

Semi-Annual Battery Inspection Report

ACME Banking

20 KVA UPS

5/13/03

Summary Information

We recommend that Cat-vents be installed. No other corrective action recommended at this time.

Report to: John Smith

Customer	Site
ACME Banking 325 Grand Blvd. New York NY, 12345 Contact: John Smith Phone: 555-555-5555	ACME Banking 325 Grand Blvd. New York NY, 12345 Contact: John Smith Phone: 555-555-5555

System ID: 20 KVA UPS

Site Contact(s): John Smith
Service Technician(s): Clyde Fairbanks, Gene McGirl

Inspection Type: Semi-Annual Battery Inspection
Inspection Date: 5/13/03

Battery Manufacturer: GNB
Battery Model: 90A09
Battery Rating: 350 Ah @ 8Hr. rate to 1.75vpc
Battery Type: VR-AGM
Battery Rack: EP-Stack
Module Orientation: Normal
Cell Labeling: Cell 1 Most Positive

Rectifier Type: 3Ø UPS
Number of UPS: 1
Number of Battery Strings: 1
Cells per String: 180
Total Number of cells: 180
Approx. Max String Current: 92.6 Amps - based on the UPS ratings.

Overcurrent Protection type: Breaker
Overcurrent Protection rating: 100 Amps

Charge State: Float
Ambient Temperature: 79 °F

Battery Manufacturers Recommended Values (@77°F)

Nom Cell Voltage:	2.25
Min Cell Voltage:	2.23
Max Cell Voltage:	2.27
Nom String Voltage:	405.00
Min String Voltage:	401.40
Max String Voltage:	408.60
Voltage Temp. Corr.:	.003
Nom Specific Gravity:	-
Specific Gravity Flag:	
Internal Ohmic Type:	Resistance
Nom Int. Ohmic Value:	689
Internal Ohmic Scale:	uOhms
Internal Ohmic Flag:	20 %
Max inter-cell drop:	30 mV
Max inter-tier drop:	100 mV
Inter-cell Baseline:	
Inter-tier Baseline:	

System Modeling Summary

Voltages compensated for ambient temperature.

	Nominal	Maximum	Minimum	Flagged High When	Flagged Low When	Flag Trigger
Ambient Temp.	77°F	80.0°F	65.0°F	> 80.0°F	< 65.0°F	> Maximum or < Minimum
String Vdc (79.0°F)	403.92 Vdc	407.52 Vdc	400.32 Vdc	> 407.52 Vdc	< 400.32 Vdc	> Maximum or < Minimum
Cell Vdc (79.0°F)	2.2440 Vdc	2.2640 Vdc	2.2240 Vdc	> 2.2640 Vdc	< 2.2240 Vdc	> Maximum or < Minimum
Internal Ohmic	689 uOhms	827 uOhms	n/a	> 827 uOhms	n/a	20% > Nominal
Specific Gravity	n/a	n/a	n/a	n/a	n/a	± Points from Nominal
Cell Temperature A	77.0°F	85.0°F	75.0°F	> 85.0°F	< 75.0°F	± 5°F from Average (80.0°F)
Cell Temperature B	77.0°F	84.0°F	74.0°F	> 84.0°F	< 74.0°F	± 5°F from Ambient (79.0°F)
Cell Temperature C	77.0°F	80.0°F	65.0°F	> 80.0°F	< 65.0°F	< or > Ambient Modeling
Inter-Cell Resistance	<= 324 uOhms	324 uOhms	n/a	> 324 uOhms	n/a	> Maximum
Inter-Tier Resistance	<= 1080 uOhms	1080 uOhms	n/a	> 1080 uOhms	n/a	> Maximum

Visual Inspection Information

	Evaluation	Comment
Safety Placards	ok	
Eye-wash/Shower	ok	
Ventilation	ok	
Fire Suppression	not ok	No fire extinguisher present.
Spill Containment	n/a	
Frame Ground	not ok	None.
Electrolyte Level	n/a	
Posts	ok	
Connections	ok	
Valves/Arrestors	ok	
Catalyst	n/a	
Rack/Cabinet	ok	
Covers	ok	
Jars	ok	
External Post Seals	ok	
Internal Post Seals	n/a	
Positive Plates	n/a	
Negative Plates	n/a	
Sediment	n/a	
Torque	ok	
Load Test	n/a	
Insulation Test	n/a	
Cell Pressure Test	n/a	
Thermography Test	n/a	

UPS Information

UPS ID	Spec. #	Manufacturer	Model	Serial Number	Rating	Meter Vdc	Meter Adc
UPS 1	UDC63020C25 DT03	Liebert	AP332	M11950F	20 Kva	405	.01

String Readings

String ID	Spec. #	Install Date	String Vac	P-Gnd Vac	N-Gnd Vac	String Aac	String Vdc	P-Gnd Vdc	N-Gnd Vdc	String Adc	P-Term R	N-Term R
String 1		10/99	.37	81.8	31.06	2.98	405	201.7	202.8	.40	na	na

Cell Readings

Internal cell ohmic values are shown in uOhms and were obtained using a Cellcorder meter. Internal cell ohmic values designated with 'OS' are off scale.

Cell temperatures were obtained at the negative post with an infrared thermometer.

Connection resistance readings are shown in uOhms. The connection resistance for a given cell represents the resistance of the connection between that cell and the next. A reading suffix of 'IT', 'IR', 'SH', or 'SW' indicates inter-tier connection cables (IT), inter-rack connection cables (IR), shunt equipped connections (SH), and switch equipped connections (SW).

Not all readings are applicable to all battery types or inspection types.

Cell Readings Summary

	Voltage	+ Electrode	- Electrode	uOhms	Gravity	Temperature	Inter-Cell R	IT/IR/SH/SW R
Average	2.25			577		80.0	54.1	229.0
Minimum	2.24			522		80.0	19.0	46.0
Maximum	2.28			647		80.0	63.0	776.0

String 1

Cell ID	Serial #	Date Code	Voltage	+ Elect.	- Elect.	uOhms	Gravity	Temp.	Rconn-A	Rconn-B	Rconn-C
1	KEB12A099	5/99	2.25			574		80	54		
2	KEB12A099	5/99	2.25			574		80	58		
3	KEB12A099	5/99	2.25			574		80	54		
4	KEB12A099	5/99	2.26			587		80	56		
5	KEB12A099	5/99	2.26			600		80	55		
6	KEB12A099	5/99	2.25			574		80	55		
7	KEB12A099	5/99	2.25			587		80	36		
8	KEB12A099	5/99	2.26			587		80	58		
9	KEB12A099	5/99	2.25			613		80	59		
10	KEB12A099	5/99	2.25			574		80	56		
11	KEB12A099	5/99	2.25			600		80	58		
12	KEB12A099	5/99	2.25			561		80	55		
13	KEB12A099	5/99	2.25			561		80	58		
14	KEB12A099	5/99	2.25			600		80	39		
15	KEB12A099	5/99	2.25			600		80	54		
16	KEB12A099	5/99	2.25			600		80	55		
17	KEB12A099	5/99	2.25			581		80	56		
18	KEB12A099	5/99	2.25			580		80	58		
19	KEB12A099	5/99	2.25			580		80	55		
20	KEB12A099	5/99	2.25			613		80	58		
21	KEB12A099	5/99	2.25			587		80	40		
22	KEB12A099	5/99	2.26			574		80	59		
23	KEB12A099	5/99	2.25			574		80	60		
24	KEB12A099	5/99	2.25			600		80	57		
25	KEB12A099	5/99	2.25			574		80	58		
26	KEB12A099	5/99	2.25			574		80	57		
27	KEB12A099	5/99	2.25			607		80	60		
28	KEB12A099	5/99	2.25			587		80	40		
29	KEB12A099	5/99	2.25			613		80	56		
30	KEB12A099	5/99	2.25			567		80	56		
31	KEB12A099	5/99	2.25			567		80	53		
32	KEB12A099	5/99	2.25			594		80	57		
33	KEB12A099	5/99	2.25			574		80	55		
34	KEB12A099	5/99	2.25			608		80	55		
35	KEB12A099	5/99	2.26			600		80	38		
36	KEB12A099	5/99	2.26			620		80	59		
37	KEB12A099	5/99	2.26			600		80	58		

Cell ID	Serial #	Date Code	Voltage	+ Elect.	- Elect.	uOhms	Gravity	Temp.	Rconn-A	Rconn-B	Rconn-C
38	KEB12A099	5/99	2.25			607		80	61		
39	KEB12A099	5/99	2.25			600		80	54		
40	KEB12A099	5/99	2.25			567		80	59		
41	KEB12A099	5/99	2.25			594		80	59		
42	KEB12A099	5/99	2.25			610		80	776 IT		
43	KEB12A099	5/99	2.25			548		80	54		
44	KEB12A099	5/99	2.25			633		80	56		
45	KEB12A099	5/99	2.26			574		80	57		
46	KEB12A099	5/99	2.25			548		80	55		
47	KEB12A099	5/99	2.25			561		80	58		
48	KEB12A099	5/99	2.25			548		80	56		
49	KEB12A099	5/99	2.26			626		80	38		
50	KEB12A099	5/99	2.25			574		80	61		
51	KEB12A099	5/99	2.25			575		80	63		
52	KEB12A099	5/99	2.25			581		80	57		
53	KEB12A099	5/99	2.25			594		80	56		
54	KEB12A099	5/99	2.25			554		80	57		
55	KEB12A099	5/99	2.25			620		80	60		
56	KEB12A099	5/99	2.24			567		80	42		
57	KEB12A099	5/99	2.25			580		80	56		
58	KEB12A099	5/99	2.25			580		80	56		
59	KEB12A099	5/99	2.25			555		80	58		
60	KEB12A099	5/99	2.25			561		80	55		
61	KEB12A099	5/99	2.25			608		80	56		
62	KEB12A099	5/99	2.25			647		80	54		
63	KEB12A099	5/99	2.25			587		80	37		
64	KEB12A099	5/99	2.25			607		80	59		
65	KEB12A099	5/99	2.25			607		80	60		
66	KEB12A099	5/99	2.25			548		80	61		
67	KEB12A099	5/99	2.25			541		80	60		
68	KEB12A099	5/99	2.25			594		80	59		
69	KEB12A099	5/99	2.24			580		80	63		
70	KEB12A099	5/99	2.25			594		80	38		
71	KEB12A099	5/99	2.24			568		80	55		
72	KEB12A099	5/99	2.25			607		80	60		
73	KEB12A099	5/99	2.27			522		80	57		
74	KEB12A099	5/99	2.25			574		80	58		
75	KEB12A099	5/99	2.25			561		80	56		
76	KEB12A099	5/99	2.25			574		80	56		
77	KEB12A099	5/99	2.25			613		80	36		
78	KEB12A099	5/99	2.25			580		80	59		
79	KEB12A099	5/99	2.25			600		80	56		
80	KEB12A099	5/99	2.25			561		80	58		
81	KEB12A099	5/99	2.25			541		80	61		
82	KEB12A099	5/99	2.24			555		80	58		
83	KEB12A099	5/99	2.25			594		80	59		
84	KEB12A099	5/99	2.25			581		80	46 IT		
85	KEB12A099	5/99	2.24			568		80	54		
86	KEB12A099	5/99	2.25			567		80	58		
87	KEB12A099	5/99	2.25			594		80	57		
88	KEB12A099	5/99	2.25			548		80	57		
89	KEB12A099	5/99	2.26			562		80	57		
90	KEB12A099	5/99	2.25			594		80	56		
91	KEB12A099	5/99	2.25			600		80	39		
92	KEB12A099	5/99	2.25			607		80	59		
93	KEB12A099	5/99	2.24			581		80	59		
94	KEB12A099	5/99	2.25			574		80	59		
95	KEB12A099	5/99	2.25			567		80	61		
96	KEB12A099	5/99	2.24			574		80	59		
97	KEB12A099	5/99	2.24			548		80	59		
98	KEB12A099	5/99	2.25			574		80	39		
99	KEB12A099	5/99	2.24			580		80	53		
100	KEB12A099	5/99	2.24			594		80	57		
101	KEB12A099	5/99	2.24			554		80	56		
102	KEB12A099	5/99	2.25			548		80	56		
103	KEB12A099	5/99	2.25			554		80	54		
104	KEB12A099	5/99	2.25			594		80	53		

Cell ID	Serial #	Date Code	Voltage	+ Elect.	- Elect.	uOhms	Gravity	Temp.	Rconn-A	Rconn-B	Rconn-C
105	KEB12A099	5/99	2.25			561		80	38		
106	KEB12A099	5/99	2.28			573		80	57		
107	KEB12A099	5/99	2.25			594		80	61		
108	KEB12A099	5/99	2.24			554		80	58		
109	KEB12A099	5/99	2.24			580		80	61		
110	KEB12A099	5/99	2.25			535		80	58		
111	KEB12A099	5/99	2.24			581		80	62		
112	KEB12A099	5/99	2.24			568		80	40		
113	KEB12A099	5/99	2.25			574		80	54		
114	KEB12A099	5/99	2.25			567		80	53		
115	KEB12A099	5/99	2.26			522		80	56		
116	KEB12A099	5/99	2.25			535		80	59		
117	KEB12A099	5/99	2.25			561		80	52		
118	KEB12A099	5/99	2.24			594		80	57		
119	KEB12A099	5/99	2.25			594		80	41		
120	KEB12A099	5/99	2.28			613		80	59		
121	KEB12A099	5/99	2.25			561		80	57		
122	KEB12A099	5/99	2.25			554		80	58		
123	KEB12A099	5/99	2.25			581		80	57		
124	KEB12A099	5/99	2.25			528		80	59		
125	KEB12A099	5/99	2.25			568		80	59		
126	KEB12A099	5/99	2.25			567		80	48 IT		
127	KEB12A099	5/99	2.25			567		80	55		
128	KEB12A099	5/99	2.25			594		80	58		
129	KEB12A099	5/99	2.25			574		80	57		
130	KEB12A099	5/99	2.25			574		80	56		
131	KEB12A099	5/99	2.25			574		80	58		
132	KEB12A099	5/99	2.26			541		80	53		
133	KEB12A099	5/99	2.25			570		80	41		
134	KEB12A099	5/99	2.25			621		80	60		
135	KEB12A099	5/99	2.25			561		80	61		
136	KEB12A099	5/99	2.25			548		80	57		
137	KEB12A099	5/99	2.25			535		80	59		
138	KEB12A099	5/99	2.24			580		80	57		
139	KEB12A099	5/99	2.24			562		80	59		
140	KEB12A099	5/99	2.25			561		80	40		
141	KEB12A099	5/99	2.26			561		80	58		
142	KEB12A099	5/99	2.24			607		80	56		
143	KEB12A099	5/99	2.25			548		80	55		
144	KEB12A099	5/99	2.24			554		80	58		
145	KEB12A099	5/99	2.25			587		80	56		
146	KEB12A099	5/99	2.25			561		80	58		
147	KEB12A099	5/99	2.25			613		80	39		
148	KEB12A099	5/99	2.25			633		80	60		
149	KEB12A099	5/99	2.24			567		80	59		
150	KEB12A099	5/99	2.25			541		80	58		
151	KEB12A099	5/99	2.25			535		80	60		
152	KEB12A099	5/99	2.25			574		80	57		
153	KEB12A099	5/99	2.25			574		80	59		
154	KEB12A099	5/99	2.26			574		80	39		
155	KEB12A099	5/99	2.26			554		80	58		
156	KEB12A099	5/99	2.25			587		80	57		
157	KEB12A099	5/99	2.25			535		80	56		
158	KEB12A099	5/99	2.25			548		80	56		
159	KEB12A099	5/99	2.25			548		80	56		
160	KEB12A099	5/99	2.25			561		80	56		
161	KEB12A099	5/99	2.25			626		80	39		
162	KEB12A099	5/99	2.25			600		80	56		
163	KEB12A099	5/99	2.25			594		80	60		
164	KEB12A099	5/99	2.25			567		80	59		
165	KEB12A099	5/99	2.25			567		80	60		
166	KEB12A099	5/99	2.25			561		80	59		
167	KEB12A099	5/99	2.25			581		80	62		
168	KEB12A099	5/99	2.25			594		80	59		
169	KEB12A099	5/99	2.24			567		80	40		
170	KEB12A099	5/99	2.25			567		80	41		
171	KEB12A099	5/99	2.25			580		80	40		

Cell ID	Serial #	Date Code	Voltage	+ Elect.	- Elect.	uOhms	Gravity	Temp.	Rconn-A	Rconn-B	Rconn-C
172	KEB12A099	5/99	2.24			581		80	41		
173	KEB12A099	5/99	2.25			567		80	41		
174	KEB12A099	5/99	2.24			580		80	46 IT		
175	KEB12A099	5/99	2.25			554		80	39		
176	KEB12A099	5/99	2.25			567		80	41		
177	KEB12A099	5/99	2.24			580		80	41		
178	KEB12A099	5/99	2.24			608		80	42		
179	KEB12A099	5/99	2.24			561		80	40		
180	KEB12A099	5/99	2.25			542		80	19		

Recommendations

VISUAL:

See 'Visual Inspection' section of this report.

COMMENT: Safety equipment requirements should be reviewed

COMMENT: Battery frames should be grounded.

COMMENT: Cell 88 had dried acid on the top side of the jar cover. Area was cleaned and neutralized. This cell passed pressure test.

CELL VOLTAGE:

String 1, Cells; 73, 106, 120.

COMMENT: Cell voltages are a slightly high but within acceptable tolerance. No corrective action is required at this time. Batteries should be monitored semi-annually.