

State of Charge Tables for Lead-Acid Batteries

Summary Overview of Types

Battery Open Circuit Voltage

State of Charge	Type of Battery		
	AGM (Maint.free)	Conventional	6-Volt
100%	12.8v - 13.0v +	12.6v +	6.32v
75% - 100%	12.5v - 12.8v	12.4v -12.6V	6.21v
50% - 75%	12.0v -12.5v	12.1v - 12.4V	6.12v
25% - 50%	11.5v - 12.0v	12.0v - 12.2V	6.02v
0% - 25%	11.5 or less	11.5 or less	5.93 or less

AGM or Gel Cells

AGM BATTERY STATE OF CHARGE	
Level	Voltage
100%	13.00V
90%	12.75V
80%	12.50V
70%	12.30V
60%	12.15V
50%	12.05V
40%	11.95V
30%	11.81V
20%	11.66V
10%	11.51V
0%	10.50V

AGM Charge and Float Voltages at Various Temperature Ranges

Temp. °F	Charge		Float		Temp. °C
	Optimum	Maximum	Optimum	Maximum	
≥ 120	13.60	13.90	12.80	13.00	≥ 49
110 – 120	13.80	14.10	12.90	13.20	43 – 49
100 – 110	13.90	14.20	13.00	13.30	38 – 43
90 – 100	14.00	14.30	13.10	13.40	32 – 38
80 – 90	14.10	14.40	13.20	13.50	27 – 32
70 – 80	14.30	14.60	13.40	13.70	21 – 27
60 – 70	14.45	14.75	13.55	13.85	16 – 21
50 – 60	14.60	14.90	13.70	14.00	10 – 16
40 – 50	14.80	15.10	13.90	14.20	4 – 10
≤ 40	15.10	15.40	14.20	14.50	≤ 4

Lead-Acid Wet Cell Data

State of Charge	12 Volt battery	Volts per Cell
100%	12.7	2.12
90%	12.5	2.08
80%	12.42	2.07
70%	12.32	2.05
60%	12.20	2.03
50%	12.06	2.01
40%	11.9	1.98
30%	11.75	1.96
20%	11.58	1.93
10%	11.31	1.89
0	10.5	1.75

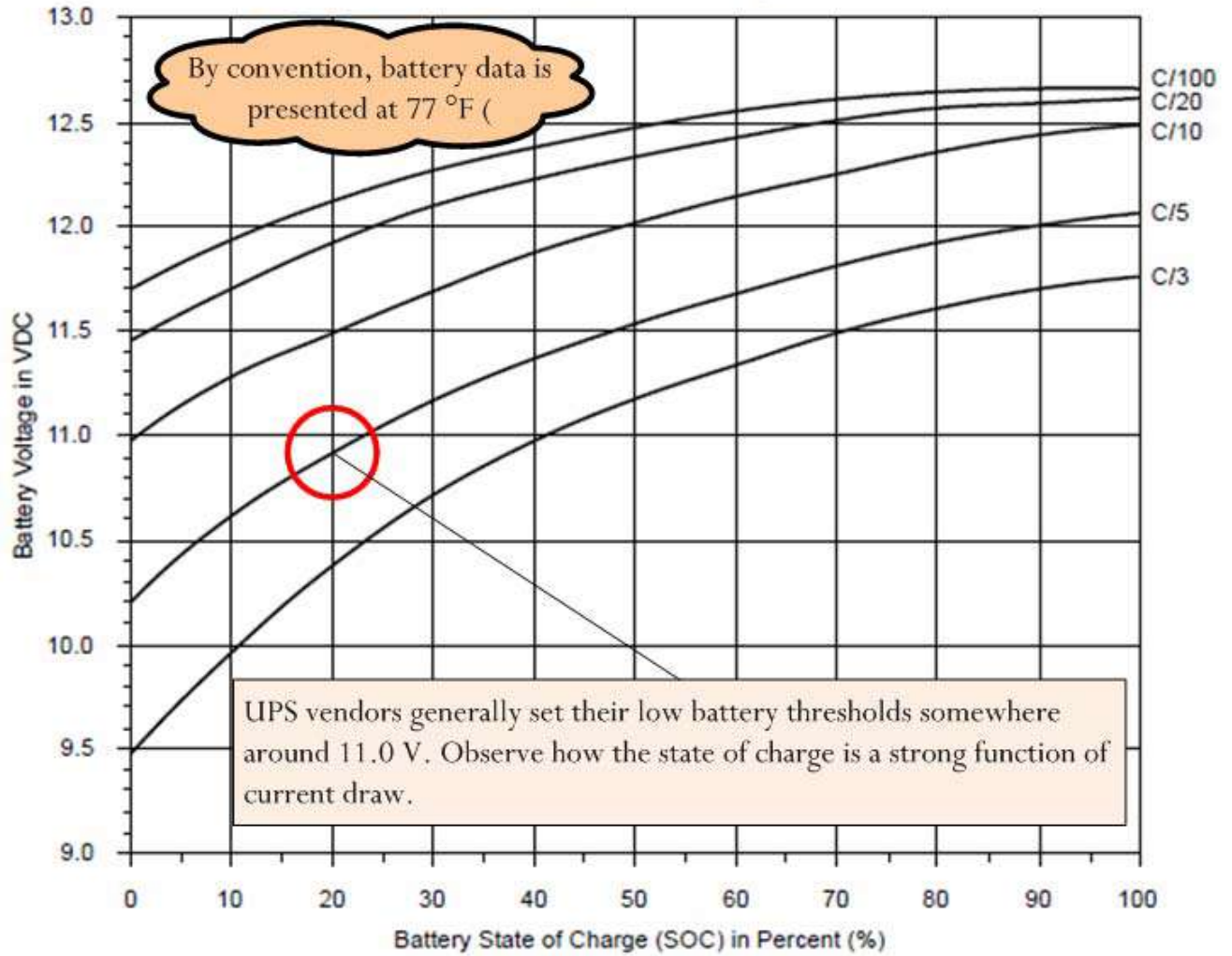
STATE OF CHARGE

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charge	V open circuit	V open circuit	V open circuit	V open circuit	specific gravity per cell
	<u>6-V battery</u>	<u>12-V battery</u>	<u>24-V bank</u>	<u>48-V bank</u>	
100%	6.37	12.73	25.46	50.92	1.277
90%	6.31	12.62	25.24	50.48	1.258
80%	6.25	12.50	25.00	50.00	1.238
70%	6.19	12.37	24.74	49.48	1.217
60%	6.12	12.24	24.48	48.96	1.195
50%	6.05	12.10	24.20	48.40	1.172
40%	5.98	11.96	23.92	47.84	1.148
30%	5.91	11.81	23.62	47.24	1.124
20%	5.83	11.66	23.32	46.64	1.098
10%	5.75	11.51	23.02	46.04	1.073

% Of Charge	Standard Battery	Standard Battery
	<u>Equivalent Resting Volts</u>	<u>Typical Specific Gravity (After Temperature Correction)</u>
100%	12.60-12.75	
95%	12.60-12.70	
90%	12.60-12.65	Resting voltage for standard RV battery.
85%	12.6	Same as above. No point being too picky.
80%	12.50-12.55	We try not to discharge below this point.
75%	12.5	Minimum resting voltage for a charged battery.
70%	12.45	Anything below this is "poorly" charged.
65%	12.4	
60%	12.35	
55%	12.3	
50%	12.25	Try to never discharge below this point.
45%	12.2	
40%	12.15-12.20	
25%	12.10-12.15	Dangerously low; battery being damaged.
20%	11.80-12.00	Cells die soon at this point. Bye-bye battery.

12 Volt Lead Acid Battery State of Charge (SOC) vs. Voltage while under discharge



Specific Gravity Readings

Table 7

State of Charge as a Measure of Specific Gravity and Open-Circuit Voltage					
Percentage Charge	Specific Gravity	Open Circuit Voltage			
		Cell	6 Volt	8 Volt	12 Volt
100	1.277	2.122	6.37	8.49	12.73
90	1.258	2.103	6.31	8.41	12.63
80	1.238	2.083	6.25	8.33	12.50
70	1.217	2.062	6.19	8.25	12.37
60	1.195	2.04	6.12	8.16	12.24
50	1.172	2.017	6.05	8.07	12.10
40	1.148	1.993	5.98	7.97	11.96
30	1.124	1.969	5.91	7.88	11.81
20	1.098	1.943	5.83	7.77	11.66
10	1.073	1.918	5.75	7.67	11.51

Electrolyte Temperature		Wet Low Maintenance (Sb/Ca) or Wet Standard (Sb/Sb) Battery									
		Specific Gravity Reading					Open Circuit Voltage Reading				
Degrees Fahrenheit	Degrees Celsius	100% SoC	75% SoC	50% SoC	25% SoC	0% SoC	100% SoC	75% SoC	50% SoC	25% SoC	0% SoC
120	48.9	1.249	1.209	1.174	1.139	1.104	12.663	12.463	12.253	12.073	11.903
110	43.3	1.253	1.213	1.178	1.143	1.108	12.661	12.461	12.251	12.071	11.901
100	37.8	1.257	1.217	1.182	1.147	1.112	12.658	12.458	12.248	12.068	11.898
90	32.2	1.261	1.221	1.186	1.151	1.116	12.655	12.455	12.245	12.065	11.895
80	26.7	1.265	1.225	1.190	1.155	1.120	12.650	12.450	12.240	12.060	11.890
70	21.1	1.269	1.229	1.194	1.159	1.124	12.643	12.443	12.233	12.053	11.883
60	15.6	1.273	1.233	1.198	1.163	1.128	12.634	12.434	12.224	12.044	11.874
50	10.0	1.277	1.237	1.202	1.167	1.132	12.622	12.422	12.212	12.032	11.862
40	4.4	1.281	1.241	1.206	1.171	1.136	12.606	12.406	12.196	12.016	11.846
30	-1.1	1.285	1.245	1.210	1.175	1.140	12.588	12.388	12.178	11.998	11.828
20	-6.7	1.289	1.249	1.214	1.179	1.144	12.566	12.366	12.156	11.976	11.806
10	-12.2	1.293	1.253	1.218	1.183	1.148	12.542	12.342	12.132	11.952	11.782
0	-17.8	1.297	1.257	1.222	1.187	1.152	12.516	12.316	12.106	11.926	11.756