ALPHA BATTERIES - CONDUCTANCE REFERENCE NOS.

DEEP CYCLE SERIES	Siemens/Mhos
DCS-33	725
DCS-50SAE	850
DCS-75BT	1200
DCS-100L	1400
UPS—HIGH RATE SERIES (AGM)	
UPS12-100	600
UPS12-140	950
UPS12-170	980
UPS12-200	1100
UPS12-270	1375
UPS12-310	1750
UPS12-370	1850
UPS12-475	2000
UPS6-620	4200
UPS-FLAME RETARDANT HIGH RATE SERIES	
UPS12-100FR	600
UPS12-140FR	950
UPS12-170FR	980
UPS12-270FR	1375
UPS12-310FR	1750
UPS12-370FR	1850
UPS12-475FR	2000
UPS6-620FR	4200
MPS PRODUCTS (AGM)	
MPS12-33	800
MPS12-50	980
MPS12-75	1200
MPS12-88	1300
MPS12-100	1400
TELECOMM—LONG DURATION SERIES (AGM)	
TEL12-125	2000
TEL12-30	800
TEL12-30/SLC	800
TEL12-45	900
TEL12-45/SLC	900
TEL12-70	1125
TEL12-80	1325
TEL12-90	1590
TEL12-105F	1325
TEL6-180	
ALPHACELL	
85GXL	600
165GXL	1000
180GXL/190 Gold-HP	1100
160A	1300
210GXL/215 Gold-HP	1200

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QS-9000 CERTIFIED

P/N: DM-3200 AT

Digital Midtron

Quick Reference Guide

Model: DM-3200 AT

SPECIFICATIONS

- **This test set is designed to take conductance measurements exclusively on 6 and 12 Volt Lead/Acid batteries while either on line (float service) or off line**

- Operating range:
  Voltage: 5.5V – 15.0V DC
  Amp Hour Range: approx. 5 Ah to 450 Ah,
- Conductance: 0 – 3,200 Siemens
- Test results: DC Voltage and Conductance (expressed in Siemens) will be stored in internal memory after each test until the next measurement. By depressing the “Review” key, the last test result will be displayed for 15 seconds to allow time to manually record the test information
- Accuracy: +/- 2% across test range
- Voltmeter resolution: +/- 20 mV DC
- Calibration: Auto-calibration each test; no calibration required
- Power requirements: Unit is powered by the battery under test; one replaceable 9V alkaline battery used to power the display
- Operating Temperature range: 0º C to +40º C, 95% relative humidity, non-condensing
- Storage Temperature Range: -29º C to + 70º C, 95% relative humidity, non-condensing
- Over Voltage Protection: Fused protected to 60 V DC
- Fuse Specifications: 5mm x 20mm 1.25 Amp fuse
- Reverse Polarity Protection: Diode protected
- Test cables: Interchangeable interface. One standard #C065 DuraProbe cable set and spare probe tips provided with each tester – other interfaces available from Alpha.

BATTERY TESTING AND OPERATION

Automatic Battery Testing
The Digital Midtron Analyzer requires no setup or calibration. Each unit is shipped with the DuraProbe cable pre-installed and ready to test.

The Analyzer must have good contact with both the positive and negative battery posts before it will begin to process the test. The unit will then automatically begin upon the establishment of a good connection.

(Continued on next page.)

BATTERY TESTING AND OPERATION, *(CONTINUED)*

Low Battery Voltage Message
If the battery being tested has a voltage under the appropriate specified limit (6.3 V or 12.6 V), the test set will sound a dual audible beep after completing the test indicating a low test voltage. If the battery being tested has a voltage below 5.5 V or 11.5 V, as appropriate, a "Low Voltage" error message will be displayed and the unit will not test. This indicates that the subject battery's state of charge is too low to be tested or has some other internal fault condition, which will prohibit a valid test result.

Battery Test Results
Each test takes less than 10 seconds, and the test result is held in memory until the next test is completed. Each subsequent test overwrites the previous test result. **Always record and report each test result per operating procedures. If any test results are suspect, simply re-test as many times as needed to verify the result.**

CONDUCTANCE AND BATTERY STATE OF HEALTH

All batteries have an electrical signature or "Reference Conductance Value" which can be associated with a Model Number. Reference Conductance Values may or may not be provided by the battery manufacturers. In general, higher measured conductance equals higher typical battery discharge performance.

Batteries will age and wear out when placed in normal float service. Issues affecting the actual battery life include the number and depth of battery discharge cycles, the float charge condition, and any sustained high temperature operation. Deviations from manufacturers' recommendations will cause both the battery capacity and measured conductance to decline. When battery conductance has dropped by 30% to 40% from initial installed value or from a valid reference value, it is likely that the cell is below acceptable service condition.
Example:

- Measured Conductance in three stages of battery life

New Battery	Marginal Battery	Typical Failure
1000 Siemens	>700 Siemens	<550 Siemens

Each user must determine the exact battery failure and replacement criteria based on guidelines consistent with company approved business objectives and battery manufacturers' instructions.

Developing a Reference Conductance Value
If test history or an established battery reference value are unavailable, one can easily be developed. Simply test a representative number (30 or more are recommended) of healthy new batteries, fully charged and on-line in float service.

While some variance can be expected, typical values among VRLA batteries are:

- New cells - - - 10% deviation (±5% from population average)
- Mid-service - - 20% deviation (±10% from population average)
- Failed cells - - 30% deviation (30% or more below cell average)

Test Probe Placement
Test probe placement is CRITICAL and will affect measured results. The Digital Midtron Analyzer is a sensitive electrical instrument and placing the test probes on battery connectors, bolts, washers or other hardware may cause false test results. ***We recommend that test probes always be placed directly on the lead battery posts for the most consistent test results.*** A **"Check Connection"** message is an indication of poor battery contact. Move the probes to a better angle and press firmly with both leads to break any surface oxidation and complete the test circuit with all four contacts. Good electrical contact is required for proper test set operation.

Battery Temperature
Battery temperature will affect measured battery conductance. Never condemn a battery without verifying that the low measurement is not temperature related. Cold batteries will not provide their rated power and this factor should be considered when provisioning battery installations.

Temperature Compensation
A digital Infrared Temperature sensor is available (Alpha pn# 189-048-10) to quickly measure battery temperature. This allows the operator to compensate for cold battery performance by simple application of the following conversion formula to the Conductance Reference Value:

Battery Temperature	*Multiply%Ref. Value by*
35 °C (95 °F) or warmer	0.930
30 °C (86 °F)	0.965
25 °C (77 °F)	1.000
20 °C (68 °F)	1.035
15 °C (59 °F)	1.070
10 °C (50 °F)	1.105
5 °C (41 °F)	1.140
0 °C (32 °F) or colder	1.175

Example: For testing against a Reference Value of 1100 Siemens:

If the battery temperature measures 77 °F, no compensation is used. The battery should be measured against 1100.
If it measures 50 °F, simply apply the following compensation formula: 1100 ÷ 1.105 (T-Comp Formula) = 995 Siemens. A battery that measures at least 995 Siemens, or 90% of reference value, still has 100% relative conductance, and the reduced test value should be expected.

Compensation should only be used with batteries between 32°F to 95°F for reliable results.

Off-Line Testing - Testing Before Installation

1. If the batteries are new and healthy, Alpha recommends that they should all test within 20% of each other (+/- 10% of the average).
2. The Analyzer will also display open circuit voltage. This allows the operator to remove any battery that is not in a full state of charge for charging/further testing. Variances in state of charge will cause variance in the conductance measurements.
3. Test all batteries to be installed against a known reference value.
4. Retest any batteries outside of +/- 10% of the average