.794	1.908	0
		7:00	1.785	1.887	1.824	1.794	1.922	0
		8:00	1.800	1.902	1.824	1.828	1.922	0
		9:00	1.807	1.909	1.838	1.828	1.936	0
		10:00	1.815	1.916	1.845	1.842	1.943	0
		11:00	1.815	1.916	1.852	1.842	1.950	0
		12:00	1.815	1.916	1.852	1.842	1.950	0
	5/18	1:00 A.M.	1.815	1.916	1.852	1.842	1.950	0
		2:00	1.815	1.916	1.852	1.842	1.950	0
		3:00	1.815	1.916	1.852	1.842	1.950	0
Charge		4:00	-	-	-	-	-	
		5:00	1.935	2.048	1.978	1.996	2.062	10.99
		6:00	1.942	2.055	1.992	2.002	2.076	10.72
		7:00	1.958	2.070	2.006	2.016	2.090	10.55
		8:00	1.980	2.091	2.020	2.030	2.104	10.46
		9:00	1.995	2.121	2.048	2.051	2.125	9.66
		10:00	2.070	2.208	2.048	2.135	2.286	9.57
		11:00	2.160	2.369	2.230	2.302	2.384	9.48
		12:00 noon	2.265	2.413	2.300	2.358	2.440	9.31
		1:00 P.M.	2.265	2.413	2.300	2.358	2.426	9.75
Disch.	5/18	2:00	1.875	1.960	1.880	1.898	2.006	8.86
		3:00	1.852	1.945	1.866	1.870	1.978	8.77
		4:00	1.852	1.945	1.852	1.856	1.957	8.69
		5:00	1.830	1.931	1.838	1.842	1.943	8.60

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
	5/18	6:00	1.807	1.909	1.831	1.821	1.922	8.51
		7:00	1.792	1.894	1.824	1.800	1.908	8.42
		8:00	1.770	1.872	1.796	1.787	1.887	8.33
		9:00	1.762	1.865	1.789	1.773	1.894	6.82
		10:00	1.748	1.850	1.775	1.759	1.880	6.69
		11:00	1.740	1.843	1.768	1.716	1.852	6.12
Stand		12:00	1.785	1.894	1.838	1.807	1.907	0
	5/19	1:00 A.M.	1.792	1.902	1.824	1.814	1.907	0
		2:00	1.792	1.902	1.824	1.814	1.907	0
		3:00	1.800	1.909	1.838	1.821	1.922	0
		4:00	1.800	1.916	1.852	1.828	1.929	0
		5:00	1.800	1.916	1.838	1.828	1.922	0
		6:00	1.800	1.924	1.852	1.842	1.936	0
		7:00	1.800	1.916	1.852	1.835	1.936	0
		8:00	1.800	1.916	1.852	1.835	1.936	0
		9:00	1.800	1.924	1.852	1.842	1.936	0
Charge		10:00	1.860	1.975	1.985	1.996	2.062	11.21
		11:00	1.875	1.989	1.999	2.002	2.076	11.08
		12:00 noon	1.958	2.077	2.013	2.016	2.090	10.90
		1:00 P.M.	1.972	2.099	2.034	2.030	2.104	10.99
		2:00	1.995	2.121	2.048	2.051	2.132	10.77
		3:00	2.010	2.157	2.076	2.079	2.160	10.46
		4:00	2.040	2.237	2.146	2.149	2.216	10.10
		5:00	2.115	2.383	2.300	2.344	2.384	9.66
		6:00	2.235	2.398	2.300	2.358	2.398	9.39
		7:00	2.250	2.413	2.300	2.358	2.398	9.39
		8:00	2.250	2.405	2.300	2.358	2.398	9.44
Stand		9:00	2.020	2.062	1.985	1.982	2.062	0
		10:00	2.005	2.048	1.971	1.968	2.048	0
		11:00	1.998	2.048	1.964	1.954	2.048	0
		12:00	1.990	2.033	1.964	1.940	2.048	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on cells #1	#2	#3	#4	#5	Amp. #6
	5/20	1:00 A. M.	1.990	2.033	1.964	1.940	2.041	0
		2:00	1.990	2.026	1.957	1.933	2.034	0
		3:00	1.982	2.011	1.950	1.919	2.034	0
		4:00	1.982	2.018	1.950	1.926	2.034	0
		5:00	1.975	2.011	1.943	1.926	2.020	0
Disch.		6:00	1.937	1.960	1.894	1.884	1.971	8.86
		7:00	1.930	1.945	1.880	1.870	1.964	8.77
		8:00	1.915	1.931	1.866	1.856	1.950	8.73
		9:00	1.908	1.924	1.859	1.842	1.943	8.51
		10:00	1.892	1.909	1.838	1.821	1.922	8.46
		11:00	1.878	1.894	1.831	1.800	1.908	8.42
		12:00 noon	1.870	1.887	1.817	1.773	1.894	8.15
		1:00 P.M.	1.863	1.880	1.824	1.766	1.894	6.74
		2:00	1.848	1.872	1.810	1.738	1.880	6.03
		3:00	1.833	1.858	1.796	1.696	1.866	5.81
		4:00	1.982	2.011	1.950	1.947	2.020	8.86
		5:00	2.005	2.040	1.971	1.968	2.041	8.91
		6:00	2.020	2.048	1.985	1.982	2.055	8.86
		7:00	2.035	2.062	2.006	1.996	2.076	8.77
		8:00	2.043	2.077	2.006	2.002	2.090	8.42
		9:00	2.058	2.099	2.027	2.016	2.104	8.33
		10:00	2.073	2.106	2.034	2.030	2.118	8.15
		11:00	2.088	2.142	2.070	2.051	2.146	7.98
		12:00	2.110	2.252	2.146	2.107	2.216	7.45
	5/21	1:00 A.M.	2.155	2.369	2.279	2.288	2.349	6.60
Stand		2:00	2.020	2.070	1.985	2.009	2.090	0
		3:00	2.005	2.040	1.964	1.982	2.062	0
		4:00	2.005	2.033	1.950	1.975	2.048	0
		5:00	1.998	2.033	1.957	1.975	2.048	0
		6:00	2.005	2.033	1.964	1.968	2.048	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on cells #1	#2	#3	#4	#5	Amp. #6
	5/21	7:00 A.M.	2.005	2.033	1.964	1.968	2.048	0
		8:00	1.998	2.026	1.957	1.968	2.048	0
		9:00	1.990	2.026	1.957	1.961	2.048	0
		10:00	1.990	2.026	1.957	1.961	2.048	0
		11:00	1.983	2.018	1.957	1.954	2.034	0
		12:00 noon	1.983	2.018	1.950	1.954	2.034	0
Disch.		1:00 P.M.	1.930	1.960	1.880	1.877	1.971	8.77
		2:00	1.915	1.938	1.859	1.856	1.957	8.77
		3:00	1.908	1.924	1.852	1.842	1.943	8.73
		4:00	1.893	1.916	1.838	1.828	1.936	8.51
		5:00	1.878	1.894	1.824	1.807	1.922	8.42
		6:00	1.855	1.872	1.817	1.787	1.908	8.42
		7:00	1.848	1.887	1.810	1.773	1.901	6.91
		8:00	1.833	1.872	1.810	1.752	1.894	6.03
		9:00	1.825	1.872	1.796	1.717	1.880	5.85
		10:00	1.810	1.858	1.782	1.675	1.880	5.85
Charge	5/21	11:00	1.983	2.011	1.964	1.940	2.034	8.60
		12:00	1.998	2.026	1.971	1.954	2.041	8.60
	5/22	1:00 A.M.	2.013	2.040	1.985	1.968	2.055	8.38
		2:00	2.028	2.055	1.999	1.982	2.069	8.15
		3:00	2.042	2.077	2.020	1.996	2.090	8.07
		4:00	2.058	2.091	2.034	2.016	2.104	8.11
		5:00	2.073	2.106	2.048	2.037	2.118	7.84
		6:00	2.088	2.128	2.076	2.065	2.146	7.62
		7:00	2.110	2.216	2.146	2.163	2.216	7.18
		8:00	2.132	2.325	2.258	2.274	2.328	6.47
Stand		9:00	2.013	2.040	1.992	1.975	2.062	0
		10:00	2.005	2.033	1.978	1.954	2.048	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on cells #1	#2	#3	#4	#5	Amp. #6
	5/22	11:00 A.M.	1.998	2.026	1.964	1.947	2.034	0
		12:00 noon	1.990	2.018	1.964	1.933	2.034	0
		1:00 P.M.	1.990	2.018	1.964	1.926	2.034	0
		2:00	1.990	2.018	1.964	1.933	2.034	0
		3:00	1.990	2.018	1.971	1.933	2.034	0
		4:00	1.990	2.018	2.978	1.933	2.041	0
		5:00	1.990	2.018	1.971	1.940	2.034	0
		6:00	1.990	2.018	1.964	1.933	2.027	0
Disch.		7:00	1.938	1.960	1.901	1.870	1.964	8.86
		8:00	1.923	1.945	1.894	1.856	1.957	8.77
		9:00	1.915	1.938	1.894	1.856	1.950	8.77
		10:00	1.900	1.931	1.880	1.842	1.936	8.64
		11:00	1.885	1.909	1.852	1.814	1.908	8.42
		12:00	1.863	1.894	1.838	1.794	1.901	8.15
	5/23	1:00 A.M.	1.855	1.887	1.838	1.780	1.894	6.56
		2:00	1.840	1.887	1.824	1.759	1.880	5.98
		3:00	1.825	1.872	1.824	1.738	1.880	5.76
		4:00	1.810	1.858	1.810	1.703	1.866	5.67
Charge		5:00	1.983	2.018	1.964	1.954	2.020	8.91
		6:00	1.998	2.033	1.978	1.954	2.034	8.86
		7:00	2.012	2.048	1.992	1.975	2.048	8.82
		8:00	2.020	2.070	2.006	1.996	2.062	8.73
		9:00	2.043	2.084	2.020	2.009	2.076	8.69
		10:00	2.058	2.106	2.041	2.023	2.097	8.51
		11:00	2.073	2.135	2.076	2.051	2.132	8.33
		12:00 noon	2.095	2.201	2.118	2.121	2.174	7.98
		1:00 P.M.	2.125	2.354	2.244	2.316	2.300	7.27
		2:00	2.155	2.369	2.272	2.316	2.328	7.09
		CHART MESSED UP						

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
Disch.	5/24	8:00 A.M.	1.840	1.887	1.838	1.758	1.894	6.38
		9:00	1.825	1.872	1.824	1.731	1.894	5.85
		10:00	1.840	1.858	1.796	1.689	1.866	5.76
Charge		11:00	1.990	2.033	1.978	1.953	2.034	9.57
		12:00 noon	2.005	2.048	1.992	1.981	2.048	9.39
		1:00 P.M.	-	-	-	-	-	-
		2:00	-	-	-	-	-	-
		3:00	2.050	2.091	2.048	2.009	2.104	9.39
		4:00	2.080	2.121	2.062	2.037	2.118	9.31
		5:00	2.110	2.164	2.104	2.079	2.132	9.31
		6:00	2.155	2.325	2.216	2.246	2.286	8.51
		7:00	2.200	2.383	2.300	2.344	2.370	8.07
		8:00	2.230	2.383	2.300	2.330	2.370	7.89
Stand		9:00	2.020	2.062	2.006	2.009	2.342	0
		10:00	2.020	2.048	1.992	1.982	2.328	0
		11:00	2.005	2.033	1.978	1.982	2.314	0
		12:00	2.005	2.033	1.978	1.968	2.314	0
	5/25	1:00 A.M.	1.990	2.033	1.978	1.968	2.314	0
		2:00	1.990	2.018	1.978	1.968	2.314	0
		3:00	1.990	2.018	1.978	1.954	2.314	0
		4:00	1.990	2.018	1.978	1.954	2.314	0
		5:00	1.990	2.018	1.978	1.954	2.314	0
		6:00	1.990	2.018	1.978	1.954	2.314	0
Disch.		7:00	1.930	1.945	1.908	1.870	1.964	8.69
		8:00	1.915	1.945	1.894	1.856	1.950	8.60
		9:00	1.900	1.931	1.800	1.842	1.936	8.42
		10:00	1.900	1.916	1.866	1.828	1.922	8.24
		11:00	1.900	1.916	1.852	1.814	1.908	8.15
		12:00 noon	1.855	1.902	1.838	1.801	1.894	6.82
		1:00 P.M.	1.840	1.887	1.838	1.773	1.894	6.03
		2:00	1.825	1.872	1.824	1.759	1.880	5.85
		3:00	1.825	1.872	1.810	1.731	1.866	5.41

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
	5/25	4:00 P.M.	1.795	1.858	1.796	1.689	1.852	5.32
Charge		5:00	1.990	2.033	1.978	1.954	2.314	9.13
		6:00	2.005	2.048	2.006	1.982	2.342	9.31
		7:00	2.020	2.062	2.020	1.982	2.356	9.22
		8:00	2.035	2.077	2.034	1.996	2.090	8.95
		9:00	2.050	2.091	2.048	2.023	2.104	8.86
		10:00	2.080	2.121	2.076	2.037	2.132	8.69
		11:00	2.110	2.164	2.104	2.079	2.160	8.24
		12:00	2.155	2.325	2.230	2.204	2.286	7.53
	5/26	1:00 A.M.	2.200	2.354	2.314	2.316	2.370	6.91
Stand		2:00	2.065	2.121	2.062	2.051	2.118	0
		3:00	2.020	2.062	2.020	2.009	2.076	0
		4:00	2.020	2.048	2.006	1.982	2.048	0
		5:00	2.005	2.048	1.992	1.982	2.048	0
		6:00	2.005	2.033	1.992	1.968	2.048	0
		7:00	1.990	2.033	1.978	1.954	2.034	0
		8:00	1.990	2.033	1.978	1.954	2.034	0
		9:00	1.990	2.033	1.978	2.954	2.034	0
		10:00	1.990	2.033	2.978	2.954	2.034	0
		11:00	1.990	2.033	1.978	1.954	2.034	0
Disch.		12:00 noon	1.930	1.960	1.922	1.884	1.978	8.33
		1:00 P.M.	1.930	1.960	1.894	1.870	1.978	8.33
		2:00	1.915	1.945	1.880	1.856	1.964	8.33
		3:00	1.900	1.931	1.884	1.856	1.950	8.24
		4:00	1.885	1.916	1.866	1.842	1.922	8.06
		5:00	1.870	1.916	1.866	1.814	1.922	8.15
		6:00	1.870	1.902	1.852	1.814	1.908	6.47
		7:00	1.855	1.902	1.852	1.787	1.908	5.85
		8:00	1.840	1.872	1.838	1.773	1.894	5.58
		9:00	1.825	1.887	1.838	1.745	1.880	5.32

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
Charge	5/26	10:00	1.975	2.018	1.978	1.940	2.034	8.77
		11:00	1.990	2.033	1.992	1.954	2.048	8.60
		12:00	2.005	2.048	2.006	1.982	2.062	8.69
	5/27	1:00 A.M.	2.020	2.062	2.020	1.982	2.076	8.42
		2:00	2.050	2.077	2.034	2.009	2.090	8.42
		3:00	2.065	2.091	2.062	2.023	2.118	8.24
		4:00	2.080	2.121	2.076	2.037	2.146	8.07
		5:00	2.110	2.150	2.118	2.065	2.174	7.89
		6:00	2.140	2.296	2.230	2.177	2.286	7.18
		7:00	2.200	2.383	2.314	2.316	2.370	6.65
Stand		8:00	2.095	2.150	2.104	2.093	2.160	0
		9:00	2.020	2.077	2.020	1.982	2.076	0
		10:00	2.020	2.048	1.992	1.968	2.062	0
		11:00	2.005	2.033	1.992	1.954	2.048	0
		12:00 noon	1.990	2.033	1.978	1.940	2.034	0
		1:00 P.M.	1.990	2.004	1.978	1.926	2.034	0
		2:00	1.990	2.004	1.978	1.926	2.034	0
		3:00	1.990	2.018	1.978	1.926	2.034	0
		4:00	1.990	2.018	1.978	1.926	2.034	0
		5:00	1.990	2.018	1.978	1.926	2.034	0
		6:00	1.975	2.018	1.964	1.926	2.020	0
Disch.		7:00	1.930	1.931	1.908	1.898	1.964	8.33
		8:00	1.945	1.975	1.894	1.856	1.950	8.24
		9:00	1.900	1.931	1.880	1.856	1.936	8.07
		10:00	1.885	1.916	1.880	1.828	1.922	7.89
		11:00	1.900	1.916	1.866	1.814	1.922	7.89
		12:00	1.855	1.902	1.852	1.800	1.908	6.47
	5/28	1:00 A.M.	1.840	1.887	1.838	1.787	1.894	5.85
		2:00	1.840	1.887	1.838	1.773	1.894	5.50
		3:00	1.825	1.872	1.824	1.745	1.880	5.32

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

	Date	Hour	Voltage on cells #1	#2	#3	#4	#5	Amp. #6
	5/28	4:00 A.M.	1.810	1.872	1.810	1.717	1.866	5.23
Charge		5:00	1.990	2.033	1.978	1.954	2.034	8.33
		6:00	1.990	2.048	1.992	1.968	2.048	8.33
		7:00	2.020	2.062	2.006	1.982	2.062	8.42
		8:00	2.020	2.062	2.020	1.996	2.076	8.24
		9:00	2.050	2.071	2.034	2.009	2.090	8.07
		10:00	2.065	2.106	2.062	2.023	2.118	7.89
		11:00	2.080	2.121	2.076	2.037	2.132	7.62
		12:00 noon	2.110	2.164	2.118	2.065	2.174	7.45
		1:00 P. M.	2.140	2.281	2.188	2.149	2.258	6.91
		2:00	2.185	2.383	2.300	2.316	2.300	6.38
Disch.		3:00	1.930	1.960	1.922	1.884	1.964	8.68
		4:00	1.915	1.945	1.894	1.870	1.950	8.33
		5:00	1.900	1.931	1.894	1.856	1.950	8.24
		6:00	1.900	1.945	1.880	1.828	1.936	8.15
		7:00	1.870	1.916	1.866	1.814	1.922	7.98
		8:00	1.870	1.916	1.866	1.870	1.922	6.29
		9:00	1.855	1.902	1.852	1.801	1.908	5.76
		10:00	1.840	1.902	1.852	1.787	1.908	5.58
		11:00	1.825	1.887	1.824	1.745	1.880	5.50
Charge		12:00	1.960	2.004	1.964	1.926	2.020	8.42
	5/29	1:00 A.M.	1.990	2.048	1.978	1.954	2.034	8.24
		2:00	2.005	2.048	2.006	1.982	2.062	8.24
		3:00	2.020	2.062	2.020	1.996	2.076	8.15
		4:00	2.050	2.077	2.034	2.009	2.090	7.98
		5:00	2.065	2.107	2.048	2.023	2.104	8.07
		6:00	2.080	2.135	2.076	2.037	2.132	7.80
		7:00	2.110	2.164	2.104	2.065	2.160	7.62
		8:00	2.140	2.223	2.160	2.121	2.216	6.91
		9:00	2.170	2.369	2.286	2.302	2.342	6.29
Stand		10:00	2.050	2.121	2.060	2.051	2.118	0

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TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
Stand	5/29	11:00 A.M.	2.020	2.062	2.006	1.996	2.062	0
		12:00 noon	2.005	2.048	2.006	1.982	2.062	0
		1:00 P.M.	1.990	2.033	2.006	1.968	2.062	0
		2:00	1.990	2.033	1.992	1.954	2.048	0
		3:00	1.990	2.033	1.978	1.954	2.034	0
		RECORDING PAPER MESSED UP.						
Charge	5/30	6:00 A.M.	1.990	2.033	1.978	1.954	2.034	8.24
		7:00	1.990	2.033	1.992	1.968	2.048	8.07
		8:00	2.005	2.048	2.006	1.982	2.062	8.33
		9:00	2.020	2.077	2.034	1.996	2.090	8.15
		10:00	2.050	2.091	2.034	2.009	2.090	8.15
		11:00	2.065	2.121	2.062	2.023	2.118	7.98
		12:00 noon	2.080	2.135	2.090	2.051	2.146	7.71
		1:00 P.M.	2.110	2.194	2.146	2.093	2.202	7.45
		2:00	2.155	2.340	2.272	2.288	2.342	6.65
		3:00	2.200	2.383	2.300	2.330	2.370	6.47
Stand		4:00	2.005	2.048	1.992	1.982	2.062	0
		5:00	1.990	2.033	1.992	1.954	2.048	0
		6:00	1.990	2.033	1.964	1.954	2.034	0
		7:00	1.990	2.033	1.964	1.940	2.034	0
		8:00	1.975	2.033	1.964	1.940	2.034	0
Disch.		9:00	1.915	1.960	1.908	1.885	1.964	8.24
		RECORDINGS MISSED.						
Charge	5/31	1:00 P.M.	1.990	2.048	1.992	1.968	2.048	9.22
		2:00	2.005	2.062	2.006	1.982	2.062	9.39
		3:00	2.020	2.077	2.020	1.996	2.090	9.13
		4:00	2.050	2.091	2.048	2.009	2.104	9.22
		5:00	2.065	2.121	2.062	2.037	2.132	9.13

[redacted]

[redacted]

TABLE I

LEAD BATTERY EXPOSURE TESTS DATA (Continued)

Voltage on cells

	Date	Hour	#1	#2	#3	#4	#5	Amp. #6
	5/31	6:00 P.M.	2.110	2.150	2.104	2.065	2.160	8.86
		7:00	2.140	2.252	2.174	2.135	2.230	8.33
		8:00	2.185	2.383	2.300	2.330	2.356	7.36
		9:00	2.215	2.398	2.328	2.344	2.384	7.27
Stand		10:00	2.065	2.121	2.048	2.037	2.118	0
		11:00	2.020	2.077	2.020	2.009	2.076	0
		12:00	2.020	2.062	2.006	1.982	2.062	0
	6/1	1:00 A.M.	2.005	2.048	1.992	1.982	2.048	0
		2:00	2.005	2.048	1.992	1.968	2.048	0
		3:00	1.990	2.033	1.978	1.968	2.048	0
		4:00	1.990	2.033	1.978	1.954	2.048	0
		5:00	1.990	2.033	1.978	1.954	2.034	0
		6:00	1.990	2.033	1.978	1.940	2.034	0
		7:00	1.975	2.004	1.964	1.926	2.020	0
		8:00	-	-	-	-	-	-
Disch.		9:00	1.915	1.960	1.908	1.884	1.964	8.15
		10:00	1.900	1.945	1.866	1.856	1.992	8.15
		11:00	1.900	1.931	1.852	1.842	1.964	8.51
		12:00 noon	1.870	1.916	1.852	1.828	1.936	8.51
		1:00 P.M.	1.870	1.916	1.838	1.814	1.922	7.36
		2:00	1.840	1.902	1.824	1.801	1.908	6.56
		3:00	1.840	1.902	1.824	1.787	1.908	6.03
		4:00	1.825	1.887	1.824	1.759	1.908	5.58
		5:00	1.810	1.872	1.810	1.731	1.880	5.50

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.
5/13	11:00 A.M.	82
	12:00 noon	84
	1:00 P.M.	87
	2:00	87
	3:00	88
	4:00	85
	5:00	80
	6:00	77
	7:00	72
	8:00	71
	9:00	72
	10:00	71
	11:00	69
	12:00 P.M.	67
5/14	1:00 A.M.	73
	2:00	74
	3:00	75
	4:00	75
	5:00	76
	6:00	76
	7:00	76
	8:00	76
	9:00	77
	10:00	76
	11:00	77
	12:00 noon	78
	1:00 P.M.	80
	2:00	80
	3:00	80
	4:00	80
	5:00	80
	6:00	79
	7:00	77
	8:00	74
5/14	9:00 P.M.	75
	10:00	75
	11:00	74
	12:00 P.M.	73
5/15	1:00 A.M.	72
	2:00	72
	3:00	70
	4:00	70
	5:00	70
	6:00	70
	7:00	70
	8:00	72
	9:00	75
	10:00	78
	11:00	81
	12:00 noon	81
	1:00 P.M.	83
	2:00	83
	3:00	85
	4:00	88
	5:00	86
	6:00	84
	7:00	82
	8:00	78
	9:00	74
	10:00	72
	11:00	72
	12:00 P.M.	70
5/16	1:00 A.M.	67
	2:00	66
	3:00	66
	4:00	67
	5:00	68
	6:00	69

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.
5/16	7:00 A.M.	70
	8:00	71
	9:00	74
	10:00	77
	11:00	79
	12:00 noon	79
	1:00 P.M.	77
	2:00	78
	3:00	80
	4:00	86
	5:00	81
	6:00	79
	7:00	79
	8:00	77
	9:00	76
	10:00	78
	11:00	77
	12:00 P.M.	76
5/17	1:00 A.M.	75
	2:00	75
	3:00	73
	4:00	73
	5:00	71
	6:00	68
	7:00	65
	8:00	72
	9:00	75
	10:00	77
	11:00	81
	12:00 noon	80
	1:00 P.M.	80
	2:00	84
	3:00	93
	4:00	88
5/17	5:00 P.M.	87
	6:00	85
	7:00	85
	8:00	84
	9:00	80
	10:00	78
	11:00	76
	12:00 P.M.	74
5/18	1:00 A.M.	75
	2:00	74
	3:00	73
	4:00	76
	5:00	73
	6:00	73
	7:00	73
	8:00	77
	9:00	78
	10:00	114
	11:00	104
	12:00 noon	104
	1:00 P.M.	100
	2:00	95
	3:00	95
	4:00	93
	5:00	91
	6:00	92
	7:00	92
	8:00	91
	9:00	88
	10:00	87
	11:00	84
	12:00 P.M.	82
5/19	1:00 A.M.	75
	2:00	72

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.	Date	Hour	Degrees Fah.
5/19	3:00 A.M.	70	5/20	1:00 P.M.	94
	4:00	71		2:00	96
	5:00	70		3:00	98
	6:00	71		4:00	101
	7:00	70		5:00	102
	8:00	78		6:00	100
	9:00	85		7:00	98
	10:00	91		8:00	95
	11:00	94		9:00	90
	12:00 noon	96		10:00	83
	1:00 P.M.	97		11:00	79
	2:00	98		12:00 P.M.	77
	3:00	99	5/21	1:00 A.M.	75
	4:00	100		2:00	73
	5:00	102		3:00	72
	6:00	96		4:00	69
	7:00	95		5:00	69
	8:00	82		6:00	67
	9:00	77		7:00	70
	10:00	74		8:00	74
	11:00	70		9:00	80
	12:00 P.M.	72		10:00	86
5/20	1:00 A.M.	73		11:00	90
	2:00	73		12:00 noon	94
	3:00	71		1:00 P.M.	98
	4:00	70		2:00	102
	5:00	68		3:00	104
	6:00	66		4:00	104
	7:00	68		5:00	105
	8:00	70		6:00	102
	9:00	76		7:00	99
	10:00	83		8:00	97
	11:00	88		9:00	97
	12:00 noon	90		10:00	95

[redacted]

[redacted]

TABLE I (continued)
BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.
5/21	11:00 P.M.	94
	12:00 P.M.	91
5/22	1:00 A.M.	88
	2:00	87
	3:00	80
	4:00	80
	5:00	75
	6:00	70
	7:00	68
	8:00	70
	9:00	70
	10:00	72
	11:00	74
	12:00 noon	75
	1:00 P.M.	78
	2:00	81
	3:00	83
	4:00	86
	5:00	86
	6:00	83
	7:00	81
	8:00	78
	9:00	74
	10:00	74
	11:00	70
	12:00 P.M.	67
5/23	1:00 A.M.	66
	2:00	64
	3:00	63
	4:00	65
	5:00	66
	6:00	67
	7:00	68
	8:00	71
5/23	9:00 A.M.	74
	10:00	76
	11:00	78
	12:00 noon	80
	1:00 P.M.	81
	2:00	82
	3:00	83
	4:00	85
	5:00	87
	6:00	87
	7:00	86
	8:00	80
	9:00	77
	10:00	74
	11:00	71
	12:00 P.M.	69
5/24	1:00 A.M.	67
	2:00	67
	3:00	68
	4:00	69
	5:00	70
	6:00	70
	7:00	70
	8:00	72
	9:00	74
	10:00	77
	11:00	80
	12:00 noon	82
	1:00 P.M.	83
	2:00	84
	3:00	88
	4:00	90
	5:00	90
	6:00	87

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.	Date	Hour	Degrees Fah.
5/24	7:00 P.M.	83	5/27	9:00 P.M.	84
	8:00	78		10:00	82
	9:00	75		11:00	79
	10:00	74		12:00 P.M.	76
	11:00	73	5/28	1:00 A.M.	74
	12:00 P.M.	71		2:00	72
5/25	1:00 A.M.	71		3:00	72
	2:00	70		4:00	72
	3:00	70		5:00	72
	4:00	70		6:00	71
	5:00	72		7:00	70
	6:00	73		8:00	73
	7:00	74		9:00	75
	8:00	78		10:00	78
	9:00	82		11:00	82
	10:00	83		12:00 noon	85
	11:00	87		1:00 P.M.	88
	12:00 noon	89		2:00	89
	1:00 P.M.	91		3:00	86
	2:00	93		4:00	84
	3:00	94		5:00	84
	4:00	95		6:00	83
	5:00	98		7:00	83
	6:00	98		8:00	82
	7:00	95		9:00	77
	8:00	92		10:00	78
	9:00	89		11:00	78
	10:00	87		12:00 P.M.	78
	11:00	84	5/29	1:00 A.M.	77
	12:00 P.M.	80		2:00	76
5/26	1:00 A.M.	73		3:00	77
	2:00	69		4:00	78
5/27	7:00 P.M.	93		5:00	79
	8:00	90		6:00	80

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.
5/29	7:00 A.M.	80
	8:00	81
	9:00	80
	10:00	80
	11:00	80
	12:00 noon	82
	1:00 P.M.	84
	2:00	85
	3:00	86
	4:00	87
	5:00	85
	6:00	85
	7:00	85
	8:00	82
	9:00	81
	10:00	81
	11:00	80
	12:00 P.M.	80
5/30	1:00 A.M.	80
	2:00	80
	3:00	80
	4:00	79
	5:00	78
	6:00	78
	7:00	78
	8:00	78
	9:00	77
	10:00	79
	11:00	79
	12:00 noon	80
5/30	1:00 P.M.	83
	2:00	84
	3:00	87
	4:00	86
	5:00	84
	6:00	84
	7:00	84
	8:00	83
	9:00	83
	10:00	82
	11:00	80
	12:00	80
5/31	1:00 A.M.	79
	2:00	78
	3:00	77
	4:00	78
	5:00	80
	6:00	81
	7:00	81
	8:00	81
	9:00	82
	10:00	85
	11:00	85
	12:00 noon	85
	1:00 P.M.	86
	2:00	87
	3:00	88
	4:00	77
	5:00	77
	6:00	76

[redacted]

[redacted]

TABLE I (continued)

BATTERY OPERATING TEMPERATURES DURING EXPOSURE

Date	Hour	Degrees Fah.	Date	Hour	Degrees Fah.
5/31	7:00 P.M.	75	6/1	1:00 A.M.	75
	8:00	75		2:00	72
	9:00	75		3:00	80
	10:00	75		4:00	82
	11:00	75		5:00	86
	12:00 P.M.	76		6:00	89
				7:00	93

[redacted]

TABLE II [redacted]

LIST OF MATERIAL			Stock No. 17-B-9433
Quantities Are For One Storage Battery			
Name of Piece	Number Wanted	Parts per Cell	Material
Case	1		Hard Rubber 17-B-4
Cover	3	1	Hard Rubber 17-B-4
Pos. Group Part 5 and 6 Plates	3	1	Plates-Lead
Neg. Group Parts 6 and 9 Plates	3	1	Plates-Lead
Positive Strap	3	1	Antimony-Lead Alloy
Negative Strap	3	1	Antimony-Lead Alloy
Separator	48	16	Wood
Retainer	48	16	Plastic
Intercell Connector	2		Antimony-Lead Alloy
Terminal Connector	2		Antimony-Lead Alloy
Seal Nut	6	2	Antimony-Lead Alloy
Gasket for Seal Nut	6	2	Soft Rubber
Nut	2		Brass and Lead Alloy
Bolt	2		Brass and Lead Alloy
Vent Plug	2	1	Acid-resisting Material
Gasket for Vent Plug	3	1	Soft Rubber
Lug (For 60,000 C.M. Cable)	2		Copper-Lead Crated

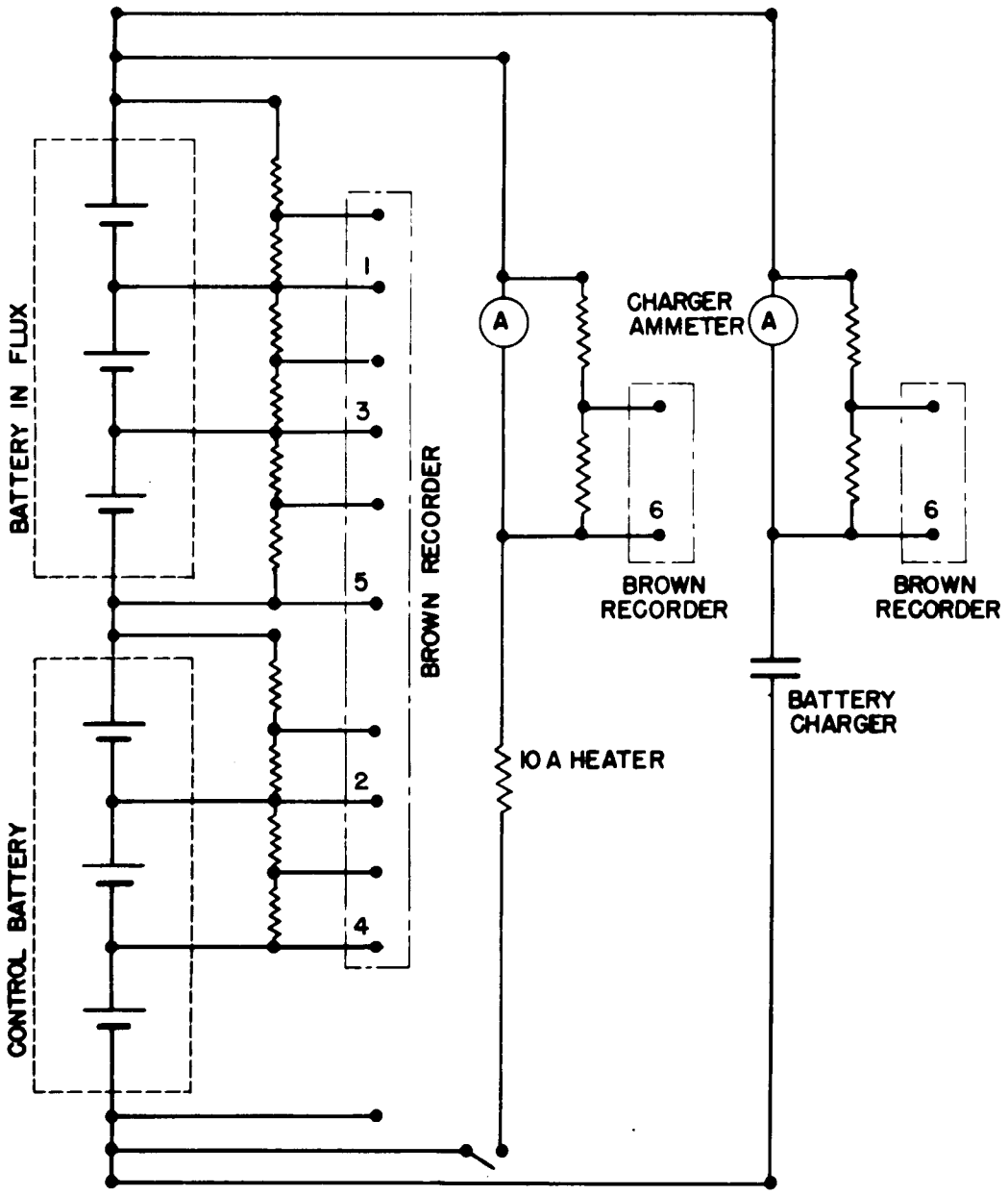
Weights: Bone-Dry 70 lbs.
Filled and charged 82.2 lbs [redacted]

[redacted]

Dr. No. 5943

FIG. 1

WIRING DIAGRAM FOR BATTERY TEST

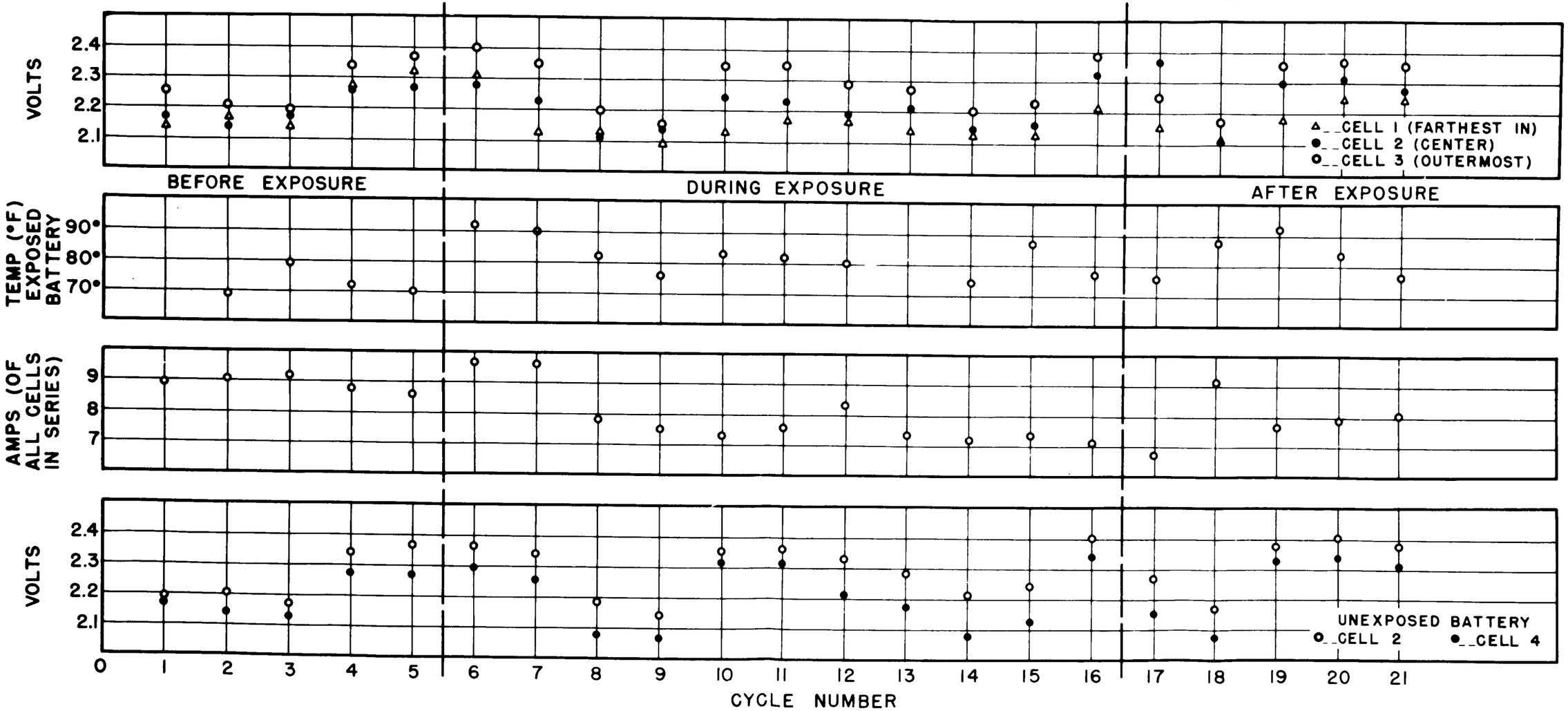


[redacted]

Dr 5944

FIG. 2

DATA OF EXPOSED & UNEXPOSED BATTERY AFTER 8 HRS. OF CHARGE

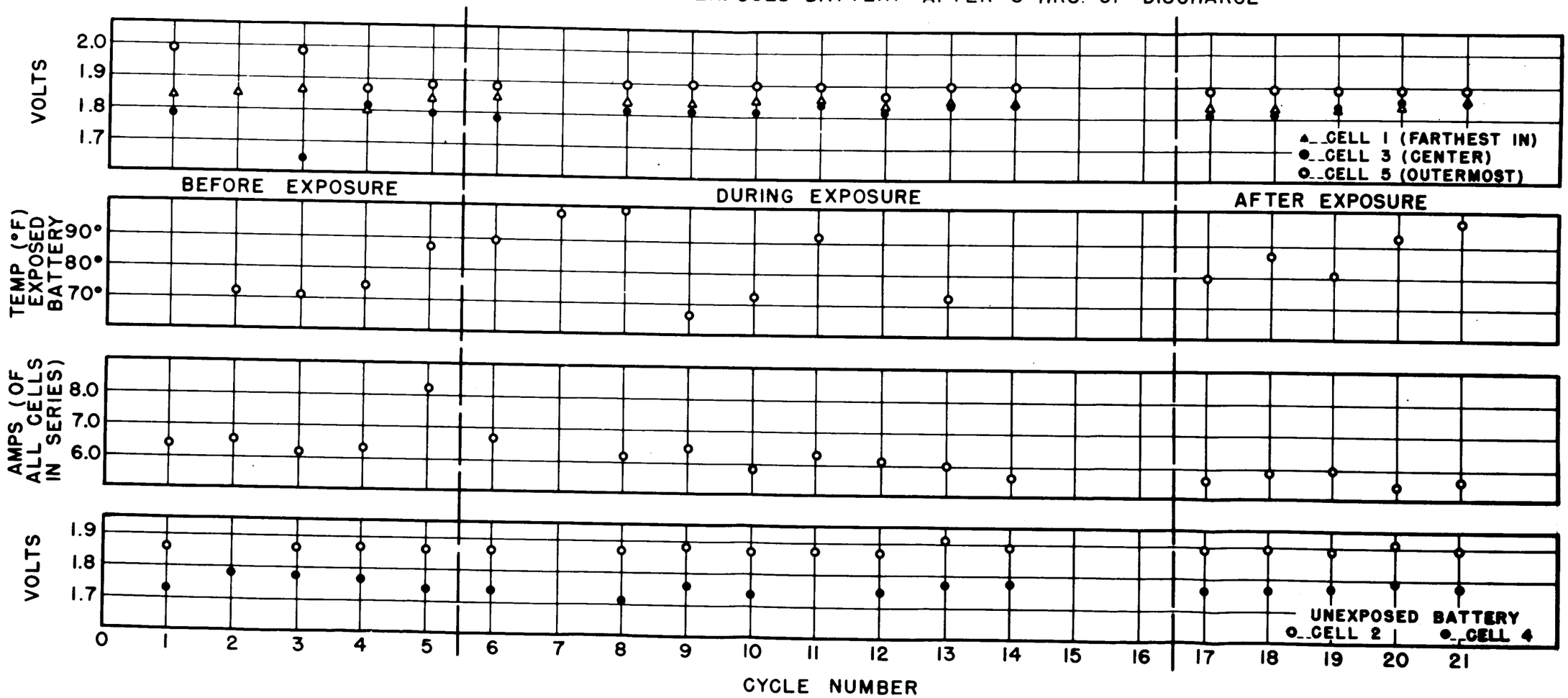


[redacted]

FIG. 3

DATA OF EXPOSED & UNEXPOSED BATTERY AFTER 8 HRS. OF DISCHARGE

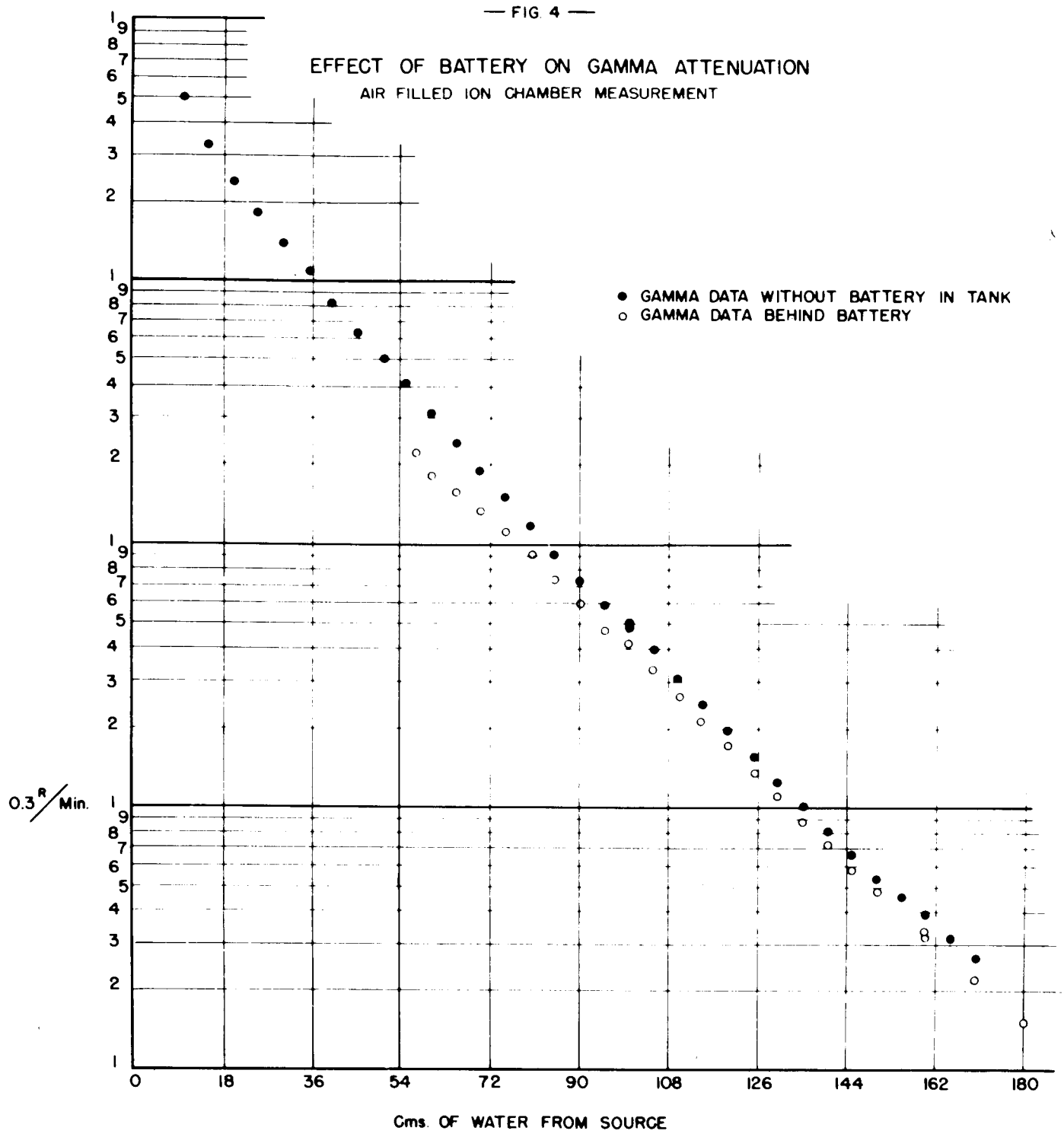
Dr 5945



[redacted]

Dr. No. 5946

— FIG. 4 —

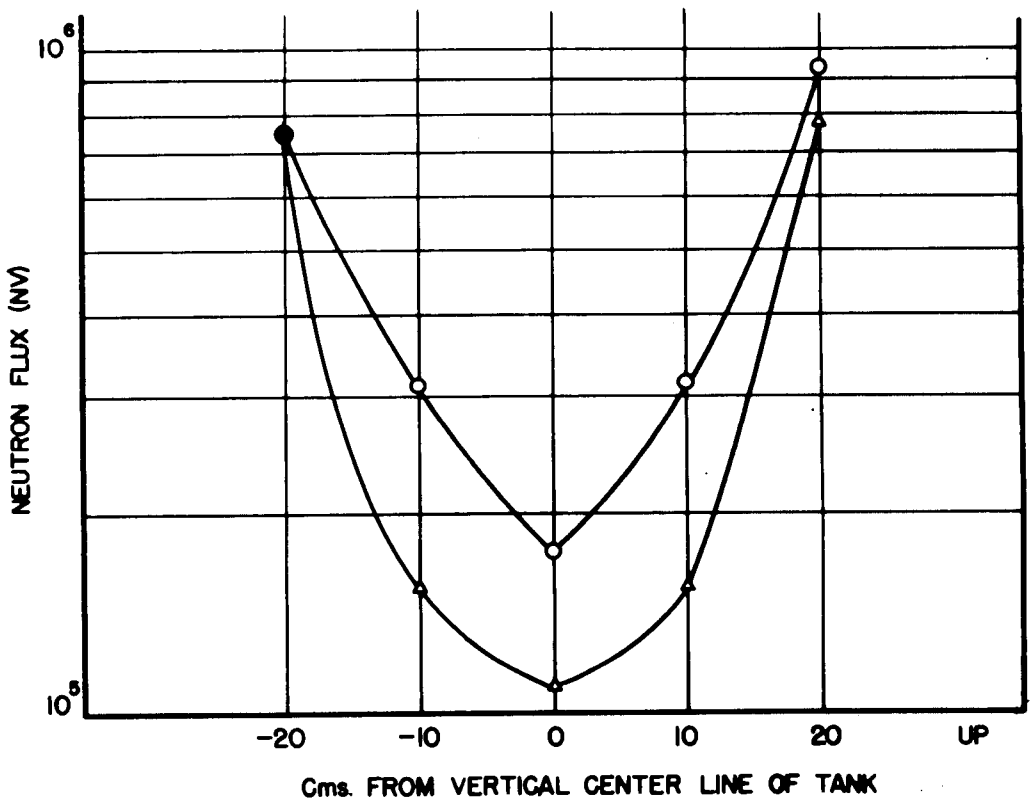


[redacted]

Dr. No. 5947

—FIG. 5—

NEUTRON VERTICAL TRAVERSES
INDIUM FOIL MEASUREMENTS

o–45 Cm. OF BATTERY + 3 Cm. WATER

Δ–48 Cm. WATER – NO BATTERY