



Our experience shows that the key factor in achieving optimum performance and long life is a solid battery care and maintenance program. Following the simple procedures we've described is sure to provide the biggest returns on your battery investment. **Equipment:** AML recommends the following basic equipment for use in battery care and maintenance.

- Wrench
- Post Cleaner
- Distilled Water
- Baking Soda
- Voltmeter
- Petroleum Jelly
- Hydrometer
- Goggles and Gloves

CAUTION: Always wear protective clothing, gloves, and goggles when handling batteries & electrolyte.

Inspection:

1. Examine the outside appearance of the battery. - Look for cracks in the container. - The top of the battery, posts and connections should be free of dirt, fluids and corrosion. (If batteries are dirty, see Cleaning section.)
2. Any fluids on or around the battery may indicate that electrolyte is spilling, leaching or leaking out. - Leaking batteries must be replaced.
3. Check all battery cables and connections. - Look closely for loose or damaged parts. - Replace any cable that is broken or frayed.
4. Tighten all wiring connections to the proper specifications (see below). Be sure there is good contact with the terminals.

WARNING: Do not over-tighten terminals. Over-tightening can result in the post breakage, post meltdown or fire.

Proper Torque Values for Connection Hardware

- Flooded **65 to 75** in-lbs
- Gel or AGM **90 to 100** in-lbs

Specific Gravity Testing : (Flooded batteries only)

1. Do not add water yet.
2. Fill and drain the hydrometer 2-4 times before drawing a sample from the battery.
3. Have enough sample electrolyte in the hydrometer to completely support the float.
4. Take a reading, record it and return the electrolyte to the cell.
5. Check all cells in the battery, repeating the steps above.
6. Replace vent caps and wipe off any electrolyte that might have been spilled.
7. Correct the readings to **80° F** - Add **.004** to the readings for every **10°** above **80° F**. - Subtract **.004** for every **10°** below **80° F**.
8. Check the state of charge using the Table listed below. The readings should be at or above the factory specification of **1.277 +/- .007**. If any specific gravity reading registers low, follow these steps:
 1. Check and record voltage level(s).
 2. Put batteries on a complete charges.
 3. Take specific gravity readings again. If any specific gravity reading still registers low, follow these steps:
 1. Check voltage level(s).
 2. Perform equalization charge.
 3. Take specific gravity readings again.

Open-Circuit Voltage Testing:

For accurate voltage readings, batteries must remain idle (no charging, no discharging) for at least 6 hours and preferably 24 hours.

1. Disconnect all loads from the batteries.
2. Measure the voltage with a DC voltmeter.
3. Correct the reading to **80° F**. - Add **.028/cell** for every **10°** above **80° F**. - Subtract **.028/cell** for every **10°** below **80° F**.
4. Check the state of charge with the Table below.
5. Charge the battery if it register **0-70%** charged. If battery registers below Table values these conditions may exist:
 1. The battery was left in a state of discharge too long.
 2. The battery has a bad cell. Batteries in these conditions should be taken to a specialist for further evaluation, or retired from service.

PERCENTAGE OF CHARGE	SPECIFIC GRAVITY CORRECTED TO 80° F	OPEN-CIRCUIT VOLTAGE	
		6 VOLT	12 VOLT
100	1.277	6.37	12.73
90	1.258	6.31	12.62
80	1.238	6.25	12.50
70	1.217	6.19	12.37
60	1.195	6.12	12.24
50	1.172	6.05	12.10
40	1.148	5.98	11.96
30	1.124	5.91	11.81
20	1.098	5.83	11.66
10	1.073	5.75	11.51

Watering: (Flooded batteries only)

Water should always be added after fully charging the battery. Prior to charging, there should be enough water to cover the plates. If the battery has been discharged (partially or fully), the water level should also be above the plates.

Important things to remember:

1. Do not let plates get exposed to air.
2. Do not fill the water all the way up to the cap.
3. Do not use water with a high mineral content.
4. Use only distilled or deionized water.

CAUTION: The electrolyte is a solution of acid and water, so skin contact should be avoided.

Procedure:

1. Open the vent caps and check the electrolyte level: the minimum level is to the top of the plates.
2. If there is no water visible, add just enough to cover the plates.
3. Put batteries on a complete charge before adding any more water (see charging section).
4. Once charging is completed, open the vent caps and check the electrolyte level.
5. **Add water until the electrolyte level is 1/8" below the bottom of the fill well.**
6. Clean, replace, and tighten all vent caps.

WARNING: Never add acid to a battery.

Cleaning:

1. Check that all vent caps are tight.
2. Clean the battery top with a cloth or brush and a solution of baking soda and water. - Do not allow any cleaning solution, or other foreign matter to get inside the battery.
3. Rinse with water and dry with a clean cloth.
4. Clean battery terminal and the inside of cable clamps with a post and clamp cleaner.
5. Reconnect the clamps to the terminals and thinly coat them with petroleum jelly.
6. Keep the area around batteries clean and dry.

Storage - Important things to avoid:

1. Freezing - Avoid locations where freezing temperature is expected. Keeping battery at a high state of charge will also prevent freezing.
2. Heat - Avoid direct exposure to heat sources, such as radiators or space heaters. Temperatures above **80° F** accelerate the battery's self-discharge characteristics.

Procedure:

1. Completely charge the battery before storing.
2. Store the battery in a cool, dry location, protected from the elements.
3. During storage, monitor the specific gravity (flooded) or voltage. Stored batteries should be given a boost charge when they show a **70%** charge or less.
4. Completely charge the battery before re-activating.

Charging - Correctly charging batteries requires administering the right amount of current at the right voltage. Most charging equipment automatically regulates these values. Some chargers allow the user to set these values. For proper charging, refer to the instructions that came with your charging equipment. **Important things to remember:**

1. Become familiar with and follow the instructions from the charger manufacturer.
2. Batteries should be charged after each period of use.
3. Lead acid batteries do not develop a memory and need not be fully discharged before recharging.
4. Charge only in well-ventilated areas. Keep sparks or flames away from a charging battery.
5. Verify charger voltage settings are correct.
6. Check water level.
7. Tighten all vent caps before charging.
8. Do not overcharge or undercharge the batteries.
9. Never charge a frozen battery.
10. Avoid charging at temperatures above **120° F**.